A Consultancy Report

On

Assessment of Capacitor Requirement In Northern Region For Year 2019-20

Client Ref. No.: W.O. vide: NRPC/OPR/104/5/2018/5990 dated 18/05/2018
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1.0 Introduction

With reference to the letter NRPC/OPR/104/5/2018/5990 dated 18/05/2018, Northern Region Power Committee (NRPC) has utilized the services of Power Systems Division (PSD) of Central Power Research Institute (CPRI) for carrying out the Capacitor Bank requirement for the Northern region of Indian Grid for Year 2019-20. Northern region consists of Uttar Pradesh, Rajasthan, Haryana, Punjab, Delhi, Uttarakhand, Himachal Pradesh, Chandigarh, Jammu & Kashmir(UT) and Ladakh (UT).

As per the provided data by NRPC, in 2018 total demand of the northern region was 61707.7 MW against available power generation of 47090.2 MW as of 11.07.2018 00:45 HRS. It is also observed that the voltage profile of a few buses of the Northern region is low and varying in the range of 0.85 to 0.97 p.u, especially in the state of Punjab, Haryana, U.P and Rajasthan. This low voltage profile of state utilities results in a high drawl of reactive power over interstate transmission lines (ISTS) and inter-regional power transmission lines of Central utility. It also stresses generating units to supply their dynamic reactive power support for voltage control.

The transportation of reactive power over long ISTS/Interregional links/Generating units may result in artificial loading of power systems and resulting in more losses and a fall in system efficiency.

In this context, a study has been carried out on the scenario of 11 July 2018 at 00:45 Hrs for recommending the required capacitor bank for the year 2019-20 at 66 kV & above substations of the NR state utilities. The main objectives of this study are :

1. Identification of minimum no. of Capacitor banks at the most sensitive location for Voltage improvement in the state utilities
2. To minimize the reactive power exchange on inter-regional / interstate transmission lines to avoid artificial loading on Power systems due to transportation of reactive power.

The provided data for each state utility(Mentioned as Base Case in this report) has been reviewed for its correctness in active and reactive power flow, voltage profile, and no. of shunt capacitor banks. The results of the base case power flow have been shared with NRPC for verification.

The scope of work is confined to the transmission network of the voltage level at 66kV/132kV and above. Therefore, the capacitor bank's requirement for voltage improvement will only be identified at 220/132 /66 kV buses modeled in provided base case PSSE. NRPC has requested CPRI to devise a thumb rule for translating identified capacitor banks at 220/132/66 kV to distribution voltage levels.

2.0 Modelling of Base Case

Base case has been modelled by NRLDC and was supplied to CPRI through NRPC Secretariat. It is to highlight that base case has been modelled up to transmission level only (132kV/66kV). Therefore, modelling of existing capacitors has been done at 132/66 kV only. Although, effect of any downstream capacitor is already reflected in reactive power load values (Qload).

2.1 Voltage Profile in Northern Region

The provided base case PSS/E file has been reviewed, and the state-wise node summary for voltage profile has been listed in Table 1 below. It is observed that most of the bus voltage varies between 0.98 to 1.00 p.u, and these buses are called here as regular buses. There are good no. of buses whose voltage is below 0.98 and classified as low voltage buses. There are a few buses at 220 kV and above where the bus voltage is more than 1.05 %, violating the IEGC voltage limits. No. of buses identified for capacitor placement are also listed in the last column of this Table1. These identified buses are minimal, and hardly 35 % of low voltage buses. The methodology for identifying these optimal locations is listed in the later section of this report.

Table 1. Summary of Nodes identified for compensation from base case PSSE file - Northern grid.

State	Total No of buses in State	Voltage kV	Total No of Buses	No. of buses (V<0.98)	No. of buses (V>0.98)	No. of buses (V>1.05)	New Recommended Location
UTTARPRADESH	821	765	11	0	11	0	0
		400	48	0	45	3	0
		220	170	2	168	0	0
		132	590	89	501	0	40
		66	0	0	0	0	0
		33	2	0	2	0	0
		Total	821	**91**	727	3	**40**
RAJASTHAN	731	765	2	0	0	2	0
		400	28	0	14	14	0
		220	156	5	151	0	0
		132	544	132	404	8	53
		66	0	0	0	0	0
		33	1	0	1	0	0
		Total	731	**137**	570	24	**53**
HARYANA	382	400	11	0	11	0	0

		220	95	30	65	0	0
		132	241	187	54	0	60
		66	29	11	18	0	4
		33	6	0	6	0	0
		Total	382	**228**	154	0	**64**
PUNJAB	334	400	8	0	8	0	0
		220	123	36	87	0	2
		132	115	61	54	0	21
		66	88	59	29	0	40
		33	0	0	0	0	0
		Total	334	**156**	178	0	**63**
UTTRAKHAND	82	400	3	0	3	0	0
		220	22	1	21	0	0
		132	57	42	15	0	15
		66	0	0	0	0	0
		33	0	0	0	0	0
		Total	82	**43**	40	0	**15**
HIMACHAL PRADESH	54	400	3	0	3	0	0
		220	17	1	16	0	0
		132	30	7	23	0	2
		66	3	0	3	0	0
		33	1	1	0	0	0
		Total	54	**9**	45	0	**2**
DELHI	97	400	5	0	5	0	0
		220	49	10	39	0	0
		132	0	0	0	0	0
		66	25	6	19	0	2
		33	18	8	10	0	4
		Total	97	**24**	73	0	**6**
JAMMU & KASHMIR	56	400	2	0	0	2	0
		220	9	0	8	1	0
		132	45	2	43	0	1
		66	0	0	0	0	0
		33	0	0	0	0	0
		Total	56	**2**	51	3	**1**
CHANDIGARH	15	220	1	**1**	0	0	0
		66	14	**14**	0	0	3
		Total	15	**15**	0	0	**3**

2.2 Base case load flow results

The power flow results in the northern region's active and reactive power flow concerning different transmission & Generating State utilities & Central utilities have been listed in Table.2 below. It consists of various power systems elements that contribute to the generation/absorption of the active & reactive power in the northern region of the national grid. The transformer, lines reactance, shunt reactors, and load are the primary sink for reactive power. Generating stations, line/cable charging, and shunt capacitor bank are the source of reactive power. The total power demand in the northern region is 61707.7 MW and 16463.7 MVAr. The active power demand is met from NR Generation and imported from the neighboring areas. The NR Generation is 47090.2 MW, and the import is 16462.7 MW. The active power loss in NR region is of quantity of 1845.2 MW.

Active Power Loss is given as :

Active Power Generation in NR + Active Power Import(- supply/+absorb) - Active Power Load=Active Power Loss.

The Reactive Network Demand is given as:

Generating Units(+supply/-absorb)+line Charging(+ cap) - Line shunt(+ ind) + Shunt Cap((+cap/-ind)+ Reactive Power Import(-supply/+absorb) - Reactive Power Load = Reactive Network Demand.

Table 2. Summary of load flow for base case PSSE file - Northern grid

Utility	Generation		Load		Net Operational Shunt Capacitor (+cap/ -ind)	Line Absorption (Inductive)	Line Charging (capacitive)	Active Power Losses	Reactive Network Demand	Tie-Line Flow (-import/+export)	
	P	Q	P	Q	Q	Q	Q	P	Q	P	Q
	MW	MVAR	MW	MVAR	MVAR	MVAR	MVAR	MW	MVAR	MW	MVAR
PUNJAB	5295.4	653.9	11297.1	2515.1	371.2	96.4	2422.3	209.4	2796.2	-6211.1	-1960.3
HARYANA	2504	105.7	10255	2508.2	0	97	1676.8	126.7	1854.5	-7877.7	-2677.1
RAJASTHAN	7435.9	-310.8	10300.1	3385.5	-106.7	3609.9	11289.2	259.4	2226	-3123.6	1650.3
DELHI	1274	-36.9	6160	278	0	0	590	34	989.3	-4920	-714.2
UTTARPRA	9946.6	-851.1	19120.3	6296.3	2305.4	2849	10386.6	465.8	4438.1	-9640	-1742.4
UTTARAKH	1009.9	-168.3	1751.5	575.7	-75.3	0	659.1	44.2	289.3	-785.8	-449.5
HIMACHAL	939	-8.5	809.3	266	0	0	251.8	19.7	103.6	110.1	-126.3
JAMUKASH	858.7	-27.6	1556	511.4	0	0	193.2	9.6	123.1	-706.9	-468.9
CHANDIGA	0	0	320	91.9	0	0	3.2	2.2	38.1	-322.2	-126.7
NR_ISTS_PUN	0	0	0	0	-824.1	1115.9	3579.3	32.5	382.6	-32.5	1256.8

NR_ISTS_HAR	0	0	0	0	658.8	1688.3	4503.9	129.2	3036.1	-129.2	438.3
NR_ISTS_RAJ	0	0	0	0	-1431.1	4150.5	5978.6	27.3	346.7	-27.3	50.2
NR_ISTS_DEL	0	0	0	0	0	961.4	1764.1	10.7	261.1	-10.7	541.6
NR_ISTS_UP	0	0	19.5	6.4	-2441	12396	25654.3	231.3	5723.9	-250.8	5086.9
NR_ISTS_UTT	0	0	0	0	0	0	413.4	2.3	39.5	-2.3	373.9
NR_ISTS_HP	0	0	0	0	-80	146.5	838.2	21	178.3	-21	433.3
NR_ISTS_JK	0	0	0	0	-460.3	102.7	1618.8	12.6	143.1	-12.6	912.6
RAILWAYS	0	0	0	0	0	0	0	0	0	0	0
NRIST-BB	0	0	0	0	0	0	451.2	19.7	149.4	-19.7	301.9
NR_ISTS	0	0	0	0	1186.3	97.1	210.9	134.9	2185	-134.9	-884.9
Cumulative ISTS	**0**	**0**	**19.5**	**6.4**	**-3391.4**	**20658.4**	**45012.7**	**621.5**	**12445.7**	**-641**	**8510.6**
SINGRAUL	1160	-46.5	0	0	-48.3	123.1	309.8	5.6	62.5	1154.4	29.4
RIHAND-G	1922	-35.9	0	0	-77	0	0	0	0	1922	-112.9
DADRI_C	708	-6.3	0	0	0	0	0	2	40.2	706	-46.4
DADR-NCR	940	-98.6	0	0	-59.6	0	280.3	2.9	32.3	937.1	89.8
UNCHAHAR	724	-104.3	0	0	0	0	119.9	7.1	37.3	716.9	-21.7
IGSTPS	1122	-65.9	0	0	0	0	0	0	0	1122	-65.9
SHRE_CEM	150	0	0	0	-80.9	100.6	157.4	1.3	14.4	148.7	-38.4
DADRI-G	230	-85.4	0	0	0	0	0	0.4	7.4	229.6	-92.8
ANTA	0	0	0	0	0	0	128.3	2.8	15.4	-2.8	112.9
AURAIYA	107.9	-33.4	26.5	8.7	0	0	55.1	0.8	4.3	80.6	8.7
NAPS	402.6	-132	0	0	0	0	4.7	0.1	0.3	402.5	-127.6
RAPS-B	402.6	12.3	0	0	0	0	45.3	2	10.8	400.6	46.8
RAPS-C	402.6	4.5	0	0	-124.1	142	356.3	2.2	24.4	400.4	70.3
CHAMER-1	540	45.3	0	0	0	0	22.1	0	0	540	67.4
CHAMER-2	285	-60	0	0	0	0	0	0	0	285	-60
CHAMER-3	230	-61	0	0	0	0	75	0.1	0.8	229.9	13.2
BAIRASIU	111	9.3	0	0	0	0	0	0	0	111	9.3
SALAL	690	0	0	0	0	0	36.6	3.2	16.8	686.8	19.7
TANAKPUR	81	-28.3	0	0	0	0	0	0.1	2.1	80.9	-30.4
URI-1	480	0	0	0	0	0	0	0	0	480	0
URI-2	240	0	0	0	0	0	72.4	0.8	8.4	239.2	64
DHAULIGA	279	-59.9	0	0	0	19.5	49.6	2.9	32.6	276.1	-62.3
DULHASTI	329	0	0	0	0	0	0	0	0	329	0
SEWA-II	133	-36	0	0	0	0	1.4	0.3	0.8	132.7	-35.4
JHAKRI	1620	-107	0	0	-78.5	0	0	0	0	1620	-185.4
RAMPUR HEP	414	-6.4	0	0	0	0	29.9	0.5	6.9	413.5	16.6
TEHRI	610	-71.3	0	0	0	0	35.5	0.3	7.1	609.7	-42.9
KOTESWAR	90	-30	0	0	0	0	3	0	0	90	-27
BHAKRA	555	179	92.5	20.6	9.2	0	1	0.6	22.4	461.9	146.3
DEHAR	560	49.4	0	0	-118.9	0	0.2	1	20.7	559	-90

PONG	150	-13.8	0	0	0	0	41.6	2.2	11.6	147.8	16.2
ADHYDRO	150	14.2	0	0	0	0	24.8	2.3	11.9	147.7	27.1
KARCHAMW	1000	10.3	0	0	0	0	324.7	10.7	184.2	989.3	150.9
BUDHIL	70	-21	0	0	0	0	0	0	0	70	-21
KOLDAM	768	139.9	0	0	-78.5	0	36.9	0.1	1	767.9	97.3
PARBATI-3	0	0	0	0	0	0	9.4	0	0	0	9.4
PARBATI-2	0	0	0	0	0	0	0.6	0	0	0	0.6
KISHANGANGA	170	0	0	0	0	0	0	0	0	170	0
ROSA	0	0	0	0	0	0	0	0	0	0	0
BHADLA SOLAR	0	0	0	0	0	0	16.4	0	0	0	16.4
Cumulative ISGS	**17826.7**	**-638.8**	**119**	**29.3**	**-656.6**	**385.2**	**2238.2**	**52.3**	**576.6**	**17655.4**	**-47.8**
Total	**47090.2**	**-1282.4**	**61707.8**	**16463.8**	**-1553.4**	**27695.9**	**74723.1**	**1844.8**	**25880.5**	**-16462.8**	**1847.7**

In the base file, the reactive load is 16463.8 MVAr, Line shunt absorption of 27696 MVAr, net shunt reactor 1553.3 MVAr, and reactive demand is 25880.5 MVAr. The line charging contribution is 74723.1 MVAr, reactive export is 1847.6 MVAr. The difference reactive power is absorbed by generating units equal to 1282.1 MVAr. The units for P and Q are in MW and MVAr, respectively.

2.3 Interstate tie line flows:

The Exchange of active and reactive power among different power transmission & generation utilities in the northern grid is mentioned in Table 3. From Table 3, it is seen that all STU imports reactive power except Rajasthan. Major importers of reactive power are Haryana (2677.2 MVAr), Punjab (1960.5 MVAr), and UP (1742 MVAr). Details of active & reactive power import/export for other states are listed in Table.3.

Table.3 Base case CTU/STU Power flow exchange in Northern Grid

FROM	TO	P(MW) (- import/+export)	Q(MVAR) (- import/+export)
PUNJAB	1002 HARYANA	93.5	13.2
	1007 HIMACHAL	-30.7	60
	1008 JAMUKASH	-312.4	-11.7
	1009 CHANDIGA	96.1	31.9
	1020 NR-ISTS-PUN	-4691.9	-1668.9
	1021 NR_ISTS_HAR	-0.2	25
	1026 NR-ISTS-HP	-261.1	-72.9
	1027 NR-ISTS-JK	-241.9	-34.3

	1041 NR-ISTS-BB	-514	-320.1
	1050 NR-ISTS	90.6	3
	1215 BHAKRA	-212.8	-26.4
	1216 DEHAR	-74.5	71
	1217 PONG	-151.7	-30.3
	Total	**-6211**	**-1960.5**
FROM	**TO**	**P(MW) (- import/+export)**	**Q(MVAR) (- import/+export)**
HARYANA	1001 PUNJAB	-93.5	-13.2
	1003 RAJASTHA	-11.6	-5.4
	1004 DELHI	212.8	-63.4
	1007 HIMACHAL	-76.4	-14.5
	1009 CHANDIGA	14.6	4.8
	1021 NR_ISTS_HAR	-4374.2	-1822.8
	1022 NR_ISTS_RAJ	69.4	-148.2
	1041 NRIST-BB	-1579.1	-642.7
	1050 NR_ISTS	-1508.90	-17.2
	1105 IGSTPS	-530.7	45.4
	Total	**-7877.6**	**-2677.2**
FROM	**TO**	**P(MW) (- import/+export)**	**Q(MVAR) (- import/+export)**
RAJASTAN	1002 HARYANA	11.6	5.4
	1004 DELHI	-4.7	-10
	1005 UTTARPRA	-174.3	-19.3
	1021 NR_ISTS_HAR	1175	7.2
	1022 NR_ISTS_RAJ	-1463.7	616.1
	1024 NR_ISTS_UP	-253.7	216.9
	1041 NRIST-BB	-17.5	40.1
	1050 NR_ISTS	-22	268.2
	1106 SHRE_CEM	-260.6	71.7
	1151 ANTA	-84.7	-102.4
	1155 RAPS-B	-313	-57.3
	1156 RAPS-C	-246.3	32
	3014 MP	15.2	12
	3035 WR_ISTS_MP	-1484.9	569.7
	Total	**-3123.60**	**1650.30**
FROM	**TO**	**P(MW) (- import/+export)**	**Q(MVAr) (-import/+export)**
DELHI	1002 HARYANA	-212.8	63.4
	1003 RAJASTHA	4.7	10
	1005 UTTARPRA	152.4	84.8
	1021 NR_ISTS_HAR	-331.6	-128.7
	1023 NR_ISTS_DEL	-3369.5	-700.8
	1041 NRIST-BB	-16.4	43.5

	1103 DADR-NCR	-555.5	-106.9
	1105 IGSTPS	-591.3	20.4
	Total	**-4920**	**-714.3**
FROM	**TO**	**P(MW) (- import/+export)**	**Q(MVAR) (- import/+export)**
UTTAR-PRADESH	1003 RAJASTHA	174.3	19.3
	1004 DELHI	-152.4	-84.8
	1006 UTTARAKH	-268.2	197
	1021 NR_ISTS_HAR	432.3	17
	1023 NR_ISTS_DEL	721.6	-142.7
	1024 NR_ISTS_UP	-8976.7	-1959.6
	1025 NR_ISTS_UTT	79.7	-15.7
	1050 NR_ISTS	-786.3	-68.6
	1100 SINGRAUL	-163.4	-8.3
	1103 DADR-NCR	-71.3	80.4
	1104 UNCHAHAR	-92.3	90.5
	1152 AURAIYA	-73.8	-33.1
	1153 NAPS	-402.5	127.6
	1205 TANAKPUR	10.5	26.4
	1208 DHAULIGA	-101.7	28.8
	2002 JHARKHAND	63.5	-28.8
	2051 ER_ISTS_BIH	-33.3	12.2
	Total	**-9640**	**-1742.4**
FROM	**TO**	**P(MW) (- import/+export)**	**Q(MVAR) (- import/+export)**
UTTARKHAND	1005 UTTARPRA	268.2	-197
	1007 HIMACHAL	19.9	15.1
	1024 NR_ISTS_UP	-411	-75.3
	1025 NR_ISTS_UTT	-276.2	-98.8
	1050 NR_ISTS	-212.3	-127.1
	1208 DHAULIGA	-174.4	33.6
	Total	**-785.8**	**-449.5**
FROM	**TO**	**P(MW) (- import/+export)**	**Q(MVAR) (- import/+export)**
HIMACHAL PRADESH	1001 PUNJAB	30.7	-60
	1002 HARYANA	76.4	14.5
	1006 UTTARAKH	-19.9	-15.1
	1020 NR-ISTS-PUN	59.2	39
	1026 NR-ISTS-HP	-279.4	-85.7
	1203 BAIRASIU	-55.9	-6.3
	1216 DEHAR	-50.7	11.7
	1217 PONG	53.6	10.2
	1218 ADHYDRO	-54	-13.4
	1219 KARCHAMW	306.1	-6.3

	1222 PARBATI-3	20.6	-7.7
	1223 PARBATI-2	23.3	-7.3
	Total	**110**	**-126.4**
FROM	**TO**	**P(MW) (- import/+export)**	**Q(MVAR) (- import/+export)**
JAMMU & KASHMIR	1001 PUNJAB	312.4	11.7
	1027 NR_ISTS_JK	-141.9	-310.2
	1050 NR_ISTS	-631.6	-193.5
	1210 SEWA-II	-132.7	35.4
	1225 KISHANGANGA	-113.2	-12.3
	Total	**-707**	**-468.9**
FROM	**TO**	**P(MW) (- import/+export)**	**Q(MVAR) (- import/+export)**
CHANDIGARH	1001 PUNJAB	-96.1	-31.9
	1002 HARYANA	-14.6	-4.8
	1026 NR_ISTS_HP	-211.4	-90
	Total	**-322.1**	**-126.7**

2.4 Inter-regional flows:

The cumulative export of reactive power to other regions is 1847.5 MVAr, and the breakup of active and reactive power exchange is listed in Table 4.

Table 4. Base case Inter- regional power import

FROM AREA	TO AREA	P(MW) (- import/+export)	Q(MVAR) (-import/+export)
UP (1005)	ER_ISTS_BIH (2051)	-33.3	12.2
AURAIYA (1152)	MP (3014)	22.1	19.8
NR_ISTS (1050)	GUJARAT (3013)	-2005.7	-987.8
NR_ISTS_RAJ (1022)	GUJARAT (3013)	211.4	94.7
RAJASTHAN (1003)	MP (3014)	15.2	12
RAJASTHAN (1003)	WR_ISTS_MP (3035)	-1484.9	569.7
NR_ISTS_UP (1024)	WR_ISTS_MP (3035)	-6199.6	1101.3
NR_ISTS_UP (1024)	PGCIL-NER (5001)	-902	-366.4
UP (1005)	JHARKHAND (2002)	63.5	-28.8
NR_ISTS_RAJ (1022)	WR_ISTS_GUJ (3037)	-370.6	-50.5
NR_ISTS_UP (1024)	ER_ISTS_WB (2055)	-540.6	-134
NR_ISTS_HAR (1021)	WR_ISTS_CHAT (3038)	-2500	-1132.1
RAPS-C (1156)	WR_ISTS_MP (3035)	-140.7	178.2
TANAKPUR (1205)	FAR-WEST NEP (8600)	28.1	-10.7
NR_ISTS_UP (1024)	ER_ISTS_BIH (2051)	-2625.5	2569.9
TOTAL		**-16462.6**	**1847.5**

3.0 Criteria and Methodology for Capacitor Placement

The study for assessment of capacitor requirement for Northern region is carried as per following procedure:

3.1 IEGC Code

Central Electricity Regulatory Commission (CERC), in its Indian Electricity Grid Code (IEGC) regulation, has provided the limits on the transmission system voltages of various levels, as can be seen in Table 5. This study has considered the exact limits while recommending the capacitor placement locations and size. This study assessed the criteria mentioned in the IEGC and transmission planning manual. In these references, it has been suggested that the reactive power compensation and other facilities shall be provided by State Transmission Utilities (STUs), and users connected to ISTS as far as possible in the low voltage systems close to the load points at the respective states.

Table 5. Voltage limits as per IEGC

Voltage level in RMS (kV)		
Nominal Voltage	Minimum Voltage	Maximum Voltage
765	728	800
400	380	420
220	198	245
132	122	145

In this study, all these criteria are adopted to recommend capacitor banks at outgoing of 132kV and 66 kV substations of STUs to maintain the bus voltage within IEGC limits & to minimize the flow of reactive power exchange on the ISTS & inter-regional lines. Highly sensitive buses are identified for recommending locations for installing new capacitor banks.

3.2 Methodology for Capacitor placement and recommended compensation

Lack of enough reactive power support in the northern region is one reason for low voltages at 132/66 kV buses in state utilities. The capacitor requirement for voltage improvement above 0.98 p.u is identified by identifying the sensitive locations for reactive power supply in the northern region. The following steps are followed for identifications of Capacitor requirements.

1. All 132 kV and 66 kV load buses are considered candidates for Capacitor placement in the state utility network.
2. Synchronous condensers with their Vref : 0.98 PU are modeled at these candidate load buses.
3. The location where synchronous condensers absorb the reactive power is dropped during the solution. The problem is solved in an iterative way to attain a bus voltage of more than 0.98 pu where the synchronous condenser supplies the reactive power.
4. If any voltage more than IEGC limits persists in transmission level, then it is controlled by enabling the available reactors.
5. The dynamic support of generators in state generation/central cogeneration is not generally utilized by tuning the Vref of generating units.
6. In a few cases where reactors are not available, like in HP & JK, the reactive power limits of generating units are relaxed to absorb surplus reactive power within reactive power capabilities of units to limit the grid voltage within 5%.

3.3 *Modelling of Additional Capacitor Banks*

The additional capacitor banks are identified as per the methodology given above. These devices are modeled as fixed shunt capacitors connected as shunt with 66kV and above buses in NR region. The amount of reactive power supplied by these fixed shunt capacitor is function of bus voltage. The reactive power supplied at 1.0 p.u bus voltage is termed as nominal capacitor value and reactive power supplied at operational bus voltage is termed as operational capacitor value.

4.0 Voltage Profile with identified Capacitor(Compensation)

As mentioned in the previous section, capacitors are added at identified locations for each state. These capacitor banks are recognized for the most sensitive 132kV/66 kV buses so that utilities can improve their voltage above 0.98 p.u with the least no . of the capacitor at least location in their utility. The substation-wise details of capacitor bank at 132/66 kV and above are listed in Annexure-I-A for the base case and Annexure-I-B for the compensated case. This annexure provides the details of capacitors that were in operation in the base case and compensated, and the location and size of the capacitor bank recommended at the most sensitive location as an outcome of this study.

The improvement in bus voltage profile by recommendation of identified capacitors for all utility 132/66 kV buses has been listed in Annexure-II- A(state STU), Annexure-II- B(ISTS), and Annexure-II-C(ISGS). It also provides comparative information for voltage improvement with recommended capacitors concerning base case voltage profile. It is observed that all the low voltage buses which were identified in the base case have been improved above 0.98 p.u. The voltage profile on a few high voltage buses is brought within IEGC limits by tuning the generating units.

4.1Identified Cap. Banks

A consolidated report of nominal Capacitor Bank requirement at 1 p.u for each state utility in NR is listed in Table 6. In the base case file, the locations where capacitors are kept "ON" are termed as in service capacitors locations. Similarly, the locations where the capacitors are kept "OF" in base file are termed as not in service capacitor locations. From this study, additional capacitors banks are identified for improvement of voltage. The state-wise break up for additional capacitor banks is given in the last column of Table.6. The Capacitors Bank in MVAR in Compensated File at 132/66 kV and above indicates the total no. of capacitors needed for each state for voltage maintaining the voltage at 132/66 kV above 0.98 p.u.

These capacitors are identified considering the base case file, where NRLDC has already considered the effect of downstream (below 132kV/ 66kV) compensation in terms of reactive power during modeling of the base case. Therefore, any entry zero does not mean that their existing capacitors in the field are zero. Utilities may compare the reactive power flow at 132/66kV substations to compare actual field conditions.

Table 6. Summary of Nominal Capacitor Requirement for the Northern grid –For Loading on 11/7/2018 at 00.45 Hrs.

STATE	A. Capacitors In Base Case				B. Capacitors In Compensated File				C. Additional Recommendation	
	Total location	In Service location	Out of Service location	In service Total Capacitors (MVAr)	Total location	Recommended In service Location	Recommended Out of Service Location	In Service Total Capacitors (MVAr)	Net Capacitor (MVAr)	New Location
UTTARPRADESH	101	85	16	3340	141	122	19	3866.64	526.64	40
RAJASTHAN	82	56	26	375.22	135	73	62	781.4	406.18	53
HARYANA	11	0	11	0	75	65	10	931.88	931.88	64
PUNJAB	13	13	0	380	76	70	6	1321.3	941.3	63
UTTRAKHAND	0	0	0	0	15	15	0	216.11	216.11	15
HIMACHAL PRADESH	0	0	0	0	2	2	0	29	29	2
DELHI	0	0	0	0	6	6	0	99.1	99.1	6
JAMMU & KASHMIR	1	0	1	0	2	1	1	20	20	1
CHANDIGARH	0	0	0	0	3	3	0	99.32	99.32	3
Total	208	154	54	4095.22	455	357	98	7364.75	3269.53	247

The col. A of Table.6 above gives details of total no. of location in base case file, where the capacitor are kept in service and out of service. The total capacitor in service in NR region in base case are 4095.22 MVAr. The total location are 208 out of which 154 location are in service and 54 location are out of service. The col. B gives details of Total recommended capacitor banks details with no of locations. The required total capacitors for NR region are 7364.75 MVAr at 357 in service location out of 455 location. The out of service locations are 98 which consist of all out of service location of col. A and some additional in service locations of col. A which are recommended to keep out of service. The details of location where these capacitor are recommended in service or out of service are given in Annexure-1-A.

The col. C of Table.6, above gives the recommendation (consisting of new location plus increase/decrease in operational capacitors banks) for additional net capacitor bank requirement of 3269.53 MVAr in NR region.

4.2 *Load flow results with identified Capacitor(Compensation):*

As per the base case power flow analysis, it is clear that active and reactive power were imported by most of the STU in NRPC over the inter-regional tie lines. The minimal no. of capacitor banks are listed in Table 6 in-state utilities to regulate the reactive power in the NR region. The power flow with recommended compensation in the NR region is tabled illustrated in Table 7.

Table.7: Load flow Summary of the Network with Recommended Capacitor banks.

Utility	Generation		Load		Net Operational Shunt Capacitor (+cap/ -ind)	Line Absorption (Inductive)	Line Charging (capacitive)	Active Power Losses	Reactive Network Demand	Tie-Line Flow (-import/+export)	
	P	Q	P	Q	Q	Q	Q	P	Q	P	Q
	MW	MVAR	MW	MVAR	MVAR	MVAR	MVAR	MW	MVAR	MW	MVAR
PUNJAB	5295.4	-23.7	11344.5	2525.8	1146.1	98.9	2518.6	157.8	2246.4	-6207	-1230.1
HARYANA	2504	-59.6	10255	2508.2	874.8	97.1	1767.3	107.4	1611.3	-7858.4	-1634.1
RAJASTHAN	7435.9	-73.9	10300.1	3385.5	-865.7	3527.2	11125.4	249.8	2154	-3113.9	1119.2
DELHI	1274	-31.9	6160	278	95.8	0	600.3	33.1	965.5	-4919.1	-579.3
UTTARPRA	9946.6	-739.7	19121.5	6296.7	2248.5	2829.9	10369.7	454.3	4358.2	-9629.6	-1606.3
UTTARAKH	1009.9	-16.7	1751.5	575.7	130.5	0	666.4	38.9	252.5	-780.4	-47.9
HIMACHAL	939	-60.1	809.3	266	28	0	258.7	18.3	97.4	111.5	-136.8
JAMUKASH	858.7	-177	1556	511.4	19.2	0	191.1	9.5	120.8	-706.8	-598.8
CHANDIGA	0	0	320	91.9	98.7	0	3.7	1.7	30.6	-321.7	-20.1
NR_ISTS_PUN	0	0	0	0	-667.1	1119.5	3634.1	28.7	340.8	-28.7	1506.8
NR_ISTS_HAR	0	0	0	0	46.9	1660.7	4520.9	127.7	3096.9	-127.7	-189.8
NR_ISTS_RAJ	0	0	0	0	-1500.1	4128.2	5915.1	26.6	337.3	-26.6	-50.6
NR_ISTS_DEL	0	0	0	0	0	958.8	1763.3	10.4	256.2	-10.4	548.3
NR_ISTS_UP	0	0	19.5	6.4	-3036.7	12325.3	25489.6	230.2	5722.4	-249.6	4398.8
NR_ISTS_UTT	0	0	0	0	-79.4	0	418.8	2.1	36.9	-2.1	302.5
NR_ISTS_HP	0	0	0	0	-172	147.9	852.8	19.8	169	-19.8	363.9
NR_ISTS_JK	0	0	0	0	-444.6	99.1	1569.7	12	136.6	-12	889.4
RAILWAYS	0	0	0	0	0	0	0	0	0	0	0
NRIST-BB	0	0	0	0	0	0	478	17.2	133.6	-17.2	344.4
NR_ISTS	0	0	0	0	1198.4	96.8	211.5	134.6	2201.8	-134.6	-888.6
Cumulative ISTS	**0**	**0**	**19.5**	**6.4**	**-4654.6**	**20536.3**	**44853.8**	**609.3**	**12432**	**-628.7**	**7225.1**
SINGRAUL	1160	-48.8	0	0	-48.3	122	307.8	5.5	61.6	1154.5	27
RIHAND-G	1922	-6.1	0	0	-77.1	0	0	0	0	1922	-83.2
DADRI_C	708	-16.7	0	0	0	0	0	2	39.2	706	-55.9
DADR-NCR	940	-96.1	0	0	-60.5	0	288.9	2.9	31.6	937.1	100.7
UNCHAHAR	724	-114.7	0	0	0	0	120	7.1	36.9	716.9	-31.7
IGSTPS	1122	-69	0	0	0	0	0	0	0	1122	-69
SHRE_CEM	150	-100	0	0	-90	98.1	151.8	1.4	15.5	148.6	-151.8
DADRI-G	230	-85.4	0	0	0	0	0	0.4	7.2	229.6	-92.6
ANTA	0	0	0	0	0	0	128.4	2.8	15.3	-2.8	113.2
AURAIYA	107.9	-33.4	26.5	8.7	0	0	54.8	0.7	4.2	80.6	8.6
NAPS	402.6	-132	0	0	0	0	4.8	0.1	0.3	402.5	-127.6
RAPS-B	402.6	-7.4	0	0	0	0	45.7	2	10.5	400.6	27.9
RAPS-C	402.6	-10	0	0	0	141.6	354.2	2.1	23.6	400.5	179
CHAMER-1	540	0	0	0	0	0	22.1	0	0	540	22.1
CHAMER-2	285	-60	0	0	0	0	0	0	0	285	-60
CHAMER-3	230	-55.4	0	0	0	0	75	0.1	0.8	229.9	18.8
BAIRASIU	111	-14	0	0	0	0	0	0	0	111	-14
SALAL	690	0	0	0	0	0	35.9	3.2	17.1	686.8	18.8
TANAKPUR	81	-2.3	0	0	0	0	0	0.1	2.1	80.9	-4.4
URI-1	480	-60.2	0	0	0	0	0	0	0	480	-60.2
URI-2	240	-31	0	0	0	0	69.5	0.8	8.5	239.2	29.9
DHAULIGA	279	-53.1	0	0	0	19.5	49	2.8	31.6	276.2	-55.2

DULHASTI	329	-151.1	0	0	0	0	0	0	0	329	-151.1
SEWA-II	133	-7.6	0	0	0	0	1.4	0.3	0.8	132.7	-7
JHAKRI	1620	-104.5	0	0	-80	0	0	0	0	1620	-184.5
RAMPUR HEP	414	-62	0	0	0	0	30.5	0.5	6.8	413.5	-38.3
TEHRI	610	-39.3	0	0	0	0	36.2	0.3	6.9	609.7	-10
KOTESWAR	90	-30	0	0	0	0	3.1	0	0	90	-27
BHAKRA	555	-8.6	92.5	20.6	10.2	0	1.1	0.5	19.7	462	-37.5
DEHAR	560	-10.8	0	0	-122.7	0	0.2	1	19.4	559	-152.8
PONG	150	0	0	0	0	0	42.5	2	10.9	148	31.6
ADHYDRO	150	-17.3	0	0	0	0	25.6	2.2	11.4	147.8	-3.1
KARCHAMW	1000	-127.4	0	0	0	0	332.3	10.4	179.5	989.6	25.5
BUDHIL	70	-16	0	0	0	0	0	0	0	70	-16
KOLDAM	768	-43	0	0	-80	0	37.9	0	0.4	768	-85.6
PARBATI-3	0	0	0	0	0	0	9.6	0	0	0	9.6
PARBATI-2	0	0	0	0	0	0	0.6	0	0	0	0.6
KISHANGANGA	170	0	0	0	0	0	0	0	0	170	0
ROSA	0	0	0	0	0	0	0	0	0	0	0
BHADLA SOLAR	0	0	0	0	0	0	16.4	0	0	0	16.4
Cumulative ISGS	**17827**	**-1613**	**119**	**29.3**	**-548.4**	**381.2**	**2245.3**	**51.2**	**561.8**	**17656**	**-888.8**
Total	**47090**	**-2796**	**61756**	**16475**	**-1427.1**	**27470.6**	**74600.3**	**1731**	**24830**	**-16398**	**1602.1**

In the compensated file, the active power balance is the same as in the base case file except for a slight reduction in active loss from 1845 MW to 1731 MW. This reduction in active loss is around 6.00% concerning base case losses, and the total decrease in active loss is 0.18% concerning total systems active demand.

The compensated file's reactive load is 16475 MVAr, the Line shunt absorption of 27470.6 MVAr, the net shunt capacitor is 1427.1 MVAr, and the reactive demand is 24830 MVAr. The line charging contribution is 74600.3 MVAr, reactive export is 1602.1 MVAr; the difference in reactive power is absorbed by generating units which is equal 2796 MVAr. The units for P and Q are in MW and MVAr, respectively.

4.3 Interstate tie line flows:

Flow of active and reactive power from one CTU/STU to another CTU/STU is provided in Table 8. Reactive Power exchange from the neighboring state and ISTS lines is reduced as shown in Table 8.

Table.8. Inter CTU/STU Power flow exchange with Recommended Capacitor banks

FROM	TO	P(MW) (- import/+export)	Q(MVAr) (-import/+export)
PUNJAB	1002 HARYANA	93.5	-13.9
	1007 HIMACHAL	-32.1	18.6
	1008 JAMUKASH	-302	34.2
	1009 CHANDIGA	100.7	-13.8
	1020 NR-ISTS-PUN	-4699.1	-1243.7
	1021 NR_ISTS_HAR	2.9	64.7
	1026 NR-ISTS-HP	-262.9	-12.9

	1027 NR-ISTS-JK	-237.1	-3.3
	1041 NR-ISTS-BB	-520	-113.2
	1050 NR-ISTS	89.7	-20.7
	1215 BHAKRA	-216.6	11.8
	1216 DEHAR	-73.7	78
	1217 PONG	-150.1	-15.8
	Total	**-6206.8**	**-1230**
FROM	**TO**	**P(MW) (- import/+export)**	**Q(MVAR) (- import/+export)**
HARYANA	1001 PUNJAB	-93.5	13.9
	1003 RAJASTHA	-8.8	1.8
	1004 DELHI	213.8	8.6
	1007 HIMACHAL	-75.8	-8.1
	1009 CHANDIGA	9.8	-3
	1021 NR_ISTS_HAR	-4378	-1120.7
	1022 NR_ISTS_RAJ	71.1	-34.5
	1041 NRIST-BB	-1559.3	-478.9
	1050 NR_ISTS	-1507.50	-67
	1105 IGSTPS	-530.5	53.9
	Total	**-7858.7**	**-1634**
FROM	**TO**	**P(MW) (- import/+export)**	**Q(MVAR) (- import/+export)**
RAJASTAN	1002 HARYANA	8.8	-1.8
	1004 DELHI	-5.6	-10.9
	1005 UTTARPRA	-176.5	1.5
	1021 NR_ISTS_HAR	1165.5	-107.1
	1022 NR_ISTS_RAJ	-1457.8	416.9
	1024 NR_ISTS_UP	-250.3	186.6
	1041 NRIST-BB	-33.5	10.1
	1050 NR_ISTS	-23.3	173.3
	1106 SHRE_CEM	-256.5	136.2
	1151 ANTA	-84.9	-106
	1155 RAPS-B	-313	-35.1
	1156 RAPS-C	-248.1	39.4
	3014 MP	13.9	12.7
	3035 WR_ISTS_MP	-1452.9	403.2
	Total	**-3114.2**	**1119.00**
FROM	**TO**	**P(MW) (- import/+export)**	**Q(MVAR) (- import/+export)**
DELHI	1002 HARYANA	-213.8	-8.6
	1003 RAJASTHA	5.6	10.9
	1005 UTTARPRA	150.3	67.1
	1021 NR_ISTS_HAR	-330.2	-181.1
	1023 NR_ISTS_DEL	-3366.4	-422
	1041 NRIST-BB	-17.8	36.7
	1103 DADR-NCR	-555.3	-97.4
	1105 IGSTPS	-591.5	15.1
	Total	**-4919.1**	**-579.3**
FROM	**TO**	**P(MW) (- import/+export)**	**Q(MVAR) (- import/+export)**
UTTAR-PRADESH	1003 RAJASTHA	176.5	-1.5
	1004 DELHI	-150.3	-67.1
	1006 UTTARAKH	-274.4	-87.6
	1021 NR_ISTS_HAR	430.8	70.3
	1023 NR_ISTS_DEL	721.3	-135.2

	1024 NR_ISTS_UP	-8971.5	-1549.4
	1025 NR_ISTS_UTT	80.2	-6.1
	1050 NR_ISTS	-783.4	-92.5
	1100 SINGRAUL	-164.2	31.9
	1103 DADR-NCR	-70	40.1
	1104 UNCHAHAR	-89.9	78.6
	1152 AURAIYA	-73.1	-29.8
	1153 NAPS	-402.5	127.6
	1205 TANAKPUR	10.6	5.2
	1208 DHAULIGA	-100.6	19
	2002 JHARKHAND	63.7	-28.6
	2051 ER_ISTS_BIH	-32.7	18.7
	Total	**-9629.5**	**-1606.4**
FROM	**TO**	**P(MW) (- import/+export)**	**Q(MVAR) (- import/+export)**
UTTARKHAND	1005 UTTARPRA	274.4	87.6
	1007 HIMACHAL	20.5	13.7
	1024 NR_ISTS_UP	-410.7	82.8
	1025 NR_ISTS_UTT	-273.6	-193.6
	1050 NR_ISTS	-215.6	-74.6
	1208 DHAULIGA	-175.5	36.2
	Total	**-780.5**	**-47.9**
FROM	**TO**	**P(MW) (- import/+export)**	**Q(MVAR) (- import/+export)**
HIMACHAL PRADESH	1001 PUNJAB	32.1	-18.6
	1002 HARYANA	75.8	8.1
	1006 UTTARAKH	-20.5	-13.7
	1020 NR-ISTS-PUN	57.7	21.5
	1026 NR-ISTS-HP	-276.5	-95.3
	1203 BAIRASIU	-56.1	3.7
	1216 DEHAR	-49	-10.3
	1217 PONG	52.2	-8
	1218 ADHYDRO	-54.1	4.8
	1219 KARCHAMW	306.1	-13.9
	1222 PARBATI-3	20.6	-7.7
	1223 PARBATI-2	23.3	-7.3
	Total	**111.6**	**-136.7**
FROM	**TO**	**P(MW) (- import/+export)**	**Q(MVAR) (- import/+export)**
JAMMU & KASHMIR	1001 PUNJAB	302	-34.2
	1027 NR_ISTS_JK	-135.6	-402.3
	1050 NR_ISTS	-627.2	-157.3
	1210 SEWA-II	-132.7	7
	1225 KISHANGANGA	-113.4	-12
	Total	**-706.9**	**-598.8**
FROM	**TO**	**P(MW) (- import/+export)**	**Q(MVAR) (- import/+export)**
CHANDIGARH	1001 PUNJAB	-100.7	13.8
	1002 HARYANA	-9.8	3
	1026 NR_ISTS_HP	-211.2	-36.9
	Total	**-321.7**	**-20.1**

4.4 Inter-regional flows:

The power flow results for inter-regional lines emanating from the northern grid have been presented in Table 9 for identified compensation in the NR region. Since determining compensation is provided locally in-state utilities, this resulted in reduced interstate tie-line flows in terms of reactive power in most cases. The reduction in reactive power export is from 1847.5 MVAr to 1601.8 MVAr.

Table.9 Inter regional Power flow with Recommended Capacitor banks

FROM AREA	TO AREA	P(MW) (-import/+export)	Q(MVAR) (- import/+export)
UP (1005)	ER_ISTS_BIH (2051)	-32.7	18.7
AURAIYA (1152)	MP (3014)	23.1	20.7
NR_ISTS (1050)	GUJARAT (3013)	-2005.7	-987.8
NR_ISTS_RAJ (1022)	GUJARAT (3013)	213.1	86.1
RAJASTHAN (1003)	MP (3014)	13.9	12.7
RAJASTHAN (1003)	WR_ISTS_MP (3035)	-1452.9	403.2
NR_ISTS_UP (1024)	WR_ISTS_MP (3035)	-6187.4	1141.4
NR_ISTS_UP (1024)	PGCIL-NER (5001)	-902	-366.4
UP (1005)	JHARKHAND (2002)	63.7	-28.6
NR_ISTS_RAJ (1022)	WR_ISTS_GUJ (3037)	-368.4	-67.6
NR_ISTS_UP (1024)	ER_ISTS_WB (2055)	-540.6	-134
NR_ISTS_HAR (1021)	WR_ISTS_CHAT (3038)	-2500	-1131.7
RAPS-C (1156)	WR_ISTS_MP (3035)	-135.6	165.7
TANAKPUR (1205)	FAR-WEST NEP (8600)	28.2	-10.8
NR_ISTS_UP (1024)	ER_ISTS_BIH (2051)	-2614.8	2480.2
TOTAL		**-16398**	**1601.8**

5.0 Recommendations

Capacitor banks are required at an optimal location to improve voltage above 0.98 p.u in the utility network. The state-wise recommendation for additional net capacitor requirements given in Table 10.

Table 10. State wise additional Net Cap . requirement.

STATE	Additional Net Capacitors Recommended (MVAr)
UP	526.64
RAJASTHAN	406.18
HARYANA	931.88
PUNJAB	941.3
UTTARAKHAND	216.11
HIMACHAL PRADESH	29
DELHI	99.1
J&K	20
CHANDIGARH	99.32

The summary of the base case capacitor is illustrated in Annexure I-A and recommended capacitors are illustrated in Annexure I-B. The voltage profile of all states, ISTS, and ISGS, are illustrated in Annexure II-A, Annexure II-B, and Annexure II-C. Annexure-III-A and Annexure III-B give the power flow for states and Central generators**.** The detailed summary of shunt reactors in the base file and with recommended compensation is provided in Annexure-IV. Annexure V provides the general case study. Annexure-VI gives the detailed tie-line power flow breakup. Annexure-VII provides details of the minutes of the meeting and email correspondence with NRPC.

6.0 An empirical relationship for Capacitor bank requirement against voltage profile in distribution– A General case Study

Compensation close to the loading sub-stations will avoid artificial stress on the upstream transmission infrastructure. So the recommendation of additional capacitor banks at 33/11 kV will be an ideal choice. But non availability of distribution network data, is one of the hindrances to carrying out such studies. However, utilizing the knowledge of the distribution network configurations, loading profile, and variance of power factor with load can be used to derive an empirical relationship for Capacitor bank requirement against voltage variation in a distribution system. The proposed empirical relation will not guarantee the exact compensation needed at downstream 33/11 kV substations due to broad assumptions considered for modelling of distribution systems. But it may work as a thumb rule for distribution utility for capacitor bank planning in their distribution systems. The performance of the proposed index is studied for a few distribution configurations in terms of distributing the capacitor bank requirement identified at a 132 kV substation to 33/11 kV.

Distribution systems data of Haryana state has been reviewed, and it is observed that there are two general distribution systems configurations Viz 132/33/11kV (Config-1),132/11kV (Config-2) & config-3 (66/11 kV) as shown in Annexure-V (Figure (a) & Figure(b)). The no. of 11 kV substations may vary from 4-6 of each configuration. The load is placed at 11 kV buses, and desired capacitor banks are provided to regulate the voltage at these buses. The study has been performed for 50 % to 90 % loading capacity of 132 kV power transformers located at 132 kV.

This study establishes a pattern for additional capacitors required at 33/11 kV for a step-change in bus voltage. The loading profile at 11 kV buses is varied to generate the low voltage profiles. Table 11. gives the capacitor requirement for 0.1 p. u boost in the downstream bus voltage at 11 kV.

Table.11 Compensation Requirement for Step change in Voltage in Configuration I ,II & III

Voltage at 11 kV buses (p.u)		Incremental capacitor requirement Qem (MVAR)
Vi (initial) (p.u)	**Vd(Desire) (p.u)**	**Config1 (132/33/11kV)**
0.75	0.76	0.95
0.76	0.77	0.89
0.77	0.78	0.84
0.78	0.79	0.79
0.79	0.8	0.75
0.8	0.81	0.63
0.81	0.82	0.59
0.82	0.83	0.55
0.83	0.84	0.52
0.84	0.85	0.41
0.85	0.86	0.29
0.86	0.87	0.27
0.87	0.88	0.23
0.88	0.89	0.19
0.89	0.9	0.19
0.9	0.91	0.19
0.91	0.92	0.19
0.92	0.93	0.18
0.93	0.94	0.18
0.94	0.95	0.18
0.95	0.96	0.18
0.96	0.97	0.18
0.97	0.98	0.18
Voltage at 11 kV buses (p.u)		**Incremental capacitor requirement Qem (MVAR)**
Vi(initial) (p.u)	**Vd(Desire) (p.u)**	**Config2 (132/11kV)**
0.82	0.83	1.29
0.83	0.84	1.14
0.84	0.85	1.01
0.85	0.86	0.89
0.86	0.87	0.78
0.87	0.88	0.68
0.88	0.89	0.61
0.89	0.9	0.59
0.9	0.91	0.57
0.91	0.92	0.56
0.92	0.93	0.56
0.93	0.94	0.55
0.94	0.95	0.53
0.95	0.96	0.53
0.96	0.97	0.52
0.97	0.98	0.52

Voltage at 11 kV buses (p.u)		Incremental capacitor requirement Qem (MVAR)
Vi(initial) (p.u)	Vd(Desire) (p.u)	Config3 (66/11kV)
0.90	0.91	0.61
0.91	0.92	0.5
0.92	0.93	0.44
0.93	0.94	0.34
0.94	0.95	0.33
0.95	0.96	0.33
0.96	0.97	0.32
0.97	0.98	0.32

It is observed that the capacitor requirement required for different configurations is different for per unit change in bus voltage. These variations arise due to network connectivity, no. of feeders, and distribution transformers associated with each configuration. But the capacitor requirement for per unit increase for buses voltage needed more or less fixed for a particular configuration as shown in Table.11 and Fig.1. As an example for a high loading profile, when bus voltage at any 11 kV is 0.85 p.u, and it is intended to boost this voltage to 0.95 p.u for configuration1, then the requirement of capacitor will be 2.09 MVAR.

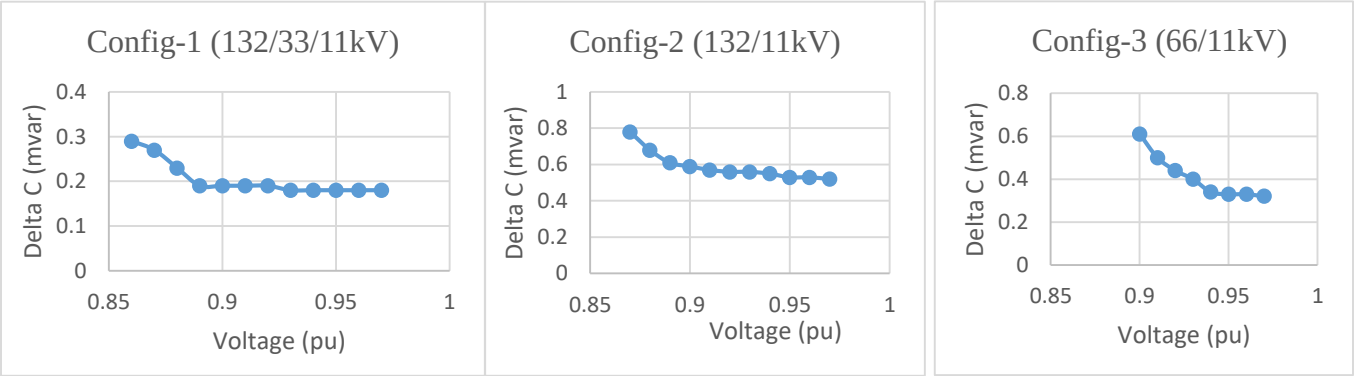

Figure 1: Variation of Additional Compensation with per unit Voltage

For the sake of analysis, we have chosen two 132kV stations, DHAMTAAN and RAI _1, with the downstream configuration as shown in Annexure-V (Fig. a & Fig. b). The voltage profile at these buses with and without capacitor bank placement is given in Table 12. The amount of capacitor requirement obtained at transmission level is denoted by Qt, and required compensation identified at 11 kV buses using empirical relation is denoted by Qem. Table 12 below gives the downstream 11kV bus voltage profile with and without capacitor bank placement. Considering the initial bus voltage of a 11kV bus of configuration1 (625720-KHA_TF1) as 0.86p.u, then the compensation required to boost this voltage to

0.95pu will be 1.8 MVAr. Similarly, the improvement in bus voltage other feeders is also studied. It is observed, there is consistent relationship between bus voltage improvement, and the amount of additional capacitor requirement required for each configuration listed above.

Table.12 Voltage profile of 132kV buses with Capacitor

Bus Name	Base kV	No: of 11kV buses under Config-1	No: of 11kV buses under Config-2	Initial Bus Voltage Vi (p.u)	Compensation at transmission level Qt(MVAR)	Bus Voltage with Compensation Qt, Vd (p.u)	Compensation Calculated by empirical formula Qem(MVAR)	Bus Voltage with Qem, Vd' (p.u)
DHAMTAAN	132	2	2	0.92	11	0.99	11.6	0.99
RAI _1	132	5	1	0.89	40	0.9843	40.22	0.98

Table 13 gives 11 kV downstream bus voltage profile with and without capacitor bank requirement.

Table.13 Voltage profile of 11kV buses with Compensation

Bus Number	Bus Name	Base kV	Configuration	Initial Bus Voltage, Vi (p.u)	Compensation Calculated by empirical formula Qem(MVAR)	Bus Voltage with Qem , Vd' (p.u)
121088	DHAMTAAN	132	-	0.923	11.6	0.99
625720	KHA_TF1	11	1	0.86	1.8	0.952
625721	DHA_TF1	11	1	0.85	2.09	0.95
625722	DHA_TF1_11	11	2	0.89	3.89	0.96
625723	DHA_TF2_11	11	2	0.9	3.82	0.96
121080	RAI _1	132	-	0.89	40.22	0.989
625500	RAI_BHA_IN	11	1	0.7795	7.53	0.9504
625501	RAI_SAF_IN	11	1	0.7906	5.9	0.9561
625502	RAI_ATT_IN	11	1	0.7795	7.53	0.9504
625503	RAI_ANS_IN	11	1	0.8231	3.93	0.9642
625504	RAI_NAH_IN	11	1	0.8103	4.52	0.9547
625505	HSIIDC-R_INC2	11	2	0.8275	10.81	0.959

A similar, more detailed analysis of the empirical relation of Qem for different voltage profiles for other configurations is listed in Annexure-V.

The stability of this empirical relation is studied with the following broad assumptions:

- The No. of 11 kV substations for each 132 kV are typically 4 to 6.
- No. of Transformers at 132/33/11 kV substation is considered one or two.
- No. of Transformers at 66/11 kV are considered one or two.
- Length of line feeder for 33 kV is regarded as 5 km Dog Conductor.
- Length of line feeder for 66kV is considered as 10 km Panther Conductor.
- 132/33/11 kV substations are loaded up to 75% of their transformer rating; however, they are only loaded around 50 % as per the PSSE file.
- All the downstream 33/11kV stations are uniformly loaded.

The primary outcome of this study is an aggregation of compensation required for 2019-20 at 132 kV substations. This compensation is identified for around 30 % of the total 132kV substation. The determined compensation will improve the overall northern region voltage profile within desired voltage limits for peak loading conditions.

The interregional and interstate flow of the reactive power flow is regulated to the minimum value so that reactive power support can be met for local identified sources.

Identifying the compensation at 33/11 kV loading substation is a real challenge without modeling the distribution network. But an attempt has been made in this report, where the compensation identified at 132 kV substation is distributed to 11 kV substation based on a variety of loading, voltage profile, and amount of compensation required.

7.0 Reference

1. IEGC regulation 2010.http://www.cercind.gov.in/2016/regulation/9.pdf.

2.http://cea.nic.in/reports/others/ps/pspa2/tr_plg_criteria_manual_jan13.pdf

ANNEXURE-I-A

Base case –Capacitors Banks in Northern Grid

Capacitor Bank Code in Base Case : C1, C2, and C3

(C1: Capacitor at Bus; C2: 2nd Capacitor at same bus, if any; C3: 3rd Capacitor at same bus, If any)

These capacitors are modelled in the provided PSSE base case file for NR region.

STATE	Bus Number	Bus Name	ID	In Service (1) / Out Of Service (0)	Capacitor (MVAr)
PUNJAB	111010	FEROZPUR21 132.00	C1	1	32.58
	111012	MAHILPUR21 132.00	C1	1	43.44
	111020	WADALAGRAN21132.00	C1	1	21
	111023	VERPAL21 132.00	C1	1	65.16
	111026	PATTI21 132.00	C1	1	21.72
	111036	MUKATSAR21 132.00	C1	1	27.3
	111037	SULTANPUR21 132.00	C1	1	32.58
	111055	MOGA-II 132.00	C1	1	33
	111106	MOGA-1 132.00	C1	1	32.16
	111107	MUKATSAR 132.00	C1	1	27
	112020	WADALAGRANTH132.00	C1	1	22.44
	112028	GORAYA 132.00	C1	1	10.86
	112030	CIVILINE 132.00	C1	1	10.86
HARYANA	121004	SAFIDON 132.00	C1	0	19.9
	121056	ASSANDH 132.00	C1	0	19.9
	121071	SAMALKHA2_1 132.00	C1	0	19.9
	121083	GANNAUR 132.00	C1	0	19.9
	121119	JIND-NEW 132.00	C1	0	19.9
	121141	KOSLI 132.00	C1	0	24
	121150	JUI 132.00	C1	0	24
	121198	CHEEKA_132 132.00	C1	0	19.9
	121201	ROHTAK-132 132.00	C1	0	19.9
	121206	SIWAN 132.00	C1	0	19.9
	121215	BAHADURG_132132.00	C1	0	19.9
RAJASTHAN	131016	BADAGAON 132.00	C1	1	5.43
	131023	BAGORA1 132.00	C1	1	10.46
	131034	BAORI1 132.00	C1	1	10.86
	131054	BHADROONA 132.00	C1	1	5.43
	131060	BHOPALGARH 132.00	C1	1	10.86
	131066	BORUNDA1 132.00	C1	1	10.43
	131139	BHOPA-21 132.00	C1	1	16.26
	131153	BILARA1 132.00	C1	1	2.71

	131165	BALI1 132.00	C1	0	5.43
	131272	LAXMAN-S 132.00	C1	1	8.15
	131312	NADBAI 132.00	C1	1	0.51
	131314	NAINWA1 132.00	C1	1	2.71
	131318	NARWA 132.00	C1	0	5.43
	131319	NASIRABA 132.00	C1	0	5.43
	131321	NAWA 132.00	C1	0	10.86
	131323	NAWALGAR 132.00	C1	0	16.18
	131326	NOHAR 132.00	C1	1	7.7
	131327	NOKHA 132.00	C1	1	10.43
	131328	NPH-JODH 132.00	C1	1	5.43
	131331	OSIAN 132.00	C1	1	10.83
	131333	PADAMPUR 132.00	C1	1	6.8
	131334	PADROO1 132.00	C1	1	5.43
	131335	PALADAR 132.00	C1	0	5.43
	131339	PAREWARA 132.00	C1	1	16.29
	131342	PATLISAR 132.00	C1	0	10.86
	131348	PIPAR1 132.00	C1	0	5.43
	131351	POONSA 132.00	C1	1	5.43
	131355	PS-5 132.00	C1	0	10.86
	131360	PUGALROA 132.00	C1	1	6.79
	131361	PURANAGH 132.00	C1	0	6.32
	131363	PUSKA-RO 132.00	C1	0	5.43
	131365	RAISINGH 132.00	C1	0	5.43
	131366	RAJAKHER 132.00	C1	1	2.71
	131369	RAJIASR 132.00	C1	1	5
	131370	RAMGAR-A 132.00	C1	1	10.86
	131373	RANASAR1 132.00	C1	1	5.43
	131374	RANI 132.00	C1	0	5.43
	131375	RANIWARA 132.00	C1	1	5.43
	131378	RASHMI 132.00	C1	0	10.86
	131380	RAWATSAR 132.00	C1	1	5.43
	131385	RIRI 132.00	C1	1	16.29
	131387	ROON1 132.00	C1	1	2.71
	131390	SADULSHA 132.00	C1	1	3.53
	131393	SALASAR 132.00	C1	1	2.72
	131396	SANCHOR1 132.00	C1	0	10.86
	131398	SANGOD 132.00	C1	1	5.43
	131399	SANGRIA 132.00	C1	0	10.86
	131400	SANJOO 132.00	C1	1	5.43
	131401	SANKAD1 132.00	C1	0	10.86

	131402	SANWAD1 132.00	C1	0	5.43
	131403	SANWREEJ 132.00	C1	1	10.86
	131404	SAPOL 132.00	C1	0	5.43
	131406	SARDARSH 132.00	C1	0	10.86
	131407	SARMATHU 132.00	C1	1	1.38
	131410	SAWA(B)1 132.00	C1	1	5.43
	131412	SAYLA1 132.00	C1	1	2.71
	131413	SEDWA 132.00	C1	1	5.43
	131434	SOORSAGA 132.00	C1	1	5.43
	131435	SOYLA1 132.00	C1	1	10.86
	131437	SRIDUNG1 132.00	C1	1	16.29
	131438	SRIGANGA 132.00	C1	1	9.63
	131439	SRIKARNP 132.00	C1	1	1.8
	131440	SRIMADHO 132.00	C1	1	8.14
	131441	SRIMAHAV 132.00	C1	1	2.7
	131442	SRIVIJAY 132.00	C1	0	5.43
	131443	SUJANGARH1 132.00	C1	1	2.97
	131446	SUMERPUR 132.00	C1	1	12.2
	131448	SURPURA1 132.00	C1	1	2.7
	131451	TAGOREN 132.00	C1	1	0.94
	131452	TALERA 132.00	C1	0	10.86
	131454	TEHANDESAR 132.00	C1	0	21.72
	131459	THOI_1 132.00	C1	1	3.98
	131461	TODABHIM 132.00	C1	1	3.6
	131462	TODARASI 132.00	C1	0	5.43
	131465	UDAIPURW 132.00	C1	0	10.86
	131467	UNDOO 132.00	C1	1	8.14
	131469	UPANI_1 132.00	C1	1	16.29
	131509	HATUNDI 132.00	C1	1	5.43
	131521	BHANIPURA 132.00	C1	1	5.43
	131523	SULTANPUR 132.00	C1	1	1.35
	132030	SIROHI 220.00	C1	1	1.62
	132115	RATANGAR 220.00	C1	0	5.43
DELHI	--	--	--	--	*
UTTARPRADESH	151000	NOIDA_20 132.00	C1	1	40
	151000	NOIDA_20 132.00	C2	1	40
	151000	NOIDA_20 132.00	C3	1	40
	151001	GOKUL 132.00	C1	0	40
	151001	GOKUL 132.00	C2	0	40
	151003	ATRAULI1 132.00	C1	1	40
	151004	BARAUT1 132.00	C1	1	40

	151004	BARAUT1 132.00	C2	1	40
	151005	AGRAN1 132.00	C1	1	40
	151005	AGRAN1 132.00	C2	1	40
	151005	AGRAN1 132.00	C3	1	20
	151009	BANDA1 132.00	C1	1	40
	151010	HATHRAS1 132.00	C1	1	40
	151011	CHIBRMAU 132.00	C1	1	40
	151015	SHATABD 132.00	C1	1	40
	151016	SIMBOLI 132.00	C1	1	40
	151016	SIMBOLI 132.00	C2	1	40
	151017	GAJRAULA 132.00	C1	1	40
	151017	GAJRAULA 132.00	C2	1	40
	151019	SAHIBAD 132.00	C1	1	40
	151019	SAHIBAD 132.00	C2	1	40
	151021	NEHTOR1 132.00	C1	1	40
	151021	NEHTOR1 132.00	C2	1	40
	151023	NIGHASAN 132.00	C1	0	40
	151023	NIGHASAN 132.00	C2	0	40
	151025	CBGANJ 132.00	C1	1	40
	151025	CBGANJ 132.00	C2	1	40
	151028	SITAPUR1 132.00	C1	1	40
	151029	LUCKNOW1 132.00	C1	1	40
	151031	MURABAD1 132.00	C1	1	40
	151031	MURABAD1 132.00	C2	1	40
	151032	MODIPURM_220132.00	C1	1	40
	151032	MODIPURM_220132.00	C2	0	40
	151032	MODIPURM_220132.00	C3	0	40
	151033	MURADNG1 132.00	C1	1	40
	151033	MURADNG1 132.00	C2	1	40
	151034	SHAMLI1 132.00	C1	1	40
	151035	SAHARAN1 132.00	C1	1	40
	151035	SAHARAN1 132.00	C2	1	40
	151036	AZAMGARH_220132.00	C1	1	40
	151037	NARA 132.00	C1	1	40
	151038	KHURJA1 132.00	C1	1	40
	151038	KHURJA1 132.00	C2	1	40
	151041	DEORIA1 132.00	C1	1	20
	151042	MAINPUR 132.00	C1	1	40
	151042	MAINPUR 132.00	C2	1	40
	151044	PANKI1 132.00	C1	1	40
	151045	FEROZBD1 132.00	C1	1	40

	151046	NAUBSTA 132.00	C1	1	40
	151053	GAZIPR2 132.00	C1	1	40
	151054	FATEHPR1 132.00	C1	1	40
	151055	SAHUPR1 132.00	C1	1	40
	151055	SAHUPR1 132.00	C2	1	40
	151056	SARNATH1 132.00	C1	1	40
	151057	BADAUN1 132.00	C1	1	40
	151058	GORAKPR1 132.00	C1	1	40
	151059	SULTANP1 132.00	C1	1	40
	151061	GONDA1 132.00	C1	1	40
	151083	BAGPAT 132.00	C1	1	40
	151089	BANSI 132.00	C1	1	40
	151092	BARELY-1 132.00	C1	1	40
	151116	FARIDNAGAR 132.00	C1	1	40
	151120	DEBAI 132.00	C1	1	40
	151122	DEORIA_1 132.00	C1	1	20
	151127	ETAH 132.00	C1	1	40
	151136	GAJOKHAR 132.00	C1	1	40
	151157	JAHANGIR 132.00	C1	1	40
	151157	JAHANGIR 132.00	C2	1	40
	151161	JANSETH 132.00	C1	1	40
	151164	JAUNPUR1 132.00	C1	1	40
	151167	JHUSI 132.00	C1	1	40
	151169	RCGREEN 132.00	C1	1	40
	151174	RAMPUR 132.00	C1	1	40
	151176	RASRA 132.00	C1	1	40
	151184	SEFAI 132.00	C1	1	40
	151194	SIKANDRABAD 132.00	C1	0	40
	151197	SIRATHU 132.00	C1	0	40
	151216	SAMBHAL 132.00	C1	1	40
	151219	DADRI_13 132.00	C1	1	40
	151235	KARVI 132.00	C1	0	40
	151244	KHAIR 132.00	C1	1	40
	151298	NANAUTA 132.00	C1	1	40
	151300	SHAHJAHA 132.00	C1	1	40
	151300	SHAHJAHA 132.00	C2	1	40
	151310	MIRZAPUR22 132.00	C1	1	40
	151316	PARTAPGA 132.00	C1	0	40
	151318	PARTAPPU 132.00	C1	1	40
	151318	PARTAPPU 132.00	C2	1	40
	151412	KURSIROAD 132.00	C1	1	40

	151413	BEHAT 132.00	C1	1	40
	151421	NEW TANDA 132.00	C1	1	40
	151422	BAHRAICH 220132.00	C1	1	40
	151440	SIKANDRARAO 132.00	C1	1	40
	151476	CHHATA 132.00	C1	1	40
	151477	SIRSA 132.00	C1	1	40
	151478	CHARLA 132.00	C1	0	40
	151501	AMROHA_220 132.00	C1	0	40
	151512	SIKANDRA 132.00	C1	0	40
	151512	SIKANDRA 132.00	C2	0	40
	151531	SEC-148_132 132.00	C1	0	40
	151549	BARABNKI_220132.00	C1	0	40
UTTARAKHND	--	--	--	--	*
HIMACHAL	--	--	--	--	*
JAMMU & KASH	181040	DRABA1 132.00	C1	0	20
CHANDI GARH	--	--	--	--	*

*in case of Delhi, Uttrakhand , Himachal and Chandigarh, there are no capacitor modeled at 66 kV or above. Although the effect of downstream capacitor are already considered.

ANNEXURE-I-B

Recommended Capacitor banks in Northern Region

Recommend Cap, bank code is as follow :

Punjab	: PU
Haryana	: HN
Rajasthan	: RN
Delhi	: DN
Uttar Pradesh	: UP
Uttarakhand	: UK
Himachal	: HM
Jammu &Kashmir	: JN
Chandigarh	: CN

In the recommended capacitor bank table, some capacitors which were modeled in base case under C1 to C3 code are recommended to switched off/increased/decreased, as their location/size was not optimal as per this study.

(C1: Capacitor at Bus; C2: 2nd Capacitor at same bus, if any; C3: 3rd Capacitor at same bus, If any)

Summary of Recommended Capacitor Banks

STATE	Bus Number	Bus Name	ID	In Service (1) / Out Of Service (0)	Capacitor (MVAr)
PUNJAB	110002	JAMALPUR 66.000	PU	1	4.73
	110004	DANDHARIKAL166.000	PU	1	19.76
	110005	SAHNEWAL 66.000	PU	1	55
	110006	GOBINDGARH1 66.000	PU	1	43
	110007	AMLOHROAD 66.000	PU	1	45
	110008	VERPAL 66.000	PU	1	6.4
	110009	BAHADR 66.000	PU	1	10.59
	110011	KARTARPUR 66.000	PU	1	27
	110012	DERABASSI 66.000	PU	1	0.98
	110014	CIVILINE 66.000	PU	1	15
	110017	MANSA 66.000	PU	1	24
	110020	FATEHGARH 66.000	PU	1	8
	110021	KHARAR 66.000	PU	1	25
	110025	KOHARA 66.000	PU	1	60
	110026	PATTI 66.000	PU	1	5
	110028	RAJPURA 66.000	PU	1	15.45

	110029	JAMSHER 66.000	PU	1	12.94
	110031	GOBINDGARH2 66.000	PU	1	44.8
	110032	LALTONKA 66.000	PU	1	27.34
	110037	AMLOH 66.000	PU	1	30
	110038	RAJLA 66.000	PU	1	4.51
	110040	BHATINDA 66.000	PU	1	9.74
	110043	MOHLI 66.000	PU	1	35
	110044	MAJITHA6 66.000	PU	1	9
	110049	DHANDARIKAL266.000	PU	1	16.26
	110051	RASHIANA 66.000	PU	1	10
	110053	PAKHOWAL 66.000	PU	1	11.39
	110055	JHUNIR 66.000	PU	1	10.74
	110056	LALRU 66.000	PU	1	24
	110059	REHANAJATTAN66.000	PU	1	10.14
	110064	DORAHA 66.000	PU	1	30
	110065	IKOLAHA 66.000	PU	1	10.88
	110066	PASSIANA 66.000	PU	1	9.22
	110067	GAUNSGARH 66.000	PU	1	45
	110068	BASSIPATHNA 66.000	PU	1	12
	110070	UDHOKE 66.000	PU	1	3.2
	110071	GHULAL66 66.000	PU	1	45
	110076	BANUR 66.000	PU	1	2.38
	110085	HSPR26 66.000	PU	1	16.06
	110086	JADLA26 66.000	PU	1	16
	111001	GURDASPUR 132.00	PU	1	12
	111002	DHARIWAL 132.00	PU	1	33
	111007	BANGA 132.00	PU	1	4.77
	111008	PHAGWARA 132.00	PU	1	28.8
	111010	FEROZPUR21 132.00	C1	0	--
	111011	CHAMKAUR 132.00	PU	1	7.23
	111012	MAHILPUR21 132.00	C1	0	--
	111020	WADALAGRAN21132.00	C1	0	--
	111021	KHARAR 132.00	PU	1	9.97
	111023	VERPAL21 132.00	C1	1	44
	111026	PATTI21 132.00	C1	1	15.64
	111027	BILASPUR 132.00	PU	1	2.22
	111029	AMRITSAR21 132.00	PU	1	15
	111030	SIHORA 132.00	PU	1	0.92
	111033	SEH 132.00	PU	1	4.74
	111036	MUKATSAR21 132.00	C1	0	--
	111037	SULTANPUR21 132.00	C1	0	--

	111039	GIDDERBAH 132.00	PU	1	3.02
	111040	BADAL 132.00	PU	1	3.85
	111045	NAWANSHAHAR 132.00	PU	1	38.05
	111055	MOGA-II 132.00	C1	1	23.76
	111058	FEROZSHAH 132.00	PU	1	20
	111064	NURMEHAL 132.00	PU	1	5.19
	111079	NARAINANGAL 132.00	PU	1	18
	111081	SAKTRIBAD 132.00	PU	1	6
	111083	GTROADAM 132.00	PU	1	30
	111084	VERKA 132.00	PU	1	28
	111093	ANANDPUR 132.00	PU	1	5.12
	111106	MOGA-1 132.00	C1	1	4
	111107	MUKATSAR 132.00	C1	0	--
	111111	TALWANDISABO132.00	PU	1	9.53
	112020	WADALAGRANTH132.00	C1	1	16.16
	112023	KOHARA 220.00	PU	1	65
	112028	GORAYA 132.00	C1	1	7.82
	112030	CIVILINE 132.00	C1	1	14
	112073	GAUNSGARH 220.00	PU	1	35
HARYANA	120000	JAGADHARI_BB66.000	HN	1	15.69
	120007	RAMPUR_KAMBO66.000	HN	1	15
	120030	SHAHBAD1 66.000	HN	1	1.67
	120033	SALEMPUR 66.000	HN	1	5
	121001	PINJORE 132.00	HN	1	25
	121004	SAFIDON 132.00	C1	1	19.9
	121010	KURUKSHETRA_132.00	HN	1	1.83
	121025	JINDALSTEEL 132.00	HN	1	5.54
	121030	KARNAL2_1 132.00	HN	1	35
	121039	KIRMICH 132.00	HN	1	4
	121048	BHORE 132.00	HN	1	8.26
	121053	AMIN 132.00	HN	1	3.69
	121054	SAGGA 132.00	HN	1	21.84
	121055	JUNDLA 132.00	HN	1	14.98
	121056	ASSANDH 132.00	C1	0	--
	121056	ASSANDH 132.00	HN	1	16
	121057	JALMANA 132.00	HN	1	16.67
	121059	GHARAUNDA 132.00	HN	1	20
	121060	MADHUBAN 132.00	HN	1	30
	121061	NEWAL 132.00	HN	1	25
	121062	BHADSON 132.00	HN	1	6.44
	121064	NIDANA 132.00	HN	1	10.59

	121071	SAMALKHA2_1 132.00	C1	0	--
	121079	HSIIDC-RAI_1132.00	HN	1	12.85
	121080	RAI _1 132.00	HN	1	40
	121082	MURTHAL 132.00	HN	1	23.25
	121083	GANNAUR 132.00	C1	0	--
	121083	GANNAUR 132.00	HN	1	2.71
	121088	DHAMTAAN 132.00	HN	1	11.43
	121092	GHOGHARIAN 132.00	HN	1	9.9
	121096	BEGA 132.00	HN	1	12.56
	121103	KALANAUR 132.00	HN	1	2.13
	121109	NILOKHERI 132.00	HN	1	15
	121110	PIPLI 132.00	HN	1	3.13
	121114	NAGURAN 132.00	HN	1	28
	121115	ALEWA 132.00	HN	1	18
	121116	KHERI_TALODA132.00	HN	1	42
	121118	JULANA 132.00	HN	1	13.47
	121119	JIND-NEW 132.00	C1	0	--
	121119	JIND-NEW 132.00	HN	1	7.61
	121121	MATLODA 132.00	HN	1	6.43
	121125	NAULTHA 132.00	HN	1	2.93
	121126	MDU-ROHTAK 132.00	HN	1	11.26
	121127	SEC-3-ROHTAK132.00	HN	1	11.53
	121133	GOHANA 132.00	HN	1	15
	121136	JASSIA 132.00	HN	1	8.57
	121137	MAHAM 132.00	HN	1	15
	121141	KOSLI 132.00	C1	0	--
	121144	SATNALI 132.00	HN	1	8.87
	121146	NANGAL-CHOUD132.00	HN	1	6.3
	121147	ATELI-MANDI 132.00	HN	1	14.77
	121150	JUI 132.00	C1	0	--
	121158	BAHU 132.00	HN	1	5
	121160	BIBIPUR 132.00	HN	1	12
	121163	KABRI 132.00	HN	1	20.36
	121172	NARNAUND 132.00	HN	1	12
	121180	TOHANA 132.00	HN	1	29
	121181	UKLANA 132.00	HN	1	20.03
	121185	JAKHAL 132.00	HN	1	15
	121187	BHUTHAN_KALA132.00	HN	1	5.68
	121190	TELIWARA 132.00	HN	1	35
	121198	CHEEKA_132 132.00	C1	0	--
	121199	RAMBA 132.00	HN	1	24

	121201	ROHTAK-132 132.00	C1	0	--
	121206	SIWAN 132.00	C1	0	--
	121208	BIANA 132.00	HN	1	12
	121209	DABRI 132.00	HN	1	24
	121210	BALLAH 132.00	HN	1	4.84
	121215	BAHADURG_132132.00	C1	0	--
	121224	CHANDER_KHUR132.00	HN	1	15
	121233	BHANDERI 132.00	HN	1	7.5
	121236	HSIIDC-KUNDL132.00	HN	1	5.12
	121237	URLANA 132.00	HN	1	15
	121238	CHHAJPUR_132132.00	HN	1	9.55
	121240	MAKRANI 132.00	HN	1	16
RAJASTHAN	131001	ABUROAD 132.00	RN	1	5
	131008	ANDHI1 132.00	RN	1	30
	131010	ANTROLI1 132.00	RN	1	15
	131015	BABAI1 132.00	RN	1	20
	131016	BADAGAON 132.00	C1	1	8.14
	131016	BADAGAON 132.00	RN	1	14
	131018	BADISADAR 132.00	RN	1	26
	131023	BAGORA1 132.00	C1	0	--
	131034	BAORI1 132.00	C1	0	--
	131042	BAYANA 132.00	RN	1	17
	131054	BHADROONA 132.00	C1	0	--
	131058	BHINDER1 132.00	RN	1	8
	131059	BHIWADI1 132.00	RN	1	40.81
	131060	BHOPALGARH 132.00	C1	0	--
	131061	BHUSAWAR 132.00	RN	1	5
	131066	BORUNDA1 132.00	C1	0	--
	131067	BUHANA1 132.00	RN	1	22
	131082	CHURU 132.00	RN	1	5
	131083	DAKANKOT 132.00	RN	1	16
	131087	DARIBA 132.00	RN	1	5
	131139	BHOPA-21 132.00	C1	0	--
	131153	BILARA1 132.00	C1	0	--
	131165	BALI1 132.00	C1	0	--
	131193	GUDHAGOR 132.00	RN	1	37
	131206	JAHAJPUR 132.00	RN	1	11
	131221	JOJAWAR1 132.00	RN	1	4
	131226	KAILADEV 132.00	RN	1	18
	131229	KAMA1 132.00	RN	1	3.84
	131243	KHAJUWAL 132.00	RN	1	10

	131272	LAXMAN-S 132.00	C1	0	--
	131289	MANDRAYW 132.00	RN	1	5.91
	131294	MAPLAWAS 132.00	RN	1	13
	131296	MATHAN-1 132.00	RN	1	2
	131309	MOMASAR1 132.00	RN	1	4
	131312	NADBAI 132.00	C1	0	--
	131314	NAINWA1 132.00	C1	0	--
	131318	NARWA 132.00	C1	0	--
	131319	NASIRABA 132.00	C1	0	--
	131321	NAWA 132.00	C1	0	--
	131323	NAWALGAR 132.00	C1	0	--
	131324	NEEMKATH 132.00	RN	1	13
	131326	NOHAR 132.00	C1	0	--
	131327	NOKHA 132.00	C1	0	--
	131328	NPH-JODH 132.00	C1	1	14
	131330	OPH-JODH 132.00	RN	1	4
	131331	OSIAN 132.00	C1	1	16.25
	131333	PADAMPUR 132.00	C1	0	--
	131334	PADROO1 132.00	C1	0	--
	131335	PALADAR 132.00	C1	0	--
	131339	PAREWARA 132.00	C1	0	--
	131340	PARTAPUR 132.00	RN	1	6.43
	131342	PATLISAR 132.00	C1	0	--
	131342	PATLISAR 132.00	RN	1	15
	131348	PIPAR1 132.00	C1	0	--
	131351	POONSA 132.00	C1	0	--
	131352	PRATA-UD 132.00	RN	1	10.19
	131355	PS-5 132.00	C1	0	--
	131359	PSNO1 132.00	RN	1	3
	131360	PUGALROA 132.00	C1	0	--
	131361	PURANAGH 132.00	C1	0	--
	131363	PUSKA-RO 132.00	C1	0	--
	131365	RAISINGH 132.00	C1	0	--
	131366	RAJAKHER 132.00	C1	1	4.07
	131368	RAJGARH1 132.00	RN	1	5
	131369	RAJIASR 132.00	C1	0	--
	131370	RAMGAR-A 132.00	C1	1	4
	131373	RANASAR1 132.00	C1	0	--
	131374	RANI 132.00	C1	0	--
	131375	RANIWARA 132.00	C1	0	--
	131378	RASHMI 132.00	C1	0	--

	131380	RAWATSAR 132.00	C1	1	8.14
	131385	RIRI 132.00	C1	0	--
	131386	RISHDEO 132.00	RN	1	4.42
	131387	ROON1 132.00	C1	1	4.07
	131390	SADULSHA 132.00	C1	1	5.29
	131393	SALASAR 132.00	C1	1	4.08
	131396	SANCHOR1 132.00	C1	0	--
	131398	SANGOD 132.00	C1	1	8.14
	131399	SANGRIA 132.00	C1	0	--
	131400	SANJOO 132.00	C1	1	8.14
	131401	SANKAD1 132.00	C1	0	--
	131402	SANWAD1 132.00	C1	0	--
	131402	SANWAD1 132.00	RN	1	7.28
	131403	SANWREEJ 132.00	C1	0	--
	131404	SAPOL 132.00	C1	0	--
	131406	SARDARSH 132.00	C1	0	--
	131406	SARDARSH 132.00	RN	1	28
	131407	SARMATHU 132.00	C1	1	2.07
	131407	SARMATHU 132.00	RN	1	4.63
	131410	SAWA(B)1 132.00	C1	1	8.14
	131412	SAYLA1 132.00	C1	0	--
	131413	SEDWA 132.00	C1	0	--
	131428	SISARMA1 132.00	RN	1	18.27
	131434	SOORSAGA 132.00	C1	1	8.14
	131435	SOYLA1 132.00	C1	0	--
	131437	SRIDUNG1 132.00	C1	0	--
	131438	SRIGANGA 132.00	C1	0	--
	131439	SRIKARNP 132.00	C1	0	--
	131440	SRIMADHO 132.00	C1	1	12.21
	131441	SRIMAHAV 132.00	C1	1	4.05
	131442	SRIVIJAY 132.00	C1	0	--
	131443	SUJANGARH1 132.00	C1	0	--
	131446	SUMERPUR 132.00	C1	0	--
	131448	SURPURA1 132.00	C1	0	--
	131451	TAGOREN 132.00	C1	1	7
	131452	TALERA 132.00	C1	0	--
	131453	TARANAGA 132.00	RN	1	12
	131454	TEHANDESAR 132.00	C1	0	--
	131459	THOI_1 132.00	C1	1	5.97
	131461	TODABHIM 132.00	C1	0	--
	131462	TODARASI 132.00	C1	0	--

	131462	TODARASI 132.00	RN	1	12
	131465	UDAIPURW 132.00	C1	0	--
	131467	UNDOO 132.00	C1	0	--
	131469	UPANI_1 132.00	C1	0	--
	131474	Z_MINES 132.00	RN	1	26.54
	131479	KUSHALGARH 132.00	RN	1	4.3
	131482	AAU2 132.00	RN	1	5
	131484	BAITHWASIA 132.00	RN	1	15
	131500	PAHARI 132.00	RN	1	16.75
	131505	ANANDPUR KAL132.00	RN	1	8
	131509	HATUNDI 132.00	C1	1	8.14
	131509	HATUNDI 132.00	RN	1	9.02
	131511	SEEMALWARA 132.00	RN	1	9.62
	131512	GHATOL 132.00	RN	1	8.13
	131517	KHERWARA 132.00	RN	1	8.8
	131518	PEEPALWARA 132.00	RN	1	3.12
	131521	BHANIPURA 132.00	C1	1	8.14
	131522	BICHHIWARA 132.00	RN	1	8.79
	131523	SULTANPUR 132.00	C1	0	--
	131527	GUDHACHANDRJ132.00	RN	1	16.57
	131531	AJASAR 132.00	RN	1	0.03
	131541	JOOJHPURA_1 132.00	RN	1	12.77
	132030	SIROHI 220.00	C1	0	--
	132115	RATANGAR 220.00	C1	0	--
DELHI	140011	BURARI 33.000	DN	1	20
	140017	BURARI 66.000	DN	1	8.65
	140026	WAZIRABAD 66.000	DN	1	56.51
	140028	PATPARGANJ 33.000	DN	1	4.73
	140029	GEETACOLONY 33.000	DN	1	4.18
	140041	IP 33.000	DN	1	5.03
UTTARPRADESH	151000	NOIDA_20 132.00	C1	1	40
	151000	NOIDA_20 132.00	C2	1	40
	151000	NOIDA_20 132.00	C3	1	40
	151001	GOKUL 132.00	C1	0	--
	151001	GOKUL 132.00	C2	0	--
	151003	ATRAULI1 132.00	C1	1	40
	151004	BARAUT1 132.00	C1	1	40
	151004	BARAUT1 132.00	C2	1	40
	151005	AGRAN1 132.00	C1	1	40
	151005	AGRAN1 132.00	C2	1	40
	151005	AGRAN1 132.00	C3	1	20

	151009	BANDA1 132.00	C1	1	40
	151010	HATHRAS1 132.00	C1	1	40
	151011	CHIBRMAU 132.00	C1	1	40
	151015	SHATABD 132.00	C1	1	40
	151016	SIMBOLI 132.00	C1	1	40
	151016	SIMBOLI 132.00	C2	1	40
	151017	GAJRAULA 132.00	C1	1	40
	151017	GAJRAULA 132.00	C2	1	40
	151019	SAHIBAD 132.00	C1	1	40
	151019	SAHIBAD 132.00	C2	1	40
	151021	NEHTOR1 132.00	C1	0	--
	151021	NEHTOR1 132.00	C2	1	40
	151023	NIGHASAN 132.00	C1	0	--
	151023	NIGHASAN 132.00	C2	0	--
	151025	CBGANJ 132.00	C1	0	--
	151025	CBGANJ 132.00	C2	0	--
	151028	SITAPUR1 132.00	C1	1	40
	151029	LUCKNOW1 132.00	C1	1	3
	151031	MURABAD1 132.00	C1	1	40
	151031	MURABAD1 132.00	C2	1	40
	151032	MODIPURM_220132.00	C1	1	40
	151032	MODIPURM_220132.00	C2	0	--
	151032	MODIPURM_220132.00	C3	0	--
	151033	MURADNG1 132.00	C1	1	40
	151033	MURADNG1 132.00	C2	1	40
	151034	SHAMLI1 132.00	C1	1	55
	151035	SAHARAN1 132.00	C1	1	40
	151035	SAHARAN1 132.00	C2	1	40
	151036	AZAMGARH_220132.00	C1	1	40
	151037	NARA 132.00	C1	1	40
	151038	KHURJA1 132.00	C1	1	40
	151038	KHURJA1 132.00	C2	1	40
	151041	DEORIA1 132.00	C1	1	25
	151042	MAINPUR 132.00	C1	1	40
	151042	MAINPUR 132.00	C2	1	40
	151044	PANKI1 132.00	C1	1	40
	151045	FEROZBD1 132.00	C1	1	40
	151046	NAUBSTA 132.00	C1	1	40
	151048	AKBARPUR 132.00	UP	1	10
	151053	GAZIPR2 132.00	C1	1	40
	151054	FATEHPR1 132.00	C1	1	40

	151055	SAHUPR1 132.00	C1	1	45
	151055	SAHUPR1 132.00	C2	1	45
	151056	SARNATH1 132.00	C1	1	40
	151057	BADAUN1 132.00	C1	1	58
	151058	GORAKPR1 132.00	C1	1	40
	151059	SULTANP1 132.00	C1	1	40
	151061	GONDA1 132.00	C1	1	40
	151081	BABRALA 132.00	UP	1	40
	151083	BAGPAT 132.00	C1	1	40
	151088	BANGERMA 132.00	UP	1	30
	151089	BANSI 132.00	C1	1	40
	151092	BARELY-1 132.00	C1	1	40
	151093	BADHALGA 132.00	UP	1	12
	151094	NOIDA129 132.00	UP	1	2.88
	151095	BAHADOHI 132.00	UP	1	12
	151108	BUDHANA 132.00	UP	1	9.67
	151109	CHANDOLI 132.00	UP	1	5
	151116	FARIDNAGAR 132.00	C1	1	40
	151118	DARSHANN 132.00	UP	1	4
	151120	DEBAI 132.00	C1	1	40
	151121	DEOBAND 132.00	UP	1	30.86
	151122	DEORIA_1 132.00	C1	1	20
	151123	DIBIYAPU 132.00	UP	1	37
	151127	ETAH 132.00	C1	1	40
	151132	FATEHABA 132.00	UP	1	15
	151133	GANGOH 132.00	UP	1	5.75
	151136	GAJOKHAR 132.00	C1	1	40
	151137	GHATAMPU 132.00	UP	1	30
	151142	GOPIGANJ 132.00	UP	1	27
	151148	MEERUTRO 132.00	UP	1	4
	151157	JAHANGIR 132.00	C1	1	40
	151157	JAHANGIR 132.00	C2	1	40
	151158	JAHANABA 132.00	UP	1	10
	151161	JANSETH 132.00	C1	1	40
	151164	JAUNPUR1 132.00	C1	1	40
	151167	JHUSI 132.00	C1	1	40
	151169	RCGREEN 132.00	C1	1	40
	151172	RAJAPAKA 132.00	UP	1	16
	151174	RAMPUR 132.00	C1	1	40
	151176	RASRA 132.00	C1	1	40
	151177	RATH 132.00	UP	1	3

	151184	SEFAI 132.00	C1	1	40
	151186	SHAHGANJ 132.00	UP	1	10.72
	151194	SIKANDRABAD 132.00	C1	0	--
	151197	SIRATHU 132.00	C1	0	--
	151215	ZAMNIA 132.00	UP	1	7
	151216	SAMBHAL 132.00	C1	1	40
	151219	DADRI_13 132.00	C1	1	40
	151235	KARVI 132.00	C1	0	--
	151244	KHAIR 132.00	C1	1	45
	151253	KUNDA 132.00	UP	1	25
	151268	MANJHANP 132.00	UP	1	2
	151272	MARTINPURWA 132.00	UP	1	45
	151276	MAU_RANI 132.00	UP	1	6.86
	151280	MAHARAJGANJ 132.00	UP	1	22
	151291	MOTH 132.00	UP	1	29.75
	151297	NAKUR 132.00	UP	1	3.94
	151298	NANAUTA 132.00	C1	1	40
	151300	SHAHJAHA 132.00	C1	1	40
	151300	SHAHJAHA 132.00	C2	1	40
	151303	NEBODPAR 132.00	UP	1	7
	151307	NKN 132.00	UP	1	4
	151309	NOIDA_IV 132.00	UP	1	9.93
	151310	MIRZAPUR22 132.00	C1	1	40
	151316	PARTAPGA 132.00	C1	0	--
	151318	PARTAPPU 132.00	C1	1	40
	151318	PARTAPPU 132.00	C2	1	40
	151384	DALMAU 132.00	UP	1	38
	151389	JALAUN1 132.00	UP	1	2
	151412	KURSIROAD 132.00	C1	1	40
	151413	BEHAT 132.00	C1	1	40
	151421	NEW TANDA 132.00	C1	1	40
	151422	BAHRAICH 220132.00	C1	1	40
	151440	SIKANDRARAO 132.00	C1	1	40
	151444	SARENI 132.00	UP	1	7
	151445	GURSARAYE 132.00	UP	1	5.3
	151458	MAHMUDABAD 132.00	UP	1	7
	151462	SALON 132.00	UP	1	14
	151464	MEHRAUNI 132.00	UP	1	4.84
	151476	CHHATA 132.00	C1	1	40
	151477	SIRSA 132.00	C1	1	40
	151478	CHARLA 132.00	C1	0	--

	151484	JAHGIRPUR 132.00	UP	1	17
	151501	AMROHA_220 132.00	C1	0	--
	151503	NOIDA_BHANGL132.00	UP	1	58.24
	151512	SIKANDRA 132.00	C1	0	--
	151512	SIKANDRA 132.00	C2	0	--
	151531	SEC-148_132 132.00	C1	0	--
	151549	BARABNKI_220132.00	C1	0	--
UTTARAKHAND	161000	CPP 132.00	UK	1	6
	161010	ALMORA 132.00	UK	1	33
	161011	KICCHHA 132.00	UK	1	6
	161014	KOTDWAR 132.00	UK	1	27
	161016	BHAGWANN 132.00	UK	1	28
	161017	BINDAL 132.00	UK	1	7
	161020	PURKULGA 132.00	UK	1	12
	161022	RUDRAPUR 132.00	UK	1	12
	161026	RANIKHET 132.00	UK	1	9
	161030	LAKSAR 132.00	UK	1	40
	161036	MAZRA 132.00	UK	1	10
	161041	ASIGLS 132.00	UK	1	3
	161046	RBNS 132.00	UK	1	8.09
	161050	CHUDIYALA 132.00	UK	1	9.02
	161053	ELDICO 132.00	UK	1	6
JAMMU & KASHMIR	181009	ARAMGARH 132.00	JN	1	20
CHANDIGARH	190000	CHANDIGA_S3966.000	CN	1	42.2
	190004	CHANDIGA_S2866.000	CN	1	15.36
	190010	CHANDIGA_S5666.000	CN	1	41.76
HIMACHAL PRADDESH	171011	KALAAMB1 132.00	HM	1	17
	171013	PAONTA1 132.00	HM	1	12

ANNEXURE-II-A
Bus Wise State Voltage Profile

Punjab						
Bus Number	**Base kV**	**Bus Name**	**Area Name**	**Owner Name**	**Base Case V (PU)**	**With Recommended Capacitors V (PU)**
110000	66	JALANDHAR	PUNJAB	PUNJ_STU	0.9807	0.9981
110001	66	SANGRUR	PUNJAB	PUNJ_STU	**0.9657**	0.9931
110002	66	JAMALPUR	PUNJAB	PUNJ_STU	**0.9611**	0.9953
110003	66	BUTARI	PUNJAB	PUNJ_STU	0.9866	1.002
110004	66	DANDHARIKAL1	PUNJAB	PUNJ_STU	**0.9415**	0.9899
110005	66	SAHNEWAL	PUNJAB	PUNJ_STU	**0.6384**	0.9944
110006	66	GOBINDGARH1	PUNJAB	PUNJ_STU	**0.873**	0.9806
110007	66	AMLOHROAD	PUNJAB	PUNJ_STU	**0.8632**	0.989
110008	66	VERPAL	PUNJAB	PUNJ_STU	**0.9618**	0.9867
110009	66	BAHADR	PUNJAB	PUNJ_STU	**0.9441**	0.9911
110010	66	KOTLAJUNGAN	PUNJAB	PUNJ_STU	**0.9738**	0.9996
110011	66	KARTARPUR	PUNJAB	PUNJ_STU	**0.9383**	0.9841
110012	66	DERABASSI	PUNJAB	PUNJ_STU	**0.9473**	0.9946
110013	66	HUMBRAN1	PUNJAB	PUNJ_STU	**0.9723**	0.9996
110014	66	CIVILINE	PUNJAB	PUNJ_STU	**0.9584**	0.986
110015	66	JAGRAON	PUNJAB	PUNJ_STU	**0.9759**	0.996
110016	66	GHUBAYA	PUNJAB	PUNJ_STU	1.0169	1.022
110017	66	MANSA	PUNJAB	PUNJ_STU	**0.9346**	0.9842
110018	66	SUNAM	PUNJAB	PUNJ_STU	**0.9743**	0.9951
110019	66	DHURI	PUNJAB	PUNJ_STU	**0.971**	1.0054
110020	66	FATEHGARH	PUNJAB	PUNJ_STU	**0.9647**	0.9845
110021	66	KHARAR	PUNJAB	PUNJ_STU	**0.8466**	0.9818
110022	66	FEROZPUR_RD	PUNJAB	PUNJ_STU	**0.9686**	0.9961
110023	66	BATLA	PUNJAB	PUNJ_STU	0.9832	0.9908
110024	66	BOTIANWALA	PUNJAB	PUNJ_STU	0.9971	1.0043
110025	66	KOHARA	PUNJAB	PUNJ_STU	**0.5439**	0.9882
110026	66	PATTI	PUNJAB	PUNJ_STU	0.9804	0.9883
110027	66	DASUYA	PUNJAB	PUNJ_STU	**0.9778**	0.9891
110028	66	RAJPURA	PUNJAB	PUNJ_STU	**0.9379**	0.9894
110029	66	JAMSHER	PUNJAB	PUNJ_STU	**0.9425**	0.9899

110030	66	HIMMATPURA	PUNJAB	PUNJ_STU	0.9811	0.9948
110031	66	GOBINDGARH2	PUNJAB	PUNJ_STU	**0.875**	0.9823
110032	66	LALTONKA	PUNJAB	PUNJ_STU	**0.931**	0.9843
110033	66	BAZAKHANA	PUNJAB	PUNJ_STU	0.9991	1.0091
110034	66	PATRAN	PUNJAB	PUNJ_STU	0.9893	1.0126
110035	66	ABLOWAL	PUNJAB	PUNJ_STU	**0.9676**	1.0025
110036	66	MALERKOTLA	PUNJAB	PUNJ_STU	**0.9585**	0.9935
110037	66	AMLOH	PUNJAB	PUNJ_STU	**0.9104**	0.9836
110038	66	RAJLA	PUNJAB	PUNJ_STU	**0.9556**	0.9914
110039	66	BARNALA	PUNJAB	PUNJ_STU	0.9895	1.0094
110040	66	BHATINDA	PUNJAB	PUNJ_STU	**0.9552**	0.9809
110041	66	BRAHPURANA	PUNJAB	PUNJ_STU	1.0004	1.0101
110042	66	KHASA	PUNJAB	PUNJ_STU	0.9883	1.003
110043	66	MOHLI	PUNJAB	PUNJ_STU	**0.8601**	0.9812
110044	66	MAJITHA6	PUNJAB	PUNJ_STU	**0.9552**	0.9842
110045	66	K.S.MAL	PUNJAB	PUNJ_STU	**0.9758**	0.9864
110046	66	TIBBER	PUNJAB	PUNJ_STU	0.9927	0.9961
110047	66	AJITWAL	PUNJAB	PUNJ_STU	0.9851	0.9999
110048	66	MOHALI-II	PUNJAB	PUNJ_STU	**0.9175**	1.0027
110049	66	DHANDARIKAL2	PUNJAB	PUNJ_STU	**0.9484**	0.9915
110050	66	SADIQ	PUNJAB	PUNJ_STU	**0.976**	0.9821
110051	66	RASHIANA	PUNJAB	PUNJ_STU	**0.9597**	0.9818
110052	66	MALOUT	PUNJAB	PUNJ_STU	**0.9783**	0.9859
110053	66	PAKHOWAL	PUNJAB	PUNJ_STU	**0.95**	0.9854
110054	66	NABHA	PUNJAB	PUNJ_STU	0.9863	1.0122
110055	66	JHUNIR	PUNJAB	PUNJ_STU	**0.9469**	0.9848
110056	66	LALRU	PUNJAB	PUNJ_STU	**0.9006**	0.9889
110057	66	ALGAON	PUNJAB	PUNJ_STU	0.9908	0.9958
110058	66	KAPURTHALA	PUNJAB	PUNJ_STU	**0.9727**	0.9877
110059	66	REHANAJATTAN	PUNJAB	PUNJ_STU	**0.9375**	0.9884
110060	66	GOBINDGARH-3	PUNJAB	PUNJ_STU	1	1
110061	66	CHOLASAHIB	PUNJAB	PUNJ_STU	0.9943	0.9957
110062	66	MASTEWAL	PUNJAB	PUNJ_STU	1.0097	1.0168
110063	66	MEHALKALAN	PUNJAB	PUNJ_STU	0.9837	1.0011
110064	66	DORAHA	PUNJAB	PUNJ_STU	**0.9012**	0.9838
110065	66	IKOLAHA	PUNJAB	PUNJ_STU	**0.9072**	0.9931
110066	66	PASSIANA	PUNJAB	PUNJ_STU	**0.9374**	0.9883
110067	66	GAUNSGARH	PUNJAB	PUNJ_STU	**0.5145**	0.9893
110068	66	BASSIPATHNA	PUNJAB	PUNJ_STU	**0.8703**	0.9852

110069	66	KAKRALA	PUNJAB	PUNJ_STU	**0.9746**	0.9992
110070	66	UDHOKE	PUNJAB	PUNJ_STU	**0.9719**	0.9849
110071	66	GHULAL66	PUNJAB	PUNJ_STU	**0.6538**	0.99
110072	66	DHANAULA	PUNJAB	PUNJ_STU	0.9822	1.0019
110073	66	BADSHAHPUR	PUNJAB	PUNJ_STU	0.9987	1.007
110074	66	BANGAN	PUNJAB	PUNJ_STU	1.0044	1.0258
110075	66	CHOGAWAN	PUNJAB	PUNJ_STU	**0.9717**	0.987
110076	66	BANUR	PUNJAB	PUNJ_STU	**0.9485**	0.9925
110077	66	LEHRAMOHABBT	PUNJAB	PUNJ_STU	0.9856	0.9969
110078	66	KOTKAPURA	PUNJAB	PUNJ_STU	1.0117	1.0187
110079	66	NOORMEHAL	PUNJAB	PUNJ_STU	0.9873	1.0107
110080	66	CHAJLI	PUNJAB	PUNJ_STU	1.0115	1.0317
110081	66	MAJRA	PUNJAB	PUNJ_STU	**0.9152**	0.9883
110082	66	NARAINGARH	PUNJAB	PUNJ_STU	0.9818	0.9961
110084	66	GOBINDGR426	PUNJAB	PUNJ_STU	**0.9036**	0.9848
110085	66	HSPR26	PUNJAB	PUNJ_STU	**0.9355**	0.9847
110086	66	JADLA26	PUNJAB	PUNJ_STU	**0.8754**	0.9942
110087	66	LADOWAL26	PUNJAB	PUNJ_STU	**0.9714**	0.9982
110088	66	BHWANIGR26	PUNJAB	PUNJ_STU	0.9825	1.0086
111000	132	UBDCPH-1	PUNJAB	PUNJ_HYD	0.996	0.998
111001	132	GURDASPUR	PUNJAB	PUNJ_STU	**0.972**	0.9922
111002	132	DHARIWAL	PUNJAB	PUNJ_STU	**0.967**	0.9936
111003	132	SHRIHARGOBIN	PUNJAB	PUNJ_STU	1.0042	0.9964
111004	132	PIMS	PUNJAB	PUNJ_STU	0.9801	0.9975
111005	132	ASRON	PUNJAB	PUNJ_STU	**0.9178**	0.9939
111006	132	JADLA	PUNJAB	PUNJ_STU	**0.9381**	0.9979
111007	132	BANGA	PUNJAB	PUNJ_STU	**0.9267**	0.9871
111008	132	PHAGWARA	PUNJAB	PUNJ_STU	**0.9218**	0.9887
111009	132	MUKERIAN-4	PUNJAB	PUNJ_HYD	1.028	1.011
111010	132	FEROZPUR21	PUNJAB	PUNJ_STU	1.0014	0.9988
111011	132	CHAMKAUR	PUNJAB	PUNJ_STU	**0.9218**	0.9918
111012	132	MAHILPUR21	PUNJAB	PUNJ_STU	**0.9724**	1.0063
111013	132	GHULAL	PUNJAB	PUNJ_STU	**0.9353**	0.9948
111014	132	GHOLIA	PUNJAB	PUNJ_STU	0.9877	0.9948
111015	132	CHOHAL	PUNJAB	PUNJ_STU	**0.9734**	0.9815
111016	132	BHOGPUR	PUNJAB	PUNJ_STU	0.9809	0.9887
111017	132	MUKERI-3	PUNJAB	PUNJ_HYD	1.0305	1.0132
111018	132	PATHANKOT	PUNJAB	PUNJ_STU	0.9897	0.9931
111019	132	SARNA21	PUNJAB	PUNJ_STU	0.996	0.9998

111020	132	WADALAGRAN21	PUNJAB	PUNJ_STU	0.9955	0.9963
111021	132	KHARAR	PUNJAB	PUNJ_STU	**0.9133**	0.9917
111022	132	MEHMUDAN	PUNJAB	PUNJ_STU	**0.9322**	0.9928
111023	132	VERPAL21	PUNJAB	PUNJ_STU	**0.9703**	0.9885
111024	132	DORAHA	PUNJAB	PUNJ_STU	**0.9306**	0.9918
111025	132	MOGA21	PUNJAB	PUNJ_STU	0.9918	0.9989
111026	132	PATTI21	PUNJAB	PUNJ_STU	0.9951	0.9975
111027	132	BILASPUR	PUNJAB	PUNJ_STU	**0.9249**	0.9888
111028	132	JALANDHAR21	PUNJAB	PUNJ_STU	0.9825	1.0001
111029	132	AMRITSAR21	PUNJAB	PUNJ_STU	**0.9628**	0.9849
111030	132	SIHORA	PUNJAB	PUNJ_STU	**0.926**	0.9891
111031	132	ROPAR21	PUNJAB	PUNJ_STU	**0.9131**	0.9978
111032	132	GORAYA21	PUNJAB	PUNJ_STU	**0.9282**	0.9924
111033	132	SEH	PUNJAB	PUNJ_STU	**0.9266**	0.9892
111034	132	SHAMSPUR	PUNJAB	PUNJ_STU	**0.9279**	0.9896
111035	132	MAUR	PUNJAB	PUNJ_STU	**0.9767**	0.994
111036	132	MUKATSAR21	PUNJAB	PUNJ_STU	1.0036	0.9968
111037	132	SULTANPUR21	PUNJAB	PUNJ_STU	1.0173	1.0067
111038	132	BALUANA	PUNJAB	PUNJ_STU	**0.9741**	0.9914
111039	132	GIDDERBAH	PUNJAB	PUNJ_STU	**0.9627**	0.9838
111040	132	BADAL	PUNJAB	PUNJ_STU	**0.9608**	0.9833
111041	132	JAMALPUR21	PUNJAB	PUNJ_STU	**0.9527**	1.0024
111042	132	MALOUT	PUNJAB	PUNJ_STU	0.993	0.9895
111043	132	ABOHAR	PUNJAB	PUNJ_STU	0.9985	0.9984
111044	132	BHATINDA21	PUNJAB	PUNJ_STU	0.9808	0.9962
111045	132	NAWANSHAHAR	PUNJAB	PUNJ_STU	**0.9233**	0.9902
111046	132	ANANDGARH-2	PUNJAB	PUNJ_HYD	**0.95**	1.005
111047	132	JALALABAD	PUNJAB	PUNJ_STU	0.9896	0.9828
111048	132	SADIQ	PUNJAB	PUNJ_STU	1.0022	0.9999
111049	132	SARAINANGAL	PUNJAB	PUNJ_STU	0.9944	0.9898
111050	132	PANJGARY	PUNJAB	PUNJ_STU	0.9917	0.9919
111051	132	KOTAKPUR	PUNJAB	PUNJ_STU	0.986	0.9847
111052	132	KOTAKPUR1	PUNJAB	PUNJ_STU	0.9863	0.9841
111053	132	BAGHAPURANA	PUNJAB	PUNJ_STU	0.9874	0.9923
111054	132	SAMADHBH	PUNJAB	PUNJ_STU	0.9857	0.9928
111055	132	MOGA-II	PUNJAB	PUNJ_STU	0.992	0.9988
111056	132	FARIDKOT	PUNJAB	PUNJ_STU	0.9969	0.9946
111057	132	MANASING	PUNJAB	PUNJ_STU	0.9842	0.9887
111058	132	FEROZSHAH	PUNJAB	PUNJ_STU	**0.9708**	0.9825

111059	132	TALWANDI	PUNJAB	PUNJ_STU	0.9838	0.991
111060	132	SOSAN	PUNJAB	PUNJ_STU	0.9855	0.9926
111061	132	BADNIKALAN	PUNJAB	PUNJ_STU	0.982	0.9891
111062	132	DHARAMKOT	PUNJAB	PUNJ_STU	0.9939	1.0016
111063	132	SWADIKALAN	PUNJAB	PUNJ_STU	**0.9639**	0.9955
111064	132	NURMEHAL	PUNJAB	PUNJ_STU	**0.944**	0.9869
111065	132	NAKODAR	PUNJAB	PUNJ_STU	**0.9561**	0.9901
111066	132	URBANEST	PUNJAB	PUNJ_STU	**0.9653**	0.994
111067	132	UBDCPH-3	PUNJAB	PUNJ_HYD	0.993	0.9969
111068	132	UBDCPH-2	PUNJAB	PUNJ_HYD	0.9948	0.9975
111069	132	RCFACTORY	PUNJAB	PUNJ_STU	**0.9786**	0.9958
111070	132	KHERAMAN	PUNJAB	PUNJ_STU	1.0139	1.0033
111071	132	ALAWALPUR	PUNJAB	PUNJ_STU	0.9825	0.9955
111072	132	BEAS	PUNJAB	PUNJ_STU	**0.9762**	0.9929
111073	132	HOSHIARPUR	PUNJAB	PUNJ_STU	**0.974**	0.982
111074	132	TANDA	PUNJAB	PUNJ_STU	0.9868	0.9892
111075	132	JANDIALA	PUNJAB	PUNJ_STU	**0.9677**	0.983
111076	132	EKALGADA	PUNJAB	PUNJ_STU	**0.968**	0.9828
111077	132	TARANTARAN	PUNJAB	PUNJ_STU	**0.971**	0.9848
111078	132	BHIKIWIND	PUNJAB	PUNJ_STU	0.9809	0.9834
111079	132	NARAINANGAL	PUNJAB	PUNJ_STU	**0.9608**	0.9826
111080	132	HAKIMAGARH	PUNJAB	PUNJ_STU	**0.9622**	0.9819
111081	132	SAKTRIBAD	PUNJAB	PUNJ_STU	**0.9616**	0.9815
111082	132	MALMANDI	PUNJAB	PUNJ_STU	**0.9584**	0.9811
111083	132	GTROADAM	PUNJAB	PUNJ_STU	**0.9576**	0.981
111084	132	VERKA	PUNJAB	PUNJ_STU	**0.9599**	0.9809
111085	132	POWERCOLONY	PUNJAB	PUNJ_STU	**0.9609**	0.9825
111086	132	MUKERI-1	PUNJAB	PUNJ_HYD	1.032	1.0144
111087	132	MUKERI-2	PUNJAB	PUNJ_HYD	1.03	1.013
111088	132	MAMUN	PUNJAB	PUNJ_STU	0.9884	0.9913
111089	132	JOGINDERNAGA	PUNJAB	PUNJ_HYD	1.022	1.013
111090	132	SARNA	PUNJAB	PUNJ_STU	0.993	0.9969
111091	132	TANGRA	PUNJAB	PUNJ_STU	**0.9672**	0.9827
111092	132	ANANDGARH-1	PUNJAB	PUNJ_HYD	**0.9489**	1.0045
111093	132	ANANDPUR	PUNJAB	PUNJ_STU	**0.9487**	1.0044
111094	132	KAHANPUR	PUNJAB	PUNJ_STU	**0.9784**	0.9886
111095	132	BATALA	PUNJAB	PUNJ_STU	0.9899	0.9931
111096	132	BUTARI21	PUNJAB	PUNJ_STU	**0.9696**	0.9852
111097	132	CHILDERNPARK	PUNJAB	PUNJ_STU	0.9803	0.9978

111098	132	DHILWAN	PUNJAB	PUNJ_STU	**0.9703**	0.9865
111099	132	GOBI2-21	PUNJAB	PUNJ_STU	**0.9267**	0.9892
111100	132	IGCBHATI	PUNJAB	PUNJ_STU	**0.9775**	0.9931
111101	132	JAYANTI	PUNJAB	PUNJ_STU	**0.9744**	0.9858
111102	132	KAPURTHALA	PUNJAB	PUNJ_STU	**0.9789**	0.9961
111103	132	KARTARPUR21	PUNJAB	PUNJ_STU	0.9853	1.0033
111104	132	KOTLIS21	PUNJAB	PUNJ_STU	0.9958	0.9966
111105	132	KATHUNAN	PUNJAB	PUNJ_STU	**0.9673**	0.9811
111106	132	MOGA-1	PUNJAB	PUNJ_STU	0.988	0.9961
111107	132	MUKATSAR	PUNJAB	PUNJ_STU	1.0016	0.9945
111108	132	PHILLLOUR	PUNJAB	PUNJ_STU	**0.9354**	0.9935
111109	132	SCIENCE	PUNJAB	PUNJ_STU	0.9804	0.9976
111110	132	ROPAR	PUNJAB	PUNJ_STU	**0.9211**	0.9936
111111	132	TALWANDISABO	PUNJAB	PUNJ_STU	**0.946**	0.9837
111112	132	KANGR-PS	PUNJAB	PUNJ_STU	1.0001	0.9983
111115	132	DHALLEKE	PUNJAB	PUNJ_STU	0.9926	1.0003
111116	132	NAKODER21	PUNJAB	PUNJ_STU	**0.9633**	0.9943
112000	220	BUTARI	PUNJAB	PUNJ_STU	0.995	1.0103
112001	220	DANDHAR1	PUNJAB	PUNJ_STU	**0.9769**	1.0083
112002	220	SAHNEWAL	PUNJAB	PUNJ_STU	**0.6658**	0.9826
112003	220	GOBINDGARH-1	PUNJAB	PUNJ_STU	**0.9165**	0.9964
112004	220	LEHRAMOHABBA	PUNJAB	PUNJ_TH	1.005	1.016
112005	220	BAHADURGARH	PUNJAB	PUNJ_STU	0.9804	1.0172
112006	220	NAKODAR	PUNJAB	PUNJ_STU	0.9866	1.012
112007	220	KARTARPUR	PUNJAB	PUNJ_STU	0.9908	1.0133
112008	220	DERABASSI	PUNJAB	PUNJ_STU	**0.9625**	1.0083
112009	220	HUMBARAN	PUNJAB	PUNJ_STU	0.9841	1.011
112010	220	FEROZPUR	PUNJAB	PUNJ_STU	1.0062	1.0118
112011	220	JAGRAON	PUNJAB	PUNJ_STU	0.9942	1.0139
112012	220	MAHILPUR	PUNJAB	PUNJ_STU	**0.9731**	1.0089
112013	220	MANSA	PUNJAB	PUNJ_STU	**0.9624**	0.9924
112014	220	SUNAM	PUNJAB	PUNJ_STU	1.0043	1.0242
112015	220	DHURI	PUNJAB	PUNJ_STU	0.9807	1.0147
112016	220	FATEHGARH	PUNJAB	PUNJ_STU	0.9827	0.9962
112017	220	KHARAR	PUNJAB	PUNJ_STU	**0.8796**	0.9904
112018	220	SARNA	PUNJAB	PUNJ_STU	1.0182	1.0215
112019	220	RSD	PUNJAB	PUNJ_HYD	1.022	1.0249
112020	132	WADALAGRANTH	PUNJAB	PUNJ_STU	0.9956	1.0031
112021	220	BOTIANWALA	PUNJAB	PUNJ_STU	1.0149	1.022

112022	220	VERPAL	PUNJAB	PUNJ_STU	0.9995	1.0137
112023	220	KOHARA	PUNJAB	PUNJ_STU	**0.6388**	0.9866
112024	220	MOGA-PS	PUNJAB	PUNJ_STU	1.0143	1.0237
112025	220	PATTI	PUNJAB	PUNJ_STU	1.0011	1.0051
112026	220	RAJPURA	PUNJAB	PUNJ_STU	**0.9777**	1.0149
112027	220	JAMSHER	PUNJAB	PUNJ_STU	**0.9709**	1.0069
112028	132	GORAYA	PUNJAB	PUNJ_STU	**0.9051**	0.9972
112029	220	ROPAR	PUNJAB	PUNJ_TH	**0.8817**	0.997
112030	132	CIVILINE	PUNJAB	PUNJ_STU	0.9816	0.9973
112031	220	HIMMATPURA	PUNJAB	PUNJ_STU	1.0003	1.0136
112032	220	GHUBAYA	PUNJAB	PUNJ_STU	1.0222	1.0273
112033	220	GOBINDGARH-2	PUNJAB	PUNJ_STU	**0.9148**	0.9942
112034	220	LALTONKA	PUNJAB	PUNJ_STU	0.9821	1.0114
112035	220	BAJAKHANA	PUNJAB	PUNJ_STU	1.0091	1.0189
112036	220	MUKTSAR	PUNJAB	PUNJ_STU	1.0039	1.0098
112037	220	SULTANPUR	PUNJAB	PUNJ_STU	1.0077	1.0095
112038	220	PATRAN	PUNJAB	PUNJ_STU	1.0049	1.0278
112039	220	PATIALA-PS	PUNJAB	PUNJ_STU	0.9862	1.0203
112040	220	MALERKOTL-PS	PUNJAB	PUNJ_STU	0.9841	1.0179
112041	220	AMLOH	PUNJAB	PUNJ_STU	**0.9498**	0.9968
112042	220	RAJLA	PUNJAB	PUNJ_STU	0.9873	1.0182
112043	220	BARNALA-PS	PUNJAB	PUNJ_STU	0.9951	1.0149
112044	220	BATHINDA	PUNJAB	PUNJ_TH	0.9983	1.0081
112045	220	BAGHAPUR	PUNJAB	PUNJ_STU	1.0121	1.0217
112046	220	KHASSA	PUNJAB	PUNJ_STU	0.9927	1.0074
112047	220	MOHALI-1	PUNJAB	PUNJ_STU	**0.9749**	1.0147
112048	220	MAJITHA	PUNJAB	PUNJ_STU	0.9807	0.9955
112049	220	KOTLISURATMA	PUNJAB	PUNJ_STU	0.9878	0.9983
112050	220	TIBBER	PUNJAB	PUNJ_STU	1.0115	1.0148
112051	220	AJITWAL	PUNJAB	PUNJ_STU	1.003	1.0174
112052	220	MOHALI-2	PUNJAB	PUNJ_STU	**0.9612**	1.0079
112053	220	DANDHARIKAL2	PUNJAB	PUNJ_STU	**0.9766**	1.008
112054	220	AMLOHROAD	PUNJAB	PUNJ_STU	**0.9066**	0.9915
112055	220	SADIQ	PUNJAB	PUNJ_STU	1.0036	1.0094
112056	220	RASHIANA	PUNJAB	PUNJ_STU	0.9919	0.9984
112057	220	MALOUT	PUNJAB	PUNJ_STU	0.9997	1.007
112058	220	PAKHOWAL	PUNJAB	PUNJ_STU	0.9847	1.01
112059	220	FP.NABHA	PUNJAB	PUNJ_STU	0.9992	1.0248
112060	220	JHUNIR	PUNJAB	PUNJ_STU	**0.9567**	0.9887

112061	220	LALRU	PUNJAB	PUNJ_STU	**0.9688**	1.0127
112062	220	ALGAON	PUNJAB	PUNJ_STU	1.0042	1.0091
112063	220	FEROZPUR_RD	PUNJAB	PUNJ_STU	0.9848	1.0117
112064	220	KAPURTHALA	PUNJAB	NR_PGCIL	1.0066	1.0209
112065	220	REHANAJATTAN	PUNJAB	PUNJ_STU	**0.9752**	1.0085
112066	220	GOINDWAL	PUNJAB	PUNJ_STU	1.012	1.011
112067	220	CHOLASHAHIB	PUNJAB	PUNJ_STU	1.0068	1.0081
112068	220	MASTEWAL	PUNJAB	PUNJ_STU	1.0167	1.0238
112069	220	MEHALKALAN	PUNJAB	PUNJ_STU	0.9979	1.015
112070	220	DORAHA	PUNJAB	PUNJ_STU	0.9848	1.013
112071	220	IKOLOHA	PUNJAB	PUNJ_STU	**0.9347**	1.0013
112072	220	PASSIANA	PUNJAB	PUNJ_STU	0.9838	1.0177
112073	220	GAUNSGARH	PUNJAB	PUNJ_TH	**0.6628**	0.9858
112074	220	BASSIPATHNA	PUNJAB	PUNJ_STU	**0.9021**	0.9944
112075	220	KAKRALA	PUNJAB	PUNJ_STU	1.0018	1.0254
112076	220	TALWANDISABO	PUNJAB	PUNJ_STU	**0.9706**	0.9954
112077	220	UDHOKE	PUNJAB	PUNJ_STU	0.9924	1.0004
112078	220	DHURI4	PUNJAB	PUNJ_STU	1.0152	1.0337
112079	220	DEVIGARH	PUNJAB	PUNJ_STU	**0.9795**	1.0196
112080	220	MAKHU	PUNJAB	PUNJ_STU	1.0171	1.0242
112081	220	MOHALI-S	PUNJAB	PUNJ_STU	**0.8928**	0.9913
112082	220	MOHALI-3	PUNJAB	PUNJ_STU	**0.9749**	1.0147
112083	220	PATRAN_400	PUNJAB	PUNJ_STU	1.0065	1.0299
112084	220	MUKATSAR	PUNJAB	PUNJ_STU	1.0329	1.0376
112085	220	NAKODAR42	PUNJAB	PUNJ_STU	0.997	1.0201
112086	220	RAJPURA42	PUNJAB	PUNJ_STU	**0.9784**	1.0206
112087	220	DHANAULA	PUNJAB	PUNJ_STU	1	1.0193
112088	220	BADSHAHPUR	PUNJAB	PUNJ_STU	1.0019	1.0102
112089	220	BANGAN	PUNJAB	PUNJ_STU	1.0077	1.029
112090	220	CHOGAWAN	PUNJAB	PUNJ_STU	0.9877	1.0027
112091	220	BANUR	PUNJAB	PUNJ_STU	**0.9729**	1.012
112092	220	NOORMEHAL	PUNJAB	PUNJ_STU	0.9946	1.0177
112093	220	CHAJLI	PUNJAB	PUNJ_STU	1.0115	1.0317
112094	220	TALWANDIBHAI	PUNJAB	PUNJ_STU	1.0132	1.0211
112095	220	KOTKAPURA	PUNJAB	PUNJ_STU	1.0149	1.0219
112096	220	AMRIT-PG	PUNJAB	NR_PGCIL	1.0007	1.0147
112097	220	MALER-PG	PUNJAB	NR_PGCIL	0.9878	1.0206
112098	220	MOGA-PG	PUNJAB	NR_PGCIL	1.0144	1.0238
112099	220	LUDHIANA	PUNJAB	NR_PGCIL	0.9891	1.0164

112100	220	PATIA-PG	PUNJAB	NR_PGCIL	0.995	1.026
112102	220	JALANDHAR-BB	PUNJAB	BBMB	0.9942	1.0115
112108	220	DHARAMKOTE	PUNJAB	PUNJ_STU	1.0141	1.0216
112109	220	SANDHAUR	PUNJAB	PUNJ_STU	0.9863	1.0168
112110	220	ABOHAR	PUNJAB	PUNJ_STU	1.0017	1.0077
112111	220	BADAL	PUNJAB	PUNJ_STU	1	1
112112	220	LLK-1	PUNJAB	PUNJ_STU	0.988	1.0152
112113	220	BHARI	PUNJAB	PUNJ_STU	**0.9226**	0.9969
112114	220	GHULAL2	PUNJAB	PUNJ_STU	**0.6978**	0.9812
112115	220	MAJRA	PUNJAB	PUNJ_STU	**0.9253**	0.9975
112116	220	NARAINGARH	PUNJAB	PUNJ_STU	0.9983	1.0123
112117	220	LADHOWAL2	PUNJAB	PUNJ_STU	0.9857	1.0121
112118	220	SCINCITY2	PUNJAB	PUNJ_TH	1.0049	1.0193
112119	220	GOBINGRH42	PUNJAB	PUNJ_STU	**0.9162**	0.9962
112120	220	HOSHIARPUR2	PUNJAB	PUNJ_STU	**0.9737**	1.0055
112121	220	JADLA2	PUNJAB	PUNJ_STU	**0.8971**	0.9978
112122	220	MAUR2	PUNJAB	PUNJ_STU	0.9833	1.0023
112123	220	SAHNEWALB2	PUNJAB	PUNJ_STU	0.9875	1.0145
112124	220	JAMSHERB2	PUNJAB	PUNJ_STU	0.9996	1.0111
112125	220	BHWANIGARH2	PUNJAB	PUNJ_STU	0.9971	1.0227
112126	220	ALAWALPUR	PUNJAB	PUNJ_STU	0.9968	1.0128
112127	220	BADHNIKALAN	PUNJAB	PUNJ_STU	1.0088	1.0199
112128	220	TARN TARAN	PUNJAB	PUNJ_STU	1.0222	1.0293
114000	400	TALWANDISABO	PUNJAB	PUNJ_TH	1.05	1.0542
114001	400	DHURI	PUNJAB	PUNJ_STU	1.0341	1.047
114002	400	MAKHU	PUNJAB	PUNJ_STU	1.0356	1.0439
114003	400	MUKTSAR	PUNJAB	PUNJ_STU	1.0428	1.0464
114004	400	NAKODAR	PUNJAB	PUNJ_STU	1.0349	1.0442
114005	400	RAJPURA_TH	PUNJAB	PUNJ_TH	1.03	1.0463
114006	400	RAJPURA	PUNJAB	PUNJ_STU	1.0273	1.0447
114013	400	PATRAN_400	PUNJAB	PUNJ_STU	1.0226	1.0432

Haryana

Bus Number	Base kV	Bus Name	Area Name	Owner Name	Base Case V (PU)	With Recommended Capacitors V (PU)
120000	66	JAGADHARI_BB	HARYANA	HAR_STU	**0.9375**	1.0029
120001	66	TEPLA	HARYANA	HAR_STU	**0.969**	1.0019

120002	66	DHULKOTE	HARYANA	HAR_STU	**0.9553**	1.0058
120003	66	BALABGR1	HARYANA	HAR_STU	1.0062	1.011
120004	66	PALLA	HARYANA	HAR_STU	0.9845	0.9894
120006	66	PALWAL	HARYANA	HAR_STU	1.0022	1.0069
120007	66	RAMPUR_KAMBO	HARYANA	HAR_STU	**0.9343**	0.995
120008	66	PALI	HARYANA	HAR_STU	0.9952	0.9999
120009	66	GURGAON-56	HARYANA	HAR_STU	1.0059	1.01
120010	66	PANCHGAON	HARYANA	HAR_STU	1.0096	1.0144
120011	33	GURGAON-72	HARYANA	HAR_STU	1.0138	1.0176
120013	33	SAGWAN	HARYANA	HAR_STU	1	1
120015	66	MAU_HR	HARYANA	HAR_STU	0.9935	0.9994
120016	33	CHORMAR	HARYANA	HAR_STU	1.0039	1.0247
120017	33	DHANONDA	HARYANA	HAR_STU	1.0171	1.0251
120018	33	DADHIBANA	HARYANA	HAR_STU	1.0103	1.0184
120019	33	LULA_AHIR	HARYANA	HAR_STU	1.0097	1.0192
120022	66	RAIWALI	HARYANA	HAR_STU	0.9832	1.0082
120024	66	NAWADA	HARYANA	HAR_STU	0.9926	0.998
120025	66	A5_FARIDABAD	HARYANA	HAR_STU	0.9814	0.9869
120026	66	RANGALA_RAJP	HARYANA	HAR_STU	1.0033	1.0077
120028	66	BADSHAHPUR1	HARYANA	HAR_STU	1.0006	1.006
120029	66	MADANPUR	HARYANA	HAR_STU	**0.975**	1.0019
120030	66	SHAHBAD1	HARYANA	HAR_STU	**0.9625**	1.0014
120031	66	SEC-52_GURGA	HARYANA	HAR_STU	1.0071	1.0111
120032	66	JORIAN	HARYANA	HAR_STU	**0.9705**	1.0077
120033	66	SALEMPUR	HARYANA	HAR_STU	**0.9395**	0.9972
120034	66	DAULATABAD	HARYANA	HAR_STU	**0.9785**	0.9865
120035	66	SEC-1_MANESA	HARYANA	HAR_STU	0.9879	0.9942
120036	66	SONTA	HARYANA	HAR_STU	**0.9734**	1.0127
120037	66	GURGAON-20	HARYANA	HAR_STU	1.0026	1.0064
120038	66	GURGAON-33	HARYANA	HAR_STU	1.0054	1.0092
120039	66	A4-FARIDABAD	HARYANA	HAR_STU	0.985	0.9905
120040	66	MEERPUR_KURA	HARYANA	HAR_STU	0.9999	1.0046
120042	66	PINJORE	HARYANA	HAR_STU	**0.9751**	1.0014
121000	132	BHIWANIBB	HARYANA	BBMB	**0.9606**	0.9902
121001	132	PINJORE	HARYANA	HAR_STU	**0.9116**	0.991
121002	132	KAIRU	HARYANA	HAR_STU	**0.978**	1.0028
121003	132	JIND2_1	HARYANA	HAR_STU	**0.9016**	1.0048
121004	132	SAFIDON	HARYANA	HAR_STU	**0.8994**	1.0082
121005	132	BARHI	HARYANA	HAR_STU	**0.9698**	1.0047

121006	132	NISSING	HARYANA	HAR_STU	**0.9298**	1.0134
121007	132	GHASO	HARYANA	HAR_STU	**0.9343**	1.0007
121008	132	BHUNA	HARYANA	HAR_STU	**0.9397**	0.9973
121009	132	SONEPAT2_1	HARYANA	HAR_STU	**0.9329**	0.9868
121010	132	KURUKSHETRA_	HARYANA	HAR_STU	**0.9422**	0.9992
121011	132	KIRORI	HARYANA	HAR_STU	**0.9623**	1.0045
121012	132	ISRANA	HARYANA	HAR_STU	0.9834	1.008
121013	132	REWARI	HARYANA	HAR_STU	0.9999	1.0066
121014	132	NARNAUL	HARYANA	HAR_STU	**0.9439**	0.9856
121015	132	NARWANA2_1	HARYANA	HAR_STU	**0.9391**	1.0051
121016	132	SEWAH_BBMB	HARYANA	HAR_STU	**0.962**	1.0017
121017	132	HANSI	HARYANA	HAR_STU	**0.96**	0.9896
121018	132	MOHINDERGARH	HARYANA	HAR_STU	**0.9576**	0.9886
121019	132	GOHANA ROAD_	HARYANA	HAR_STU	**0.9599**	0.9996
121020	132	DIWANA_RAIL	HARYANA	HAR_STU	**0.9438**	0.9991
121021	132	HISAR_BBMB	HARYANA	BBMB	**0.9744**	1.0034
121022	132	IA-BHIWANI	HARYANA	HAR_STU	0.9866	1.0034
121023	132	SIRSA2_1	HARYANA	HAR_STU	0.9902	1.0076
121024	132	BAPORA	HARYANA	HAR_STU	0.9895	1.0063
121025	132	JINDALSTEEL	HARYANA	HAR_STU	**0.9518**	0.989
121026	132	FATEHABAD_21	HARYANA	HAR_STU	0.9805	1.0083
121027	132	RANIA	HARYANA	HAR_STU	0.9953	1.0171
121028	132	PTPS_1-4	HARYANA	HAR_STU	**0.9437**	0.999
121029	132	ROHTAK2_1	HARYANA	HAR_STU	**0.9158**	0.9932
121030	132	KARNAL2_1	HARYANA	HAR_STU	**0.8604**	1.0074
121031	132	BHUSTHALA	HARYANA	HAR_STU	**0.972**	1.0122
121032	132	ADHON	HARYANA	HAR_STU	**0.973**	1.0131
121033	132	IA-HISAR	HARYANA	HAR_STU	**0.9799**	1.0095
121034	132	UNISPUR	HARYANA	HAR_STU	**0.8982**	1.0067
121035	132	LUKHI	HARYANA	HAR_STU	**0.9578**	1.0071
121036	132	PEHOWA	HARYANA	HAR_STU	**0.9609**	1.01
121037	132	CHEEKA2_1	HARYANA	HAR_STU	**0.9713**	1.0097
121038	132	KAITHAL2_1	HARYANA	HAR_STU	**0.9657**	1.0116
121039	132	KIRMICH	HARYANA	HAR_STU	**0.8964**	1.0065
121040	132	ISHERWAL	HARYANA	HAR_STU	**0.9799**	1.0046
121041	132	MASUDPUR	HARYANA	HAR_STU	**0.9452**	0.9952
121042	132	BHIWANI_OLD_	HARYANA	BBMB	0.9883	1.0051
121043	132	NAUTCH	HARYANA	HAR_STU	**0.9626**	1.0086
121044	132	BODHNI	HARYANA	HAR_STU	**0.9589**	1.0081

121045	132	DHAND	HARYANA	HAR_STU	**0.9582**	1.0075
121046	132	ISMAILABAD	HARYANA	HAR_STU	**0.9709**	1.0111
121047	132	MALIKPUR	HARYANA	HAR_STU	**0.9595**	1.0087
121048	132	BHORE	HARYANA	HAR_STU	**0.9357**	0.9995
121049	132	NARWANA-OLD	HARYANA	HAR_STU	**0.9384**	1.0045
121050	132	KURUNGWALI	HARYANA	HAR_STU	0.9866	1.008
121051	132	BASTARA	HARYANA	HAR_STU	**0.9222**	0.9977
121052	132	INDRI	HARYANA	HAR_STU	**0.897**	1.0057
121053	132	AMIN	HARYANA	HAR_STU	**0.8964**	1.0058
121054	132	SAGGA	HARYANA	HAR_STU	**0.9188**	1.0116
121055	132	JUNDLA	HARYANA	HAR_STU	**0.923**	1.0113
121056	132	ASSANDH	HARYANA	HAR_STU	**0.9219**	0.9973
121057	132	JALMANA	HARYANA	HAR_STU	**0.9217**	1.0114
121058	132	MUNAK	HARYANA	HAR_STU	**0.938**	0.9937
121059	132	GHARAUNDA	HARYANA	HAR_STU	**0.9147**	0.9934
121060	132	MADHUBAN	HARYANA	HAR_STU	**0.9105**	0.9911
121061	132	NEWAL	HARYANA	HAR_STU	**0.8557**	1.0065
121062	132	BHADSON	HARYANA	HAR_STU	**0.8964**	1.0058
121063	132	NAGLAMEGHA	HARYANA	HAR_STU	**0.9198**	0.9956
121064	132	NIDANA	HARYANA	HAR_STU	**0.9215**	1.0114
121065	132	RAJOUND	HARYANA	HAR_STU	**0.9581**	1.0057
121066	132	PAI	HARYANA	HAR_STU	**0.9618**	1.0079
121067	132	RASINA	HARYANA	HAR_STU	**0.9286**	1.0123
121068	132	KAUL	HARYANA	HAR_STU	**0.9587**	1.0125
121069	132	PADLA	HARYANA	HAR_STU	**0.9553**	1.0031
121070	132	PUNDRI	HARYANA	HAR_STU	**0.9614**	1.0076
121071	132	SAMALKHA2_1	HARYANA	HAR_STU	**0.9528**	0.9965
121072	132	BHAGAL	HARYANA	HAR_STU	**0.9672**	1.0058
121073	132	CHAKULDHANA	HARYANA	HAR_STU	**0.9677**	1.0063
121074	132	KHERIGULAM_A	HARYANA	HAR_STU	**0.9686**	1.0071
121075	132	THANA	HARYANA	HAR_STU	**0.9582**	1.0075
121076	132	KABULPUR	HARYANA	HAR_STU	0.991	1.0151
121077	132	HABRI	HARYANA	HAR_STU	**0.9519**	1.0061
121078	132	MOHANA	HARYANA	HAR_STU	0.989	1.0134
121079	132	HSIIDC-RAI_1	HARYANA	HAR_STU	**0.9283**	0.9846
121080	132	RAI _1	HARYANA	HAR_STU	**0.8909**	0.9894
121081	132	KUNDLI _1	HARYANA	HAR_STU	**0.9686**	1.0034
121082	132	MURTHAL	HARYANA	HAR_STU	**0.9258**	0.9846

121083	132	GANNAUR	HARYANA	HAR_STU	**0.9501**	0.9924
121084	132	HARSANAKALAN	HARYANA	HAR_STU	0.9833	1.0078
121085	132	DEEPALPUR	HARYANA	HAR_STU	**0.9334**	0.9982
121086	132	KHARKHODA	HARYANA	HAR_STU	**0.9788**	1.0035
121087	132	PANCHGAON	HARYANA	HAR_STU	1.0153	1.02
121088	132	DHAMTAAN	HARYANA	HAR_STU	**0.923**	0.9959
121089	132	GARHI	HARYANA	HAR_STU	**0.9332**	0.9998
121090	132	DHANOURI	HARYANA	HAR_STU	**0.9319**	0.9986
121091	132	UCHANA	HARYANA	HAR_STU	**0.9342**	1.0007
121092	132	GHOGHARIAN	HARYANA	HAR_STU	**0.8931**	1.0007
121093	132	DURALA	HARYANA	HAR_STU	**0.9732**	1.0133
121094	132	NUHIYANWALI	HARYANA	HAR_STU	0.9941	1.0151
121095	132	SITAMAI	HARYANA	HAR_STU	**0.9573**	1.0112
121096	132	BEGA	HARYANA	HAR_STU	**0.9447**	0.992
121097	132	GANGAICHA_JA	HARYANA	HAR_STU	1.0055	1.0151
121098	132	HSIIDC-BAWAL	HARYANA	HAR_STU	0.9887	0.9948
121099	132	NANGAL_MOHAN	HARYANA	HAR_STU	1.0187	1.0267
121100	132	SEKA	HARYANA	HAR_STU	**0.9411**	0.9829
121101	132	PALI_MHNDRGR	HARYANA	HAR_STU	1.0187	1.0267
121102	132	GARNAWATI	HARYANA	HAR_STU	0.989	1.0132
121103	132	KALANAUR	HARYANA	HAR_STU	**0.9464**	0.9814
121104	132	BHADANA	HARYANA	HAR_STU	**0.9761**	1.0009
121105	132	BADLI	HARYANA	HAR_STU	**0.9721**	0.9969
121106	132	ASAUDHA_HV	HARYANA	HAR_STU	**0.967**	1.0019
121107	132	KANGTHALI	HARYANA	HAR_STU	**0.9675**	1.0062
121108	132	MELAGROUND	HARYANA	HAR_STU	0.9868	1.0043
121109	132	NILOKHERI	HARYANA	HAR_STU	**0.8929**	1.0047
121110	132	PIPLI	HARYANA	HAR_STU	**0.9418**	0.9992
121111	132	GENCO	HARYANA	HAR_STU	0.9882	1
121112	132	RAMNAGARIA	HARYANA	HAR_STU	0.994	1.0158
121113	132	MUNDIA_KHERA	HARYANA	HAR_STU	**0.9524**	0.9836
121114	132	NAGURAN	HARYANA	HAR_STU	**0.8771**	0.9983
121115	132	ALEWA	HARYANA	HAR_STU	**0.872**	0.9976
121116	132	KHERI_TALODA	HARYANA	HAR_STU	**0.8638**	1
121117	132	JIND-OLD	HARYANA	HAR_STU	**0.8991**	1.0026
121118	132	JULANA	HARYANA	HAR_STU	**0.8854**	1.001
121119	132	JIND-NEW	HARYANA	HAR_STU	**0.8931**	0.9994
121120	132	DABLAIN	HARYANA	HAR_STU	**0.9385**	1.0046
121121	132	MATLODA	HARYANA	HAR_STU	**0.8952**	1.007

121122	132	CHHAJPUR 2_1	HARYANA	HAR_STU	**0.9447**	0.9932
121123	132	CHANDOLI	HARYANA	HAR_STU	**0.9377**	0.9911
121124	132	BEHOLI	HARYANA	HAR_STU	**0.9473**	0.9927
121125	132	NAULTHA	HARYANA	HAR_STU	**0.947**	0.992
121126	132	MDU-ROHTAK	HARYANA	HAR_STU	**0.9509**	0.9877
121127	132	SEC-3-ROHTAK	HARYANA	HAR_STU	**0.9105**	0.9905
121128	132	HSIIDC_ROHTA	HARYANA	HAR_STU	0.9861	1.0104
121129	132	SAMPLA2_1	HARYANA	HAR_STU	**0.9674**	0.9982
121130	132	JHAJJAR	HARYANA	HAR_STU	**0.9726**	0.9975
121131	132	BERI	HARYANA	HAR_STU	0.9891	1.0132
121132	132	MIE_BAHADURG	HARYANA	HAR_STU	0.9969	1.0132
121133	132	GOHANA	HARYANA	HAR_STU	**0.8971**	0.9845
121134	132	CHORMAR	HARYANA	HAR_STU	0.9933	1.0146
121135	132	MUNDLANA	HARYANA	HAR_STU	0.9848	1.0094
121136	132	JASSIA	HARYANA	HAR_STU	**0.9056**	0.9881
121137	132	MAHAM	HARYANA	HAR_STU	**0.8967**	0.9858
121138	132	PALI-GOTHRA	HARYANA	HAR_STU	0.9933	1.0001
121139	132	BAWAL_OLD_1	HARYANA	HAR_STU	0.9873	0.9934
121140	132	DHANONDA	HARYANA	HAR_STU	1.0186	1.0266
121141	132	KOSLI	HARYANA	HAR_STU	**0.979**	0.9859
121142	132	BUROLI	HARYANA	HAR_STU	0.994	1.0008
121143	132	DAHINA	HARYANA	HAR_STU	0.9928	0.9996
121144	132	SATNALI	HARYANA	HAR_STU	**0.9446**	0.9811
121145	132	KANINA	HARYANA	HAR_STU	**0.9496**	0.9809
121146	132	NANGAL-CHOUD	HARYANA	HAR_STU	**0.9362**	0.9813
121147	132	ATELI-MANDI	HARYANA	HAR_STU	**0.9326**	0.9813
121148	132	BATTA	HARYANA	HAR_STU	**0.9603**	1.0078
121149	132	KALANAUR_TSS	HARYANA	HAR_STU	**0.9464**	0.9814
121150	132	JUI	HARYANA	HAR_STU	0.9819	0.997
121151	132	DIGHAWA_JATT	HARYANA	HAR_STU	**0.9645**	0.9897
121152	132	STAUNDI	HARYANA	HAR_STU	**0.9179**	0.9947
121153	132	BEHAL	HARYANA	HAR_STU	**0.9704**	0.9955
121154	132	LOHARU	HARYANA	HAR_STU	**0.9718**	0.9871
121155	132	DADRI_1_HV	HARYANA	HAR_STU	**0.9552**	0.9885
121156	132	ATELA-HV	HARYANA	HAR_STU	**0.9488**	0.9822
121157	132	MATANHAIL	HARYANA	HAR_STU	**0.9531**	0.9864
121158	132	BAHU	HARYANA	HAR_STU	**0.9363**	0.9815
121159	132	JHOJHU_KALAN	HARYANA	HAR_STU	0.9961	1.0043
121160	132	BIBIPUR	HARYANA	HAR_STU	**0.8832**	0.9952

121161	132	KHANPUR_HR	HARYANA	HAR_STU	**0.963**	1.009
121162	132	BEGU	HARYANA	HAR_STU	0.9872	1.0046
121163	132	KABRI	HARYANA	HAR_STU	**0.9323**	0.9933
121164	132	SAGWAN	HARYANA	HAR_STU	0.9852	1.0096
121165	132	ODHAN	HARYANA	HAR_STU	0.9902	1.0112
121166	132	DABWALI	HARYANA	HAR_STU	0.9876	1.009
121167	132	ASSA_KHERA	HARYANA	HAR_STU	0.9849	1.0064
121168	132	JEEWANAGAR	HARYANA	HAR_STU	0.9929	1.0148
121169	132	KARIWALA	HARYANA	HAR_STU	0.9874	1.0085
121170	132	ELLENABAD	HARYANA	HAR_STU	0.9891	1.011
121171	132	MADHO_SINGHA	HARYANA	HAR_STU	0.9928	1.0146
121172	132	NARNAUND	HARYANA	HAR_STU	**0.9238**	0.9835
121173	132	MIRAN	HARYANA	HAR_STU	**0.9777**	1.0025
121174	132	TOSHAM	HARYANA	HAR_STU	**0.9767**	1.0015
121175	132	DADIBANA	HARYANA	HAR_STU	0.9988	1.007
121176	132	LULA_AHIR	HARYANA	HAR_STU	1.0076	1.0172
121177	132	KHANAK	HARYANA	HAR_STU	0.9842	1.0087
121178	132	BEER	HARYANA	HAR_STU	**0.9673**	0.9974
121179	132	ADAMPUR	HARYANA	HAR_STU	**0.9608**	0.9955
121180	132	TOHANA	HARYANA	HAR_STU	**0.8683**	0.9848
121181	132	UKLANA	HARYANA	HAR_STU	**0.937**	0.9925
121182	132	RATIA	HARYANA	HAR_STU	**0.974**	1.0007
121183	132	AHERWAN	HARYANA	HAR_STU	**0.9751**	1.0021
121184	132	DHARSUL	HARYANA	HAR_STU	**0.9312**	0.9894
121185	132	JAKHAL	HARYANA	HAR_STU	**0.917**	0.9839
121186	132	BHATTU_KHURD	HARYANA	HAR_STU	**0.9784**	1.0062
121187	132	BHUTHAN_KALA	HARYANA	HAR_STU	**0.9279**	0.9883
121188	132	ARYA-NAGAR	HARYANA	HAR_STU	**0.967**	0.9971
121189	132	BARWALA	HARYANA	HAR_STU	**0.9464**	0.9954
121190	132	TELIWARA	HARYANA	HAR_STU	**0.9004**	0.9842
121191	132	KHEDAR	HARYANA	HAR_STU	**0.9589**	1.0026
121192	132	BERLA	HARYANA	HAR_STU	0.9937	1.0019
121193	132	KHAIREKAN	HARYANA	HAR_STU	0.9848	1.006
121194	132	SIKANDERPUR	HARYANA	HAR_STU	0.989	1.0064
121195	132	DING	HARYANA	HAR_STU	**0.9748**	1.0027
121196	132	HALLUWAS	HARYANA	HAR_STU	**0.9544**	0.9877
121197	132	KAITHAL_132	HARYANA	HAR_STU	**0.9643**	1.0103
121198	132	CHEEKA_132	HARYANA	HAR_STU	**0.9705**	1.009
121199	132	RAMBA	HARYANA	HAR_STU	**0.8523**	1.0066

121200	132	FAZILPUR_132	HARYANA	HAR_STU	**0.9326**	0.9865
121201	132	ROHTAK-132	HARYANA	HAR_STU	**0.9143**	0.992
121202	132	DADRI_2_HV_B	HARYANA	HAR_STU	**0.9574**	0.9906
121203	132	NUNAMAJRA_2_	HARYANA	HAR_STU	0.9998	1.0161
121204	132	BHADRA	HARYANA	HAR_STU	**0.9751**	0.9903
121205	132	FATEHABAD_13	HARYANA	HAR_STU	**0.9798**	1.0075
121206	132	SIWAN	HARYANA	HAR_STU	**0.9658**	1.0045
121207	132	NFL	HARYANA	HAR_STU	**0.9599**	0.9997
121208	132	BIANA	HARYANA	HAR_STU	**0.8848**	1.0015
121209	132	DABRI	HARYANA	HAR_STU	**0.8473**	1.0028
121210	132	BALLAH	HARYANA	HAR_STU	**0.9153**	0.9945
121211	132	PANIPAT_S-29	HARYANA	HAR_STU	**0.9568**	0.9975
121212	132	IOC_PANIPAT	HARYANA	HAR_STU	**0.9439**	0.9992
121213	132	KHURANA	HARYANA	HAR_STU	**0.9676**	1.0062
121214	132	NARELA_BB	HARYANA	BBMB	**0.9692**	1.004
121215	132	BAHADURG_132	HARYANA	HAR_STU	0.9982	1.0145
121216	132	STARWIRE	HARYANA	HAR_STU	**0.9577**	0.9887
121217	132	DUDHIYAWALI	HARYANA	HAR_STU	0.9898	1.0109
121218	132	HUKMAWALI	HARYANA	HAR_STU	0.9801	1.0063
121219	132	POLYSTEEL	HARYANA	HAR_STU	**0.974**	1.0031
121220	132	HISAR-SEC27	HARYANA	HAR_STU	**0.9706**	0.9998
121221	132	HISAR-CANTT	HARYANA	HAR_STU	**0.9683**	0.9975
121222	132	BARSI	HARYANA	HAR_STU	**0.9367**	0.9871
121223	132	SAMAIN	HARYANA	HAR_STU	**0.9206**	0.9837
121224	132	CHANDER_KHUR	HARYANA	HAR_STU	**0.917**	0.9825
121225	132	SRI_JYOTI_DH	HARYANA	HAR_STU	**0.9544**	0.9877
121226	132	MUND	HARYANA	HAR_STU	**0.9367**	1.0064
121227	132	HSIIDC-PANIP	HARYANA	HAR_STU	**0.9339**	0.9947
121228	132	MACHHROLI	HARYANA	HAR_STU	**0.9737**	0.9986
121229	132	HSIIDC-BHDRG	HARYANA	HAR_STU	0.9991	1.0155
121230	132	ALLIED STRIP	HARYANA	HAR_STU	**0.967**	1.0019
121231	132	RAIL-ASAUDHA	HARYANA	HAR_STU	**0.967**	1.0019
121232	132	IMT-ROHTAK	HARYANA	HAR_STU	**0.9638**	0.9947
121233	132	BHANDERI	HARYANA	HAR_STU	**0.9082**	0.9905
121235	132	KHEWRA	HARYANA	HAR_STU	**0.922**	0.9935
121236	132	HSIIDC-KUNDL	HARYANA	HAR_STU	**0.9189**	0.9868
121237	132	URLANA	HARYANA	HAR_STU	**0.8947**	1.0054
121238	132	CHHAJPUR_132	HARYANA	HAR_STU	**0.9437**	0.9925
121239	132	TAJPUR_HARYA	HARYANA	HAR_STU	**0.9308**	0.9957

121240	132	MAKRANI	HARYANA	HAR_STU	**0.9312**	0.9813
121241	132	BHATTUSOTTER	HARYANA	HAR_STU	**0.9762**	1.0025
122000	220	FATEHABAD-PG	HARYANA	NR_PGCIL	1.0005	1.0238
122001	220	JIND_HV	HARYANA	HAR_STU	**0.9412**	1.0074
122002	220	BADSHAHPUR	HARYANA	HAR_STU	1.0105	1.0158
122003	220	SAFIDON	HARYANA	HAR_STU	**0.9418**	1.0091
122004	220	TEPLA	HARYANA	HAR_STU	0.9883	1.0204
122005	220	MADANPUR	HARYANA	HAR_STU	0.9923	1.0187
122006	220	SHAHBAD	HARYANA	HAR_STU	0.981	1.018
122007	220	NISSING	HARYANA	HAR_STU	**0.955**	1.0132
122008	220	BHUNA	HARYANA	HAR_STU	**0.9715**	1.0101
122009	220	SONEPAT_HV	HARYANA	HAR_STU	**0.9646**	1.0015
122010	220	PTPS_1-4	HARYANA	HARY_TH	**0.9767**	1.0116
122011	220	REWARI	HARYANA	HAR_STU	1.0098	1.0164
122012	220	NARNAUL	HARYANA	HAR_STU	**0.9671**	0.9945
122013	220	NARWANA	HARYANA	HAR_STU	**0.9602**	1.01
122014	220	KAITHAL_HV	HARYANA	HAR_STU	**0.9731**	1.0184
122015	220	MAHINDERGARH	HARYANA	HAR_STU	**0.9744**	0.9991
122016	220	PALLA	HARYANA	HAR_STU	1.0059	1.0106
122017	220	PALWAL	HARYANA	HAR_STU	1.0111	1.0157
122018	220	SIRSA	HARYANA	HAR_STU	0.997	1.0187
122019	220	PALLI	HARYANA	HAR_STU	1.0109	1.0156
122020	220	FATEHABAD_HV	HARYANA	HAR_STU	0.9989	1.0224
122021	220	GURGAON-52	HARYANA	HAR_STU	1.0134	1.0173
122022	220	RANIA	HARYANA	HAR_STU	1.0019	1.0234
122023	220	PTPS_5-8	HARYANA	HARY_TH	**0.95**	1.0141
122024	220	ROHTAK	HARYANA	HAR_STU	**0.9578**	1.0065
122025	220	KARNAL	HARYANA	HAR_STU	**0.9081**	1.0002
122026	220	NUNAMAJRA_HV	HARYANA	HAR_STU	1.0059	1.022
122027	220	JORIAN	HARYANA	HAR_STU	0.9866	1.0232
122028	220	IA-HISAR	HARYANA	HAR_STU	0.9869	1.0161
122029	220	YTPP_2	HARYANA	HARY_TH	**0.975**	1.0212
122030	220	SALEMPUR	HARYANA	HAR_STU	**0.9598**	1.0129
122031	220	UNISPUR	HARYANA	HAR_STU	**0.9271**	1.0052
122032	220	DAULTABAD	HARYANA	HAR_STU	1.0104	1.018
122033	220	SEC-1 MANESA	HARYANA	HAR_STU	1.0078	1.0141
122034	220	GURGAON-20	HARYANA	HAR_STU	1.0125	1.0162
122035	220	CHEEKA	HARYANA	HAR_STU	0.9836	1.0213
122036	220	KIRORI	HARYANA	HAR_STU	0.983	1.0174

122037	220	GURGAON-56	HARYANA	HAR_STU	1.0133	1.0174
122038	220	GURGAON-72_H	HARYANA	HAR_STU	1.0157	1.0195
122039	220	ISHERWAL	HARYANA	HAR_STU	0.988	1.0124
122040	220	MASUDPUR	HARYANA	HAR_STU	0.9817	1.0138
122041	220	BAPORA	HARYANA	HAR_STU	0.997	1.0158
122042	220	JINDAL_STEEL	HARYANA	HAR_STU	0.9864	1.015
122043	220	JAGADHARI-RA	HARYANA	LEITWIND	0.9977	1.0293
122044	220	BASTARA	HARYANA	HAR_STU	**0.9481**	1.0114
122045	220	KAUL	HARYANA	HAR_STU	**0.9646**	1.0179
122046	220	MOHANA	HARYANA	HAR_STU	0.9955	1.0197
122047	220	SAMPLA	HARYANA	HAR_STU	0.9951	1.0177
122048	220	SAMALKHA	HARYANA	HAR_STU	0.9811	1.0117
122049	220	MAU_HR	HARYANA	HAR_STU	1.0107	1.0165
122050	220	CHHAJPUR	HARYANA	HAR_STU	**0.9768**	1.0105
122051	220	CHORMAR	HARYANA	HAR_STU	1.0039	1.0247
122052	220	DEEPALPUR	HARYANA	HAR_STU	**0.9787**	1.0109
122053	220	KABULPUR	HARYANA	HAR_STU	0.9982	1.0221
122054	220	DHANONDA	HARYANA	HAR_STU	1.0171	1.0251
122055	220	DADIBANA	HARYANA	HAR_STU	1.0103	1.0184
122056	220	LULA_AHIR	HARYANA	HAR_STU	1.0097	1.0192
122057	220	NUHIYANWALI	HARYANA	HAR_STU	1.0048	1.0254
122058	220	BATTA	HARYANA	HAR_STU	**0.9677**	1.0145
122059	220	SAGWAN	HARYANA	HAR_STU	0.9941	1.0182
122060	220	SAMAIN	HARYANA	HAR_STU	**0.9771**	1.0124
122061	220	RAIWALI	HARYANA	HAR_STU	1.0037	1.0281
122062	220	RAMPR KAMBOY	HARYANA	HAR_STU	0.9852	1.023
122063	220	NAWADA	HARYANA	HAR_STU	1.0092	1.0146
122064	220	A5FARIDABAD	HARYANA	HAR_STU	1.0059	1.0112
122065	220	BARHI	HARYANA	HAR_STU	**0.9698**	1.0047
122066	220	BHADANA	HARYANA	HAR_STU	0.9936	1.0176
122067	220	RANGALA_RAJP	HARYANA	HAR_STU	1.0121	1.0164
122068	220	PEHOWA	HARYANA	HAR_STU	**0.9685**	1.0171
122069	220	DHURALA	HARYANA	HAR_STU	**0.9778**	1.0176
122070	220	ABDULLAPUR_P	HARYANA	NR_PGCIL	0.9977	1.0293
122071	220	KAITHAL-PG2	HARYANA	NR_PGCIL	0.9907	1.0273
122072	220	BAHDURG_PG2	HARYANA	NR_PGCIL	1.0076	1.0235
122073	220	FARIDABAD_NT	HARYANA	NTPC-NR	1.0151	1.0198
122074	220	SONEPAT-PG2	HARYANA	NR_PGCIL	0.997	1.0207
122078	220	PANIPAT	HARYANA	HAR_STU	**0.9791**	1.0131

122086	220	GURGAON-72_P	HARYANA	NR_PGCIL	1.0158	1.0196
122087	220	GURGAON-33	HARYANA	HAR_STU	1.0152	1.019
122088	220	JIND-PG2	HARYANA	NR_PGCIL	1	1
122089	220	MANESAR-PG2	HARYANA	HAR_STU	1.0154	1.0201
122090	220	HSIIDC-BAWAL	HARYANA	HAR_STU	1.0082	1.0142
122091	220	SONTA	HARYANA	HAR_STU	**0.9799**	1.0188
122092	220	A4-FARIDABAD	HARYANA	HAR_STU	1.0042	1.0095
122093	220	MEERPURKURAL	HARYANA	HAR_STU	1.0087	1.0134
122094	220	HUKMAWALI	HARYANA	HAR_STU	0.996	1.0192
122095	220	MUND	HARYANA	HAR_STU	**0.9466**	1.0087
122096	220	PINJORE	HARYANA	HAR_STU	0.9913	1.017
122097	220	PANCHGAON	HARYANA	HAR_STU	1.0153	1.02
122098	220	GURGAON-57	HARYANA	HAR_STU	1.0139	1.0178
122099	220	SONEPAT-6	HARYANA	HAR_STU	**0.9782**	1.0104
122100	220	PANCHKULA-32	HARYANA	HAR_STU	1	1
122101	220	KURUKSHETRA	HARYANA	NR_PGCIL	**0.9641**	1.0193
122102	220	PRITHALA	HARYANA	HAR_STU	1.0363	1.0303
122103	220	KADARPUR	HARYANA	HAR_STU	1.0316	1.0313
122104	220	SOHNAROAD	HARYANA	HAR_STU	1.029	1.031
124001	400	KHEDAR	HARYANA	HARY_TH	1.02	1.0345
124002	400	DAULATABAD_4	HARYANA	HAR_STU	1.0278	1.0316
124003	400	KIRORI	HARYANA	HAR_STU	1.0192	1.0343
124004	400	JHAJAR_CLP	HARYANA	HARY_TH	1.031	1.038
124005	400	NAWADA	HARYANA	HAR_STU	1.0277	1.0329
124006	400	DEEPALPUR	HARYANA	JKTPL	1.0224	1.0347
124007	400	KABULPUR	HARYANA	HAR_STU	1.0271	1.0371
124008	400	DHANONDA	HARYANA	HAR_STU	1.033	1.0383
124009	400	NUHIYANWALI	HARYANA	HAR_STU	1.0168	1.0338
124030	400	SOHNAROAD	HARYANA	GPTL	1.029	1.031
124999	400	DHANONDABYPA	HARYANA	HAR_STU	1.033	1.0383

Rajasthan

Bus Number	Base kV	Bus Name	Area Name	Owner Name	Base Case V (PU)	With Recommended Capacitors V (PU)
130000	18.4	KANKROLI_SVC	RAJASTHA	NR_PGCIL	1.027	1.0265
131000	132	AAU	RAJASTHA	RAJ_STU	0.9863	0.9852
131001	132	ABUROAD	RAJASTHA	RAJ_STU	**0.9552**	0.9845

131002	132	AJITGARH	RAJASTHA	RAJ_STU	0.9958	0.9909
131003	132	AJOLIYAKAKHE	RAJASTHA	RAJ_STU	1.0162	1.0225
131004	132	AKLERA	RAJASTHA	RAJ_STU	1.0069	0.9913
131005	132	AMET	RAJASTHA	RAJ_STU	0.9873	0.9979
131006	132	AMRAPURA	RAJASTHA	RAJ_STU	1.0064	1.0072
131007	132	DAUSA1	RAJASTHA	RAJ_STU	1.0081	1.0054
131008	132	ANDHI1	RAJASTHA	RAJ_STU	**0.9563**	1.0108
131009	132	ANTA	RAJASTHA	RAJ_STU	1.001	1.0002
131010	132	ANTROLI1	RAJASTHA	RAJ_STU	**0.9649**	0.9895
131011	132	ANUPGARH	RAJASTHA	RAJ_STU	**0.9721**	0.9876
131012	132	ASIND	RAJASTHA	RAJ_STU	0.9973	0.9905
131013	132	ASPUR-21	RAJASTHA	RAJ_STU	**0.9305**	0.9987
131014	132	ATRU1	RAJASTHA	RAJ_STU	1.0291	1.017
131015	132	BABAI1	RAJASTHA	RAJ_STU	**0.9403**	0.9834
131016	132	BADAGAON	RAJASTHA	RAJ_STU	**0.9421**	0.9873
131017	132	BADESAR1	RAJASTHA	RAJ_STU	1.0168	1.0244
131018	132	BADISADAR	RAJASTHA	RAJ_STU	**0.912**	0.9817
131019	132	BADNU1	RAJASTHA	RAJ_STU	1.0405	1.0181
131020	132	BADRA-21	RAJASTHA	RAJ_STU	0.9993	1.0073
131021	132	BAGGER	RAJASTHA	RAJ_STU	**0.9675**	0.9908
131022	132	BAGIDRA	RAJASTHA	RAJ_STU	**0.9399**	0.9881
131023	132	BAGORA1	RAJASTHA	RAJ_STU	***1.0524***	1.0292
131024	132	BAGOT1	RAJASTHA	RAJ_STU	1.0061	0.993
131025	132	BAGRA1	RAJASTHA	RAJ_STU	**0.9707**	0.9872
131026	132	BAGRU1	RAJASTHA	RAJ_STU	0.9999	0.9915
131027	132	BAJJU	RAJASTHA	RAJ_STU	0.9963	0.9815
131028	132	BAKANI1	RAJASTHA	RAJ_STU	1.0179	1.0004
131029	132	BALAWALA	RAJASTHA	RAJ_STU	1.0229	1.0137
131030	132	BALESAR	RAJASTHA	RAJ_STU	0.9895	0.989
131031	132	BANAR1	RAJASTHA	RAJ_STU	0.9834	0.9829
131032	132	BANDIKUI	RAJASTHA	RAJ_STU	0.9956	0.9956
131033	132	BANSUR	RAJASTHA	RAJ_STU	1.0035	1.009
131034	132	BAORI1	RAJASTHA	RAJ_STU	1.0057	1.005
131035	132	BAP1	RAJASTHA	RAJ_STU	1.0247	1.0208
131036	132	BARLI-21	RAJASTHA	RAJ_STU	1.0017	1.001
131037	132	BARMER1	RAJASTHA	RAJ_STU	1.0423	1.0411
131038	132	BAROLI	RAJASTHA	RAJ_STU	**0.9659**	0.9925
131039	132	BASERI1	RAJASTHA	RAJ_STU	**0.9638**	0.9901
131040	132	BASSI-CH	RAJASTHA	RAJ_STU	1.0145	1.0209

131041	132	BASSI1	RAJASTHA	RAJ_STU	1.0067	0.9999
131042	132	BAYANA	RAJASTHA	RAJ_STU	**0.9437**	0.9835
131043	132	BEGOD	RAJASTHA	RAJ_STU	1.0157	1.0167
131044	132	BEGUN	RAJASTHA	RAJ_STU	1.0144	1.0155
131045	132	BEHRORE	RAJASTHA	RAJ_STU	1.0116	1.0159
131046	132	BHADLA	RAJASTHA	RAJ_STU	1.0296	1.0272
131047	132	BHADOTI1	RAJASTHA	RAJ_STU	1.0113	1.0094
131048	132	BHADRA	RAJASTHA	RAJ_STU	0.9968	1.0035
131050	132	BHANKROT	RAJASTHA	RAJ_STU	0.9996	0.9911
131051	132	BHARATPUR1	RAJASTHA	RAJ_STU	**0.9724**	0.992
131052	132	BHATEWAR	RAJASTHA	RAJ_STU	**0.9375**	0.9831
131053	132	BHAWAMAN	RAJASTHA	RAJ_STU	1.0076	0.9977
131054	132	BHADROONA	RAJASTHA	RAJ_STU	1.0468	1.0308
131055	132	BHERUNDA	RAJASTHA	RAJ_STU	**0.9654**	0.9883
131056	132	BHERUNDA	RAJASTHA	RAJ_STU	1.0066	0.9979
131057	132	BHINASAR	RAJASTHA	RAJ_STU	1.019	0.9995
131058	132	BHINDER1	RAJASTHA	RAJ_STU	**0.9308**	0.9815
131059	132	BHIWADI1	RAJASTHA	RAJ_STU	**0.9606**	0.9815
131060	132	BHOPALGARH	RAJASTHA	RAJ_STU	1.0232	1.003
131061	132	BHUSAWAR	RAJASTHA	RAJ_STU	**0.948**	0.9822
131062	132	BIDASAR1	RAJASTHA	RAJ_STU	1.0493	1.0231
131063	132	BIDIYAD1	RAJASTHA	RAJ_STU	1.0094	0.9963
131064	132	BIJOLIA	RAJASTHA	RAJ_STU	1.0154	1.0164
131065	132	BISSAU	RAJASTHA	RAJ_STU	**0.9722**	0.99
131066	132	BORUNDA1	RAJASTHA	RAJ_STU	1.0043	0.99
131067	132	BUHANA1	RAJASTHA	RAJ_STU	**0.94**	0.9818
131068	132	BUNDI	RAJASTHA	RAJ_STU	0.9922	0.9983
131069	132	BUNDI-21	RAJASTHA	RAJ_STU	0.9959	1.0016
131070	132	CHAKSU	RAJASTHA	RAJ_STU	1.0243	1.0142
131071	132	CHAMBAL1	RAJASTHA	RAJ_STU	1.0129	1.0041
131072	132	CHAMPAPUR	RAJASTHA	RAJ_STU	1.0051	0.9967
131073	132	CHAMU	RAJASTHA	RAJ_STU	0.99	0.99
131074	132	CHANDGOT	RAJASTHA	RAJ_STU	**0.9545**	0.9821
131075	132	CHANDN1	RAJASTHA	RAJ_STU	1.0039	1.004
131076	132	CHIPABAD	RAJASTHA	RAJ_STU	1.0258	1.0136
131077	132	CHIRAWA	RAJASTHA	RAJ_STU	**0.9638**	0.9912
131078	132	CHITAWA	RAJASTHA	RAJ_STU	1.0308	1.0167
131079	132	CHOPANKI	RAJASTHA	RAJ_STU	**0.9722**	0.9876
131080	132	CHOPASAN	RAJASTHA	RAJ_STU	0.9944	0.9937

131081	132	CHOTISADAR	RAJASTHA	RAJ_STU	**0.9265**	0.9823
131082	132	CHURU	RAJASTHA	RAJ_STU	**0.9756**	0.985
131083	132	DAKANKOT	RAJASTHA	RAJ_STU	**0.9333**	0.9856
131084	132	DALOT	RAJASTHA	RAJ_STU	0.985	0.9851
131085	132	DANTA	RAJASTHA	RAJ_STU	1.0088	1.0009
131086	132	DANT-BHI	RAJASTHA	RAJ_STU	1.0181	1.0188
131087	132	DARIBA	RAJASTHA	RAJ_STU	**0.94**	0.9814
131088	132	DASPAN	RAJASTHA	RAJ_STU	1.0446	1.0318
131089	132	DEBARI1	RAJASTHA	RAJ_STU	**0.9562**	0.996
131090	132	DECHU-21	RAJASTHA	RAJ_STU	1.0254	1.0169
131091	132	DECHU1	RAJASTHA	RAJ_STU	1.0245	1.0155
131092	132	DEEDWANA	RAJASTHA	RAJ_STU	1.0368	1.0222
131093	132	DEEG	RAJASTHA	RAJ_STU	**0.9519**	0.9867
131094	132	DEOGARH1	RAJASTHA	RAJ_STU	1.013	1.0137
131095	132	DEOLI	RAJASTHA	RAJ_STU	**0.9709**	0.9825
131096	132	DEOLIKOT	RAJASTHA	RAJ_STU	1.0065	1.0098
131097	132	DESHNOK1	RAJASTHA	RAJ_STU	1.029	1.0022
131098	132	DHAULAKU	RAJASTHA	RAJ_STU	0.9915	0.995
131099	132	MERTA	RAJASTHA	RAJ_STU	1.0319	1.0215
131100	132	BHIWADI-2	RAJASTHA	RAJ_STU	**0.9766**	0.9919
131101	132	NAGAUR1	RAJASTHA	RAJ_STU	1.0302	1.0151
131102	132	BHINMAL1	RAJASTHA	RAJ_STU	1.047	1.0316
131103	132	DHURIYAWA	RAJASTHA	RAJ_STU	**0.9238**	0.9929
131104	132	KUKAS1	RAJASTHA	RAJ_STU	1.0016	1.0091
131105	132	DUDU	RAJASTHA	RAJ_STU	1.0164	1.0074
131106	132	DUG	RAJASTHA	RAJ_STU	0.9943	0.9842
131107	132	RATANGARH	RAJASTHA	RAJ_STU	1.0039	1.0082
131108	132	ALWAR1	RAJASTHA	RAJ_STU	1.0014	1.0069
131109	132	JAISALMER	RAJASTHA	RAJ_STU	1.0317	1.0318
131110	132	JAIPUR1	RAJASTHA	RAJ_STU	1.0157	1.0072
131111	132	REENGUS1	RAJASTHA	RAJ_STU	1.0056	1.0008
131112	132	KHETRI1	RAJASTHA	RAJ_STU	**0.9538**	0.9876
131113	132	AJMER1	RAJASTHA	RAJ_STU	1.0181	1.0102
131114	132	PHULERA1	RAJASTHA	RAJ_STU	1.0186	1.0096
131115	132	BHILWARA	RAJASTHA	RAJ_STU	1.0214	1.0221
131116	132	RAMGARH21	RAJASTHA	RAJA_TH	1.05	1.03
131117	132	BEAWAR1	RAJASTHA	RAJ_STU	1.0222	1.0156
131118	132	BHARATPUR-21	RAJASTHA	RAJ_STU	**0.9772**	0.9967
131119	132	KOTA-IA1	RAJASTHA	RAJ_STU	1.0078	1.0111

131120	132	DHOLPUR1	RAJASTHA	RAJ_STU	**0.9784**	1.0001
131121	132	RPS1	RAJASTHA	RAJA_HYD	1.0165	1.0198
131122	132	MANIYA	RAJASTHA	RAJ_STU	**0.9715**	0.9938
131123	132	UDAIPUR1	RAJASTHA	RAJ_STU	1	1
131124	132	BARME-21	RAJASTHA	RAJ_STU	1.0429	1.0417
131125	132	KOTPUTLI	RAJASTHA	RAJ_STU	1.0049	1.0124
131126	132	NIMBHER1	RAJASTHA	RAJ_STU	**0.966**	0.9998
131127	132	JHUNJHUN	RAJASTHA	RAJ_STU	**0.9784**	0.9961
131128	132	CHITTORG	RAJASTHA	RAJ_STU	1.0193	1.0262
131129	132	TINWARI1	RAJASTHA	RAJ_STU	0.9998	0.9993
131130	132	SIROHI1	RAJASTHA	RAJ_STU	0.9808	0.9971
131131	132	JODHP-21	RAJASTHA	RAJ_STU	0.9944	0.9936
131132	132	BALOTRA1	RAJASTHA	RAJ_STU	1.0176	1.015
131133	132	SANGANER	RAJASTHA	RAJ_STU	1.0171	1.0081
131134	132	MODAK1	RAJASTHA	RAJ_STU	1.009	1.0039
131135	132	NEEMRANA	RAJASTHA	RAJ_STU	1.0148	1.0187
131136	132	PALI-21	RAJASTHA	RAJ_STU	1.0004	1.0047
131137	132	AMARSAGA	RAJASTHA	RAJ_STU	1.0353	1.0353
131138	132	PHALODI	RAJASTHA	RAJ_STU	1.0178	1.0143
131139	132	BHOPA-21	RAJASTHA	RAJ_STU	1.028	1.0063
131140	132	KHINVSAR	RAJASTHA	RAJ_STU	1.0266	1.0042
131141	132	KUCHAMAN	RAJASTHA	RAJ_STU	1.0327	1.0186
131142	132	DHAURIMA	RAJASTHA	RAJ_STU	1.0359	1.025
131143	132	JALOR-21	RAJASTHA	RAJ_STU	1.0127	1.0047
131144	132	PINDWARA	RAJASTHA	RAJ_STU	**0.9777**	0.9976
131145	132	SUJNGA-2	RAJASTHA	RAJ_STU	***1.0536***	1.0298
131146	132	MANDAWAR	RAJASTHA	RAJ_STU	0.9978	1.0023
131147	132	UDYOGVIH	RAJASTHA	RAJ_STU	1.0293	1.0121
131148	132	JHALAWAR	RAJASTHA	RAJ_STU	1.0269	1.0095
131149	132	DAHRA1	RAJASTHA	RAJ_STU	1.0101	1.0093
131150	132	DULCHASA	RAJASTHA	RAJ_STU	1.0324	1.0072
131151	132	SAWAIMAD	RAJASTHA	RAJ_STU	1.0174	1.0157
131152	132	HINDAUN1	RAJASTHA	RAJ_STU	**0.979**	1.0033
131153	132	BILARA1	RAJASTHA	RAJ_STU	1.0062	0.9992
131154	132	SIKAR1	RAJASTHA	RAJ_STU	1.0184	1.0057
131155	132	BIKANER1	RAJASTHA	RAJ_STU	1.0265	1.0065
131156	132	SURATGAR	RAJASTHA	RAJ_STU	1.0265	1.0191
131157	132	SRIDU-21	RAJASTHA	RAJ_STU	1.0435	1.0163
131158	132	HANUMANG	RAJASTHA	RAJ_STU	1.0167	1.0118

131159	132	MAHI-I	RAJASTHA	RAJA_HYD	**0.9418**	0.9884
131160	132	BANSWAR1	RAJASTHA	RAJ_STU	**0.9417**	0.9883
131161	132	KISHA-21	RAJASTHA	RAJ_STU	1.0074	0.9984
131162	132	CHOMU1	RAJASTHA	RAJ_STU	1.0047	0.999
131163	132	DULNIYA1	RAJASTHA	RAJ_STU	**0.9493**	0.9847
131164	132	KANKR-21	RAJASTHA	RAJ_STU	0.9946	1.0066
131165	132	BALI1	RAJASTHA	RAJ_STU	0.9972	1.0026
131166	132	MAKRANA1	RAJASTHA	RAJ_STU	1.0159	1.003
131167	132	DUNGRPR	RAJASTHA	RAJ_STU	**0.9071**	0.9957
131168	132	DUNI1	RAJASTHA	RAJ_STU	0.9892	0.9967
131169	132	VKIA_21	RAJASTHA	RAJ_STU	1.0104	1.0032
131170	132	BARA-21	RAJASTHA	RAJ_STU	1.0212	1.0135
131171	132	ENGGCOLL	RAJASTHA	RAJ_STU	0.9847	0.9847
131172	132	BARAN	RAJASTHA	RAJ_STU	1.017	1.0092
131173	132	DHOD	RAJASTHA	RAJ_STU	1.036	1.0253
131174	132	BORNDA	RAJASTHA	RAJ_STU	0.9921	0.9896
131175	132	BAGRU-21	RAJASTHA	RAJ_STU	1.0018	0.9933
131176	132	GULABPUR	RAJASTHA	RAJ_STU	1.0136	1.0096
131177	132	FALNA	RAJASTHA	RAJ_STU	0.9924	0.9982
131178	132	FATEHPUR	RAJASTHA	RAJ_STU	**0.9735**	0.9898
131179	132	GADRAROA	RAJASTHA	RAJ_STU	1.0414	1.0402
131180	132	GAJNER	RAJASTHA	RAJ_STU	1.0276	1.0088
131181	132	GAJNER	RAJASTHA	RAJ_STU	1.0272	1.0084
131182	132	GALIFA	RAJASTHA	RAJ_STU	1.0423	1.0294
131183	132	GANGA-BH	RAJASTHA	RAJ_STU	1.0223	1.023
131184	132	GANGAC21	RAJASTHA	RAJ_STU	**0.9622**	0.9909
131185	132	GANGCITY	RAJASTHA	RAJ_STU	**0.9609**	0.9895
131186	132	GHARSANA	RAJASTHA	RAJ_STU	**0.9649**	0.9859
131187	132	GOGUNDA1	RAJASTHA	RAJ_STU	**0.9498**	0.9871
131188	132	GOPAL-MI	RAJASTHA	RAJ_STU	0.9924	0.9916
131189	132	GOTAN	RAJASTHA	RAJ_STU	1.0236	1.0018
131190	132	GOVINDGA	RAJASTHA	RAJ_STU	0.9992	0.9938
131191	132	GSGR-MP	RAJASTHA	RAJ_STU	1.0167	1.02
131192	132	GUDAMALN	RAJASTHA	RAJ_STU	1.0274	1.0164
131193	132	GUDHAGOR	RAJASTHA	RAJ_STU	**0.9101**	0.9827
131194	132	GULUWALA	RAJASTHA	RAJ_STU	1.0153	1.0104
131195	132	HAMIRGAR	RAJASTHA	RAJ_STU	1.0157	1.0198
131196	132	LALAMDESAR	RAJASTHA	RAJ_STU	1.0398	1.0163
131197	132	RIICO ABU RD	RAJASTHA	RAJ_STU	**0.9545**	0.9841

131198	132	HEMDA1	RAJASTHA	RAJ_STU	1.0071	0.9966
131199	132	HESABA1	RAJASTHA	RAJ_STU	1.0203	0.9978
131200	132	HINDOLI1	RAJASTHA	RAJ_STU	**0.9786**	0.9874
131201	132	HINGONIA	RAJASTHA	RAJ_STU	1.0064	0.9982
131203	132	ITAWA	RAJASTHA	RAJ_STU	1.0127	1.0125
131204	132	JADOL1	RAJASTHA	RAJ_STU	**0.946**	0.9836
131205	132	JAGATPUR	RAJASTHA	RAJ_STU	1.0039	0.9954
131206	132	JAHAJPUR	RAJASTHA	RAJ_STU	**0.968**	0.9844
131207	132	JAITARAN	RAJASTHA	RAJ_STU	0.9868	0.9876
131208	132	JAKHARAN	RAJASTHA	RAJ_STU	1.0118	1.0163
131209	132	JALAMAND	RAJASTHA	RAJ_STU	1.0034	1.0013
131210	132	JALORE1	RAJASTHA	RAJ_STU	1.0114	1.0034
131211	132	JAMWA-RA	RAJASTHA	RAJ_STU	0.9801	1.0001
131212	132	JASRASAR	RAJASTHA	RAJ_STU	1.0402	1.0154
131213	132	JAWAR-NA	RAJASTHA	RAJ_STU	1.0005	0.9922
131214	132	JAYAL-1	RAJASTHA	RAJ_STU	1.0237	1.0084
131215	132	JEEWANA	RAJASTHA	RAJ_STU	1.0434	1.0319
131216	132	JHOKHASA	RAJASTHA	RAJ_STU	1.0199	1.0124
131217	132	JHOTWARA	RAJASTHA	RAJ_STU	1.0053	0.998
131218	132	JJN1	RAJASTHA	RAJ_STU	**0.9732**	0.9926
131219	132	JOBNER	RAJASTHA	RAJ_STU	1.0169	1.0078
131220	132	JODHP-41	RAJASTHA	RAJ_STU	0.9971	0.9954
131221	132	JOJAWAR1	RAJASTHA	RAJ_STU	**0.9726**	0.9852
131222	132	JS1	RAJASTHA	RAJA_HYD	1.0172	1.0205
131223	132	JUNAMEET	RAJASTHA	RAJ_STU	1.0041	1.0014
131224	132	KACHAWA1	RAJASTHA	RAJ_STU	1.0345	1.0238
131225	132	KACHOLA1	RAJASTHA	RAJ_STU	1.0126	1.0136
131226	132	KAILADEV	RAJASTHA	RAJ_STU	**0.9359**	0.9834
131227	132	KALADERA	RAJASTHA	RAJ_STU	0.9965	0.9911
131228	132	KALAU	RAJASTHA	RAJ_STU	1.0196	1.0105
131229	132	KAMA1	RAJASTHA	RAJ_STU	**0.9405**	0.9857
131230	132	KAMINPUR	RAJASTHA	RAJ_STU	1.0194	1.0022
131231	132	KANDELA	RAJASTHA	RAJ_STU	0.9944	0.9813
131232	132	KANKROL1	RAJASTHA	RAJ_STU	**0.9788**	0.9953
131233	132	KANWARI	RAJASTHA	RAJ_STU	1.012	1.0007
131234	132	KAPASN	RAJASTHA	RAJ_STU	1.0119	1.0195
131235	132	KARAULI1	RAJASTHA	RAJ_STU	**0.9488**	0.984
131236	132	KARERA-1	RAJASTHA	RAJ_STU	1.0159	1.0166
131238	132	KEKRI	RAJASTHA	RAJ_STU	0.9848	0.9863

131239	132	KELWARA	RAJASTHA	RAJ_STU	0.9945	0.9865
131240	132	KESHWANA	RAJASTHA	RAJ_STU	1.0069	1.0129
131241	132	KEWAI	RAJASTHA	RAJ_STU	1.032	1.0199
131242	132	KHACHRI	RAJASTHA	RAJ_STU	1.0084	1.0004
131243	132	KHAJUWAL	RAJASTHA	RAJ_STU	**0.9553**	0.9902
131244	132	KHANDAR	RAJASTHA	RAJ_STU	1.017	1.0152
131245	132	KHANPUR1	RAJASTHA	RAJ_STU	1.0128	0.9951
131246	132	KHARCHI	RAJASTHA	RAJ_STU	0.9884	0.9956
131248	132	KHERLI	RAJASTHA	RAJ_STU	0.9855	1.0004
131249	132	KHOOD1	RAJASTHA	RAJ_STU	1.0353	1.0254
131250	132	KHUTUSHY	RAJASTHA	RAJ_STU	1.0009	0.9961
131251	132	KISH-BAS	RAJASTHA	RAJ_STU	1.0006	1.0066
131252	132	KISHANG1	RAJASTHA	RAJ_STU	1.0043	0.9953
131253	132	KOLAYAT1	RAJASTHA	RAJ_STU	1.0125	0.9948
131254	132	KOODAN	RAJASTHA	RAJ_STU	1.0058	0.9928
131255	132	DAYALPURA	RAJASTHA	RAJ_STU	1.0346	1.0239
131256	132	SAWAR	RAJASTHA	RAJ_STU	**0.9769**	0.9835
131257	132	SAWALPUR	RAJASTHA	RAJ_STU	1	1
131258	132	BILWADI	RAJASTHA	RAJ_STU	1	1
131259	132	KOTKASIM	RAJASTHA	RAJ_STU	0.9927	1.0018
131260	132	KUCHARA	RAJASTHA	RAJ_STU	1.027	1.0146
131261	132	KUCHERA	RAJASTHA	RAJ_STU	1.027	1.0147
131262	132	KUMAWAS	RAJASTHA	RAJ_STU	**0.9759**	0.9936
131263	132	KUMHER	RAJASTHA	RAJ_STU	**0.9738**	0.9908
131264	132	KUNDAKI	RAJASTHA	RAJ_STU	1.002	1.0089
131265	132	KURI	RAJASTHA	RAJ_STU	0.9875	0.9869
131266	132	KUSHKHER	RAJASTHA	RAJ_STU	0.9891	1.0012
131267	132	LADNU	RAJASTHA	RAJ_STU	1.0031	0.9874
131268	132	LAKHERI	RAJASTHA	RAJ_STU	1.0145	1.0143
131269	132	LALSOT1	RAJASTHA	RAJ_STU	1.0086	1.0064
131270	132	LAMBAJAT	RAJASTHA	RAJ_STU	1.0282	1.018
131271	132	LAXMALWR	RAJASTHA	RAJ_STU	0.9893	0.9998
131272	132	LAXMAN-S	RAJASTHA	RAJ_STU	1.022	1.0067
131273	132	LOHAWAT1	RAJASTHA	RAJ_STU	0.9976	0.9971
131274	132	LOONKANS	RAJASTHA	RAJ_STU	1.0076	0.9871
131275	132	LOSAL1	RAJASTHA	RAJ_STU	1.0349	1.0242
131276	132	MADRI	RAJASTHA	RAJ_STU	**0.9372**	0.9858
131277	132	MAHAVIR	RAJASTHA	RAJ_STU	1.0139	1.0171
131278	132	MAHI-II	RAJASTHA	RAJA_HYD	**0.9414**	0.9888

131279	132	MAHUWA	RAJASTHA	RAJ_STU	0.999	1.0037
131280	132	MALAKHER	RAJASTHA	RAJ_STU	0.983	0.9912
131281	132	MALPURA1	RAJASTHA	RAJ_STU	0.9954	0.9863
131282	132	MALSISAR	RAJASTHA	RAJ_STU	**0.9738**	0.9916
131283	132	MANDALGA	RAJASTHA	RAJ_STU	1.0162	1.0172
131284	132	MANDAN	RAJASTHA	RAJ_STU	1.0096	1.0138
131285	132	MANDANA	RAJASTHA	RAJ_STU	1.0003	0.9952
131286	132	MANDAWA	RAJASTHA	RAJ_STU	**0.9714**	0.9893
131287	132	MANDAWAL	RAJASTHA	RAJ_STU	1.0061	0.998
131288	132	MANDERLA	RAJASTHA	RAJ_STU	**0.9693**	0.9889
131289	132	MANDRAYW	RAJASTHA	RAJ_STU	**0.9407**	0.982
131290	132	MANGLWAR	RAJASTHA	RAJ_STU	**0.9397**	0.9835
131291	132	MANGROL1	RAJASTHA	RAJ_STU	1.0172	1.0094
131292	132	MANOHARP	RAJASTHA	RAJ_STU	0.9989	0.9998
131293	132	MANSAROV	RAJASTHA	RAJ_STU	1.0166	1.0078
131294	132	MAPLAWAS	RAJASTHA	RAJ_STU	**0.9404**	0.9826
131295	132	MARKHI	RAJASTHA	RAJ_STU	0.9984	0.9936
131296	132	MATHAN-1	RAJASTHA	RAJ_STU	0.999	0.985
131297	132	MATHANIA	RAJASTHA	RAJ_STU	1.0002	0.9989
131298	132	MATORA	RAJASTHA	RAJ_STU	0.9811	0.984
131299	132	MAVLI	RAJASTHA	RAJ_STU	**0.9496**	0.9879
131300	132	MAYRAMG	RAJASTHA	RAJ_STU	1.0046	0.9995
131301	132	MDSUIAJ	RAJASTHA	RAJ_STU	1.0095	1.0013
131302	132	MEHLOO1	RAJASTHA	RAJ_STU	1.0389	1.0377
131303	132	MERTACIT	RAJASTHA	RAJ_STU	1.0303	1.0201
131304	132	MERTA_RO	RAJASTHA	RAJ_STU	1.0259	1.0154
131305	132	MIALWAR	RAJASTHA	RAJ_STU	1.001	1.0069
131306	132	MNIT-JAI	RAJASTHA	RAJ_STU	0.9924	0.9839
131307	132	MOKHMPUR	RAJASTHA	RAJ_STU	0.9882	0.9992
131308	132	MOLASAR1	RAJASTHA	RAJ_STU	1.0326	1.0182
131309	132	MOMASAR1	RAJASTHA	RAJ_STU	**0.9608**	0.9824
131310	132	MUNDWA1	RAJASTHA	RAJ_STU	1.0274	1.0134
131311	132	MUNDWAR	RAJASTHA	RAJ_STU	1.0014	1.0071
131312	132	NADBAI	RAJASTHA	RAJ_STU	0.9818	1.0005
131313	132	NAGAR1	RAJASTHA	RAJ_STU	**0.9769**	0.9889
131314	132	NAINWA1	RAJASTHA	RAJ_STU	1.0124	1.0073
131315	132	NANGALI	RAJASTHA	RAJ_STU	**0.9477**	0.9857
131316	132	NANGLI	RAJASTHA	RAJ_STU	**0.928**	0.9809
131317	132	NAPASAR	RAJASTHA	RAJ_STU	1.0233	1.0021

131318	132	NARWA	RAJASTHA	RAJ_STU	1.0237	0.9969
131319	132	NASIRABA	RAJASTHA	RAJ_STU	1.0138	1.0081
131320	132	NATHDWAR	RAJASTHA	RAJ_STU	**0.9592**	0.9867
131321	132	NAWA	RAJASTHA	RAJ_STU	1.0158	1.0067
131322	132	NAWAL-21	RAJASTHA	RAJ_STU	1	1
131323	132	NAWALGAR	RAJASTHA	RAJ_STU	0.9972	0.9841
131324	132	NEEMKATH	RAJASTHA	RAJ_STU	**0.9468**	0.9826
131325	132	NEWAI	RAJASTHA	RAJ_STU	1.0141	1.0124
131326	132	NOHAR	RAJASTHA	RAJ_STU	0.9936	0.9931
131327	132	NOKHA	RAJASTHA	RAJ_STU	1.0415	1.0151
131328	132	NPH-JODH	RAJASTHA	RAJ_STU	0.987	0.9869
131329	132	NPH1	RAJASTHA	RAJ_STU	1.0162	1.0077
131330	132	OPH-JODH	RAJASTHA	RAJ_STU	0.9819	0.9818
131331	132	OSIAN	RAJASTHA	RAJ_STU	0.98	0.983
131332	132	PSNO8	RAJASTHA	RAJ_STU	1.01	1.01
131333	132	PADAMPUR	RAJASTHA	RAJ_STU	1.0295	1.0134
131334	132	PADROO1	RAJASTHA	RAJ_STU	1.0062	0.9907
131335	132	PALADAR	RAJASTHA	RAJ_STU	1.0433	1.0305
131336	132	PALI1	RAJASTHA	RAJ_STU	**0.9735**	0.9812
131337	132	PALODA	RAJASTHA	RAJ_STU	**0.934**	0.9875
131338	132	PAOTA	RAJASTHA	RAJ_STU	0.9995	1.007
131339	132	PAREWARA	RAJASTHA	RAJ_STU	***1.0523***	1.0211
131340	132	PARTAPUR	RAJASTHA	RAJ_STU	**0.9276**	0.9917
131341	132	PATAN_S	RAJASTHA	RAJ_STU	**0.9722**	0.9937
131342	132	PATLISAR	RAJASTHA	RAJ_STU	**0.9555**	0.9821
131343	132	PHAGI	RAJASTHA	RAJ_STU	1.0264	1.0171
131344	132	PILANI	RAJASTHA	RAJ_STU	**0.9559**	0.9835
131345	132	PILIBANG	RAJASTHA	RAJ_STU	1.0069	1.0019
131346	132	PINAN	RAJASTHA	RAJ_STU	0.9831	0.9877
131347	132	PIPALIYA	RAJASTHA	RAJ_STU	1.0038	0.9968
131348	132	PIPAR1	RAJASTHA	RAJ_STU	1	0.9929
131349	132	PIPRALI	RAJASTHA	RAJ_STU	1.0056	0.9927
131350	132	POKRAN1	RAJASTHA	RAJ_STU	0.9895	0.9896
131351	132	POONSA	RAJASTHA	RAJ_STU	1.048	1.0298
131352	132	PRATA-UD	RAJASTHA	RAJ_STU	**0.9383**	0.9853
131353	132	PRATAPGA	RAJASTHA	RAJ_STU	1.01	1.01
131354	132	PRATA-JO	RAJASTHA	RAJ_STU	0.9929	0.9922
131355	132	PS-5	RAJASTHA	RAJ_STU	1.0153	1.012
131356	132	PS2-1	RAJASTHA	RAJ_STU	1.0273	1.0244

131358	132	PS3-1	RAJASTHA	RAJ_STU	1.0279	1.025
131359	132	PSNO1	RAJASTHA	RAJ_STU	0.9936	0.9825
131360	132	PUGALROA	RAJASTHA	RAJ_STU	1.0209	0.9993
131361	132	PURANAGH	RAJASTHA	RAJ_STU	1.0024	0.9941
131362	132	PUSHKARO	RAJASTHA	RAJ_STU	1.0064	0.9979
131363	132	PUSKA-RO	RAJASTHA	RAJ_STU	1.0139	1.006
131364	132	PWD	RAJASTHA	RAJ_STU	1.0154	1.0069
131365	132	RAISINGH	RAJASTHA	RAJ_STU	1.023	1.0068
131366	132	RAJAKHER	RAJASTHA	RAJ_STU	**0.9657**	0.9886
131367	132	RAJGARH	RAJASTHA	RAJ_STU	**0.9615**	0.9859
131368	132	RAJGARH1	RAJASTHA	RAJ_STU	**0.971**	0.9822
131369	132	RAJIASR	RAJASTHA	RAJ_STU	1.0019	0.9987
131370	132	RAMGAR-A	RAJASTHA	RAJ_STU	0.9943	0.9989
131371	132	RAMPURA	RAJASTHA	RAJ_STU	1.0023	0.996
131372	132	RAMSEEN	RAJASTHA	RAJ_STU	**0.9715**	0.9881
131373	132	RANASAR1	RAJASTHA	RAJ_STU	1.0267	1.0121
131374	132	RANI	RAJASTHA	RAJ_STU	0.9946	1
131375	132	RANIWARA	RAJASTHA	RAJ_STU	1.0454	1.0265
131376	132	RANOLI	RAJASTHA	RAJ_STU	1.0021	0.9891
131377	132	RAPP1	RAJASTHA	RAJ_STU	1.0149	1.0182
131378	132	RASHMI	RAJASTHA	RAJ_STU	1.0149	1.0202
131379	132	RAWATBHA	RAJASTHA	RAJ_STU	1.0153	1.0186
131380	132	RAWATSAR	RAJASTHA	RAJ_STU	1.0057	1.0031
131381	132	RAYLA	RAJASTHA	RAJ_STU	0.9956	0.9915
131382	132	RENWAL1	RAJASTHA	RAJ_STU	1.0113	1.0032
131383	132	REODAR	RAJASTHA	RAJ_STU	**0.9504**	0.9832
131384	132	RICO_BHI	RAJASTHA	RAJ_STU	1.0184	1.0191
131385	132	RIRI	RAJASTHA	RAJ_STU	***1.0563***	1.013
131386	132	RISHDEO	RAJASTHA	RAJ_STU	**0.9081**	0.9975
131387	132	ROON1	RAJASTHA	RAJ_STU	1.0283	1.0189
131388	132	ROOPWAS	RAJASTHA	RAJ_STU	**0.9637**	0.9858
131389	132	RUPNGARH	RAJASTHA	RAJ_STU	1.0023	0.9932
131390	132	SADULSHA	RAJASTHA	RAJ_STU	1.0264	1.01
131391	132	SAGWARA1	RAJASTHA	RAJ_STU	**0.9184**	0.9949
131392	132	SAKATPUR	RAJASTHA	RAJ_STU	1.0171	1.0204
131393	132	SALASAR	RAJASTHA	RAJ_STU	***1.0533***	1.0297
131394	132	SALUMBR1	RAJASTHA	RAJ_STU	**0.9282**	0.9979
131395	132	SAMDARI1	RAJASTHA	RAJ_STU	1.0107	1.0081
131396	132	SANCHOR1	RAJASTHA	RAJ_STU	1.0429	1.0301

131397	132	SANCHO21	RAJASTHA	RAJ_STU	1.0445	1.0317
131398	132	SANGOD	RAJASTHA	RAJ_STU	1.0248	1.0168
131399	132	SANGRIA	RAJASTHA	RAJ_STU	1.0141	1.0091
131400	132	SANJOO	RAJASTHA	RAJ_STU	1.0183	1.0079
131401	132	SANKAD1	RAJASTHA	RAJ_STU	1.0433	1.0244
131402	132	SANWAD1	RAJASTHA	RAJ_STU	**0.9415**	0.9835
131403	132	SANWREEJ	RAJASTHA	RAJ_STU	1.0265	1.0114
131404	132	SAPOL	RAJASTHA	RAJ_STU	0.9828	0.9932
131405	132	SARADHNA	RAJASTHA	RAJ_STU	1.018	1.0103
131406	132	SARDARSH	RAJASTHA	RAJ_STU	**0.9571**	0.9817
131407	132	SARMATHU	RAJASTHA	RAJ_STU	**0.9509**	0.9818
131408	132	SARNADUN	RAJASTHA	RAJ_STU	1.0033	0.9964
131409	132	SATA	RAJASTHA	RAJ_STU	1.0125	0.9931
131410	132	SAWA(B)1	RAJASTHA	RAJ_STU	1.0181	1.0021
131411	132	SAWA-CH1	RAJASTHA	RAJ_STU	1.0182	1.0258
131412	132	SAYLA1	RAJASTHA	RAJ_STU	1.0435	1.0319
131413	132	SEDWA	RAJASTHA	RAJ_STU	1.0155	0.9962
131414	132	SENTHI	RAJASTHA	RAJ_STU	**0.9565**	0.9906
131417	132	SEZ1_21	RAJASTHA	RAJ_STU	0.9999	0.9902
131418	132	SHAHJANP	RAJASTHA	RAJ_STU	1.0104	1.0144
131419	132	SHAHPURA	RAJASTHA	RAJ_STU	0.9933	0.9942
131420	132	SHAHP-BH	RAJASTHA	RAJ_STU	0.9937	0.9896
131421	132	SHEO1	RAJASTHA	RAJ_STU	1.036	1.036
131422	132	SHEOPUR1	RAJASTHA	RAJ_STU	1.0182	1.0165
131423	132	SIKANDRA	RAJASTHA	RAJ_STU	0.989	0.9925
131424	132	SIKRAI	RAJASTHA	RAJ_STU	0.9952	0.9986
131425	132	SILORA_1	RAJASTHA	RAJ_STU	1.0004	0.9913
131426	132	SINDRA1	RAJASTHA	RAJ_STU	1.0068	1.0042
131427	132	SIRSI1	RAJASTHA	RAJ_STU	1.0152	1.0066
131428	132	SISARMA1	RAJASTHA	RAJ_STU	**0.9399**	0.9856
131429	132	SITAPU-1	RAJASTHA	RAJ_STU	1.0091	1.0005
131430	132	SITAP-21	RAJASTHA	RAJ_STU	1.0106	1.002
131431	132	SIWANA	RAJASTHA	RAJ_STU	1.0092	1.0066
131432	132	SMS-STA1	RAJASTHA	RAJ_STU	1.0154	1.0065
131433	132	SOJAT1	RAJASTHA	RAJ_STU	0.9879	0.9923
131434	132	SOORSAGA	RAJASTHA	RAJ_STU	1.0004	1.0001
131435	132	SOYLA1	RAJASTHA	RAJ_STU	1.0229	0.9915
131436	132	SPOTRA-1	RAJASTHA	RAJ_STU	**0.9468**	0.984
131437	132	SRIDUNG1	RAJASTHA	RAJ_STU	1.04	1.0138

131438	132	SRIGANGA	RAJASTHA	RAJ_STU	1.0259	1.0064
131439	132	SRIKARNP	RAJASTHA	RAJ_STU	1.0234	1.0063
131440	132	SRIMADHO	RAJASTHA	RAJ_STU	1.002	0.9983
131441	132	SRIMAHAV	RAJASTHA	RAJ_STU	**0.9625**	0.9926
131442	132	SRIVIJAY	RAJASTHA	RAJ_STU	0.9954	0.9992
131443	132	SUJANGARH1	RAJASTHA	RAJ_STU	***1.0519***	1.0268
131444	132	SUKHER1	RAJASTHA	RAJ_STU	**0.945**	0.9885
131445	132	SULTANA	RAJASTHA	RAJ_STU	**0.9636**	0.9887
131446	132	SUMERPUR	RAJASTHA	RAJ_STU	0.992	0.9971
131447	132	SURAJGAR	RAJASTHA	RAJ_STU	**0.9577**	0.9879
131448	132	SURPURA1	RAJASTHA	RAJ_STU	0.9969	0.9952
131449	132	SUWANA	RAJASTHA	RAJ_STU	1.0183	1.0191
131450	132	T_VKIA1	RAJASTHA	RAJ_STU	1.0067	0.9994
131451	132	TAGOREN	RAJASTHA	RAJ_STU	**0.9738**	0.9824
131452	132	TALERA	RAJASTHA	RAJ_STU	0.9908	0.9966
131453	132	TARANAGA	RAJASTHA	RAJ_STU	**0.9532**	0.9863
131454	132	TEHANDESAR	RAJASTHA	RAJ_STU	***1.0506***	1.023
131457	132	THADOLI1	RAJASTHA	RAJ_STU	**0.9754**	0.9864
131458	132	THANAGAZ	RAJASTHA	RAJ_STU	0.99	0.9956
131459	132	THOI_1	RAJASTHA	RAJ_STU	0.999	0.9961
131460	132	TIZARA	RAJASTHA	RAJ_STU	0.9954	1.0014
131461	132	TODABHIM	RAJASTHA	RAJ_STU	0.9939	0.9974
131462	132	TODARASI	RAJASTHA	RAJ_STU	**0.9737**	0.9859
131463	132	TONK	RAJASTHA	RAJ_STU	1.0045	1.0027
131464	132	TOONGA1	RAJASTHA	RAJ_STU	1.0044	1.002
131465	132	UDAIPURW	RAJASTHA	RAJ_STU	0.9977	0.9846
131466	132	UMAIDPUR	RAJASTHA	RAJ_STU	0.9894	0.9945
131467	132	UNDOO	RAJASTHA	RAJ_STU	1.0406	1.0303
131468	132	UNIARA1	RAJASTHA	RAJ_STU	1.0137	1.01
131469	132	UPANI_1	RAJASTHA	RAJ_STU	***1.0603***	1.0119
131470	132	VAISHALI	RAJASTHA	RAJ_STU	1.0055	0.997
131472	132	VKIA1	RAJASTHA	RAJ_STU	1.0062	0.9989
131473	132	WEIR1	RAJASTHA	RAJ_STU	**0.9512**	0.984
131474	132	Z_MINES	RAJASTHA	RAJ_STU	**0.9159**	0.9951
131475	132	BAMANTUKDA	RAJASTHA	RAJ_STU	0.9929	1.0032
131476	132	MOONDSAR	RAJASTHA	RAJ_STU	1.0301	1.0083
131477	132	MASUDA	RAJASTHA	RAJ_STU	1.0159	1.0105
131478	132	SUBHASNAGAR	RAJASTHA	RAJ_STU	1.0177	1.0099
131479	132	KUSHALGARH	RAJASTHA	RAJ_STU	**0.9368**	0.9895

131480	132	BIJAIPUR	RAJASTHA	RAJ_STU	1	1
131481	132	MEHARA	RAJASTHA	RAJ_STU	**0.9434**	0.982
131482	132	AAU2	RAJASTHA	RAJ_STU	0.9869	0.9859
131483	132	BADISID	RAJASTHA	RAJ_STU	1.0257	1.0221
131484	132	BAITHWASIA	RAJASTHA	RAJ_STU	**0.9786**	0.9822
131485	132	BHAWAD	RAJASTHA	RAJ_STU	1.0042	1.0028
131486	132	DEEDWANA4	RAJASTHA	RAJ_STU	1.0388	1.0241
131487	132	PS-4	RAJASTHA	RAJ_STU	1.0196	1.0164
131488	132	MANDALGR_GSS	RAJASTHA	RAJ_STU	1.0165	1.0175
131489	132	BANSUR_GSS	RAJASTHA	RAJ_STU	1.0048	1.0103
131490	132	KANASAR	RAJASTHA	RAJ_STU	1.0286	1.0257
131491	132	NIWANA	RAJASTHA	RAJ_STU	1.0028	0.998
131492	132	BEHROR_GSS	RAJASTHA	RAJ_STU	1.0127	1.0173
131493	132	CHONKARWADA	RAJASTHA	RAJ_STU	1.0012	1.0064
131494	132	VATIKA	RAJASTHA	RAJ_STU	1.0261	1.0168
131495	132	JETHANA	RAJASTHA	RAJ_STU	1.0225	1.0152
131496	132	SAYLA_GSS	RAJASTHA	RAJ_STU	1.0437	1.0322
131497	132	KHETUSAR	RAJASTHA	RAJ_STU	1.0159	1.0134
131498	132	GONER	RAJASTHA	RAJ_STU	1.0085	1.001
131499	132	RAMGARH_421	RAJASTHA	RAJ_STU	1.0497	1.0298
131500	132	PAHARI	RAJASTHA	RAJ_STU	**0.9341**	0.9889
131501	132	SWAROOPGANJ	RAJASTHA	RAJ_STU	**0.9644**	0.989
131502	132	ARAIN	RAJASTHA	RAJ_STU	0.9968	0.9877
131503	132	BATODA	RAJASTHA	RAJ_STU	**0.956**	0.9849
131504	132	PANCHU	RAJASTHA	RAJ_STU	1.0297	1.0029
131505	132	ANANDPUR KAL	RAJASTHA	RAJ_STU	0.9823	0.9863
131506	132	POSALIYA	RAJASTHA	RAJ_STU	0.9834	0.9945
131507	132	KIRMASARAIYA	RAJASTHA	RAJ_STU	0.9973	0.9969
131508	132	BHASINA	RAJASTHA	RAJ_STU	1.0485	1.0172
131509	132	HATUNDI	RAJASTHA	RAJ_STU	**0.9755**	0.9851
131510	132	PARBATSAR	RAJASTHA	RAJ_STU	1.0003	0.9912
131511	132	SEEMALWARA	RAJASTHA	RAJ_STU	**0.9115**	0.9974
131512	132	GHATOL	RAJASTHA	RAJ_STU	**0.9289**	0.99
131513	132	SHERERA	RAJASTHA	RAJ_STU	1.0225	0.9995
131514	132	ROOPARAIL	RAJASTHA	RAJ_STU	1.0217	1.0043
131515	132	JATAWALI	RAJASTHA	RAJ_STU	1.0006	0.9949
131516	132	DEH	RAJASTHA	RAJ_STU	1.0079	0.9922
131517	132	KHERWARA	RAJASTHA	RAJ_STU	**0.9036**	0.9985
131518	132	PEEPALWARA	RAJASTHA	RAJ_STU	**0.9434**	0.9871

131519	132	BHIM	RAJASTHA	RAJ_STU	0.9941	0.9872
131520	132	KISHANGANJ	RAJASTHA	RAJ_STU	1.0044	0.9965
131521	132	BHANIPURA	RAJASTHA	RAJ_STU	**0.9639**	0.9838
131522	132	BICHHIWARA	RAJASTHA	RAJ_STU	**0.9007**	1
131523	132	SULTANPUR	RAJASTHA	RAJ_STU	1.0045	1.0031
131524	132	SHAITANSINGH	RAJASTHA	RAJ_STU	1.0022	0.9997
131525	132	SATWARA	RAJASTHA	RAJ_STU	1.0206	1.0122
131526	132	KOLUKHERI	RAJASTHA	RAJ_STU	1.0219	1.0096
131527	132	GUDHACHANDRJ	RAJASTHA	RAJ_STU	**0.9382**	0.9842
131528	132	NANGALPY	RAJASTHA	RAJ_STU	1.0045	1.0021
131530	132	BAGDI	RAJASTHA	RAJ_STU	1.0082	1.0062
131531	132	AJASAR	RAJASTHA	RAJ_STU	**0.9799**	0.98
131533	132	AMBERI	RAJASTHA	RAJ_STU	**0.9508**	0.9926
131534	132	BHAWAMAN_21	RAJASTHA	RAJ_STU	1.0109	1.0004
131535	132	MAMONI	RAJASTHA	RAJ_STU	0.9903	0.9823
131536	132	DADABARI	RAJASTHA	RAJ_STU	1.0118	1.0151
131537	132	CHOUTH_KA_BA	RAJASTHA	RAJ_STU	1.0083	1.0066
131538	132	SANGARH_1	RAJASTHA	RAJ_STU	1.0302	1.0302
131539	132	SANWALI_ROAD	RAJASTHA	RAJ_STU	1.009	0.9961
131540	132	BAPINI_1	RAJASTHA	RAJ_STU	0.982	0.981
131541	132	JOOJHPURA_1	RAJASTHA	RAJ_STU	**0.9268**	0.9834
131542	132	KITASAR	RAJASTHA	RAJ_STU	1.025	1.0088
131543	132	PARASNEU	RAJASTHA	RAJ_STU	1.013	1.0068
131544	132	NANTA	RAJASTHA	RAJ_STU	1.018	1.0213
131545	132	GOVINDG_ALWA	RAJASTHA	RAJ_STU	0.9855	0.994
131546	132	NARAINPUR	RAJASTHA	RAJ_STU	0.9963	1.0019
131547	132	DHIGARIABHIM	RAJASTHA	RAJ_STU	0.9968	0.9985
131548	132	BALICHA	RAJASTHA	RAJ_STU	**0.9288**	0.9897
131549	132	RASOOLPUR	RAJASTHA	RAJ_STU	**0.9638**	0.9977
131550	132	MOKHAMPURA_P	RAJASTHA	RAJ_STU	1.0024	1.0025
131551	132	DESURI	RAJASTHA	RAJ_STU	0.9977	1.0031
131552	132	DEGANA	RAJASTHA	RAJ_STU	1.0128	1.0033
131553	132	BAPAWAR	RAJASTHA	RAJ_STU	1.0274	1.0181
131554	132	RICCOREENGUS	RAJASTHA	RAJ_STU	1.003	0.9979
131555	132	PRATAPURA_BH	RAJASTHA	RAJ_STU	1.0078	1.001
132000	220	DAUSA	RAJASTHA	RAJ_STU	1.0228	1.0208
132001	220	MERTA-42	RAJASTHA	RAJ_STU	1.0429	1.0298
132002	220	BHIWA-RS	RAJASTHA	RAJ_STU	1.0069	1.0139
132003	220	NAGAUR	RAJASTHA	RAJ_STU	1.0375	1.0217

132004	220	RANPUR	RAJASTHA	RAJ_STU	1.0283	1.0307
132005	220	RAPS_A2	RAJASTHA	NPCIL-NR	1.027	1.0332
132006	220	KUKAS	RAJASTHA	RAJ_STU	1.0226	1.0197
132007	220	KANKR-PG	RAJASTHA	NR_PGCIL	1.0199	1.0252
132008	220	HINDAU-4	RAJASTHA	RAJ_STU	1.0106	1.0181
132009	220	RATANGAR	RAJASTHA	RAJ_STU	1.0447	1.0336
132010	220	ALWAR	RAJASTHA	RAJ_STU	1.0145	1.0178
132011	220	BHARATPUR	RAJASTHA	RAJ_STU	0.9941	1.0076
132012	220	HIRAPURA	RAJASTHA	RAJ_STU	1.0281	1.0196
132013	220	REENGUS	RAJASTHA	RAJ_STU	1.0223	1.0157
132014	220	KHETRI	RAJASTHA	RAJ_STU	0.997	1.0093
132015	220	AJMER	RAJASTHA	RAJ_STU	1.0278	1.0195
132016	220	PHULERA	RAJASTHA	RAJ_STU	1.0238	1.0145
132017	220	BARMER	RAJASTHA	RAJ_STU	1.0492	1.0474
132018	220	BHILWA-2	RAJASTHA	RAJ_STU	1.0323	1.0329
132019	220	GIRALTPS	RAJASTHA	RAJA_TH	1.0487	1.0469
132020	220	BEAWAR	RAJASTHA	RAJ_STU	1.0301	1.0251
132021	220	DHOLPU-4	RAJASTHA	RAJA_TH	0.9904	1.0085
132022	220	SAKATPUR	RAJASTHA	RAJ_STU	1.0299	1.0335
132023	220	KUCHAMAN	RAJASTHA	RAJ_STU	1.0368	1.023
132024	220	JHUNJHUN	RAJASTHA	RAJ_STU	0.9939	1.0054
132025	220	KOTPU-RS	RAJASTHA	RAJ_STU	1.0213	1.0226
132026	220	MADRI	RAJASTHA	RAJ_STU	**0.9686**	1.0029
132027	220	MADA-SUZ	RAJASTHA	RAJ_WIND	1.048	1.0463
132028	220	NIMBHERA	RAJASTHA	RAJ_STU	1.0051	1.0189
132029	220	CHITTORG_GSS	RAJASTHA	RAJ_STU	1.0231	1.0301
132030	220	SIROHI	RAJASTHA	RAJ_STU	1.0149	1.0175
132031	220	BALOTRA	RAJASTHA	RAJ_STU	1.0291	1.0265
132032	220	MODAK	RAJASTHA	RAJ_STU	1.0204	1.0187
132033	220	JODHPU-2	RAJASTHA	RAJ_STU	1.0115	1.009
132034	220	SANGANER	RAJASTHA	RAJ_STU	1.0279	1.0188
132035	220	PALI	RAJASTHA	RAJ_STU	1.0217	1.0211
132036	220	NEEMR-RS	RAJASTHA	RAJ_STU	1.0227	1.0257
132037	220	AMARSAGA	RAJASTHA	RAJ_WIND	1.047	1.047
132038	220	TINWARI	RAJASTHA	RAJ_STU	1.0194	1.0163
132039	220	PHALODI	RAJASTHA	RAJ_STU	1.0262	1.0222
132040	220	BHOPALGA	RAJASTHA	RAJ_STU	1.0273	1.0162
132041	220	KHINVSAR	RAJASTHA	RAJ_STU	1.0309	1.0155
132042	220	BARSINGS	RAJASTHA	NLC-NR	1.045	1.0287

132043	220	DHAURIMA	RAJASTHA	RAJ_STU	1.0443	1.0389
132044	220	JALORE	RAJASTHA	RAJ_STU	1.0258	1.0223
132045	220	PINDWARA	RAJASTHA	RAJ_STU	0.9993	1.0085
132046	220	SUJANGAR	RAJASTHA	RAJ_STU	1.0486	1.0324
132047	220	MANDAWAR	RAJASTHA	RAJ_STU	1.0089	1.0147
132048	220	MAKRANA	RAJASTHA	RAJ_STU	1.0316	1.0189
132049	220	JHALAWAR	RAJASTHA	RAJ_STU	***1.0517***	1.0275
132050	220	KISHANGA	RAJASTHA	RAJ_STU	1.0205	1.0117
132051	220	DAHRA	RAJASTHA	RAJ_STU	1.0279	1.0278
132052	220	SAWAIMAD	RAJASTHA	RAJ_STU	1.0244	1.0233
132053	220	BIKANE-4	RAJASTHA	RAJ_STU	1.0454	1.029
132054	220	SRIDUNGA	RAJASTHA	RAJ_STU	1.0436	1.0259
132055	220	SIKAR-RS	RAJASTHA	RAJ_STU	1.0393	1.028
132056	220	BIKANE-2	RAJASTHA	RAJ_STU	1.0439	1.0272
132057	220	SURATH-2	RAJASTHA	RAJA_TH	1.05	1.038
132058	220	UDYOGVIH	RAJASTHA	RAJ_STU	1.0366	1.024
132059	220	HANUMANG	RAJASTHA	RAJ_STU	1.0296	1.0201
132060	220	BANSWARA	RAJASTHA	RAJ_STU	**0.9584**	1.0018
132061	220	KTPS	RAJASTHA	RAJA_TH	1.03	1.0336
132062	220	CHOMU	RAJASTHA	RAJ_STU	1.0186	1.0115
132063	220	BILARA	RAJASTHA	RAJ_STU	1.0181	1.013
132064	220	KANKR-RS	RAJASTHA	RAJ_STU	1.0179	1.0235
132065	220	BALI	RAJASTHA	RAJ_STU	1.0095	1.015
132066	220	BARAN2	RAJASTHA	RAJ_STU	1.0307	1.0234
132067	220	DHOLPU-2	RAJASTHA	RAJ_STU	0.9893	1.0074
132068	220	RENWAL	RAJASTHA	RAJ_STU	1.0204	1.0127
132069	220	VKIA	RAJASTHA	RAJ_STU	1.0226	1.0158
132070	220	CHABRA-2	RAJASTHA	RAJ_STU	***1.0586***	1.0384
132071	220	KAWAI	RAJASTHA	RAJ_STU	1.0409	1.0272
132072	220	HINDAU-2	RAJASTHA	RAJ_STU	1.0053	1.0142
132073	220	DHOD	RAJASTHA	RAJ_STU	1.0414	1.029
132074	220	BORANADA	RAJASTHA	RAJ_STU	1.0101	1.0075
132075	220	BAGRU	RAJASTHA	RAJ_STU	1.0195	1.0112
132076	220	GULABPUR	RAJASTHA	RAJ_STU	1.0219	1.0189
132077	220	RAJWEST	RAJASTHA	RAJA_TH	1.05	1.0495
132079	220	AKAL-2	RAJASTHA	RAJ_WIND	1.046	1.045
132080	220	ASPUR	RAJASTHA	RAJ_STU	**0.959**	1.0029
132081	220	BAP_2	RAJASTHA	RAJ_STU	1.0294	1.025
132083	220	BARLI_2	RAJASTHA	RAJ_STU	1.0147	1.0119

132084	220	BHADLA	RAJASTHA	RAJ_STU	1.0332	1.0307
132085	220	BHADRA	RAJASTHA	RAJ_STU	1.0124	1.0167
132087	220	BHILWA-4	RAJASTHA	RAJ_STU	1.0336	1.0338
132088	220	BHINM-RS	RAJASTHA	RAJ_STU	1.0408	1.035
132089	220	BUNDI	RAJASTHA	RAJ_STU	1.0146	1.0176
132090	220	CHIRAWA	RAJASTHA	RAJ_STU	0.9894	1.0069
132091	220	DEBARI	RAJASTHA	RAJ_STU	**0.9737**	1.0048
132092	220	DECHU	RAJASTHA	RAJ_STU	1.0276	1.023
132093	220	DUNI	RAJASTHA	RAJ_STU	1.0188	1.0166
132094	220	GAJNER	RAJASTHA	RAJ_STU	1.0386	1.0214
132095	220	GANGAPUR	RAJASTHA	RAJ_STU	1.0017	1.0126
132096	220	INDIRAGN	RAJASTHA	RAJ_STU	1.0247	1.0164
132097	220	JALAMAND	RAJASTHA	RAJ_STU	1.0145	1.0116
132098	220	JODHPU-4	RAJASTHA	RAJ_STU	1.02	1.0166
132099	220	KALISIND	RAJASTHA	RAJ_STU	***1.0542***	1.0293
132102	220	KISH-BAS	RAJASTHA	RAJ_STU	1.0098	1.0145
132103	220	KUCHERA	RAJASTHA	RAJ_STU	1.0375	1.0234
132104	220	KUNDAKID	RAJASTHA	RAJ_STU	1.0241	1.0209
132105	220	MANOHARP	RAJASTHA	RAJ_STU	1.0163	1.0172
132106	220	MANSAROV	RAJASTHA	RAJ_STU	1.0276	1.019
132107	220	MIA-ALWA	RAJASTHA	RAJ_STU	1.016	1.0191
132108	220	NAWALGAR	RAJASTHA	RAJ_STU	1	1
132109	220	NOKHA	RAJASTHA	RAJ_STU	1.0409	1.023
132110	220	NPH	RAJASTHA	RAJ_STU	1.0272	1.0187
132111	220	PADAMPUR	RAJASTHA	RAJ_STU	1.0359	1.0228
132113	220	RAMGARH	RAJASTHA	RAJA_TH	1.0403	1.0302
132114	220	RAS_2	RAJASTHA	RAJ_STU	1.0347	1.0278
132115	220	RATANGAR	RAJASTHA	RAJ_STU	1.0376	1.0289
132116	220	SANCHORE	RAJASTHA	RAJ_STU	1.0442	1.0373
132117	220	SAWA	RAJASTHA	RAJ_STU	1.0201	1.0282
132118	220	SITAPURA	RAJASTHA	RAJ_STU	1.0249	1.0162
132119	220	SURATGAR	RAJASTHA	RAJ_STU	1.042	1.0305
132120	220	VSLP	RAJASTHA	RAJA_TH	1.0461	1.0294
132121	220	SEZJAIP	RAJASTHA	RAJ_STU	1.0273	1.0179
132122	220	SIKRAI	RAJASTHA	RAJ_STU	1.0112	1.0147
132123	220	BADNU	RAJASTHA	RAJ_STU	1.0448	1.0263
132124	220	BAMANTUKDA	RAJASTHA	RAJ_STU	1.0129	1.0184
132125	220	LALSOT	RAJASTHA	RAJ_STU	1.0205	1.0189
132126	220	TEHANDESAR	RAJASTHA	RAJ_STU	1.0471	1.0283

132127	220	CHAKSU	RAJASTHA	RAJ_STU	1.034	1.0227
132128	220	AJMER42	RAJASTHA	RAJ_STU	1.0407	1.0327
132129	220	MANDALGARH	RAJASTHA	RAJ_STU	1.029	1.0308
132130	220	ALWAR_GSS	RAJASTHA	ATSCL	1.0177	1.0204
132131	220	AAU	RAJASTHA	RAJ_STU	1.0141	1.0108
132132	220	BADISID	RAJASTHA	RAJ_STU	1.0257	1.0221
132133	220	BAITHWASIA	RAJASTHA	RAJ_STU	1.0121	1.0084
132134	220	BHAWAD	RAJASTHA	RAJ_STU	1.0175	1.0123
132136	220	DEEDWANA	RAJASTHA	RAJ_STU	1.0482	1.033
132137	220	KUSHKHER	RAJASTHA	RAJ_STU	1.0108	1.0167
132138	220	BHINM-PG	RAJASTHA	NR_PGCIL	1.0405	1.0351
132139	220	KOTA	RAJASTHA	NR_PGCIL	1.0403	1.0377
132148	220	CHITTORGARH	RAJASTHA	RAJ_STU	1.0223	1.0296
132150	220	BANSUR	RAJASTHA	RAJ_STU	1.0212	1.0226
132151	220	KANASAR	RAJASTHA	RAJ_STU	1.0326	1.0301
132152	220	NIWANA	RAJASTHA	RAJ_STU	1.012	1.0115
132153	220	BEHROR	RAJASTHA	RAJ_STU	1.0233	1.0269
132154	220	CHONKARWADA	RAJASTHA	RAJ_STU	1.0049	1.013
132155	220	VATIKA	RAJASTHA	RAJ_STU	1.0328	1.0228
132156	220	DANTARAMGARH	RAJASTHA	RAJ_STU	1.0181	1.0103
132157	220	JETHANA	RAJASTHA	RAJ_STU	1.0372	1.0287
132158	220	SAYALA	RAJASTHA	RAJ_STU	1.0382	1.0324
132159	220	RAMGARH_GSS	RAJASTHA	RAJ_STU	1.04	1.0301
132160	220	BABAI	RAJASTHA	RAJ_STU	1.006	1.0122
132161	220	GONER	RAJASTHA	RAJ_STU	1.0316	1.0204
132162	220	NADBAI2	RAJASTHA	RAJ_STU	0.9975	1.0086
132163	220	LAXMANGARH	RAJASTHA	RAJ_STU	1.0301	1.0207
132164	220	HAMIRGARH	RAJASTHA	RAJ_STU	1.0266	1.0297
132165	220	PRATAPGARH	RAJASTHA	RAJ_STU	1.0164	1.0257
132166	220	AMBERI	RAJASTHA	RAJ_STU	**0.9762**	1.0048
132167	220	BHAWAMAN_2	RAJASTHA	RAJ_STU	1.0175	1.0131
132169	220	BHAWANI_TAP	RAJASTHA	RAJ_STU	***1.053***	1.0284
132170	220	KAKANI	RAJASTHA	RAJ_STU	1.0377	1.0346
132171	220	KTPS_S	RAJASTHA	RAJA_TH	1.04	1.038
132173	220	JAISALMER-2	RAJASTHA	RAJ_STU	1.0462	1.041
134000	400	MERTA	RAJASTHA	RAJ_STU	***1.0578***	1.0411
134001	400	AKAL-4	RAJASTHA	RAJ_STU	1.0415	1.0375
134002	400	BARMER-4	RAJASTHA	RAJ_STU	***1.0524***	1.0492
134003	400	HERAPU-4	RAJASTHA	RAJ_STU	1.048	1.0368

134004	400	RATANGAR	RAJASTHA	RAJ_STU	***1.0612***	1.0433
134005	400	HINDAU-4	RAJASTHA	RAJ_STU	1.0347	1.0324
134006	400	BHILWA-4	RAJASTHA	RAJ_STU	1.0444	1.0403
134007	400	CHABRA-4	RAJASTHA	RAJA_TH	***1.0715***	1.0457
134008	400	KALISI-4	RAJASTHA	RAJA_TH	***1.0712***	1.0396
134009	400	RAJWEST	RAJASTHA	RAJA_TH	***1.0524***	1.05
134010	400	KAWAI	RAJASTHA	ADANI	***1.071***	1.0432
134011	400	DEEDWANA	RAJASTHA	RAJ_STU	***1.0534***	1.0374
134012	400	AJMER	RAJASTHA	RAJ_STU	1.0472	1.0389
134013	400	ALWAR_GSS	RAJASTHA	ATSCL	1.028	1.0283
134014	400	BHADLA	RAJASTHA	RAJ_STU	1.0347	1.033
134015	400	JODHPU-4	RAJASTHA	RAJ_STU	1.0397	1.0364
134016	400	PHAGI_400	RAJASTHA	RAJ_STU	***1.0505***	1.038
134017	400	BIKANE-4	RAJASTHA	RAJ_STU	***1.0514***	1.0382
134018	400	SURATG-4	RAJASTHA	RAJA_TH	***1.06***	1.0472
134019	400	KOTPUT	RAJASTHA	NR_PGCIL	1.0369	1.034
134020	400	SIKAR	RAJASTHA	NR_PGCIL	***1.0605***	1.047
134032	400	CHITTORGARH	RAJASTHA	RAJ_STU	1.0373	1.0353
134033	400	RAMGARH_GSS	RAJASTHA	RAJ_STU	1.0338	1.0265
134034	400	CHHABRA_SC	RAJASTHA	RAJ_STU	***1.0716***	1.0458
134037	400	BABAI	RAJASTHA	RAJ_STU	1.006	1.0122
134038	400	SURATGARH_SC	RAJASTHA	RAJ_STU	***1.0599***	1.0471
134039	400	KANKANI	RAJASTHA	RAJ_STU	1.0491	1.0435
134041	400	BHENSARA	RAJASTHA	RAJ_STU	1.0462	1.041
137000	765	PHAGI	RAJASTHA	RAJ_STU	***1.0514***	1.0349
137001	765	ANTA	RAJASTHA	RAJ_STU	***1.0623***	1.0404

Uttar Pradesh

Bus Number	Base kV	Bus Name	Area Name	Owner Name	Base Case V (PU)	With Recommended Capacitors V (PU)
150000	33	KANPU_SO	UTTARPRA	UP_STU	1	1
150001	33	BHELUPUR	UTTARPRA	UP_STU	0.9916	0.9953
151000	132	NOIDA_20	UTTARPRA	UP_STU	0.9914	1.0017
151001	132	GOKUL	UTTARPRA	UP_STU	0.9994	1.0005
151002	132	GNOIDA1	UTTARPRA	UP_STU	0.9898	0.9997
151003	132	ATRAULI1	UTTARPRA	UP_STU	1.0178	1.0304
151004	132	BARAUT1	UTTARPRA	UP_STU	1.0209	1.0352

151005	132	AGRAN1	UTTARPRA	UP_STU	1.0202	1.0196
151006	132	AGRACANT	UTTARPRA	UP_STU	0.9968	0.9942
151007	132	UNNAO1	UTTARPRA	UP_STU	1.0012	1.0006
151008	132	AGRAFN	UTTARPRA	UP_STU	1.0008	1.0002
151009	132	BANDA1	UTTARPRA	UP_STU	1.0255	1.0242
151010	132	HATHRAS1	UTTARPRA	UP_STU	0.988	0.996
151011	132	CHIBRMAU	UTTARPRA	UP_STU	1.0137	1.0189
151012	132	ORAI1	UTTARPRA	UP_STU	0.9955	0.9985
151013	132	CHINHAT	UTTARPRA	UP_STU	1.0054	0.9995
151014	132	PHULPUR1	UTTARPRA	UP_STU	1.0052	1.0026
151015	132	SHATABD	UTTARPRA	UP_STU	1.0174	1.0253
151016	132	SIMBOLI	UTTARPRA	UP_STU	1.0126	1.0203
151017	132	GAJRAULA	UTTARPRA	UP_STU	1.014	1.0168
151018	132	SAMBHAL	UTTARPRA	UP_STU	0.9808	0.9855
151019	132	SAHIBAD	UTTARPRA	UP_STU	1.0074	1.016
151020	132	HARDOIROAD	UTTARPRA	UP_STU	0.9896	0.985
151021	132	NEHTOR1	UTTARPRA	UP_STU	1	0.9957
151022	132	DOHANA1	UTTARPRA	UP_STU	1.019	1.0061
151023	132	NIGHASAN	UTTARPRA	UP_STU	1.0036	0.9943
151024	132	SHAJANP1	UTTARPRA	UP_STU	1.0222	1.0055
151025	132	CBGANJ	UTTARPRA	UP_STU	1.0438	1.0057
151026	132	AGRATAJ	UTTARPRA	UP_STU	0.9955	0.9949
151027	132	MAU1	UTTARPRA	UP_STU	1.0207	1.022
151028	132	SITAPUR1	UTTARPRA	UP_STU	1.0144	1.0031
151029	132	LUCKNOW1	UTTARPRA	UP_STU	0.9955	0.9913
151030	132	NAZIBABA	UTTARPRA	UTKD_STU	0.9991	0.9945
151031	132	MURABAD1	UTTARPRA	UP_STU	1.0127	1.0045
151032	132	MODIPURM_220	UTTARPRA	UP_STU	1.0044	1.0129
151033	132	MURADNG1	UTTARPRA	UP_STU	1.0227	1.0298
151034	132	SHAMLI1	UTTARPRA	UP_STU	0.9838	1.0038
151035	132	SAHARAN1	UTTARPRA	UP_STU	**0.9758**	1.0137
151036	132	AZAMGARH_220	UTTARPRA	UP_STU	1.0068	1.0085
151037	132	NARA	UTTARPRA	UP_STU	1.0062	1.0174
151038	132	KHURJA1	UTTARPRA	UP_STU	1.0065	1.0194
151039	132	HARDUGN1	UTTARPRA	UP_STU	1.0104	1.0242
151040	132	AGRA1	UTTARPRA	UP_STU	1.0053	1.0037
151041	132	DEORIA1	UTTARPRA	UP_STU	0.993	1.004
151042	132	MAINPUR	UTTARPRA	UP_STU	1.0235	1.0297
151043	132	HARDOI1	UTTARPRA	UP_STU	1.0177	1.0038

151044	132	PANKI1	UTTARPRA	UP_STU	0.9896	0.9965
151045	132	FEROZBD1	UTTARPRA	UP_STU	1.0224	1.0267
151046	132	NAUBSTA	UTTARPRA	UP_STU	0.9822	0.9915
151047	132	BAH	UTTARPRA	UP_STU	0.9839	0.9975
151048	132	AKBARPUR	UTTARPRA	UP_STU	**0.9621**	0.9855
151049	132	OBRA1	UTTARPRA	UP_STU	1.0102	1.013
151050	132	OBRAH1	UTTARPRA	UP_HYD	1.0098	1.0127
151051	132	RICHA	UTTARPRA	UP_STU	1.0087	0.9956
151052	132	ALAHBAD1	UTTARPRA	UP_STU	1.015	1.0105
151053	132	GAZIPR2	UTTARPRA	UP_STU	1.0104	1.0173
151054	132	FATEHPR1	UTTARPRA	UP_STU	1.019	1.0203
151055	132	SAHUPR1	UTTARPRA	UP_STU	1.0041	1.0093
151056	132	SARNATH1	UTTARPRA	UP_STU	1.015	1.0193
151057	132	BADAUN1	UTTARPRA	UP_STU	0.9925	0.9909
151058	132	GORAKPR1	UTTARPRA	UP_STU	1.0029	1.0085
151059	132	SULTANP1	UTTARPRA	UP_STU	1.0101	1.0191
151060	132	JAUNPUR1	UTTARPRA	UP_STU	0.9969	1.0055
151061	132	GONDA1	UTTARPRA	UP_STU	1.0148	1.0156
151062	132	CANT_AL	UTTARPRA	UP_STU	0.9943	0.9921
151063	132	BASTI1	UTTARPRA	UP_STU	0.9971	1.0016
151064	132	ALIGARH2	UTTARPRA	UP_STU	1.0144	1.0276
151065	132	RIHND1	UTTARPRA	UP_HYD	1.03	1.03
151066	132	ROBERTG1	UTTARPRA	UP_STU	0.9922	0.9983
151067	132	DHAMPR1	UTTARPRA	UP_STU	0.9954	0.9951
151068	132	SARSAUL	UTTARPRA	UP_STU	1.0017	1.0156
151069	132	ANPARA1	UTTARPRA	UP_STU	1.0348	1.0361
151070	132	JHANSI2	UTTARPRA	UP_STU	0.9851	0.9984
151071	132	ALIGARH3	UTTARPRA	UP_STU	**0.9683**	0.9823
151072	132	AMROHA	UTTARPRA	UP_STU	0.988	0.9806
151073	132	ANANDNAG	UTTARPRA	UP_STU	**0.9665**	0.9812
151074	132	AONLA	UTTARPRA	UP_STU	1.0352	0.9967
151075	132	IFFCOAON	UTTARPRA	UP_STU	1.0313	0.9926
151076	132	AMRAPUR	UTTARPRA	UP_STU	0.989	0.9958
151077	132	AURAI	UTTARPRA	UP_STU	**0.966**	0.9815
151078	132	AZADNGR	UTTARPRA	UP_STU	0.9843	0.9912
151079	132	SIDHARI AZAM	UTTARPRA	UP_STU	1.0051	1.0068
151080	132	B.BNGR	UTTARPRA	UP_STU	1.0104	1.0194
151081	132	BABRALA	UTTARPRA	UP_STU	**0.9618**	0.9839
151082	132	BACHRANW	UTTARPRA	UP_STU	**0.9749**	0.989

151083	132	BAGPAT	UTTARPRA	UP_STU	1.026	1.0393
151084	132	BAHRAICH	UTTARPRA	UP_STU	1.0037	1.0014
151085	132	BALIA_UP	UTTARPRA	UP_STU	1.0116	1.0129
151086	132	BALRAMPUR	UTTARPRA	UP_STU	1.0067	1.0074
151087	132	BANDA132	UTTARPRA	UP_STU	1.0235	1.0221
151088	132	BANGERMA	UTTARPRA	UP_STU	**0.9623**	0.9883
151089	132	BANSI	UTTARPRA	UP_STU	1.0234	1.0261
151090	132	BARABANK	UTTARPRA	UP_STU	1.0121	1.009
151091	132	BARELYII	UTTARPRA	UP_STU	1.0171	1.0033
151092	132	BARELY-1	UTTARPRA	UP_STU	1.0205	1.0074
151093	132	BADHALGA	UTTARPRA	UP_STU	**0.9613**	0.9865
151094	132	NOIDA129	UTTARPRA	UP_STU	**0.9517**	0.9829
151095	132	BAHADOHI	UTTARPRA	UP_STU	**0.9631**	0.983
151096	132	BHARTHANA	UTTARPRA	UP_STU	**0.9768**	0.996
151097	132	SUMERPUR	UTTARPRA	UP_STU	0.9998	1.0004
151098	132	BHIMNAGR	UTTARPRA	UP_STU	1.0039	1.0033
151099	132	BHOOR	UTTARPRA	UP_STU	0.9852	0.9984
151100	132	BHOPAROA	UTTARPRA	UP_STU	1	1.011
151101	132	BIJNOUR	UTTARPRA	UP_STU	1.002	0.9974
151102	132	BILARI	UTTARPRA	UP_STU	0.9906	0.9883
151103	132	BILHOUR	UTTARPRA	UP_STU	**0.9789**	0.9858
151104	132	BILASPUR	UTTARPRA	UP_STU	1.0055	0.9935
151105	132	SOHAWAL	UTTARPRA	UP_STU	1.0084	1.0106
151106	132	BISAULI	UTTARPRA	UP_STU	**0.9732**	0.9806
151107	132	BODLA	UTTARPRA	UP_STU	0.9935	0.9908
151108	132	BUDHANA	UTTARPRA	UP_STU	**0.9612**	0.9862
151109	132	CHANDOLI	UTTARPRA	UP_STU	**0.9753**	0.9853
151110	132	CHANDAUS	UTTARPRA	UP_STU	0.9808	0.9855
151111	132	CHANDPUR	UTTARPRA	UP_STU	0.982	0.9771
151112	132	CHHAPRAULI	UTTARPRA	UP_STU	1.0103	1.0248
151113	132	CHUNNAR	UTTARPRA	UP_STU	0.9838	0.9891
151114	132	CHUTMALP	UTTARPRA	UP_STU	**0.9576**	0.9882
151115	132	DADANGR	UTTARPRA	UP_STU	**0.9713**	0.9807
151116	132	FARIDNAGAR	UTTARPRA	UP_STU	1.0334	1.0402
151117	132	ROBERTSGANJ2	UTTARPRA	UP_STU	1.0096	1.0133
151118	132	DARSHANN	UTTARPRA	UP_STU	**0.9774**	0.9824
151119	132	DASNA	UTTARPRA	UP_STU	1.0171	1.0238
151120	132	DEBAI	UTTARPRA	UP_STU	1.017	1.0288
151121	132	DEOBAND	UTTARPRA	UP_STU	**0.9315**	0.9949

151122	132	DEORIA_1	UTTARPRA	UP_STU	0.9922	1.0024
151123	132	DIBIYAPU	UTTARPRA	UP_STU	**0.9416**	0.9833
151124	132	DIGHAR	UTTARPRA	UP_STU	1.001	1.0024
151125	132	DOHARIGHAT	UTTARPRA	UP_STU	1.008	1.0087
151126	132	DUMARIAGANJ	UTTARPRA	UP_STU	1.0138	1.0146
151127	132	ETAH	UTTARPRA	UP_STU	1.0174	1.0275
151128	132	ETAWAH	UTTARPRA	UP_STU	**0.976**	0.9901
151129	132	ETMADPUR	UTTARPRA	UP_STU	0.9894	0.9901
151130	132	FARIDPUR	UTTARPRA	UP_STU	1.0205	1.0035
151131	132	FATEHGAR	UTTARPRA	UP_STU	1.0028	1.0081
151132	132	FATEHABA	UTTARPRA	UP_STU	**0.958**	0.9807
151133	132	GANGOH	UTTARPRA	UP_STU	**0.961**	0.9877
151134	132	GAURIGANJ	UTTARPRA	UP_STU	1.0008	1.0122
151135	132	GAZIPUR1	UTTARPRA	UP_STU	0.9975	1.0055
151136	132	GAJOKHAR	UTTARPRA	UP_STU	1.0096	1.0133
151137	132	GHATAMPU	UTTARPRA	UP_STU	**0.9592**	0.9882
151138	132	GIDA	UTTARPRA	UP_STU	1.0012	1.0069
151139	132	FCI_GORA	UTTARPRA	UP_STU	0.9918	0.9991
151140	132	GOLA	UTTARPRA	UP_STU	0.9985	0.9973
151141	132	GOMTINAG	UTTARPRA	UP_STU	1.0021	0.9957
151142	132	GOPIGANJ	UTTARPRA	UP_STU	**0.956**	0.9823
151143	132	GULAVATI	UTTARPRA	UP_STU	1.0182	1.0239
151144	132	GYANPUR	UTTARPRA	UP_STU	0.9878	0.9904
151145	132	BULANDSA	UTTARPRA	UP_STU	1.0042	1.0114
151146	132	IND_A_GZ	UTTARPRA	UP_STU	1.0044	1.0128
151147	132	MOHANNAG	UTTARPRA	UP_STU	0.9931	1.0022
151148	132	MEERUTRO	UTTARPRA	UP_STU	**0.9723**	0.9831
151149	132	HALDARPU	UTTARPRA	UP_STU	1.0176	1.0189
151150	132	HANDIA	UTTARPRA	UP_STU	0.989	0.9916
151151	132	HAPUR	UTTARPRA	UP_STU	0.9853	0.9932
151152	132	HAPURROA	UTTARPRA	UP_STU	1.0096	1.0176
151153	132	HARDUG-A	UTTARPRA	UP_STU	1.0109	1.0245
151154	132	HARRIAYA	UTTARPRA	UP_STU	0.9834	0.9881
151155	132	INDOGULF	UTTARPRA	UP_STU	1.0013	1.006
151156	132	JAGDISHP	UTTARPRA	UP_STU	1.0013	1.006
151157	132	JAHANGIR	UTTARPRA	UP_STU	1.0298	1.0435
151158	132	JAHANABA	UTTARPRA	UP_STU	**0.9719**	0.988
151159	132	JAINPUR	UTTARPRA	UP_STU	**0.9773**	0.9817
151160	132	JALESAR	UTTARPRA	UP_STU	0.992	1.0017

151161	132	JANSETH	UTTARPRA	UP_STU	1.0172	1.0285
151162	132	JASALA	UTTARPRA	UP_STU	0.9854	1.0036
151163	132	JASRANA	UTTARPRA	UP_STU	0.994	0.9995
151164	132	JAUNPUR1	UTTARPRA	UP_STU	0.9978	1.0065
151165	132	JHANSI	UTTARPRA	UP_STU	**0.9665**	0.9873
151166	132	JHINGANA	UTTARPRA	UP_STU	**0.9704**	0.9906
151167	132	JHUSI	UTTARPRA	UP_STU	1.0098	1.0124
151168	132	PURKAZI	UTTARPRA	UP_STU	0.9967	1.0075
151169	132	RCGREEN	UTTARPRA	UP_STU	0.9999	1.0096
151170	132	BINA	UTTARPRA	UP_STU	1	1
151171	132	RAEBAREL	UTTARPRA	UP_STU	**0.9728**	0.997
151172	132	RAJAPAKA	UTTARPRA	UP_STU	**0.9481**	0.9811
151173	132	RAJAKATALAB	UTTARPRA	UP_STU	0.9849	0.9895
151174	132	RAMPUR	UTTARPRA	UP_STU	1.0176	1.0058
151175	132	RAMSENGH	UTTARPRA	UP_STU	1.009	1.0059
151176	132	RASRA	UTTARPRA	UP_STU	1.0183	1.0196
151177	132	RATH	UTTARPRA	UP_STU	0.9824	0.9824
151178	132	SADABAD	UTTARPRA	UP_STU	0.9992	0.9986
151179	132	SAIDPUR	UTTARPRA	UP_STU	1.008	1.013
151180	132	SALEMPUR	UTTARPRA	UP_STU	**0.969**	0.9803
151181	132	SANDILA	UTTARPRA	UP_STU	**0.9711**	0.9858
151182	132	SARAON	UTTARPRA	UP_STU	1.0006	1.0032
151183	132	SARDHANA	UTTARPRA	UP_STU	0.9948	1.0034
151184	132	SEFAI	UTTARPRA	UP_STU	0.9878	1.0017
151185	132	SEMRIJAM	UTTARPRA	UP_STU	1.0147	1.0158
151186	132	SHAHGANJ	UTTARPRA	UP_STU	**0.9596**	0.9834
151187	132	SHAMSABA	UTTARPRA	UP_STU	1.0123	1.0128
151188	132	SHANKARG	UTTARPRA	UP_STU	1.0163	1.0101
151189	132	SHATRUGH	UTTARPRA	UP_STU	1.0069	1.0133
151190	132	SHIKARPU	UTTARPRA	UP_STU	0.9971	1.0102
151191	132	SHIKOHAB	UTTARPRA	UP_STU	0.9927	0.9972
151192	132	SIDHAULI	UTTARPRA	UP_STU	0.9929	0.9856
151193	132	SIKNDARA	UTTARPRA	UP_STU	1.0109	1.0242
151194	132	SIKANDRABAD	UTTARPRA	UP_STU	1.0191	1.029
151195	132	SIKANDAR	UTTARPRA	UP_STU	1.0065	1.0079
151196	132	SINGHAVE	UTTARPRA	UP_STU	1.0143	1.0287
151197	132	SIRATHU	UTTARPRA	UP_STU	1.0104	1.0061
151198	132	SIYANA	UTTARPRA	UP_STU	1.0024	1.0122
151199	132	SONEPUMP	UTTARPRA	UP_STU	0.99	0.9961

151200	132	SREAMBAL	UTTARPRA	UP_STU	**0.9729**	1.0109
151201	132	SURAJPUR	UTTARPRA	UP_STU	0.9845	0.9945
151202	132	TAJPUR	UTTARPRA	UP_STU	0.9952	0.9909
151203	132	TANDA	UTTARPRA	UP_STU	1.0131	1.0237
151204	132	TELCO	UTTARPRA	UP_STU	1.0042	0.9983
151205	132	THAKURDWARA	UTTARPRA	UP_STU	1.0099	0.9991
151206	132	THANABHA	UTTARPRA	UP_STU	**0.9732**	0.9956
151207	132	TRIGLASS	UTTARPRA	UP_STU	1	1
151208	132	TRT	UTTARPRA	UP_STU	0.9915	0.9873
151209	132	KUNDANRO	UTTARPRA	UP_STU	0.9813	0.9817
151210	132	SONIK	UTTARPRA	UP_STU	0.9932	0.9949
151211	132	USAWAN	UTTARPRA	UP_STU	0.9891	0.9862
151212	132	VARANASI	UTTARPRA	UP_STU	0.9888	0.9935
151213	132	VAISHALI	UTTARPRA	UP_STU	1.0008	1.0095
151214	132	VRINDAVA	UTTARPRA	UP_STU	0.9921	0.9933
151215	132	ZAMNIA	UTTARPRA	UP_STU	**0.9683**	0.9885
151216	132	SAMBHAL	UTTARPRA	UP_STU	**0.9774**	0.9821
151217	132	MATHURA2	UTTARPRA	UP_STU	0.995	0.9962
151218	132	LALGANJ	UTTARPRA	UP_STU	0.9988	1.0013
151219	132	DADRI_13	UTTARPRA	UP_STU	1.0309	1.0408
151220	132	RAEBRL_P	UTTARPRA	UP_STU	**0.9783**	1.0005
151221	132	MATH_132	UTTARPRA	UP_STU	0.9829	0.9899
151222	132	LEEDOPUR	UTTARPRA	UP_STU	1.0109	1.0154
151223	132	YAMUNAPU	UTTARPRA	UP_STU	1.0154	1.0092
151224	132	BABUGARH	UTTARPRA	UP_STU	1.0041	1.0116
151225	132	KIRAWALI	UTTARPRA	UP_STU	1.0087	1.0064
151226	132	RAEBRLY_AMWA	UTTARPRA	UP_STU	**0.9749**	0.998
151227	132	JIGNA	UTTARPRA	UP_STU	0.9802	0.99
151228	132	KADIPUR	UTTARPRA	UP_STU	0.9948	1.0087
151229	132	KAYAMGAN	UTTARPRA	UP_STU	1.0038	1.0088
151230	132	BITHOOR	UTTARPRA	UP_STU	1.0118	1.0096
151231	132	KAMLAPUR	UTTARPRA	UP_STU	1.0074	0.996
151232	132	KANNAUJ	UTTARPRA	UP_STU	0.9869	0.9921
151233	132	KANKARKHEDA	UTTARPRA	UP_STU	0.9911	0.9997
151234	132	KARCHANA	UTTARPRA	UP_STU	1.0193	1.0125
151235	132	KARVI	UTTARPRA	UP_STU	1.0249	1.0228
151236	132	KASGANJ	UTTARPRA	UP_STU	1.0029	1.014
151237	132	KHAMBAKH	UTTARPRA	BAJAJ_UP	0.9942	0.992
151238	132	KASIA	UTTARPRA	UP_STU	**0.9574**	0.9804

151239	132	KASIMABA	UTTARPRA	UP_STU	0.9973	1.0004
151240	132	KAUDIRAM	UTTARPRA	UP_STU	0.9919	0.9943
151241	132	KAJARHAA	UTTARPRA	UP_STU	0.9832	0.9885
151242	132	KERAKAT	UTTARPRA	UP_STU	1.0045	1.0078
151243	132	KHAGA	UTTARPRA	UP_STU	1.0006	1.0008
151244	132	KHAIR	UTTARPRA	UP_STU	0.9819	0.999
151245	132	KHALILAB	UTTARPRA	UP_STU	0.98	0.9846
151246	132	KHATOLI	UTTARPRA	UP_STU	0.9903	1.0001
151247	132	KHARAD	UTTARPRA	UP_STU	**0.9689**	0.9804
151248	132	KHURRAMNAGAR	UTTARPRA	UP_STU	1.0083	1.0017
151249	132	KIRATPUR	UTTARPRA	UP_STU	0.9984	0.9993
151250	132	KOLLSA	UTTARPRA	UP_STU	0.9985	1.0002
151251	132	KOSIKALA	UTTARPRA	UP_STU	0.9985	1.0001
151252	132	KRISHNAN	UTTARPRA	UP_STU	**0.9759**	0.9853
151253	132	KUNDA	UTTARPRA	UP_STU	**0.9457**	0.9877
151254	132	UTRAULA	UTTARPRA	BAJAJ_UP	1.025	1.025
151255	132	KUNDESHW	UTTARPRA	UP_STU	0.9812	0.9895
151256	132	LAKHIMPU	UTTARPRA	UP_STU	0.9937	0.9902
151257	132	LAKHAOTI	UTTARPRA	UP_STU	1.0165	1.0287
151258	132	LALGANJ	UTTARPRA	UP_STU	0.9915	0.9939
151259	132	LALITPUR	UTTARPRA	UP_STU	0.9863	0.9952
151260	132	LALUKHER	UTTARPRA	UP_STU	0.9939	1.0052
151261	132	LML	UTTARPRA	UP_STU	0.9822	0.9915
151262	132	LONI	UTTARPRA	UP_STU	0.989	0.9984
151263	132	SGPGI	UTTARPRA	UP_STU	0.982	0.9829
151264	132	MACHLISH	UTTARPRA	UP_STU	**0.9738**	0.9826
151265	132	MAHOBA	UTTARPRA	UP_STU	1.012	1.0111
151266	132	MALWA	UTTARPRA	UP_STU	0.9929	0.9972
151267	132	MANDUADI	UTTARPRA	UP_STU	0.9875	0.9924
151268	132	MANJHANP	UTTARPRA	UP_STU	0.9825	0.9811
151269	132	MANKAPUR	UTTARPRA	UP_STU	1.0091	1.0097
151270	132	MANAURI	UTTARPRA	UP_STU	0.9884	0.9863
151271	132	MARLAHU	UTTARPRA	UP_STU	**0.9757**	0.99
151272	132	MARTINPURWA	UTTARPRA	UP_STU	**0.9632**	0.9827
151273	132	MATHURA	UTTARPRA	UP_STU	1.007	1.0044
151274	132	MAU_NEW	UTTARPRA	UP_STU	1.0096	1.0127
151275	132	MAU_OLD	UTTARPRA	UP_STU	1.0054	1.0098
151276	132	MAU_RANI	UTTARPRA	UP_STU	**0.9538**	0.9855
151277	132	MAWANA	UTTARPRA	UP_STU	1.0044	1.0129

151278	132	MEDICALC	UTTARPRA	UP_STU	1.0043	1.0121
151279	132	MEJAROAD	UTTARPRA	UP_STU	1.0429	1.0338
151280	132	MAHARAJGANJ	UTTARPRA	UP_STU	**0.9579**	0.9805
151281	132	MILKIPUR	UTTARPRA	UP_STU	0.9884	0.9976
151282	132	MINTOPARK	UTTARPRA	UP_STU	1.0058	1.0016
151283	132	MIRZAPUR	UTTARPRA	UP_STU	**0.9713**	0.9831
151284	132	MODISTEE	UTTARPRA	UP_STU	1.0195	1.0266
151285	132	MOHIDDINPUR	UTTARPRA	UP_STU	1.0034	1.0095
151286	132	MOHAMMAD	UTTARPRA	UP_STU	1.0038	1.0054
151287	132	MOHAMMAD	UTTARPRA	UP_STU	1.0032	0.994
151288	132	GULABARI	UTTARPRA	UP_STU	1.0031	0.9949
151289	132	MURADABA	UTTARPRA	UP_STU	1.0111	1.003
151290	132	MAQSUDPR	UTTARPRA	BAJAJ_UP	1.019	1.0021
151291	132	MOTH	UTTARPRA	UP_STU	**0.926**	0.9859
151292	132	MUZAFARN	UTTARPRA	UP_STU	1.0003	1.0111
151293	132	BARKHER	UTTARPRA	BAJAJ_UP	1.0162	1.013
151294	132	NAGALIKI	UTTARPRA	UP_STU	1.0011	1.0089
151295	132	KUNDARK	UTTARPRA	BAJAJ_UP	1.0158	1.0166
151296	132	NAINI	UTTARPRA	UP_STU	1.0111	1.0086
151297	132	NAKUR	UTTARPRA	UP_STU	**0.9569**	0.9938
151298	132	NANAUTA	UTTARPRA	UP_STU	0.9828	1.006
151299	132	NANPARA	UTTARPRA	UP_STU	0.9992	0.9961
151300	132	SHAHJAHA	UTTARPRA	UP_STU	1.0242	1.0074
151301	132	NARAINPU	UTTARPRA	UP_STU	0.9857	0.991
151302	132	NASEERPU	UTTARPRA	UP_STU	1.0116	1.0169
151303	132	NEBODPAR	UTTARPRA	UP_STU	0.9849	0.9807
151304	132	NEWARIRO	UTTARPRA	UP_STU	1.0106	1.0187
151305	132	NIBKAROR	UTTARPRA	UP_STU	1.0042	1.0098
151306	132	NIRPURA	UTTARPRA	UP_STU	1.0019	1.0177
151307	132	NKN	UTTARPRA	UP_STU	0.9869	0.9824
151308	132	NOIDA_115	UTTARPRA	UP_STU	**0.9789**	0.9894
151309	132	NOIDA_IV	UTTARPRA	UP_STU	**0.9685**	0.9834
151310	132	MIRZAPUR22	UTTARPRA	UP_STU	0.999	1.0077
151311	132	NOIDA_VI	UTTARPRA	UP_STU	0.9835	0.9937
151312	132	NOIDA62	UTTARPRA	UP_STU	0.9894	0.9995
151313	132	NOIDA62	UTTARPRA	UP_STU	0.9936	1.0036
151314	132	ORAI_132	UTTARPRA	UP_STU	0.9872	0.9902
151315	132	PALLIA	UTTARPRA	UP_STU	0.9947	0.9869
151316	132	PARTAPGA	UTTARPRA	UP_STU	1.0021	1.0045

151317	132	PARICHHA	UTTARPRA	UP_STU	0.9824	1.0028
151318	132	PARTAPPU	UTTARPRA	UP_STU	1.0171	1.0251
151319	132	PATTI	UTTARPRA	UP_STU	0.9979	1.0031
151320	132	PHOOLPUR	UTTARPRA	UP_STU	0.9811	0.9839
151321	132	IFFCOPHU	UTTARPRA	UP_STU	1.0053	1.0026
151322	132	PINHAT	UTTARPRA	UP_STU	0.9997	1.0086
151323	132	PUVAYAN	UTTARPRA	UP_STU	1.0167	0.9998
151324	132	PUKHRAYAN	UTTARPRA	UP_STU	0.9966	0.9992
151325	132	AKBCHIN	UTTARPRA	UP-COGEN	1	1
151326	132	BALRCHIN	UTTARPRA	UP-COGEN	1	1
151327	132	DCM01	UTTARPRA	UP-COGEN	1	1
151328	132	HAIDER01	UTTARPRA	UP-COGEN	1.0121	1.0139
151329	132	LHSUGAR0	UTTARPRA	UP-COGEN	1	1
151330	132	MANCHIN	UTTARPRA	UP-COGEN	1	1
151331	132	RAUCHIN	UTTARPRA	UP-COGEN	1	1
151332	132	TRIVEN01	UTTARPRA	UP-COGEN	1	1
151333	132	TRIVEN02	UTTARPRA	UP-COGEN	1	1
151334	132	KUMBH	UTTARPRA	UP-COGEN	1	1
151335	132	GULARI01	UTTARPRA	UP-COGEN	1	1
151336	132	JKSUGAR	UTTARPRA	UP-COGEN	1	1
151337	132	MAWANA01	UTTARPRA	UP-COGEN	1	1
151338	132	MAWANA02	UTTARPRA	UP-COGEN	1	1
151339	132	MAWANA03	UTTARPRA	UP-COGEN	1	1
151340	132	SBECBIO	UTTARPRA	UP-COGEN	1.0192	1.0335
151341	132	SIMBHO01	UTTARPRA	UP-COGEN	1	1
151342	132	SIMBHO02	UTTARPRA	UP-COGEN	1	1
151343	132	AUGASSI	UTTARPRA	UP_STU	1.014	1.0126
151344	132	OUDH	UTTARPRA	UP-COGEN	1	1
151345	132	DALMI01	UTTARPRA	UP-COGEN	1	1
151346	132	DALMI02	UTTARPRA	UP-COGEN	1	1
151347	132	DALMI03	UTTARPRA	UP-COGEN	1	1
151348	132	KMSAGA	UTTARPRA	UP-COGEN	1	1
151349	132	DWARIK01	UTTARPRA	UP-COGEN	1	1
151350	132	DWARIK02	UTTARPRA	UP-COGEN	1	1
151351	132	SUKHBI	UTTARPRA	UP-COGEN	1	1
151352	132	BAJAJ02	UTTARPRA	UP-COGEN	1	1
151353	132	BAJAJ03	UTTARPRA	UP-COGEN	1	1
151354	132	BAJAJ04	UTTARPRA	UP-COGEN	1	1
151355	132	BDLAPUR	UTTARPRA	UP_STU	0.9829	0.9916

151356	132	BAJAJ06	UTTARPRA	UP-COGEN	1	1
151357	132	BAJAJ07	UTTARPRA	UP-COGEN	1	1
151358	132	BAJAJ08	UTTARPRA	UP-COGEN	1	1
151359	132	BAJAJ09	UTTARPRA	UP-COGEN	1	1
151360	132	BAJAJ10	UTTARPRA	UP-COGEN	1	1
151361	132	DCM02	UTTARPRA	UP-COGEN	1	1
151362	132	DCM03	UTTARPRA	UP-COGEN	1	1
151363	132	UTTAM01	UTTARPRA	UP-COGEN	1	1
151364	132	UTTAM02	UTTARPRA	UP-COGEN	1	1
151365	132	DHAMPU01	UTTARPRA	UP-COGEN	1	1
151366	132	DHAMPU02	UTTARPRA	UP-COGEN	1	1
151367	132	DHAMPU03	UTTARPRA	UP-COGEN	1	1
151368	132	UPPERG	UTTARPRA	UP-COGEN	1	1
151369	132	CHADA	UTTARPRA	UP-COGEN	1	1
151370	132	DAURAL	UTTARPRA	UP-COGEN	1	1
151371	132	PARLE01	UTTARPRA	UP-COGEN	1	1
151372	132	NEWIND	UTTARPRA	UP-COGEN	1	1
151373	132	PARLE02	UTTARPRA	UP-COGEN	1	1
151374	132	LHSUGAR0	UTTARPRA	UP-COGEN	1	1
151375	132	GULARI02	UTTARPRA	UP-COGEN	1	1
151376	132	HAIDER02	UTTARPRA	UP-COGEN	0.9928	0.9976
151377	132	DCM04	UTTARPRA	UP-COGEN	1	1
151378	132	BIDHUNA	UTTARPRA	UP_STU	**0.9509**	0.9834
151379	132	BIGHAPU	UTTARPRA	UP_STU	0.9871	0.9901
151380	132	CHAKALV	UTTARPRA	UP_STU	**0.9778**	0.9898
151381	132	CHAKIA	UTTARPRA	UP_STU	0.9928	0.9988
151382	132	CHANDAK	UTTARPRA	UP_STU	0.9929	0.9885
151383	132	DALA1	UTTARPRA	UP_STU	1.0079	1.0108
151384	132	DALMAU	UTTARPRA	UP_STU	**0.9488**	0.9993
151385	132	DHAURAHRA	UTTARPRA	UP_STU	0.9997	0.9942
151386	132	DYALBAGH	UTTARPRA	UP_STU	1.0192	1.0187
151387	132	GARWARA	UTTARPRA	UP_STU	0.996	0.9983
151388	132	HATHRS1	UTTARPRA	UP_STU	0.9853	0.9933
151389	132	JALAUN1	UTTARPRA	UP_STU	**0.9761**	0.9804
151390	132	JATTARI	UTTARPRA	UP_STU	**0.9739**	0.9892
151391	132	JOLLYROD	UTTARPRA	UP_STU	1.0003	1.0111
151392	132	JWAHRPUR	UTTARPRA	UP_STU	0.9894	0.9962
151393	132	KANHUPWN	UTTARPRA	UP_STU	0.9879	0.9972
151394	132	KHEKRA	UTTARPRA	UP_STU	1.0166	1.03

151395	132	KHURJAII	UTTARPRA	UP_STU	0.9982	1.0112
151396	132	MEHRBANS	UTTARPRA	UP_STU	0.9866	0.9934
151397	132	MEHDAWAL	UTTARPRA	UP_STU	0.9836	0.9882
151398	132	MEHNAGAR	UTTARPRA	UP_STU	0.9979	1
151399	132	NAUGARH	UTTARPRA	UP_STU	1.012	1.0148
151400	132	RHIMABAD	UTTARPRA	UP_STU	0.9846	0.9804
151401	132	RAMPURMANIHA	UTTARPRA	UP_STU	**0.9784**	1.0017
151402	132	SAHARACI	UTTARPRA	UP_STU	0.9877	0.9832
151403	132	SAIDNGLI	UTTARPRA	UP_STU	**0.9779**	0.9834
151404	132	SALAWA	UTTARPRA	UP_STU	1.0012	1.01
151405	132	SASNI1	UTTARPRA	UP_STU	**0.9752**	0.9854
151406	132	SHAHABAD	UTTARPRA	UP_STU	1.0077	0.9936
151407	132	SINGHOLI	UTTARPRA	UP_STU	1.0175	1.0318
151408	132	TANDARAM	UTTARPRA	UP_STU	1.0085	0.9993
151409	132	TELIARGANJ	UTTARPRA	UP_STU	0.9999	0.9962
151410	132	UJJHANI	UTTARPRA	UP_STU	0.9822	0.9805
151411	132	UPSIDCMA	UTTARPRA	UP_STU	1.0283	1.0382
151412	132	KURSIROAD	UTTARPRA	UP_STU	1.0131	1.0064
151413	132	BEHAT	UTTARPRA	UP_STU	**0.9683**	0.9985
151414	132	PILIBHI1	UTTARPRA	UP_STU	1.0159	1.0121
151415	132	SIRATHU	UTTARPRA	UP_STU	1.0127	1.012
151416	132	RASRA	UTTARPRA	UP_STU	1.0057	1.0105
151417	132	LALITPUR UP	UTTARPRA	UP_STU	0.9863	0.9952
151418	132	DHAMPUR	UTTARPRA	UP_STU	1.017	1.0288
151419	132	AFZALGARH	UTTARPRA	UP_STU	1.0047	1.0144
151420	132	GORAKHPURUP4	UTTARPRA	UP_STU	1.0163	1.0215
151421	132	NEW TANDA	UTTARPRA	UP_STU	1.0163	1.0268
151422	132	BAHRAICH 220	UTTARPRA	UP_STU	1.0136	1.0115
151423	132	PANWARI	UTTARPRA	UP_STU	0.9979	0.9971
151424	132	AGRA_SOUTH	UTTARPRA	UP_STU	1.0138	1.0111
151425	132	CHITBRGAW	UTTARPRA	UP_STU	1.01	1.0113
151426	132	INDRANAGR	UTTARPRA	UP_STU	1.0087	1.0023
151427	132	NINDURA	UTTARPRA	UP_STU	1.0091	1.0024
151428	132	LALKUA_GZB	UTTARPRA	UP_STU	1.001	1.0082
151429	132	GOVINDPR_GIS	UTTARPRA	UP_STU	1.0051	1.0123
151430	132	SARILA	UTTARPRA	UP_STU	0.9877	0.9857
151431	132	TUNDLA	UTTARPRA	UP_STU	0.9867	0.9891
151432	132	RANI_K_SARAI	UTTARPRA	UP_STU	0.9965	0.9984
151433	132	MUBARAKPUR	UTTARPRA	UP_STU	1.0016	1.0032

151434	132	HAIDRGR_NW	UTTARPRA	UP_STU	0.9926	0.9974
151435	132	TILHAR	UTTARPRA	UP_STU	0.999	0.99
151436	132	KURSATO	UTTARPRA	UP_STU	0.9942	0.9983
151437	132	KANIYAN	UTTARPRA	UP_STU	0.9848	1.003
151438	132	KORAW	UTTARPRA	UP_STU	1.015	1.0105
151439	132	SALAI_KHURD	UTTARPRA	UP_STU	1.0241	1.0172
151440	132	SIKANDRARAO	UTTARPRA	UP_STU	1.0211	1.0328
151441	132	MIRAICHI	UTTARPRA	UP_STU	1.0104	1.0223
151442	132	SAHABAD	UTTARPRA	UP_STU	0.999	0.9921
151443	132	BEGUMPUR	UTTARPRA	UP_STU	0.9979	0.9948
151444	132	SARENI	UTTARPRA	UP_STU	**0.9724**	0.9817
151445	132	GURSARAYE	UTTARPRA	UP_STU	**0.9224**	0.9859
151446	132	RUDRAPUR	UTTARPRA	UP_STU	0.9908	1.0018
151447	132	GONDA400	UTTARPRA	UP_STU	1.0197	1.0203
151448	132	COLONELGANJ	UTTARPRA	UP_STU	1.0094	1.01
151449	132	JALILPUR	UTTARPRA	UP_STU	0.995	0.9901
151450	132	AVASVIKAS	UTTARPRA	UP_STU	1.0107	1.0029
151451	132	AGWANPUR	UTTARPRA	UP_STU	1.0057	0.9994
151452	132	KHERAGARH	UTTARPRA	UP_STU	0.9971	0.9944
151453	132	HAPUR_BY_RD	UTTARPRA	UP_STU	0.9881	0.9967
151454	132	LALGANJ	UTTARPRA	UP_STU	**0.9772**	0.9875
151455	132	SULTANGANJ	UTTARPRA	UP_STU	1.0131	1.0191
151456	132	BISALPUR	UTTARPRA	UP_STU	1.0015	0.9874
151457	132	ASMAULI	UTTARPRA	UP_STU	**0.9778**	0.9834
151458	132	MAHMUDABAD	UTTARPRA	UP_STU	0.9882	0.9861
151459	132	KALPI	UTTARPRA	UP_STU	1.0018	1.0043
151460	132	PSPN_SLR_PT	UTTARPRA	UP_STU	1	1
151461	132	HAMIRPUR	UTTARPRA	UP_STU	0.9988	1.0053
151462	132	SALON	UTTARPRA	UP_STU	**0.9689**	0.9986
151463	132	GARHMUKTSR	UTTARPRA	UP_STU	1.0102	1.0155
151464	132	MEHRAUNI	UTTARPRA	UP_STU	**0.9697**	0.9834
151465	132	SUKBER_SLR_P	UTTARPRA	UP_STU	**0.9698**	0.9835
151466	132	UNIVERSL_SL	UTTARPRA	UP_STU	0.998	0.9972
151467	132	NIROSA_SLR	UTTARPRA	UP_STU	0.9979	0.9971
151468	132	HALDRPUR	UTTARPRA	UP_STU	0.9973	1.0021
151469	132	JAHANGIR_132	UTTARPRA	UP_STU	1.0275	1.041
151470	132	RAMPUR132	UTTARPRA	UP_STU	1.0186	1.0018
151471	132	CHANDUSI220	UTTARPRA	UP_STU	**0.9777**	0.9844
151472	132	RANIYA	UTTARPRA	UP_STU	0.9886	0.994

151473	132	SARSAWAN	UTTARPRA	UP_STU	**0.9712**	1.0058
151474	132	SARH	UTTARPRA	UP_STU	1.0188	1.0222
151475	132	NEEBKARORI	UTTARPRA	UP_STU	1.0174	1.0222
151476	132	CHHATA	UTTARPRA	UP_STU	1.0161	1.018
151477	132	SIRSA	UTTARPRA	UP_STU	1.0147	1.0199
151478	132	CHARLA	UTTARPRA	UP_STU	1.0057	1.0145
151479	132	JANSATH	UTTARPRA	UP_STU	1.0045	1.0154
151480	132	NEHTAUR132_4	UTTARPRA	UP_STU	1.0139	1.0092
151481	132	AZAMGARHNEW	UTTARPRA	UP_STU	1.0078	1.0105
151482	132	HAPUR_220	UTTARPRA	UP_STU	1.0044	1.0117
151483	132	MAWN_RD_HAST	UTTARPRA	UP_STU	0.9981	1.007
151484	132	JAHGIRPUR	UTTARPRA	UP_STU	**0.9558**	0.985
151485	132	DANKAUR	UTTARPRA	UP_STU	1.0169	1.0268
151486	132	JARI	UTTARPRA	UP_STU	1.0263	1.0185
151487	132	BANDAA	UTTARPRA	UP_STU	1.0124	0.9954
151488	132	NAWABGANJ	UTTARPRA	UP_STU	1.0124	1.0132
151489	132	GABHANA	UTTARPRA	UP_STU	**0.9782**	0.9954
151490	132	GWALIOR_RD	UTTARPRA	UP_STU	1.0042	1.0015
151491	132	BICHPURI	UTTARPRA	UP_STU	0.9969	0.9953
151492	132	PAYAGPUR	UTTARPRA	UP_STU	1.0047	1.0054
151493	132	BINDWL_JYRJP	UTTARPRA	UP_STU	1.0036	1.0053
151494	132	LALPUR	UTTARPRA	UP_STU	1.0121	1.0007
151495	132	JALALABAD_UP	UTTARPRA	UP_STU	1.0223	1.0054
151496	132	BACHRAWAN220	UTTARPRA	UP_STU	0.9876	0.9965
151497	132	BHOPA	UTTARPRA	UP_STU	1.0043	1.0154
151498	132	BHINGA	UTTARPRA	UP_STU	0.992	0.9888
151499	132	BONER	UTTARPRA	UP_STU	1.0145	1.0276
151500	132	KORBA	UTTARPRA	UP_STU	1.0017	1.0124
151501	132	AMROHA_220	UTTARPRA	UP_STU	1.0164	1.0129
151502	132	PURNACHHPAR	UTTARPRA	UP_STU	0.9891	1.0002
151503	132	NOIDA_BHANGL	UTTARPRA	UP_STU	**0.9438**	0.983
151504	132	CHAKKARNAGAR	UTTARPRA	UP_STU	**0.9788**	0.9958
151505	132	JASWANTNGR	UTTARPRA	UP_STU	0.9854	0.9994
151506	132	TAKHA	UTTARPRA	UP_STU	0.9825	0.9965
151507	132	GOSAISINGPR	UTTARPRA	UP_STU	1.0014	1.014
151508	132	NATHNAGAR	UTTARPRA	UP_STU	0.9921	0.9967
151509	132	JALALPUR	UTTARPRA	UP_STU	1.012	1.0231
151510	132	RASOOLABAD	UTTARPRA	UP_STU	1.0008	1.003
151511	132	SHERKOT	UTTARPRA	UP_STU	0.9981	1.0005

151512	132	SIKANDRA	UTTARPRA	UP_STU	1.0077	1.0098
151513	132	UTRATIA TSS	UTTARPRA	UP_STU	0.9814	0.9824
151514	132	TN URJA_SLR	UTTARPRA	UP_STU	1.0019	1.0044
151515	132	NAWABGANJ	UTTARPRA	UP_STU	1.0186	1.0105
151516	132	SARSOKI TSS	UTTARPRA	UP_STU	0.9872	0.9902
151517	132	SUKHBIR_SOLR	UTTARPRA	UP_STU	1.012	1.0111
151518	132	PARYTNA_SOLR	UTTARPRA	UP_STU	1.012	1.0111
151519	132	SPINAL_SOLAR	UTTARPRA	UP_STU	1.012	1.0111
151520	132	BHOOR II	UTTARPRA	UP_STU	1.0127	1.0241
151521	132	KOTHIKHIDMAT	UTTARPRA	UP_STU	1.0148	1.0157
151522	132	UPNEDA	UTTARPRA	UP_STU	**0.9228**	0.9863
151523	132	MORNA	UTTARPRA	UP_STU	1.0083	1.0062
151524	132	BEHJOI	UTTARPRA	UP_STU	**0.978**	0.9847
151525	132	BANNAT	UTTARPRA	UP_STU	0.983	1.0031
151526	132	BARHAN	UTTARPRA	UP_STU	0.988	0.9896
151527	132	TALGRAM	UTTARPRA	UP_STU	1.0154	1.0205
151528	132	BHATAHAT	UTTARPRA	UP_STU	0.9918	0.9991
151529	132	MUSAFIRKHANA	UTTARPRA	UP_STU	1.0057	1.0121
151530	132	DADARKALA	UTTARPRA	UP_STU	0.9802	0.99
151531	132	SEC-148_132	UTTARPRA	UP_STU	1.0194	1.0273
151532	132	NMRC_TSS_132	UTTARPRA	UP_STU	1.0194	1.0273
151533	132	ORAI_132_400	UTTARPRA	UP_STU	1.0097	1.012
151534	132	AURIHAR	UTTARPRA	UP_STU	1.0153	1.0196
151535	132	ATARRA	UTTARPRA	UP_STU	1.0261	1.0243
151536	132	MUNDALI	UTTARPRA	UP_STU	1.0035	1.0101
151537	132	JAGRITIVIHAR	UTTARPRA	UP_STU	1.0036	1.0114
151538	132	BURHWAL	UTTARPRA	UP_STU	1.0101	1.007
151539	132	BHADAURA	UTTARPRA	UP_STU	**0.9786**	0.9947
151540	132	SAHASWAN	UTTARPRA	UP_STU	**0.9792**	0.9859
151541	132	RANIGANJ	UTTARPRA	UP_STU	1.0005	1.0028
151542	132	DAKOR	UTTARPRA	UP_STU	1.0103	1.0126
151543	132	SAMSUNG	UTTARPRA	UP_STU	**0.9518**	0.983
151544	132	LAHARPUR	UTTARPRA	UP_STU	1.0068	0.9985
151545	132	PAHADI	UTTARPRA	UP_STU	1.0328	1.0299
151546	132	ETWA	UTTARPRA	UP_STU	1.0169	1.0183
151547	132	PASAHI	UTTARPRA	UP_STU	1.0097	1.0134
151548	132	KANKARKHRA-2	UTTARPRA	UP_STU	1.0046	1.0131
151549	132	BARABNKI_220	UTTARPRA	UP_STU	1.0169	1.0174
151550	132	RAGAUL	UTTARPRA	UP_STU	0.9999	1.0005

151551	132	GAZIPUR_TSS	UTTARPRA	UP_STU	1.0109	1.0177
151552	132	PILKHUA	UTTARPRA	UP_STU	1.0044	1.0117
151553	132	UPSIDC_MASSO	UTTARPRA	UP_STU	1.0335	1.0403
151554	132	MANDOLA_132	UTTARPRA	UP_STU	1.0229	1.0321
151555	132	GANGANAGAR	UTTARPRA	UP_STU	1.0041	1.0122
151556	132	SHAMLI SHYAM	UTTARPRA	UP_STU	0.9832	1.0064
151557	132	BANSDIH_TSS	UTTARPRA	UP_STU	1.0106	1.012
151558	132	ALAPUR	UTTARPRA	UP_STU	1.0172	1.0277
151559	132	SADAT	UTTARPRA	UP_STU	1.0107	1.0145
151560	132	MORTI_132	UTTARPRA	UP_STU	1.0215	1.0293
151561	132	GORAK_N_132	UTTARPRA	UP_STU	1.0242	1.026
151562	132	MASAULI	UTTARPRA	UP_STU	1.0384	1.0292
151563	132	RUKHI	UTTARPRA	UP_STU	1.017	1.0273
151564	132	MATH	UTTARPRA	UP_STU	1.026	1.0294
151565	132	HAPUR_TSS	UTTARPRA	UP_STU	1.0044	1.0117
151566	132	MOTH_TSS	UTTARPRA	UP_STU	**0.926**	0.9859
151567	132	MAHOBA_TSS	UTTARPRA	UP_STU	1.012	1.0111
151568	132	ASHA	UTTARPRA	UP_STU	1.007	0.9998
151569	132	UDAYPURA_TSS	UTTARPRA	UP_STU	0.9864	0.9953
151570	132	PRITHVGNJ_TS	UTTARPRA	UP_STU	1.0021	1.0045
151571	132	SHAHGANJ_TSS	UTTARPRA	UP_STU	**0.9596**	0.9834
151572	132	PRATAP VIHAR	UTTARPRA	UP_STU	1.0073	1.0157
151573	132	BAMOLI	UTTARPRA	UP_STU	1.0291	1.0325
151574	132	AMETHI	UTTARPRA	UP_STU	1.009	1.0185
151575	132	CHITRAKOOT	UTTARPRA	UP_STU	1.0248	1.0212
151576	132	AWAS VIKAS	UTTARPRA	UP_STU	**0.9759**	0.9828
151577	132	HASAYAN	UTTARPRA	UP_STU	0.9914	1.0006
151578	132	DASNA_400	UTTARPRA	UP_STU	1.0247	1.0303
151579	132	HATA	UTTARPRA	UP_STU	**0.959**	0.982
151580	132	LAXMIPUR	UTTARPRA	UP_STU	**0.9596**	0.9826
151581	132	HARSIA	UTTARPRA	UP_STU	1.0261	1.0394
151582	132	KIRTHAL	UTTARPRA	UP_STU	1.0104	1.0249
151583	132	PIPRAICHSUGR	UTTARPRA	UP_STU	**0.9591**	0.9821
151584	132	NAUTANWA	UTTARPRA	UP_STU	1.0253	1.0281
151585	132	RAMALASUGAR	UTTARPRA	UP_STU	1.0104	1.0249
151586	132	MUNDERWASUGR	UTTARPRA	UP_STU	0.9924	0.997
151587	132	KATGHARMAHEL	UTTARPRA	UP_STU	1.0082	1.0089
151588	132	NAGINA	UTTARPRA	UP_STU	1.0003	0.996
151589	132	BAPUDHAM	UTTARPRA	UP_STU	1.0051	1.0123

152000	220	NOIDA-20	UTTARPRA	UP_STU	1.0146	1.0212
152001	220	GOKUL	UTTARPRA	UP_STU	1.0151	1.0155
152002	220	GNOIDA2	UTTARPRA	UP_STU	1.009	1.0182
152003	220	ATRAULI2	UTTARPRA	UP_STU	1.0161	1.0265
152004	220	AGRAN2	UTTARPRA	UP_STU	1.0253	1.0243
152005	220	NOIDA20S	UTTARPRA	UP_STU	1.015	1.0216
152006	220	UNNAO2	UTTARPRA	UP_STU	1.0261	1.0209
152007	220	BANDA2	UTTARPRA	UP_STU	1.0292	1.0271
152008	220	PHULPUR2	UTTARPRA	UP_STU	1.0175	1.0161
152009	220	RPHKANPR	UTTARPRA	UP_STU	1.0186	1.017
152010	220	HATHRAS2	UTTARPRA	UP_STU	1.0004	1.0065
152011	220	CHINHAT2	UTTARPRA	UP_STU	1.0163	1.0091
152012	220	ETAH	UTTARPRA	UP_STU	1.0182	1.0278
152013	220	GAJRAULA	UTTARPRA	UP_STU	1.0048	1.0094
152014	220	NOIDA-62	UTTARPRA	UP_STU	1.0105	1.0185
152015	220	NOID62-S	UTTARPRA	UP_STU	1.0103	1.0184
152016	220	SHAMSHAB	UTTARPRA	UP_STU	1.0229	1.0234
152017	220	SAHIBAD2	UTTARPRA	UP_STU	1.0138	1.0214
152018	220	KANPU_SO	UTTARPRA	UP_STU	1.0233	1.0227
152019	220	NEHTOR2	UTTARPRA	UP_STU	1.0036	1.0022
152020	220	SOHAWAL	UTTARPRA	UP_STU	1.022	1.0229
152021	220	ROSA-TP1	UTTARPRA	ROSA_IPP	1.04	1.0061
152022	220	HARDOI2	UTTARPRA	UP_STU	1.0331	1.0138
152023	220	SHJNP2	UTTARPRA	UP_STU	1.0337	1.0068
152024	220	BITHOOR	UTTARPRA	UP_TH	1.0218	1.0196
152025	220	GOMTINGR	UTTARPRA	UP_STU	1.0124	1.0055
152026	220	BAKNTPR2	UTTARPRA	UP_STU	1.0318	1.0166
152027	220	SITAPUR	UTTARPRA	UP_STU	1.0198	1.0054
152028	220	HARDOIROAD	UTTARPRA	UP_STU	1.0114	1.0048
152029	220	SAROJNI2	UTTARPRA	UP_STU	1.0189	1.0125
152030	220	SAMBHAL	UTTARPRA	UP_STU	0.9916	0.9958
152031	220	MURADBD2	UTTARPRA	UP_STU	1.0331	1.0237
152032	220	SHATABDI	UTTARPRA	UP_STU	1.017	1.0244
152033	220	SIMBOLI2	UTTARPRA	UP_STU	1.0155	1.0227
152034	220	MODIPRM2	UTTARPRA	UP_STU	1.017	1.025
152035	220	MUZAFN2	UTTARPRA	UP_STU	1.0155	1.0261
152036	220	MURADNG2	UTTARPRA	UP_STU	1.0216	1.0287
152037	220	JAHANGRB	UTTARPRA	UP_STU	1.0165	1.0303
152038	220	KHARA2	UTTARPRA	UP_HYD	**0.9783**	1.0065

152039	220	SHAMLI2	UTTARPRA	UP_STU	0.9986	1.0159
152040	220	LONI2	UTTARPRA	UP_STU	1.0137	1.0216
152041	220	SAHARNP2	UTTARPRA	UP_STU	0.9827	1.0115
152042	220	NOIDA129	UTTARPRA	UP_STU	0.9907	1.0048
152043	220	NARA2	UTTARPRA	UP_STU	1.0129	1.0238
152044	220	SIKANDRABAD	UTTARPRA	UP_STU	1.026	1.0343
152045	220	KHURJA2	UTTARPRA	UP_STU	1.0141	1.0265
152046	220	CHIBRMAU	UTTARPRA	UP_STU	1.0152	1.0199
152047	220	HARDUGN2	UTTARPRA	UP_TH	1.0156	1.0315
152048	220	ORAI2	UTTARPRA	UP_STU	1.0154	1.0181
152049	220	SIKANDR2	UTTARPRA	UP_STU	1.0239	1.0228
152050	220	SAFAI2	UTTARPRA	UP_STU	0.9938	1.0058
152051	220	FEROZBD2	UTTARPRA	UP_STU	1.0269	1.0287
152052	220	MAINPUR2	UTTARPRA	UP_STU	1.0172	1.0238
152053	220	PARICHA2	UTTARPRA	UP_TH	1.01	1.015
152054	220	BHARTHNA	UTTARPRA	UP_STU	0.9858	1.0003
152055	220	PANKI2	UTTARPRA	UP_TH	1.0217	1.0212
152056	220	NAUBSTA2	UTTARPRA	UP_STU	1.0155	1.017
152057	220	MURADNG2	UTTARPRA	UP_STU	1.0216	1.0289
152058	220	GORAKP2	UTTARPRA	UP_STU	1.0212	1.0233
152059	220	DEORIA	UTTARPRA	UP_STU	1.0128	1.017
152060	220	DOHNA2	UTTARPRA	UP_STU	1.0303	1.0146
152061	220	OBRA2	UTTARPRA	UP_TH	1.0253	1.029
152062	220	ALAHBAD2	UTTARPRA	UP_STU	1.0297	1.0265
152063	220	GHAZPR2	UTTARPRA	UP_STU	1.0132	1.0179
152064	220	FATEHPR2	UTTARPRA	UP_STU	1.029	1.0285
152065	220	SAHUPU_N	UTTARPRA	UP_STU	1.0071	1.0107
152066	220	SARNATH2	UTTARPRA	UP_STU	1.0255	1.0279
152067	220	CBGANJ2	UTTARPRA	UP_STU	1.0286	1.0126
152068	220	AZAMGAR2	UTTARPRA	UP_STU	1.0232	1.0245
152069	220	BADAUN2	UTTARPRA	UP_STU	1.012	0.9986
152070	220	JAUNPUR2	UTTARPRA	UP_STU	1.005	1.0101
152071	220	SULTANP2	UTTARPRA	UP_STU	1.0187	1.0239
152072	220	GONDA2	UTTARPRA	UP_STU	1.022	1.0229
152073	220	TANDA2	UTTARPRA	NTPC-NR	1.02	1.03
152074	220	BASTI2	UTTARPRA	UP_STU	1.0115	1.0161
152075	220	GORAKPR2	UTTARPRA	UP_STU	1.0242	1.026
152076	220	CANT_AL	UTTARPRA	UP_STU	1.0228	1.0199
152077	220	JHUSI	UTTARPRA	NR_PGCIL	1.0205	1.0192

152078	220	GAJOKHA	UTTARPRA	UP_STU	1.0123	1.016
152079	220	MIRZAPU	UTTARPRA	UP_STU	1.0109	1.016
152080	220	JHANSI2	UTTARPRA	UP_STU	1.0052	1.011
152081	220	PARTAPGA	UTTARPRA	UP_STU	1.0119	1.0142
152082	220	RCGREEN	UTTARPRA	UP_STU	0.9983	1.0077
152083	220	FARIDNAGAR	UTTARPRA	UP_STU	1.023	1.0294
152084	220	NIGHASAN	UTTARPRA	UP_STU	1.0164	1.0013
152085	220	BHELUPUR	UTTARPRA	UP_STU	1.0063	1.0099
152086	220	ALIGARH	UTTARPRA	UP_STU	1.0217	1.0316
152087	220	BEHAT	UTTARPRA	UP_STU	**0.975**	1.0039
152088	220	KURSIROAD	UTTARPRA	UP_STU	1.0212	1.0131
152089	220	ROBERTSGANJ2	UTTARPRA	UP_STU	1.0146	1.0183
152090	220	CHURK	UTTARPRA	UP_STU	1.0147	1.0183
152091	220	KHAIR	UTTARPRA	UP_TH	0.9929	1.0051
152092	220	NANAUTA	UTTARPRA	UP_STU	0.9909	1.012
152093	220	BARAUT2	UTTARPRA	UP_STU	1.0199	1.0329
152094	220	DADRIUP	UTTARPRA	UP_STU	1.0209	1.0305
152095	220	MEERUT	UTTARPRA	NR_PGCIL	1.0202	1.028
152096	220	FATEH-PG	UTTARPRA	NR_PGCIL	1.0326	1.032
152097	220	LUCKNOW	UTTARPRA	NR_PGCIL	1.0317	1.022
152098	220	MAINPURI-PG	UTTARPRA	NR_PGCIL	1.0285	1.0328
152099	220	ALLAHABA	UTTARPRA	NR_PGCIL	1.0309	1.0277
152100	220	GORAK-PG	UTTARPRA	NR_PGCIL	1.031	1.0311
152106	220	SHAHJAHAN4	UTTARPRA	UP_STU	***1.055***	1.036
152107	220	RASRA	UTTARPRA	UP_STU	1.0093	1.0141
152108	220	SIRATHU	UTTARPRA	UP_STU	1.0242	1.0226
152109	220	LALITPUR-TPS	UTTARPRA	UP_TH	1.0047	1.0104
152110	220	MURADNGR NEW	UTTARPRA	UP_STU	1.0256	1.0365
152111	220	REWAROAD	UTTARPRA	UP_STU	1.0305	1.0271
152112	220	BONER	UTTARPRA	UP_STU	1.0147	1.0285
152114	220	BAGPAT-PG	UTTARPRA	NR_PGCIL	1.022	1.0347
152115	220	AGRA-PG	UTTARPRA	NR_PGCIL	1.0268	1.0282
152116	220	BAGPAT-UP	UTTARPRA	UP_STU	1.0213	1.0341
152117	220	SAHARANPR-PG	UTTARPRA	NR_PGCIL	0.9876	1.0139
152118	220	GR.NOIDA	UTTARPRA	UP_STU	1.0279	1.0329
152119	220	HARAUA	UTTARPRA	UP_STU	1.0268	1.0289
152120	220	LALITPURUP	UTTARPRA	UP_STU	1.0015	1.0075
152121	220	DEBAI	UTTARPRA	UP_STU	1.0141	1.0258
152122	220	SIRSAGANJ	UTTARPRA	UP_STU	1.0175	1.023

152123	220	TANDA_EXT	UTTARPRA	UP_STU	1.0214	1.0287
152124	220	ORAI 42	UTTARPRA	UP_STU	1.0207	1.0221
152125	220	BKT	UTTARPRA	UP_STU	1.0245	1.0124
152126	220	CHARLA	UTTARPRA	UP_STU	1.0177	1.0263
152128	220	MATHURA	UTTARPRA	UP_STU	1.0274	1.03
152129	220	MAHOBA	UTTARPRA	UP_STU	1.02	1.0193
152130	220	JANSATH	UTTARPRA	UP_STU	1.0137	1.0244
152131	220	SIKANDRARAO	UTTARPRA	UP_TH	1.0203	1.0311
152132	220	ATAUR	UTTARPRA	UP_STU	1.0231	1.0309
152133	220	BAHRAICH	UTTARPRA	UP_STU	1.02	1.0198
152134	220	RAMPUR	UTTARPRA	UP_STU	1.0234	1.0109
152135	220	GONDA4	UTTARPRA	UP_STU	1.0197	1.0203
152136	220	RANIYA	UTTARPRA	UP_TH	1.021	1.0211
152137	220	CHANDAUSI220	UTTARPRA	UP_STU	0.9943	0.9928
152138	220	BAH	UTTARPRA	UP_STU	0.9987	1.0089
152139	220	SOHAWAL42	UTTARPRA	UP_STU	1.0293	1.0289
152140	220	INDIRAPURAM	UTTARPRA	UP_STU	1.0137	1.0212
152141	220	CHHATA	UTTARPRA	UP_STU	1.0234	1.0258
152142	220	DASNA	UTTARPRA	UP_STU	1.0285	1.0328
152143	220	BANDA42	UTTARPRA	UP_STU	1.0337	1.0312
152144	220	HAPUR765	UTTARPRA	UP_STU	1.0218	1.028
152145	220	HAPUR_220	UTTARPRA	UP_STU	1.0167	1.0232
152146	220	AMROHA	UTTARPRA	UP_STU	1.0166	1.0118
152147	220	NAINI_RAILWY	UTTARPRA	LEITWIND	1.0309	1.0277
152148	220	BARABANKI	UTTARPRA	UP_STU	1.0196	1.0187
152149	220	CG CITY	UTTARPRA	UP_STU	1.016	1.0104
152150	220	SARSAWAN	UTTARPRA	UP_STU	0.9847	1.0126
152151	220	BANSI	UTTARPRA	UP_STU	1.0232	1.0258
152152	220	SARH	UTTARPRA	UP_STU	1.026	1.0271
152153	220	NEEBKARORI	UTTARPRA	UP_STU	1.0238	1.0282
152154	220	AZAMGARHNEW	UTTARPRA	UP_STU	1.0159	1.0185
152155	220	BACHRAWAN	UTTARPRA	UP_STU	1.0053	1.0078
152156	220	SIKANDRA	UTTARPRA	UP_STU	1.016	1.0172
152157	220	KANPURROAD	UTTARPRA	UP_STU	1.0183	1.012
152158	220	MANDOLAVIHAR	UTTARPRA	UP_STU	1.0229	1.0321
152159	220	MORTI	UTTARPRA	UP_STU	1.0215	1.0293
152160	220	PILIBHIT	UTTARPRA	UP_STU	1.0261	1.0147
152161	220	SEC-148_TAP	UTTARPRA	UP_STU	1.0126	1.022
152162	220	SEC-148	UTTARPRA	UP_STU	1.0194	1.0273

152163	220	GORAKH_220_N	UTTARPRA	UP_STU	1.0242	1.026
152164	220	HATA	UTTARPRA	UP_STU	1.0203	1.0231
152165	220	RUKHI	UTTARPRA	UP_STU	1.0194	1.0307
152166	220	PRATAP VIHAR	UTTARPRA	UP_STU	1.0145	1.022
152167	220	MATH	UTTARPRA	UP_STU	1.0267	1.0294
152168	220	AMETHI	UTTARPRA	UP_STU	1.0138	1.0208
152169	220	BHADAURA	UTTARPRA	UP_STU	1.0203	1.0234
152170	220	BOTANICAL GA	UTTARPRA	UP_STU	1.0157	1.0215
152171	220	PAHADI	UTTARPRA	UP_STU	1.0321	1.029
152172	220	GOLA	UTTARPRA	UP_STU	1.032	1.0321
152173	220	RAJA KATALAB	UTTARPRA	UP_STU	1.0094	1.013
152174	220	JAGRITIVIHAR	UTTARPRA	UP_STU	1.0223	1.0284
152175	220	SARANGPUR	UTTARPRA	UP_STU	1.0203	1.0189
152176	220	PARTAPUR	UTTARPRA	UP_STU	1.0207	1.0284
154000	400	AGRAUP4	UTTARPRA	UP_STU	1.0373	1.034
154001	400	UNNAO4	UTTARPRA	UP_STU	1.0494	1.0398
154002	400	BARELI4	UTTARPRA	UP_STU	***1.0519***	1.0339
154003	400	UNNAFSC1	UTTARPRA	UP_STU	1.0079	1.0051
154004	400	UNNAFSC2	UTTARPRA	UP_STU	1.0079	1.0051
154005	400	PARICHHA	UTTARPRA	UP_TH	1.015	1.0161
154006	400	ALIGARH	UTTARPRA	UP_STU	1.0364	1.0409
154007	400	GORAK_UP	UTTARPRA	UP_STU	1.0355	1.0339
154008	400	LUCKN_UP	UTTARPRA	UP_STU	1.0437	1.0342
154009	400	MURADAB4	UTTARPRA	UP_STU	1.0456	1.0357
154010	400	MUZAFRN4	UTTARPRA	UP_STU	1.0312	1.0396
154011	400	MURADNG4	UTTARPRA	UP_STU	1.0282	1.0333
154012	400	VISHNU4	UTTARPRA	UP_HYD	1.04	1.045
154013	400	PANKI4	UTTARPRA	UP_STU	1.0467	1.0425
154014	400	ANPARA4	UTTARPRA	UP_TH	1.032	1.035
154015	400	ANPARA-D	UTTARPRA	UP_STU	1.0316	1.0346
154016	400	ANPARAC	UTTARPRA	ANPARAC	1.0319	1.0349
154017	400	ROSA-TP2	UTTARPRA	ROSA_IPP	***1.0594***	1.0401
154018	400	OBRA4	UTTARPRA	UP_TH	1.0314	1.0346
154019	400	SARNATH4	UTTARPRA	UP_STU	1.0358	1.0366
154020	400	MURD_FSC	UTTARPRA	UP_STU	1.0282	1.0333
154021	400	AZAMGAR4	UTTARPRA	UP_STU	1.0335	1.0335
154022	400	SULTANP4	UTTARPRA	UP_STU	1.0247	1.0265
154023	400	MAU4	UTTARPRA	UP_STU	1.0359	1.034
154062	400	BARA	UTTARPRA	UP_STU	1.0419	1.034

154063	400	REWAROAD	UTTARPRA	UP_STU	***1.051***	1.0404
154065	400	ALAKHNANDA	UTTARPRA	UP_HYD	1.0207	1.0421
154066	400	MURADNGR NEW	UTTARPRA	UP_STU	1.0249	1.036
154068	400	GR. NOIDA74	UTTARPRA	UP_STU	1.0279	1.0329
154069	400	SIKANDRABAD	UTTARPRA	UP_STU	1.0292	1.0344
154073	400	FATEHBD_AGRA	UTTARPRA	UP_STU	1.0449	1.042
154074	400	ORAI4	UTTARPRA	UP_STU	1.025	1.0239
154075	400	MEJA	UTTARPRA	UP_STU	1.048	1.0391
154076	400	BANDA	UTTARPRA	UP_STU	1.0408	1.0365
154077	400	MAINPURI_765	UTTARPRA	UP_STU	1.0378	1.04
154078	400	UNCHAHAR	UTTARPRA	NR_PGCIL	1.0467	1.0445
154079	400	MATHURA	UTTARPRA	UP_STU	1.0385	1.0406
154080	400	GONDA	UTTARPRA	UP_STU	1	1
154081	400	HAPUR	UTTARPRA	UP_STU	1.0303	1.0341
154082	400	NEHTAUR	UTTARPRA	UP_STU	1.0356	1.0252
154083	400	ATAUR	UTTARPRA	UP_STU	1.0283	1.0337
154084	400	INDIRAPURAM	UTTARPRA	UP_STU	1.0271	1.0327
154085	400	DASNA	UTTARPRA	UP_STU	1.0303	1.0341
154086	400	ORAI (PG)	UTTARPRA	UP_STU	1.0147	1.0132
154087	400	ALIGARH (PG)	UTTARPRA	UP_STU	1.0365	1.0326
154088	400	NOIDA-148_4	UTTARPRA	UP_STU	1.0268	1.0324
154089	400	MASAULI	UTTARPRA	UP_STU	1.0484	1.0348
154090	400	TANDA_EXT	UTTARPRA	NTPC-NR	1.0215	1.0249
157000	765	ANPARAC	UTTARPRA	ANPARAC	1.0271	1.03
157001	765	ANPARA-D	UTTARPRA	UP_STU	1.0271	1.0302
157002	765	UNNAO7	UTTARPRA	UP_STU	1.0474	1.0399
157009	765	LALITPUR-TPS	UTTARPRA	UP_TH	1.05	1.045
157011	765	GR.NOIDA	UTTARPRA	UP_STU	1.0286	1.0295
157013	765	FATEHBD_AGRA	UTTARPRA	UP_STU	1.0499	1.0463
157014	765	BARA-TPS	UTTARPRA	UP_STU	1.02	1.0155
157019	765	ALGRH_GNOIDA	UTTARPRA	UP_STU	1.0341	1.0328
157020	765	ALGRH_AGRA	UTTARPRA	UP_STU	1.0364	1.0345
157021	765	ALGRH_KANPUR	UTTARPRA	UP_STU	1.0372	1.0354
157022	765	ALGRH_JHATIK	UTTARPRA	UP_STU	1.0359	1.0341
Delhi						
Bus Number	**Base kV**	**Bus Name**	**Area Name**	**Owner Name**	**Base Case**	**With Recommended**

					V (PU)	Capacitors V (PU)
140000	66	RIDGEVALLEY	DELHI	DEL_STU	1.017	1.0245
140001	66	DEL_GAS6	DELHI	DEL_TH	**0.9751**	0.9881
140003	66	NARELA_D	DELHI	DEL_STU	**0.9673**	0.984
140004	66	PATPARGANJ	DELHI	DEL_STU	0.9827	0.9955
140005	33	RAJGHATG	DELHI	DEL_STU	**0.978**	0.9909
140006	66	BAWANA	DELHI	DEL_STU	0.9933	1.0017
140007	66	OKHLA	DELHI	DEL_STU	1.0104	1.0142
140008	66	MEHRAULI_B	DELHI	DEL_STU	1.0197	1.0229
140009	66	NAZAFGARH_B	DELHI	DEL_STU	0.9931	0.9999
140010	66	VASANTKUJ	DELHI	DEL_STU	1.0207	1.0238
140011	33	BURARI	DELHI	DEL_STU	**0.9502**	0.9854
140012	33	OKHLA	DELHI	DEL_STU	1.0144	1.0181
140013	66	PAPANKALAN-1	DELHI	DEL_STU	1.0054	1.0079
140014	33	SABJIMANDI	DELHI	DEL_STU	**0.9648**	0.9842
140015	33	SHAHBAGH	DELHI	DEL_STU	0.9964	1.0047
140016	66	ROHINI	DELHI	DEL_STU	0.9859	0.9944
140017	66	BURARI	DELHI	DEL_STU	**0.9495**	0.9825
140018	66	PARKSTREET	DELHI	DEL_STU	1.0155	1.0256
140019	66	SARITAVIHAR	DELHI	DEL_STU	1.0036	1.0079
140020	33	NARAINA	DELHI	DEL_STU	0.9947	0.9973
140021	66	ROHTAKROAD	DELHI	DEL_STU	**0.9743**	1.009
140022	33	ROHTAK33	DELHI	DEL_STU	**0.9736**	1.0082
140023	33	PARKSTREET	DELHI	DEL_STU	1.014	1.024
140024	66	DIAL	DELHI	DEL_STU	1.0129	1.0157
140025	33	LODIROAD	DELHI	DEL_STU	1.0017	1.0095
140026	66	WAZIRABAD	DELHI	DEL_STU	**0.9445**	0.9822
140027	66	MEHRAULI_S	DELHI	DEL_STU	1.0115	1.0146
140028	33	PATPARGANJ	DELHI	DEL_STU	**0.9612**	0.9821
140029	33	GEETACOLONY	DELHI	DEL_STU	**0.9609**	0.9821
140030	33	KASHMIRIGATE	DELHI	DEL_STU	**0.9665**	0.9851
140031	66	KANJHAWALA	DELHI	DEL_STU	1.003	1.0104
140032	66	PAPANKALA-II	DELHI	DEL_STU	0.9968	0.9994
140033	33	MASJIDMOTH	DELHI	DEL_STU	1.0304	1.0379
140034	33	AIIMS	DELHI	DEL_STU	1.0177	1.0252
140035	33	ELECTRICLANE	DELHI	DEL_STU	1.0201	1.0277
140036	66	DSIDCBAWANA	DELHI	DEL_STU	1.0169	1.0251
140037	66	ROHINI-II_66	DELHI	DEL_STU	0.9999	1.0082

140038	33	WAZIRPUR	DELHI	DEL_STU	1.0044	1.0103
140039	66	MUNDKA	DELHI	DEL_STU	1.0212	1.027
140040	66	HARSHVIHAR	DELHI	DEL_STU	**0.9782**	0.9909
140041	33	IP	DELHI	DEL_STU	**0.9731**	0.9886
140042	66	GAZIPUR	DELHI	DEL_STU	1.0114	1.0184
140044	33	PEERAGHARI	DELHI	DEL_STU	1.0104	1.0162
142000	220	NARELA_DS	DELHI	DEL_STU	**0.9722**	0.9887
142001	220	RAJGHAT2	DELHI	DEL_TH	0.986	0.9987
142002	220	BAMNOLI2	DELHI	DEL_STU	1.0137	1.0162
142003	220	PRAGATI_BDR	DELHI	DEL_TH	1.02	1.03
142004	220	NARELA_D	DELHI	DEL_STU	**0.975**	1.0095
142005	220	PATPARGANJ2	DELHI	DEL_STU	**0.9664**	0.9853
142006	220	INDRPA2	DELHI	DEL_TH	0.9861	0.9989
142007	220	PRAGATI_MND	DELHI	DEL_TH	0.9861	0.9989
142008	220	OKHLA2	DELHI	DEL_STU	1.0167	1.0204
142009	220	MEHRAULI_BM	DELHI	DEL_STU	1.0143	1.0175
142010	220	NAZAFGARH_BW	DELHI	DEL_STU	1.0068	1.0134
142011	220	VASANTKUJ	DELHI	DEL_STU	1.0139	1.0171
142012	220	MANDOLA	DELHI	NR_PGCIL	**0.9762**	0.9926
142013	220	BAWANA2	DELHI	DEL_STU	1.011	1.0191
142014	220	PAPANKALAN-1	DELHI	DEL_STU	1.0107	1.0132
142015	220	SABJIMANDI	DELHI	DEL_STU	**0.9669**	0.9862
142016	220	SHAHBAGH2	DELHI	DEL_STU	1.0079	1.0161
142017	220	ROHINI	DELHI	DEL_STU	1.0051	1.0133
142018	220	BURARI	DELHI	DEL_STU	**0.9674**	0.9867
142019	220	PARKSTREET	DELHI	DEL_STU	1.0188	1.0288
142020	220	SARITAVIHAR2	DELHI	DEL_STU	1.0163	1.0204
142021	220	NARAINA	DELHI	DEL_STU	1.0096	1.0121
142022	220	DELHI-RR	DELHI	BBMB	**0.9728**	1.0074
142023	220	NAJAFGARH_BM	DELHI	DEL_STU	1.0068	1.0134
142024	220	DIAL	DELHI	DEL_STU	1.014	1.0168
142025	220	SARITAVIHA_S	DELHI	DEL_STU	1.0211	1.0301
142026	220	LODIROAD2	DELHI	DEL_STU	1.0218	1.0293
142027	220	RIDGEVALLEY	DELHI	DEL_STU	1.0226	1.0301
142028	220	MEHRAULI_S	DELHI	DEL_STU	1.0143	1.0175
142029	220	WAZIRABAD2	DELHI	DEL_STU	**0.9693**	0.9878
142030	220	GEETACOLONY	DELHI	DEL_STU	**0.9673**	0.986
142031	220	KASHMIRIGATE	DELHI	DEL_STU	**0.9689**	0.9873
142032	220	GAZIPUR_DL	DELHI	DEL_STU	1.0178	1.0248

142033	220	MAHARANIBAGH	DELHI	NR_PGCIL	1.0227	1.0302
142034	220	MASJIDMOTH	DELHI	DEL_STU	1.0228	1.0303
142035	220	AIIMS	DELHI	DEL_STU	1.0227	1.0302
142036	220	ELECTRICLANE	DELHI	DEL_STU	1.0229	1.0304
142037	220	DSIDCBAWANA	DELHI	DEL_STU	1.0105	1.0187
142038	220	KANJHAWALA	DELHI	DEL_STU	1.0088	1.016
142039	220	PAPANKALA-II	DELHI	DEL_STU	1.01	1.0125
142040	220	ROHINI-II	DELHI	DEL_STU	1.0069	1.0151
142041	220	WAZIRPUR	DELHI	DEL_STU	1.0097	1.0155
142042	220	PEERAGARHI	DELHI	DEL_STU	1.0104	1.0162
142043	220	MUNDKA	DELHI	DEL_STU	1.0126	1.0184
142044	220	HARSHVIHAR	DELHI	DEL_STU	0.9911	1.0036
142045	220	BADARPR2	DELHI	NTPC-NR	1.017	1.0211
142047	220	PREET VIHAR	DELHI	DEL_STU	0.9884	1.001
142048	220	TUGHLAKBAD	DELHI	NR_PGCIL	1.0179	1.0215
142049	220	PATPARGANJ	DELHI	NR_PGCIL	0.9876	1.0002
144000	400	BAWANA-G	DELHI	DEL_TH	1.0239	1.033
144001	400	HARSHVIHAR	DELHI	DEL_STU	1.0108	1.0222
144006	400	BAWANA4	DELHI	DEL_STU	1.0239	1.033
144007	400	BAMNOLI14	DELHI	DEL_STU	1.0256	1.0272
144008	400	MUNDKA	DELHI	DEL_STU	1.026	1.0289

Uttarakhand

Bus Number	Base kV	Bus Name	Area Name	Owner Name	Base Case V (PU)	With Recommended Capacitors V (PU)
161000	132	CPP	UTTARAKH	UTKD_STU	**0.9637**	0.9815
161001	132	IGL	UTTARAKH	UTKD_STU	1.0198	1.0252
161002	132	KVS	UTTARAKH	UTKD_STU	1.0201	1.0255
161003	132	SITARGANJ	UTTARAKH	UTKD_STU	0.9885	0.9953
161004	132	T-POINT	UTTARAKH	UTKD_STU	**0.9484**	0.9947
161005	132	KATHGODAM	UTTARAKH	UTKD_STU	**0.9659**	0.984
161006	132	KASHIUR-OLD	UTTARAKH	UTKD_STU	1.0204	1.0258
161007	132	DHAKRANI	UTTARAKH	UTKD_HYD	**0.95**	1.0001
161008	132	RISHIKE1	UTTARAKH	UTKD_STU	**0.9522**	0.9974
161009	132	BHOWALI	UTTARAKH	UTKD_STU	**0.9594**	0.982
161010	132	ALMORA	UTTARAKH	UTKD_STU	**0.9399**	0.9831
161011	132	KICCHHA	UTTARAKH	UTKD_STU	**0.9653**	0.9803

161012	132	HALDWAN1	UTTARAKH	UTKD_STU	**0.9722**	0.9858
161013	132	KHATIMAH	UTTARAKH	UTKD_HYD	0.9959	0.9977
161014	132	KOTDWAR	UTTARAKH	UTKD_STU	**0.8655**	0.9866
161015	132	MANGLORE	UTTARAKH	UTKD_STU	**0.9347**	0.9828
161016	132	BHAGWANN	UTTARAKH	UTKD_STU	**0.9224**	0.983
161017	132	BINDAL	UTTARAKH	UTKD_STU	**0.9278**	0.9807
161018	132	PANTNAG1	UTTARAKH	UTKD_STU	**0.9739**	0.9862
161019	132	PITHORAG	UTTARAKH	UTKD_STU	**0.9734**	0.9861
161020	132	PURKULGA	UTTARAKH	UTKD_STU	**0.9306**	0.9848
161021	132	SRINAGAR	UTTARAKH	UTKD_STU	**0.9683**	1.0117
161022	132	RUDRAPUR	UTTARAKH	UTKD_STU	**0.9657**	0.9805
161023	132	BHUPATWA	UTTARAKH	UTKD_STU	**0.9437**	0.9909
161024	132	RAMNAGAR	UTTARAKH	UTKD_STU	1.0056	1.0124
161025	132	JASPUR	UTTARAKH	UTKD_STU	1.0028	1.01
161026	132	RANIKHET	UTTARAKH	UTKD_STU	**0.9337**	0.9821
161027	132	HARIDWA1	UTTARAKH	UTKD_STU	**0.9461**	0.9913
161028	132	BAZPUR	UTTARAKH	UTKD_STU	1.0012	1.0081
161029	132	SITARGAN	UTTARAKH	NR_PGCIL	0.9897	0.9963
161030	132	LAKSAR	UTTARAKH	UTKD_STU	**0.8952**	0.9838
161031	132	KALAGARH	UTTARAKH	UTKD_HYD	1.005	1.015
161032	132	KASHIPU1	UTTARAKH	UTKD_STU	1.0141	1.0198
161033	132	ROORKEE1	UTTARAKH	UTKD_STU	**0.9317**	0.9862
161034	132	JWALAPUR	UTTARAKH	UTKD_STU	**0.9425**	0.9895
161035	132	CHILLA-H	UTTARAKH	UTKD_HYD	**0.9442**	0.9935
161036	132	MAZRA	UTTARAKH	UTKD_STU	**0.9315**	0.984
161037	132	KULHALHE	UTTARAKH	UTKD_HYD	**0.949**	1
161038	132	KHODRI	UTTARAKH	UTKD_STU	**0.9577**	1.0051
161039	132	DHALIPUR	UTTARAKH	UTKD_HYD	**0.95**	1.001
161040	132	AIRLIQU	UTTARAKH	UTKD_STU	**0.9343**	0.9824
161041	132	ASIGLS	UTTARAKH	UTKD_STU	**0.9342**	0.9828
161042	132	BHEL	UTTARAKH	UTKD_STU	**0.9425**	0.9895
161043	132	HEHONDA	UTTARAKH	UTKD_STU	**0.946**	0.9912
161044	132	MAHUAKHE	UTTARAKH	UTKD_STU	1.0325	1.0373
161045	132	PLYFLEX	UTTARAKH	UTKD_STU	1.0008	1.0078
161046	132	RBNS	UTTARAKH	UTKD_STU	**0.8944**	0.9838
161047	132	SATPULI	UTTARAKH	UTKD_STU	**0.9116**	0.9961
161048	132	DEHRADUN	UTTARAKH	UTKD_STU	**0.9494**	0.9977
161049	132	LALTHAPPER	UTTARAKH	UTKD_STU	**0.941**	0.9891
161050	132	CHUDIYALA	UTTARAKH	UTKD_STU	**0.9238**	0.9835

161051	132	SRINAGAR_UK	UTTARAKH	UTKD_STU	0.9827	1.0253
161052	132	SIMLI	UTTARAKH	UTKD_STU	**0.9793**	1.0223
161053	132	ELDICO	UTTARAKH	UTKD_STU	0.9804	0.9904
161054	132	PITHORA-TPT	UTTARAKH	UTKD_STU	**0.9734**	0.9861
161055	132	PITHORA-PG	UTTARAKH	NR_PGCIL	**0.9793**	0.9902
161056	132	LAKSHMISUGAR	UTTARAKH	UTKD_COGEN	**0.9311**	0.9859
162000	220	MANERI_1	UTTARAKH	UTKD_HYD	0.9919	1.0351
162001	220	KASHIPU2	UTTARAKH	UTKD_STU	1.0094	1.0089
162002	220	RISHIKE2	UTTARAKH	UTKD_STU	0.9944	1.0235
162003	220	CHAMBA	UTTARAKH	UTKD_STU	0.9913	1.0282
162004	220	HALDWAN2	UTTARAKH	UTKD_STU	**0.977**	0.9829
162005	220	PANTNAG2	UTTARAKH	UTKD_STU	0.9921	0.9929
162006	220	BHILANGA	UTTARAKH	UTKD_STU	0.9904	1.0275
162007	220	HARIDWA2	UTTARAKH	UTKD_STU	0.9852	1.0141
162008	220	RORKEE2	UTTARAKH	UTKD_STU	1.0003	1.0194
162009	220	GHANSAL	UTTARAKH	UTKD_STU	1	1
162010	220	MAHUAKHE	UTTARAKH	UTKD_STU	1.0031	1.0035
162011	220	GAMA INFRA	UTTARAKH	UTKD_GAS	1.0031	1.0035
162012	220	TATA	UTTARAKH	UTKD_STU	0.992	0.9928
162013	220	MANERI_2	UTTARAKH	UTKD_HYD	0.992	1.035
162014	220	CHIBRO-H	UTTARAKH	UTKD_HYD	0.985	1.02
162015	220	DEHRADUN	UTTARAKH	UTKD_STU	0.9914	1.0216
162016	220	KHODRIHE	UTTARAKH	UTKD_HYD	0.9836	1.0191
162018	220	PITHORGA	UTTARAKH	NR_PGCIL	0.9891	0.9901
162021	220	SRINAGAR_UK	UTTARAKH	UTKD_STU	1.0071	1.036
162022	220	SHRAVANTI	UTTARAKH	UTKD_GAS	1.005	1.005
162023	220	DEHRADUN-PG	UTTARAKH	UTKD_STU	1.0185	1.038
162025	220	PIRANKALIYAR	UTTARAKH	UTKD_STU	0.9964	1.0197
164000	400	RISHIKE4	UTTARAKH	UTKD_STU	1.0281	1.0369
164001	400	KASHIPU4	UTTARAKH	UTKD_STU	1.0457	1.0393
164006	400	SRINAGAR_UK	UTTARAKH	UTKD_STU	1.0186	1.0405

Himachal

Bus Number	Base kV	Bus Name	Area Name	Owner Name	Base Case V (PU)	With Recommended Capacitors V (PU)
170000	66	KOTLA6	HIMACHAL	HP_STU	0.9909	1.0037
170001	66	BADDI6	HIMACHAL	HP_STU	0.9828	1.009

170002	33	BADDI	HIMACHAL	HP_STU	**0.9633**	0.9902
170003	66	UPARNANG	HIMACHAL	HP_STU	0.9919	1.0185
171000	132	DARLAGHA	HIMACHAL	HP_STU	0.9848	1.0065
171001	132	BAJAURA1	HIMACHAL	HP_STU	1.0115	1.0251
171002	132	MALANA1	HIMACHAL	HP_STU	1.02	1.0331
171003	132	KANGRA1	HIMACHAL	HP_STU	1	0.9981
171004	132	CHHAUR	HIMACHAL	EVEREST	1.0277	1.0433
171005	132	KUNIHAR1	HIMACHAL	HP_STU	**0.9744**	0.9987
171006	132	HAMIRP-2	HIMACHAL	HP_STU	1.0071	1.015
171007	132	BASSI1	HIMACHAL	HP_HYD	1.0173	1.0132
171008	132	HAMIRP-1	HIMACHAL	HP_STU	1.0078	1.0163
171009	132	GIRI1	HIMACHAL	HP_HYD	**0.95**	0.989
171010	132	BAROTIWA	HIMACHAL	HP_STU	**0.9635**	0.9881
171011	132	KALAAMB1	HIMACHAL	HP_STU	**0.931**	0.9828
171012	132	PALAMPUR	HIMACHAL	HP_STU	0.9975	0.9972
171013	132	PAONTA1	HIMACHAL	HP_STU	**0.9388**	0.9828
171014	132	AMB1	HIMACHAL	HP_STU	1.0114	1.0176
171015	132	UNA1	HIMACHAL	HP_STU	1.006	1.0121
171016	132	LARJI1	HIMACHAL	HP_HYD	1.02	1.0319
171017	132	JASSOR1	HIMACHAL	HP_STU	1.0166	1.0214
171018	132	JUTOG1	HIMACHAL	HP_STU	**0.9639**	0.9885
171019	132	SOLAN1	HIMACHAL	HP_STU	**0.9629**	0.991
171020	132	DEHRA1	HIMACHAL	HP_STU	1.0087	1.0138
171021	132	KANGO1	HIMACHAL	HP_STU	1.0002	1.0185
171022	132	ACC1	HIMACHAL	HP_STU	1.0002	1.0185
171023	132	KNGO_SPL	HIMACHAL	HP_STU	1.0002	1.0185
171024	132	BAGHA	HIMACHAL	HP_STU	0.9905	1.0109
171025	132	BATHRI1	HIMACHAL	HP_STU	1.0076	1.0125
171026	132	BIJNI1	HIMACHAL	HP_STU	1.0108	1.0244
171027	132	KANDRI1	HIMACHAL	HP_STU	1.0108	1.0156
171028	132	MALAN-II	HIMACHAL	EVEREST	1.034	1.0499
171030	132	NEHRIAN	HIMACHAL	HP_STU	1.0157	1.0223
172001	220	HAMIRPUR42	HIMACHAL	HP_STU	1.0295	1.0357
172002	220	KOTLA2	HIMACHAL	HP_STU	1.0135	1.026
172003	220	KANGOO2	HIMACHAL	HP_STU	0.995	1.0236
172004	220	BADDI2	HIMACHAL	HP_STU	0.9965	1.0223
172005	220	UPARNANG	HIMACHAL	HP_STU	1.0002	1.0266
172006	220	CHHAUR	HIMACHAL	EVEREST	1.0342	1.0468
172007	220	RAURIAMB	HIMACHAL	HP_STU	0.9943	1.0229

172008	220	KASHANG	HIMACHAL	HP_HYD	1	1
172009	220	KUNIHAR2	HIMACHAL	HP_STU	0.9949	1.0178
172010	220	HAMIRPUR	HIMACHAL	HP_STU	1.027	1.0334
172011	220	GIR1_220	HIMACHAL	HP_STU	**0.9665**	1.0036
172012	220	BHABA2	HIMACHAL	HP_HYD	1.02	1.03
172019	220	JASSOR2	HIMACHAL	HP_STU	1.0205	1.0252
172023	220	PHOZAL	HIMACHAL	HP_STU	1.032	1.0439
172025	220	NEHRIAN	HIMACHAL	HP_STU	1.021	1.0306
172026	220	PATLI_PHOZAL	HIMACHAL	HP_STU	1.0334	1.0443
172027	220	PATLIKUL-2	HIMACHAL	HP_STU	1.0325	1.0446
174000	400	BASPA4	HIMACHAL	HP_HYD	1.042	1.0499
174014	400	SORANG	HIMACHAL	HSPPL	1.0403	1.0403
174015	400	SAINJ	HIMACHAL	HP_STU	1.0447	1.054

Jammu & Kashmir

Bus Number	Base kV	Bus Name	Area Name	Owner Name	Base Case V (PU)	With Recommended Capacitors V (PU)
181000	132	KATHUA1	JAMUKASH	J&K_STU	1.0355	1.0409
181001	132	MIRBAZAR	JAMUKASH	J&K_STU	1.0158	1.0043
181002	132	RAMBAN	JAMUKASH	J&K_STU	1	1
181003	132	SHREE	JAMUKASH	J&K_STU	**0.975**	0.9829
181004	132	LOWERJHELUM1	JAMUKASH	J&K_HYD	0.98	0.988
181005	132	PATTAN1	JAMUKASH	J&K_STU	0.9846	0.9864
181006	132	ZAINAKOT	JAMUKASH	J&K_STU	1.0111	1.0018
181007	132	CHAMASHEHI	JAMUKASH	J&K_STU	1.0063	0.9965
181008	132	UDAMPUR1	JAMUKASH	J&K_HYD	1.0246	1.0172
181009	132	ARAMGARH	JAMUKASH	J&K_STU	**0.9732**	0.9808
181010	132	MAHANPUR	JAMUKASH	J&K_STU	1.0388	1.048
181011	132	AULSTENG	JAMUKASH	J&K_STU	1	1
181012	132	MATTAN	JAMUKASH	J&K_STU	1.0109	0.9993
181013	132	KATRA1	JAMUKASH	J&K_STU	1.0306	1.0247
181014	132	JOURIAN1	JAMUKASH	J&K_STU	1.0302	1.0244
181015	132	TETHAR	JAMUKASH	J&K_STU	1.0131	1.0034
181016	132	KULGAM	JAMUKASH	J&K_STU	1.0118	1.0002
181017	132	WANGANPURA1	JAMUKASH	J&K_STU	1.0054	0.9962
181018	132	BEMINA1	JAMUKASH	J&K_STU	1.0071	0.9976
181019	132	UPPERSIND	JAMUKASH	J&K_HYD	1.005	0.9966

181020	132	RAWALPURA1	JAMUKASH	J&K_STU	1.0093	0.999
181021	132	AWANTIPURA	JAMUKASH	J&K_STU	1.0043	0.9928
181022	132	LASSIPORA	JAMUKASH	J&K_STU	0.9923	0.9807
181023	132	BARN1	JAMUKASH	J&K_STU	1.032	1.0262
181024	132	SHOPIAN	JAMUKASH	J&K_STU	0.9917	0.98
181025	132	KHANMOH	JAMUKASH	J&K_STU	1.01	0.9995
181026	132	HABBAK	JAMUKASH	J&K_STU	1.0025	0.993
181027	132	PAMPORE1	JAMUKASH	J&K_HYD	1.0147	1.0036
181028	132	WANPOH1	JAMUKASH	J&K_STU	1.014	1.0025
181029	132	KALAKOTE	JAMUKASH	J&K_STU	0.9906	0.9861
181030	132	JHAJJARKOTL1	JAMUKASH	J&K_STU	1.0225	1.0161
181031	132	JANIPUR1	JAMUKASH	J&K_STU	1.0288	1.0234
181032	132	NEWCANAL1	JAMUKASH	J&K_STU	1.0259	1.0207
181033	132	MERANSAHIB	JAMUKASH	J&K_STU	1.0226	1.0178
181034	132	BARIBRAHMINA	JAMUKASH	J&K_STU	1.0238	1.0193
181035	132	GLADINI1	JAMUKASH	J&K_STU	1.028	1.0237
181036	132	BADAMPUR	JAMUKASH	J&K_STU	0.9992	0.9902
181037	132	SAMBA	JAMUKASH	J&K_STU	1.0348	1.0339
181038	132	HERANAGAR1	JAMUKASH	J&K_STU	1.0427	1.0452
181039	132	RAJOURI1	JAMUKASH	J&K_STU	0.9856	0.981
181040	132	DRABA1	JAMUKASH	J&K_STU	0.9854	0.9807
181041	132	CHANDAK1	JAMUKASH	J&K_STU	0.9838	0.9792
181042	132	BATOT1	JAMUKASH	J&K_STU	1.0229	1.0155
181043	132	SIDHRA1	JAMUKASH	J&K_STU	1.0305	1.0249
181044	132	MAGAM	JAMUKASH	J&K_STU	0.9843	0.9861
182000	220	ZAINKOTE2	JAMUKASH	J&K_STU	1.0426	1.027
182001	220	RAMBAN	JAMUKASH	J&K_STU	1.0469	1.0347
182002	220	AULSTENG	JAMUKASH	J&K_STU	1	1
182003	220	BARN2	JAMUKASH	J&K_STU	1.0441	1.0356
182004	220	HIRANAGAR2	JAMUKASH	J&K_STU	1.0271	1.0261
182005	220	UDAMPUR2	JAMUKASH	J&K_STU	1.0453	1.0369
182014	220	DELINA	JAMUKASH	J&K_STU	1.0492	1.0329
182016	220	AMARGARH	JAMUKASH	NRSS-29	***1.055***	1.0376
184000	400	BAGLIHAR4	JAMUKASH	J&K_HYD	***1.0764***	1.0516
184008	400	BAGLIHAR-2	JAMUKASH	J&K_HYD	***1.0751***	1.0505
Chandigarh						
Bus Number	**Base kV**	**Bus Name**	**Area Name**	**Owner Name**	**Base Case**	**With Recommended**

					V (PU)	Capacitors V (PU)
190000	66	CHANDIGA_S39	CHANDIGA	CHND_STU	**0.9046**	0.9966
190001	66	CHANDIGA_S12	CHANDIGA	CHND_STU	**0.9097**	0.9969
190002	66	CHANDIGA_S01	CHANDIGA	CHND_STU	**0.9125**	0.997
190003	66	MANIMAJRA	CHANDIGA	CHND_STU	**0.9248**	0.9978
190004	66	CHANDIGA_S28	CHANDIGA	CHND_STU	**0.9212**	0.9965
190005	66	IA_PH_I	CHANDIGA	CHND_STU	**0.9206**	0.9968
190006	66	IA_PH_II	CHANDIGA	CHND_STU	**0.9188**	0.9968
190007	66	CHANDIGA_S32	CHANDIGA	CHND_STU	**0.9189**	0.9968
190008	66	CHANDIGA_S47	CHANDIGA	CHND_STU	**0.9155**	0.9967
190009	66	CHANDIGA_S52	CHANDIGA	CHND_STU	**0.9114**	0.9967
190010	66	CHANDIGA_S56	CHANDIGA	CHND_STU	**0.9066**	0.9966
190011	66	IT_PARK	CHANDIGA	CHND_STU	**0.9248**	0.9978
190012	66	CHANDIGA_S18	CHANDIGA	CHND_STU	**0.9212**	0.9965
190013	66	KISHANGA_CHA	CHANDIGA	CHND_STU	**0.9248**	0.9978
192000	220	KISHANGA_CHA	CHANDIGA	CHND_STU	**0.9726**	1.012

ANNEXURE-II-B

ISTS BUSES VOLTAGE PROFILE

Bus Number	Base kV	Bus Name	Area Name	Owner Name	Base Case V (PU)	With Recommended Capacitors V (PU)
110083	26	LUDHIANA_SVC	NR_ISTS_PUN	NR_PGCIL	**0.9235**	1.0337
112101	220	JALAN-PG	NR_ISTS_PUN	NR_PGCIL	1.0091	1.0243
112103	220	GANGUWAL	NRIST-BB	BBMB	**0.9654**	1.0105
112104	220	SANGRUR	NR_ISTS_PUN	PUNJ_STU	0.9891	1.0157
112105	220	BARNALAB2	NR_ISTS	PUNJ_STU	0.997	1.016
112106	220	DASUYA	NR_ISTS_PUN	PUNJ_STU	1.0095	1.0203
112107	220	JAMALPUR	NRIST-BB	BBMB	**0.9764**	1.0082
114007	400	MOGA	NR_ISTS_PUN	NR_PGCIL	1.0358	1.0407
114008	400	AMRITSAR	NR_ISTS_PUN	NR_PGCIL	1.0313	1.0419
114009	400	LUDHIANA	NR_ISTS_PUN	NR_PGCIL	1.0159	1.0398
114010	400	JALANDHA	NR_ISTS_PUN	NR_PGCIL	1.0376	1.0436
114011	400	MALERKOT	NR_ISTS_PUN	NR_PGCIL	1.0194	1.0411
114012	400	PATIALA	NR_ISTS_PUN	NR_PGCIL	1.0227	1.044
114014	400	LUDHIANA_SVC	NR_ISTS_PUN	NR_PGCIL	1.0159	1.0398
117000	765	MOGA-PG	NR_ISTS_PUN	NR_PGCIL	1.0293	1.0308
122075	220	HISAR-PG2	NR_ISTS_HAR	NR_PGCIL	1.0003	1.024
122076	220	PANCHKULAPG2	NR_ISTS_HAR	NR_PGCIL	1.0128	1.035
122077	220	KURUKSHETRA	NRIST-BB	BBMB	**0.9505**	1.0021
122079	220	BHIWANI	NRIST-BB	BBMB	0.9982	1.0171
122080	220	BALLABGARH	NRIST-BB	BBMB	1.0146	1.0194
122081	220	HISAR-BB	NRIST-BB	BBMB	0.9866	1.0151
122082	220	SAMAYPUR	NRIST-BB	BBMB	1.0149	1.0196
122083	220	DHULKOTE	NRIST-BB	BBMB	**0.9715**	1.0144
122084	220	CHARKHIDADRI	NRIST-BB	BBMB	0.9923	1.0111
122085	220	JAGADHARI	NRIST-BB	BBMB	**0.9477**	1.0035
124000	400	JIND_4	NR_ISTS_HAR	HAR_STU	1.0287	1.0412
124010	400	FATEHABAD	NR_ISTS_HAR	NR_PGCIL	1.0182	1.0339
124011	400	HISSAR-PG	NR_ISTS_HAR	NR_PGCIL	1.029	1.04
124012	400	ABDULLAPUR	NR_ISTS_HAR	NR_PGCIL	1.0299	1.0457
124013	400	KAITHAL-PG	NR_ISTS_HAR	NR_PGCIL	1.0247	1.0439
124014	400	BALLABHGR-PG	NR_ISTS_HAR	NR_PGCIL	1.0257	1.0288
124015	400	BALB_FSC	NR_ISTS_HAR	NR_PGCIL	1.0331	1.0375
124016	400	BAHADURG-PG	NR_ISTS_HAR	NR_PGCIL	1.0233	1.036

124017	400	GURGAON-PG	NR_ISTS_HAR	NR_PGCIL	1.0276	1.0305
124018	400	SONEPAT-PG	NR_ISTS_HAR	NR_PGCIL	1.0234	1.0381
124019	400	MANESAR-PG	NR_ISTS_HAR	NR_PGCIL	1.029	1.031
124020	400	PANCHKULA-PG	NR_ISTS_HAR	NR_PGCIL	1.0281	1.046
124021	400	BHIWN-PG	NR_ISTS_HAR	NR_PGCIL	1.0327	1.0394
124022	400	BHIWANI	NR_ISTS_HAR	BBMB	1.027	1.0375
124024	400	PANIPAT_BB	NRIST-BB	BBMB	1.008	1.0301
124025	400	MAHIN_HV	NR_ISTS	ADANI	1.0338	1.0391
124026	400	KURUKSHETRA_	NR_ISTS_HAR	NR_PGCIL	1.0267	1.0408
124027	400	BALLABH_2ND	NR_ISTS_HAR	NR_PGCIL	1.0331	1.0375
124028	400	PRITHALA	NR_ISTS_HAR	INDIA	1.0363	1.0303
124029	400	KADARPUR	NR_ISTS_HAR	GPTL	1.0316	1.0313
127000	765	BHIWN-PG_7	NR_ISTS_HAR	NR_PGCIL	1.0395	1.0305
132140	220	BASSI	NR_ISTS_RAJ	NR_PGCIL	1.0331	1.0271
132141	220	BHIWADI	NR_ISTS_RAJ	NR_PGCIL	1.0117	1.0178
132142	220	KOTPU-PG	NR_ISTS_RAJ	NR_PGCIL	1.0254	1.0258
132143	220	NEEMR-PG	NR_ISTS_RAJ	NR_PGCIL	1.0267	1.0294
132144	220	SIKAR-PG	NR_ISTS_RAJ	NR_PGCIL	1.0468	1.035
132145	220	JAIPUR_PG	NR_ISTS_RAJ	NR_PGCIL	1.0373	1.0254
134021	400	BHINMAL	NR_ISTS_RAJ	NR_PGCIL	1.0419	1.0381
134022	400	KANKROLI	NR_ISTS_RAJ	NR_PGCIL	1.033	1.0325
134023	400	KOTA	NR_ISTS_RAJ	NR_PGCIL	1.0481	1.0388
134024	400	BHIWADI	NR_ISTS_RAJ	NR_PGCIL	1.0287	1.0306
134025	400	BASSI	NR_ISTS_RAJ	NR_PGCIL	1.0484	1.0373
134026	400	NEEMR-PG	NR_ISTS_RAJ	NR_PGCIL	1.034	1.0346
134027	400	ANTA-4	NR_ISTS_RAJ	NR_PGCIL	**1.0689**	1.0438
134028	400	JAIPUR_PG	NR_ISTS_RAJ	NR_PGCIL	1.0493	1.0319
134029	400	KANKROLI_SVC	NR_ISTS_RAJ	NR_PGCIL	1.033	1.0325
134035	400	CHITTOR_PG	NR_ISTS_RAJ	NR_PGCIL	1.0307	1.0283
134036	400	AJMER_PG	NR_ISTS_RAJ	RAJ_STU	1.0361	1.0301
134042	400	BIKANER_PG	NR_ISTS_RAJ	NR_PGCIL	1.0404	1.0315
134043	400	BHADLA-PG	NR_ISTS	NR_PGCIL	1.0309	1.031
137002	765	CHITTOR_765	NR_ISTS_RAJ	NR_PGCIL	1.027	1.0242
137003	765	AJMER_765	NR_ISTS_RAJ	RAJ_STU	1.03	1.0259
137004	765	BIKANER-PG	NR_ISTS_RAJ	NR_PGCIL	1.0287	1.0256
137005	765	BHADLA-PG	NR_ISTS_RAJ	NR_PGCIL	1.0247	1.0274
142046	220	NARELA_BB	NRIST-BB	BBMB	**0.975**	1.0095
144002	400	MAHARANI	NR_ISTS_DEL	NR_PGCIL	1.0258	1.0326
144003	400	MANDOLA	NR_ISTS_DEL	NR_PGCIL	1.0193	1.0293

144004	400	JHATI-PG	NR_ISTS_DEL	NR_PGCIL	1.0271	1.0284
144005	400	JHATIK_S	NR_ISTS_DEL	NR_PGCIL	1.0271	1.0284
144009	400	TUGHLKABAD	NR_ISTS_DEL	NR_PGCIL	1.0244	1.0273
144010	400	MANDOLA_SR1	NR_ISTS_DEL	NR_PGCIL	1.02	1.0288
144011	400	MANDOLA_SR2	NR_ISTS_DEL	NR_PGCIL	1.02	1.0288
144012	400	MANDOLA_2ND	NR_ISTS_DEL	NR_PGCIL	1.0247	1.0336
147000	765	JHATI-PG	NR_ISTS_DEL	NR_PGCIL	1.0321	1.0298
152101	220	RAEBAREI	NR_ISTS_UP	NR_PGCIL	1.0164	1.0184
152102	220	KANPU-PG	NR_ISTS_UP	NR_PGCIL	1.0264	1.0263
154024	400	MEERUT	NR_ISTS_UP	NR_PGCIL	1.0331	1.0393
154025	400	BAREL-PG	NR_ISTS_UP	NR_PGCIL	**1.0559**	1.0386
154026	400	GORTCSC1	NR_ISTS_UP	NR_PGCIL	1.0396	1.0362
154027	400	GORTCSC2	NR_ISTS_UP	NR_PGCIL	1.0271	1.0223
154028	400	BAREFSC1	NR_ISTS_UP	NR_PGCIL	1.0497	1.0227
154029	400	BAREFSC2	NR_ISTS_UP	NR_PGCIL	1.0497	1.0227
154030	400	LU-GKFC1	NR_ISTS_UP	NR_PGCIL	1.0419	1.026
154031	400	LU-GKFC2	NR_ISTS_UP	NR_PGCIL	1.0419	1.026
154032	400	MAINFSC1	NR_ISTS_UP	NR_PGCIL	1.0385	1.0408
154033	400	MAINFSC2	NR_ISTS_UP	NR_PGCIL	1.0385	1.0408
154034	400	AGRA	NR_ISTS_UP	NR_PGCIL	1.0364	1.032
154035	400	AURYA4	NR_ISTS_UP	NR_PGCIL	1.0483	1.0443
154036	400	GORAKHPU	NR_ISTS_UP	NR_PGCIL	1.0396	1.0362
154037	400	KANPUR	NR_ISTS_UP	NR_PGCIL	1.0466	1.0426
154038	400	VINDHYBT	NR_ISTS_UP	NR_PGCIL	1.0317	1.0321
154039	400	RIHAN-HV	NR_ISTS_UP	NR_PGCIL	1.0298	1.0305
154040	400	LUCK4-PG	NR_ISTS_UP	NR_PGCIL	**1.0522**	1.0399
154041	400	SOHAW_FSC1	NR_ISTS_UP	NR_PGCIL	1.0377	1.0282
154042	400	SOHAW_FSC2	NR_ISTS_UP	NR_PGCIL	1.0462	1.0395
154043	400	LUCK74-P	NR_ISTS_UP	NR_PGCIL	**1.0524**	1.0401
154044	400	DADR-HVD	NR_ISTS_UP	NR_PGCIL	1.0211	1.0291
154045	400	K-B-FSC2	NR_ISTS_UP	NR_PGCIL	0.9806	0.9901
154046	400	K-B-FSC3	NR_ISTS_UP	NR_PGCIL	0.9806	0.9901
154047	400	MAINPURI	NR_ISTS_UP	NR_PGCIL	1.0384	1.0408
154048	400	SOHAW-PG	NR_ISTS_UP	NR_PGCIL	1.0462	1.0395
154049	400	FATEH-PG	NR_ISTS_UP	NR_PGCIL	1.0488	1.0461
154050	400	SHAHJ-PG	NR_ISTS_UP	NR_PGCIL	**1.0598**	1.0409
154051	400	MEERTFS1	NR_ISTS_UP	NR_PGCIL	1.0291	1.0322
154052	400	MEERTFS2	NR_ISTS_UP	NR_PGCIL	1.0331	1.0393
154053	400	ALLAHABA	NR_ISTS_UP	NR_PGCIL	1.048	1.0428

154054	400	BAL74-PG	NR_ISTS_UP	NR_PGCIL	1.0366	1.0344
154055	400	BARELI74	NR_ISTS_UP	NR_PGCIL	**1.0561**	1.0386
154058	400	AGRA_SOUTH	NR_ISTS	UP_STU	1.0369	1.0341
154059	400	GNOIDA4	NR_ISTS	UP_STU	1.0224	1.0293
154064	400	AGRA_HVDC	NR_ISTS_UP	NR_PGCIL	1.0364	1.032
154067	400	VARANASI-PG	NR_ISTS_UP	NR_PGCIL	1.0469	1.0447
154070	400	BAGPAT	NR_ISTS_UP	NR_PGCIL	1.0358	1.0466
154071	400	SAHARNPUR400	NR_ISTS_UP	NR_PGCIL	1.034	1.0431
154072	400	KANPUR_GIS	NR_ISTS_UP	NR_PGCIL	1.0473	1.0428
157003	765	LUCK7-PG	NR_ISTS_UP	NR_PGCIL	1.0482	1.0343
157004	765	BALI7-PG	NR_ISTS_UP	NR_PGCIL	1.0393	1.0357
157005	765	BARELI	NR_ISTS_UP	NR_PGCIL	**1.0637**	1.0363
157006	765	FATEH-PG	NR_ISTS_UP	NR_PGCIL	1.0439	1.0412
157007	765	AGRA-PG	NR_ISTS_UP	NR_PGCIL	1.0408	1.0372
157008	765	MERUT-PG	NR_ISTS_UP	NR_PGCIL	1.0328	1.034
157010	765	VARANASI-PG	NR_ISTS_UP	NR_PGCIL	1.0451	1.0424
157012	765	KANPUR_GIS	NR_ISTS_UP	NR_PGCIL	1.037	1.0335
157015	765	MAINPURI_765	NR_ISTS_UP	UP_STU	1.0264	1.0265
157016	765	HAPUR	NR_ISTS_UP	UP_STU	1.029	1.0305
157017	765	ORAI	NR_ISTS_UP	UP_STU	1.0273	1.0252
157018	765	ALIGARH	NR_ISTS_UP	UP_STU	1.0354	1.0336
162017	220	SITARGAN	NR_ISTS_UP	NR_PGCIL	1.0034	1.004
162020	220	ROORK-PG	NR_ISTS	UTKD_STU	1.0074	1.0251
164002	400	ROORKEE	NR_ISTS_UTT	NR_PGCIL	1.0353	1.0424
164007	400	DEHRADUN-PG	NR_ISTS_UTT	NR_PGCIL	1.0346	1.0458
167000	400	TEHR-POL	NR_ISTS_UTT	NR_PGCIL	1.0406	1.05
172013	220	NALLAGAR	NR_ISTS_HP	NR_PGCIL	1.0016	1.0281
172014	220	CHAM-POL	NR_ISTS_HP	NR_PGCIL	**1.0501**	1.05
172024	220	PARBATI_POOL	NR_ISTS_HP	NR_PGCIL	1.0361	1.0361
174003	400	NALLAGAR	NR_ISTS_HP	NR_PGCIL	1.0326	1.0482
174004	400	CHAM-POL	NR_ISTS_HP	NR_PGCIL	**1.0502**	1.0482
174005	400	PARBT-PO	NR_ISTS_HP	NR_PGCIL	1.0447	1.054
174006	400	HAMIRPUR	NR_ISTS_HP	NR_PGCIL	1.0384	1.041
174016	400	KALA AMB	NR_ISTS_HP	PKATL	1.0361	1.0499
174017	400	KALA AMB FSC	NR_ISTS_HP	PKATL	1.0311	1.0484
182006	220	MIRBAZAR	NR_ISTS	J&K_STU	1.0388	1.0246
182007	220	WAGOORA	NR_ISTS_JK	NR_PGCIL	1.0485	1.0323
182008	220	PAMPORE2	NR_ISTS	J&K_STU	1.0431	1.0277
182010	220	JAMMU2	NR_ISTS	J&K_STU	1.0383	1.032

182011	220	KISHENPUR	NR_ISTS_JK	NR_PGCIL	**1.0528**	1.0432
182012	220	NEWWANPO	NR_ISTS_JK	NR_PGCIL	1	1
182013	220	SAMBA	NR_ISTS_JK	NR_PGCIL	1.0466	1.0405
184002	400	KISHENPUR	NR_ISTS_JK	NR_PGCIL	**1.0703**	1.0536
184003	400	WAGOORA	NR_ISTS_JK	NR_PGCIL	**1.0643**	1.0452
184004	400	SAMBA	NR_ISTS_JK	NR_PGCIL	**1.0663**	1.0546
184005	400	NEWWANPO	NR_ISTS_JK	NR_PGCIL	**1.0692**	1.0512
184009	400	AMARGARH	NR_ISTS_JK	NR_PGCIL	**1.0696**	1.0492

ANNEXURE-II-C

ISGS BUSES VOLTAGE PROFILE

Bus Number	Base kV	Bus Name	Area Name	Owner Name	Base Case V (PU)	With Recommended Capacitors V (PU)
111113	132	GANGUWAL	BHAKRA	BBMB	0.957	1.009
111114	132	KOTLA	BHAKRA	BBMB	0.949	1.0052
124023	400	JHAJJAR4	IGSTPS	APCPL	1.03	1.0333
130001	33	SAURYA URJA	BHADLA SOLAR	SAURYA URJA	1.0322	1.0324
130002	33	SB ENERGY	BHADLA SOLAR	SBENERGY	1.0322	1.0324
130003	33	ADANI-SOLAR1	BHADLA SOLAR	ADANI-SOLAR	1.0324	1.0325
130004	33	AZURE POWER1	BHADLA SOLAR	AZURE POWER	1.0324	1.0325
130005	33	RENEW POWER	BHADLA SOLAR	RENEW POWER	1.0324	1.0325
130006	33	AZURE POWER2	BHADLA SOLAR	AZURE POWER	1.0324	1.0325
130007	33	ADANI-SOLAR2	BHADLA SOLAR	ADANI-SOLAR	1.0324	1.0325
130008	33	MAHOBA SOLAR	BHADLA SOLAR	ADANI-SOLAR	1.0323	1.0325
130009	33	TATA SOLAR	BHADLA SOLAR	TPREL	1.0332	1.0333
132078	220	MAHOBA SOLAR	BHADLA SOLAR	SAURYA URJA	1.0323	1.0325
132146	220	RAPS_B2	RAPS-B	NPCIL-NR	1.042	1.0453
132147	220	RAPS_C2	RAPS-C	NPCIL-NR	1.042	1.0453
132168	220	ANTA2	ANTA	NTPC-NR	1.035	1.036
132174	220	BHADLA-PG	BHADLA SOLAR	NR_PGCIL	1.0322	1.0323
132175	220	SAURYA URJA	BHADLA SOLAR	SAURYA URJA	1.0322	1.0324
132176	220	ADANI-SOLAR	BHADLA SOLAR	ADANI-SOLAR	1.0324	1.0325
132177	220	TATA SOLAR	BHADLA SOLAR	TPREL	1.0332	1.0333
134030	400	RAPS_C4	RAPS-C	NPCIL-NR	1.046	1.0416
134031	400	SHRECEM	SHRE_CEM	SHRE_CEM	1.0554	1.0287
134040	400	RAPP_D	RAPS-C	NPCIL-NR	1.0524	1.0349
152103	220	DADRI_G2	DADRI-G	NTPC-NR	1.0115	1.0195
152104	220	DADRI_TH	DADRI_C	NTPC-NR	1.02	1.033
152105	220	NAPP2	NAPS	NPCIL-NR	1.0077	1.0177

152127	220	UNCHAHR2	UNCHAHAR	NTPC-NR	1.03	1.03
154056	400	SINGRL4	SINGRAUL	NTPC-NR	1.032	1.0324
154057	400	RIHAND-G	RIHAND-G	NTPC-NR	1.03	1.0307
154060	220	AURYA2	AURAIYA	NTPC-NR	1.0398	1.0362
154061	400	DADR-NCR	DADR-NCR	NTPC-NR	1.021	1.029
154100	400	DADRI SPLIT	DADR-NCR	NTPC-NR	1.0193	1.0331
161065	132	TANAKPUR	TANAKPUR	NHPC-NR	1.0308	1.0333
162019	220	TANAKPUR2	TANAKPUR	NHPC-NR	1.0107	1.013
162024	220	DHAULI2	DHAULIGA	NHPC-NR	0.9825	0.9825
164003	400	TEHRI4	TEHRI	THDC	1.04	1.05
164004	400	KOTESHWA	KOTESWAR	THDC	1.0405	1.0499
170004	66	BHAKRA-L	BHAKRA	BBMB	1.02	1.006
170005	66	PONG	PONG	BBMB	1.015	1.0254
171029	132	DEHAR1	DEHAR	BBMB	1.0003	1.0192
172000	220	BUDHIL	BUDHIL	LANCO_IPP	1.0496	1.05
172015	220	BHAKRA_L	BHAKRA	BBMB	0.974	1.0122
172016	220	BHAKRA_R	BHAKRA	BBMB	0.975	1.0135
172017	220	DEHAR	DEHAR	BBMB	0.995	1.024
172018	220	BAIRASIUL2	BAIRASIU	NHPC-NR	1.0302	1.0302
172020	220	CHAMER-3	CHAMER-3	NHPC-NR	1.05	1.05
172021	220	PONG	PONG	BBMB	1.015	1.0254
172022	220	ADHYDRO	ADHYDRO	ADHY_IPP	1.036	1.045
174001	400	CHAMERA-1	CHAMER-1	NHPC-NR	1.05	1.0483
174002	400	CHAMERA-2	CHAMER-2	NHPC-NR	1.0504	1.0483
174007	400	DEHAR	DEHAR	BBMB	1.02	1.036
174008	400	NATHPA4	JHAKRI	SJVNL	1.04	1.05
174009	400	RAMPUR	RAMPUR HEP	SJVNL	1.04	1.05
174010	400	KARCHAMW	KARCHAMW	JP-KARCH	1.042	1.05
174011	400	PARBT-II	PARBATI-2	NHPC-NR	1.0447	1.054

174012	400	PARBTI-3	PARBATI-3	NHPC-NR	1.0448	1.054
174013	400	KOLDAM	KOLDAM	NTPC-NR	1.04	1.05
181045	132	SEWA-II	SEWA-II	NHPC-NR	1.0408	1.05
182009	220	SALAL2	SALAL	NHPC-NR	1.0586	1.0501
182015	220	KISHANGANGA	KISHANGANGA	NHPC	1.0557	1.0394
184001	400	URIG-1	URI-1	NHPC-NR	1.0742	1.05
184006	400	DULHASTI	DULHASTI	NHPC-NR	1.0806	1.05
184007	400	URIG-2	URI-2	NHPC-NR	1.0743	1.0499

ANNEXURE-III-A
Active and Reactive generation profile of States

PUNJAB									
Bus Number	Bus Name	Area Name	Base Case	With Recommended Capacitors	In Service	Base Case		With Recommended Capacitors	
			VSched (pu)	VSched (pu)		PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)	PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)
111000	UBDCPH-1 132.00	PUNJAB	0.996	0.9888	1	10.0015	6.7434	10.0015	0
111000	UBDCPH-1 132.00	PUNJAB	0.996	0.9888	1	10.1922	6.8719	10.1922	0
111009	MUKERIAN-4 132.00	PUNJAB	1.028	1.022	1	19.0028	7.6737	19.0028	0
111009	MUKERIAN-4 132.00	PUNJAB	1.028	1.022	1	19.0028	7.6737	19.0028	0
111009	MUKERIAN-4 132.00	PUNJAB	1.028	1.022	1	19.0028	7.6737	19.0028	0
111017	MUKERI-3 132.00	PUNJAB	1.0305	1.025	1	19.0028	4.6903	19.0028	0
111017	MUKERI-3 132.00	PUNJAB	1.0305	1.025	1	19.0028	4.6903	19.0028	0
111017	MUKERI-3 132.00	PUNJAB	1.0305	1.025	1	19.0028	4.6903	19.0028	0
111046	ANANDGARH-2 132.00	PUNJAB	0.95	1.005	1	28.0242	10.5337	28.0242	-0.0502
111046	ANANDGARH-2 132.00	PUNJAB	0.95	1.005	1	28.0242	10.5337	28.0242	-0.0502
111046	ANANDGARH-2 132.00	PUNJAB	0.95	1.005	1	28.0242	10.5337	28.0242	-0.0502
111046	ANANDGARH-2 132.00	PUNJAB	0.95	1.005	1	28.0242	10.5337	28.0242	-0.0502
111067	UBDCPH-3 132.00	PUNJAB	0.993	0.99	1	10.1922	5.1025	10.1922	0
111067	UBDCPH-3 132.00	PUNJAB	0.993	0.99	1	10.1922	5.1025	10.1922	0
111068	UBDCPH-2 132.00	PUNJAB	0.9948	0.9932	1	10.1922	6.8281	10.1922	0
111068	UBDCPH-2 132.00	PUNJAB	0.9948	0.9932	1	10.1922	6.8281	10.1922	0
111086	MUKERI-1 132.00	PUNJAB	1.032	1.026	1	12.0018	2.5682	12.0018	0
111086	MUKERI-1 132.00	PUNJAB	1.032	1.026	1	12.0018	2.5682	12.0018	0
111086	MUKERI-1 132.00	PUNJAB	1.032	1.026	1	12.0018	2.5682	12.0018	0
111087	MUKERI-2 132.00	PUNJAB	1.03	1.0251	1	12.0018	4.1596	12.0018	0
111087	MUKERI-2 132.00	PUNJAB	1.03	1.0251	1	12.0018	4.1596	12.0018	0
111087	MUKERI-2 132.00	PUNJAB	1.03	1.0251	1	12.0018	4.1596	12.0018	0
111089	JOGINDERNAGA132.00	PUNJAB	1.022	1.013	1	10.1922	6.6381	10.1922	0.535
111089	JOGINDERNAGA132.00	PUNJAB	1.022	1.013	1	10.1922	6.6381	10.1922	0.535
111089	JOGINDERNAGA132.00	PUNJAB	1.022	1.013	1	10.1922	6.6381	10.1922	0.535
111089	JOGINDERNAGA132.00	PUNJAB	1.022	1.013	1	10.1915	6.6376	10.1915	0.5349
111089	JOGINDERNAGA132.00	PUNJAB	1.022	1.013	1	45.0067	29.3124	45.0067	2.3623
112004	LEHRAMOHABBA220.00	PUNJAB	1.005	1.016	1	187.6481	24.5839	187.6481	-0.1405
112004	LEHRAMOHABBA220.00	PUNJAB	1.005	1.016	1	187.6481	24.5839	187.6481	-0.1405

112004	LEHRAMOHABBA220 .00	PUNJAB	1.005	1.016	1	187.6481	24.5839	187.6481	-0.1405
112004	LEHRAMOHABBA220 .00	PUNJAB	1.005	1.016	1	187.6481	24.5839	187.6481	-0.1405
112019	RSD 220.00	PUNJAB	1.022	0.99	1	120	-3.4777	120	0
112019	RSD 220.00	PUNJAB	1.022	0.99	1	120	-3.4777	120	0
112029	ROPAR 220.00	PUNJAB	0.95	0.997	1	110.2465	20	110.2465	0.0142
112029	ROPAR 220.00	PUNJAB	0.95	0.997	1	110.2465	20	110.2465	0.0142
112029	ROPAR 220.00	PUNJAB	0.95	0.997	1	110.2465	20	110.2465	0.0142
112029	ROPAR 220.00	PUNJAB	0.95	0.997	1	110.2465	20	110.2465	0.0142
112029	ROPAR 220.00	PUNJAB	0.95	0.997	1	110.2465	20	110.2465	0.0142
112029	ROPAR 220.00	PUNJAB	0.95	0.997	1	110.2465	20	110.2465	0.0142
112066	GOINDWAL 220.00	PUNJAB	1.012	1.011	1	105.0157	30.0821	105.0157	1.2477
112066	GOINDWAL 220.00	PUNJAB	1.012	1.011	1	105.0157	30.0821	105.0157	1.2477
114000	TALWANDISABO400. 00	PUNJAB	1.05	1.03	1	553.4128	38.5267	553.4128	-10
114000	TALWANDISABO400. 00	PUNJAB	1.05	1.03	1	553.4128	38.5267	553.4128	-10
114000	TALWANDISABO400. 00	PUNJAB	1.05	1.03	1	553.4128	38.5267	553.4128	-10
114005	RAJPURA_TH 400.00	PUNJAB	1.03	1.012	1	664.0994	37.0291	664.0994	0
114005	RAJPURA_TH 400.00	PUNJAB	1.03	1.012	1	664.0994	37.0291	664.0994	0
		Total				**5295.4017**	**653.933**	**5295.401**	**-23.68**

HARYANA

Bus Number	Bus Name	Area Name	Base Case	With Recommended Capacitors	In Service	Base Case		With Recommended Capacitors	
			VSched (pu)	VSched (pu)		PGen (MW) (+export/-import)	QGen (MVAr) (+export /-import)	PGen (MW) (+export/-import)	QGen (MVAr) (+export /-import)
121111	GENCO 132.00	HARYANA	1	1	1	10	6	10	0.3875
122023	PTPS_5-8 220.00	HARYANA	1.0141	1.0141	1	160.1061	2.987	160.1061	-0.4943
122023	PTPS_5-8 220.00	HARYANA	1.0141	1.0141	1	160.104	2.9869	160.104	-0.4943
122023	PTPS_5-8 220.00	HARYANA	1.0141	1.0141	1	191	3.5633	191	-0.5896
122023	PTPS_5-8 220.00	HARYANA	1.0141	1.0141	1	230.7651	4.3052	230.7651	-0.7124
122029	YTPP_2 220.00	HARYANA	1.0212	1.0212	1	261.0034	16.2376	261.0034	-5.1824
122029	YTPP_2 220.00	HARYANA	1.0212	1.0212	1	261	16.2374	261	-5.1824
124001	KHEDAR 400.00	HARYANA	1.0345	1.0345	1	600.0002	66.6434	600.0002	-9.4817
124004	JHAJAR_CLP 400.00	HARYANA	1.038	1.038	1	630.0002	-13.2601	630.0002	-37.8157
		TOTAL	**9.1713**	**9.1713**	**9**	**2503.979**	**105.700**	**2503.979**	**-59.5653**

RAJASTHAN

Bus Number	Bus Name	Area Name	Base Case	With Recommended Capacitors	In Service	Base Case		With Recommended Capacitors	
			VSched (pu)	VSched (pu)		PGen (MW) (+export/-import)	QGen (MVAr) (+export /-import)	PGen (MW) (+export/-import)	QGen (MVAr) (+export /-import)
131034	BAORI1 132.00	Rajasthan	1.005	1.005	1	8.9431	-6	8.9431	9.3181

131034	BAORI1 132.00	Rajasthan	1.005	1.005	1	50.68	-6	50.68	10
131073	CHAMU 132.00	Rajasthan	0.99	0.99	1	8.9431	3.4906	8.9431	4.1002
131084	DALOT 132.00	Rajasthan	0.985	0.985	1	8.9431	1.9492	8.9431	-10
131084	DALOT 132.00	Rajasthan	0.985	0.985	1	50.68	11.0458	50.68	-10
131109	JAISALMER 132.00	Rajasthan	1.03	1.03	1	8.9431	-10	8.9431	-10
131116	RAMGARH21 132.00	Rajasthan	1.05	1.03	1	10.5	2.0211	10.5	-0.0335
131116	RAMGARH21 132.00	Rajasthan	1.05	1.03	1	71.74	13.809	71.74	-0.2289
131116	RAMGARH21 132.00	Rajasthan	1.05	1.03	1	39	7.507	39	-0.1245
131249	KHOOD1 132.00	Rajasthan	1.026	1.026	1	1.7999	0	1.7999	3
131331	OSIAN 132.00	Rajasthan	0.98	0.98	1	13.4274	0.542	13.4274	-10
131332	PSNO8 132.00	Rajasthan	1.01	1.01	1	18.8063	0.2084	18.8063	0.5052
131332	PSNO8 132.00	Rajasthan	1.01	1.01	1	106.428	1.1794	106.428	2.859
131353	PRATAPGA 132.00	Rajasthan	1.01	1.01	1	17.9113	0.2938	17.9113	-0.2127
131353	PRATAPGA 132.00	Rajasthan	1.01	1.01	1	101.36	1.6629	101.36	-1.2038
131353	PRATAPGA 132.00	Rajasthan	1.01	1.01	1	101.36	1.6629	101.36	-1.2038
131353	PRATAPGA 132.00	Rajasthan	1.01	1.01	1	17.9113	0.2938	17.9113	-0.2127
131353	PRATAPGA 132.00	Rajasthan	1.01	1.01	1	17.9113	0.2938	17.9113	-0.2127
131355	PS-5 132.00	Rajasthan	1	1	1	1.4655	-1	1.4655	-1
131421	SHEO1 132.00	Rajasthan	1.036	1.036	1	13.4274	-9.0145	13.4274	0.8328
132021	DHOLPU-4 220.00	Rajasthan	0.988	1	1	0	-33	0	-10
132027	MADA-SUZ 220.00	Rajasthan	1.048	1.0463	1	107.4487	15.9852	107.4487	-2.4217
132037	AMARSAGA 220.00	Rajasthan	1.047	1.047	1	67.1515	2.931	67.1515	10.0951
132037	AMARSAGA 220.00	Rajasthan	1.047	1.047	1	89.527	3.9076	89.527	13.4588
132037	AMARSAGA 220.00	Rajasthan	1.047	1.047	1	89.527	3.9076	89.527	13.4588
132037	AMARSAGA 220.00	Rajasthan	1.047	1.047	1	67.1515	2.931	67.1515	10.0951
132038	TINWARI 220.00	Rajasthan	1	1	1	179.914	-10	179.914	-10
132040	BHOPALGA 220.00	Rajasthan	1	1	1	17.9113	-5	17.9113	-5
132042	BARSINGS 220.00	Rajasthan	1.045	1.028	1	112.29	0.2065	112.29	-10.5
132057	SURATH-2 220.00	Rajasthan	1.05	1.038	1	217.55	7.2649	217.55	-14.1762
132061	KTPS 220.00	Rajasthan	1.03	1.0336	1	74.62	-7.1817	74.62	-1.6544
132061	KTPS 220.00	Rajasthan	1.03	1.0336	1	188.8701	-18.1776	188.8701	-4.1874
132061	KTPS 220.00	Rajasthan	1.03	1.0336	1	207.0501	-19.9274	207.0501	-4.5904
132061	KTPS 220.00	Rajasthan	1.03	1.0336	1	180.03	-17.3268	180.03	-3.9914
132077	RAJWEST 220.00	Rajasthan	1.05	1.0495	1	134.13	-29.0094	134.13	-4.6852
132079	AKAL-2 220.00	Rajasthan	1.045	1.045	1	179.0687	-10	179.0687	2.1725
132079	AKAL-2 220.00	Rajasthan	1.045	1.045	1	179.0687	-10	179.0687	2.1725
132079	AKAL-2 220.00	Rajasthan	1.045	1.045	1	179.0687	-10	179.0687	2.1725
132079	AKAL-2 220.00	Rajasthan	1.045	1.045	1	89.527	-10	89.527	1.0862
132113	RAMGARH 220.00	Rajasthan	1.0403	1.035	1	49.7209	12.3073	49.7209	0
132159	RAMGARH_GSS 220.00	Rajasthan	1.04	1.0362	1	87.2537	-0.6044	87.2537	0
132159	RAMGARH_GSS 220.00	Rajasthan	1.04	1.0362	1	39.7711	-0.2755	39.7711	0

132159	RAMGARH_GSS 220.00	Rajasthan	1.04	1.0362	1	87.2537	-0.6044	87.2537	0
132171	KTPS_S 220.00	Rajasthan	1.04	1.038	1	180.83	-21.7314	180.83	-4.7066
132171	KTPS_S 220.00	Rajasthan	1.04	1.038	1	181.8501	-21.854	181.8501	-4.7331
134007	CHABRA-4 400.00	Rajasthan	1.05	1.04	1	249.0901	0	249.0901	0
134007	CHABRA-4 400.00	Rajasthan	1.05	1.04	1	229.17	0	229.17	-2
134007	CHABRA-4 400.00	Rajasthan	1.05	1.04	1	235.94	-23.83	235.94	-2
134008	KALISI-4 400.00	Rajasthan	1.05	1.037	1	505.0001	0	505.0001	0
134009	RAJWEST 400.00	Rajasthan	1.05	1.05	1	130.71	-40.5	130.71	-3.1888
134009	RAJWEST 400.00	Rajasthan	1.05	1.05	1	132.67	0	132.67	-3.2366
134009	RAJWEST 400.00	Rajasthan	1.05	1.05	1	138.31	0	138.31	-3.3742
134009	RAJWEST 400.00	Rajasthan	1.05	1.05	1	133.64	0	133.64	-3.2602
134009	RAJWEST 400.00	Rajasthan	1.05	1.05	1	137.87	0	137.87	-3.3634
134010	KAWAI 400.00	Rajasthan	1.05	1.03	1	557.7802	-31.59	557.7802	0
134018	SURATG-4 400.00	Rajasthan	1.05	1.0472	1	213.61	-10.9	213.61	-1.5132
134018	SURATG-4 400.00	Rajasthan	1.05	1.0472	1	246.3	-10.9	246.3	-1.7448
134018	SURATG-4 400.00	Rajasthan	1.05	1.0472	1	227.7401	-10.9	227.7401	-1.6133
134018	SURATG-4 400.00	Rajasthan	1.05	1.0472	1	250.5701	-10.9	250.5701	-1.7751
134034	CHHABRA_SC 400.00	Rajasthan	1.05	1.0458	1	386.0001	-10	386.0001	-6.9988
134034	CHHABRA_SC 400.00	Rajasthan	1.05	1.0458	1	4.77	0	4.77	-0.0865
		TOTAL	**62.9713**	**62.8032**	**61**	**7435.9353**	**-310.826**	**7435.935**	**-73.9071**

DELHI

Bus Number	Bus Name	Area Name	Base Case	With Recommended Capacitors	In Service	Base Case		With Recommended Capacitors	
			VSched (pu)	VSched (pu)		PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)	PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)
140001	DEL_GAS6 66.000	DELHI	0.91	0.91	1	22	-1	22	-1
140001	DEL_GAS6 66.000	DELHI	0.91	0.91	1	22	-1	22	-1
140001	DEL_GAS6 66.000	DELHI	0.91	0.91	1	22	-1	22	-1
140001	DEL_GAS6 66.000	DELHI	0.91	0.91	1	22	-1	22	-1
140001	DEL_GAS6 66.000	DELHI	0.91	0.91	1	19	-2	19	-2
140001	DEL_GAS6 66.000	DELHI	0.91	0.91	1	19	-2	19	-2
142003	PRAGATI_BDR 220.00	DELHI	1.02	1.03	1	83	-8.7171	83	-2.4643
142003	PRAGATI_BDR 220.00	DELHI	1.02	1.03	1	83	-8.7171	83	-2.4643
142003	PRAGATI_BDR 220.00	DELHI	1.02	1.03	1	99	-10.3975	99	-2.9394
142045	BADARPR2 220.00	DELHI	1.017	1.0203	1	161	-0.525	161	-8
142045	BADARPR2 220.00	DELHI	1.017	1.0203	1	162	-0.5282	162	-8
144000	BAWANA-G 400.00	DELHI	1.005	1.005	1	121	0	121	0
144000	BAWANA-G 400.00	DELHI	1.005	1.005	1	146	0	146	0
144000	BAWANA-G 400.00	DELHI	1.005	1.005	1	125	0	125	0
144000	BAWANA-G 400.00	DELHI	1.005	1.005	1	168	0	168	0
		TOTAL	**14.574**	**14.6106**	**15**	**1274**	**-36.8849**	**1274**	**-31.868**

UTTARPRADESH									
Bus Number	Bus Name	Area Name	Base Case	With Recommended Capacitors	In Service	Base Case		With Recommended Capacitors	
			VSched (pu)	VSched (pu)		PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)	PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)
151050	OBRAH1 132.00	UTTARPRA	1.008	1.008	1	27.1154	-9.9	27.1154	-9.9
151050	OBRAH1 132.00	UTTARPRA	1.008	1.008	1	27.1154	-9.9	27.1154	-9.9
151050	OBRAH1 132.00	UTTARPRA	1.008	1.008	1	23.3752	-9.9	23.3752	-9.9
151065	RIHND1 132.00	UTTARPRA	1.03	1.03	1	40.6736	6.7049	40.6736	2.2046
151065	RIHND1 132.00	UTTARPRA	1.03	1.03	1	40.6736	6.7049	40.6736	2.2046
151065	RIHND1 132.00	UTTARPRA	1.03	1.03	1	40.6736	6.7049	40.6736	2.2046
151065	RIHND1 132.00	UTTARPRA	1.03	1.03	1	40.6736	6.7049	40.6736	2.2046
151065	RIHND1 132.00	UTTARPRA	1.03	1.03	1	31.0031	5.1108	31.0031	1.6805
151065	RIHND1 132.00	UTTARPRA	1.03	1.03	1	31.0031	5.1108	31.0031	1.6805
151237	KHAMBAKH 132.00	UTTARPRA	0.992	0.992	1	38.0117	-13.5	38.0117	-5.6953
151237	KHAMBAKH 132.00	UTTARPRA	0.992	0.992	1	38.0117	-13.5	38.0117	-5.6953
151254	UTRAULA 132.00	UTTARPRA	1.025	1.025	1	44.3481	-5.954	44.3481	-6.5917
151254	UTRAULA 132.00	UTTARPRA	1.025	1.025	1	44.3481	-5.954	44.3481	-6.5917
151290	MAQSUDPR 132.00	UTTARPRA	0.98	0.98	1	44.3481	-13.5	44.3481	-13.5
151290	MAQSUDPR 132.00	UTTARPRA	0.98	0.98	1	44.3481	-13.5	44.3481	-13.5
151293	BARKHER 132.00	UTTARPRA	0.98	1.013	1	44.3481	-13.5	44.3481	-1.4033
151293	BARKHER 132.00	UTTARPRA	0.98	1.013	1	44.3481	-13.5	44.3481	-1.4033
151295	KUNDARK 132.00	UTTARPRA	1	1	1	44.3481	-13.5	44.3481	-13.5
151295	KUNDARK 132.00	UTTARPRA	1	1	1	44.3481	-13.5	44.3481	-13.5
152021	ROSA-TP1 220.00	UTTARPRA	1.04	1	1	252.492	-7.0566	252.492	-110
152021	ROSA-TP1 220.00	UTTARPRA	1.04	1	1	252.492	-7.0566	252.492	-110
152038	KHARA2 220.00	UTTARPRA	0.93	0.93	1	18.9831	-7.2	18.9831	-7.2
152038	KHARA2 220.00	UTTARPRA	0.93	0.93	1	18.9831	-7.2	18.9831	-7.2
152038	KHARA2 220.00	UTTARPRA	0.93	0.93	1	18.9831	-7.2	18.9831	-7.2
152047	HARDUGN2 220.00	UTTARPRA	0.96	1.0315	1	250	-75	250	14.7854
152053	PARICHA2 220.00	UTTARPRA	1.01	1.015	1	148	8.0545	148	-2.0868
152053	PARICHA2 220.00	UTTARPRA	1.01	1.015	1	148	8.0545	148	-2.0868
152061	OBRA2 220.00	UTTARPRA	1.013	1.013	1	65.6889	-28.2	65.6889	-15
152061	OBRA2 220.00	UTTARPRA	1.013	1.013	1	44.4663	-15	44.4663	-15
152073	TANDA2 220.00	UTTARPRA	1.02	1.03	1	92	-21.6162	92	0.7733
152073	TANDA2 220.00	UTTARPRA	1.02	1.03	1	92	-21.6162	92	0.7733
152073	TANDA2 220.00	UTTARPRA	1.02	1.03	1	92	-21.6162	92	0.7733
154005	PARICHHA 400.00	UTTARPRA	1.015	1.015	1	175.1691	-9.7247	175.1691	-10
154012	VISHNU4 400.00	UTTARPRA	1.04	1.045	1	86	9.0649	86	-20.332
154012	VISHNU4 400.00	UTTARPRA	1.04	1.045	1	86	9.0649	86	-20.332

154012	VISHNU4 400.00	UTTARPRA	1.04	1.045	1	86	9.0649	86	-20.332
154014	ANPARA4 400.00	UTTARPRA	1.032	1.035	1	175.8442	-10.8053	175.8442	-1.2305
154014	ANPARA4 400.00	UTTARPRA	1.032	1.035	1	175.8442	-10.8053	175.8442	-1.2305
154014	ANPARA4 400.00	UTTARPRA	1.032	1.035	1	175.8442	-10.8053	175.8442	-1.2305
154014	ANPARA4 400.00	UTTARPRA	1.032	1.035	1	425.4621	-26.144	425.4621	-2.9772
154014	ANPARA4 400.00	UTTARPRA	1.032	1.035	1	425.4621	-26.144	425.4621	-2.9772
154018	OBRA4 400.00	UTTARPRA	1.022	1.022	1	167.7594	-60	167.7594	-20
154065	ALAKHNANDA 400.00	UTTARPRA	1.02	1.02	1	82.5	-24.75	82.5	-5
154065	ALAKHNANDA 400.00	UTTARPRA	1.02	1.02	1	82.5	-24.75	82.5	-5
154065	ALAKHNANDA 400.00	UTTARPRA	1.02	1.02	1	82.5	-24.75	82.5	-5
154065	ALAKHNANDA 400.00	UTTARPRA	1.02	1.02	1	82.5	-24.75	82.5	-5
157000	ANPARAC 765.00	UTTARPRA	1.0271	1.03	1	491.1509	-54.1508	491.1509	-81.6936
157000	ANPARAC 765.00	UTTARPRA	1.0271	1.03	1	491.1509	-54.1508	491.1509	-81.6936
157001	ANPARA-D 765.00	UTTARPRA	1.0271	1	1	444.6634	0	444.6634	0
157001	ANPARA-D 765.00	UTTARPRA	1.0271	1	1	461.1331	-107.913	461.1331	0
157009	LALITPUR-TPS765.00	UTTARPRA	1.05	1.045	1	586.8212	-26.0197	586.8212	-32.7615
157009	LALITPUR-TPS765.00	UTTARPRA	1.05	1.045	1	586.8212	-26.0197	586.8212	-32.7615
157009	LALITPUR-TPS765.00	UTTARPRA	1.05	1.045	1	586.8212	-26.0197	586.8212	-32.7615
157014	BARA-TPS 765.00	UTTARPRA	1.02	1.0155	1	587.1578	-5.1081	587.1578	0.0485
157014	BARA-TPS 765.00	UTTARPRA	1.02	1.0155	1	587.1578	-5.1081	587.1578	0.0485
157014	BARA-TPS 765.00	UTTARPRA	1.02	1.0155	1	587.1578	-5.1081	587.1578	0.0485
		TOTAL	**56.8094**	**56.86**	**56**	**9946.6239**	**-851.051**	**9946.623**	**-739.737**

UTTRAKHAND

Bus Number	Bus Name	Area Name	Base Case	With Recommended Capacitors	In Service	Base Case		With Recommended Capacitors	
			VSched (pu)	VSched (pu)		PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)	PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)
161007	DHAKRANI 132.00	UTTARAKH	0.95	0.95	1	3.9379	-3.0267	3.9379	-3.375
161007	DHAKRANI 132.00	UTTARAKH	0.95	0.95	1	3.9379	-3.0267	3.9379	-3.375
161007	DHAKRANI 132.00	UTTARAKH	0.95	0.95	1	3.9379	-3.0267	3.9379	-3.375
161013	KHATIMAH 132.00	UTTARAKH	0.96	0.96	1	3.2256	-4.14	3.2256	0
161031	KALAGARH 132.00	UTTARAKH	1.005	1.015	1	60	-17.0155	60	2.1159
161031	KALAGARH 132.00	UTTARAKH	1.005	1.015	1	60	-17.0155	60	2.1159
161035	CHILLA-H 132.00	UTTARAKH	0.94	0.9935	1	20.1739	-10.8	20.1739	-2.6555
161035	CHILLA-H 132.00	UTTARAKH	0.94	0.9935	1	24.2019	-10.8	24.2019	-3.1858
161037	KULHALHE 132.00	UTTARAKH	0.949	0.949	1	6.6133	-2.4317	6.6133	0
161037	KULHALHE 132.00	UTTARAKH	0.949	0.949	1	6.6133	-2.4317	6.6133	0
161037	KULHALHE 132.00	UTTARAKH	0.949	0.949	1	6.6133	-2.4317	6.6133	0
161039	DHALIPUR 132.00	UTTARAKH	0.95	1.001	1	12.6332	-2.4221	12.6332	1.2469

161039	DHALIPUR 132.00	UTTARAKH	0.95	1.001	1	12.6332	-2.4221	12.6332	1.2469
161039	DHALIPUR 132.00	UTTARAKH	0.95	1.001	1	12.6332	-2.4221	12.6332	1.2469
161056	LAKSHMISUGAR132.00	UTTARAKH	0.95	0.95	1	14.0447	10	14.0447	-1
162000	MANERI_1 220.00	UTTARAKH	0.9901	1.0351	1	20.1739	-9	20.1739	1.7222
162000	MANERI_1 220.00	UTTARAKH	0.9901	1.0351	1	20.1739	-9	20.1739	1.7222
162006	BHILANGA 220.00	UTTARAKH	0.985	0.985	1	2.7042	-2.4	2.7042	-2.4
162006	BHILANGA 220.00	UTTARAKH	0.985	0.985	1	2.7042	-2.4	2.7042	-2.4
162006	BHILANGA 220.00	UTTARAKH	0.985	0.985	1	2.7042	-2.4	2.7042	-2.4
162011	GAMA INFRA 220.00	UTTARAKH	1.0031	0.98	1	64.434	-12.5401	64.434	0
162011	GAMA INFRA 220.00	UTTARAKH	1.0031	0.98	1	35.2239	-6.8552	35.2239	0
162013	MANERI_2 220.00	UTTARAKH	0.992	1.035	1	68	-13.8456	68	-1.4617
162013	MANERI_2 220.00	UTTARAKH	0.992	1.035	1	68	-13.8456	68	-1.4617
162013	MANERI_2 220.00	UTTARAKH	0.992	1.035	1	68	-13.8456	68	-1.4617
162014	CHIBRO-H 220.00	UTTARAKH	0.985	1.02	1	34.0552	6.2513	34.0552	1.8155
162014	CHIBRO-H 220.00	UTTARAKH	0.985	1.02	1	34.0552	6.2513	34.0552	1.8155
162014	CHIBRO-H 220.00	UTTARAKH	0.985	1.02	1	34.0552	6.2513	34.0552	1.8155
162014	CHIBRO-H 220.00	UTTARAKH	0.985	1.02	1	13.1077	2.4061	13.1077	0.6988
162016	KHODRIHE 220.00	UTTARAKH	0.956	1.0237	1	13.4476	-9	13.4476	0
162016	KHODRIHE 220.00	UTTARAKH	0.956	1.0237	1	13.4476	-9	13.4476	0
162016	KHODRIHE 220.00	UTTARAKH	0.956	1.0237	1	13.4476	-9	13.4476	0
162016	KHODRIHE 220.00	UTTARAKH	0.956	1.0237	1	7.0037	-9	7.0037	0
162022	SHRAVANTI 220.00	UTTARAKH	1.005	1.005	1	61	1.5099	61	-1.4255
162022	SHRAVANTI 220.00	UTTARAKH	1.005	1.005	1	61	1.5099	61	-1.4255
162022	SHRAVANTI 220.00	UTTARAKH	1.005	1.005	1	61	1.5099	61	-1.4255
162022	SHRAVANTI 220.00	UTTARAKH	1.005	1.005	1	61	1.5099	61	-1.4255
		TOTAL	**36.0484**	**36.912**	**37**	**1009.9374**	**-168.345**	**1009.937**	**-16.6912**

HIMACHAL

Bus Number	Bus Name	Area Name	Base Case	With Recommended Capacitors	In Service	Base Case		With Recommended Capacitors	
			VSched (pu)	VSched (pu)		PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)	PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)
171001	BAJAURA1 132.00	HIMACHAL	1.006	1.006	1	4.5929	-1.35	4.5929	0
171002	MALANA1 132.00	HIMACHAL	1.02	1.035	1	43.8881	0.8471	43.8881	0
171002	MALANA1 132.00	HIMACHAL	1.02	1.035	1	43.8881	0.8471	43.8881	0
171003	KANGRA1 132.00	HIMACHAL	1	0.996	1	10.7169	6.3	10.7169	0
171003	KANGRA1 132.00	HIMACHAL	1	0.996	1	12.2478	7.2	12.2478	0
171007	BASSI1 132.00	HIMACHAL	1.015	1.014	1	15.3098	-4.5	15.3098	0
171007	BASSI1 132.00	HIMACHAL	1.015	1.014	1	15.3098	-4.5	15.3098	0
171007	BASSI1 132.00	HIMACHAL	1.015	1.014	1	15.3098	-4.5	15.3098	0
171007	BASSI1 132.00	HIMACHAL	1.015	1.014	1	15.3098	-4.5	15.3098	0
171009	GIRI1 132.00	HIMACHAL	0.95	0.97	1	30.6196	6.6449	30.6196	0

171009	GIRI1 132.00	HIMACHAL	0.95	0.97	1	30.6196	6.6449	30.6196	0
171012	PALAMPUR 132.00	HIMACHAL	0.972	1	1	12.2478	-3.6	12.2478	0
171012	PALAMPUR 132.00	HIMACHAL	0.972	1	1	6.1239	-1.8	6.1239	0
171016	LARJI1 132.00	HIMACHAL	1.02	1.034	1	42.8674	5.5843	42.8674	0
171016	LARJI1 132.00	HIMACHAL	1.02	1.034	1	42.8674	5.5843	42.8674	0
171016	LARJI1 132.00	HIMACHAL	1.02	1.034	1	42.8674	5.5843	42.8674	0
171028	MALAN-II 132.00	HIMACHAL	1.034	1.04	1	30.6196	-0.7992	30.6196	0
171028	MALAN-II 132.00	HIMACHAL	1.034	1.04	1	51.0326	-1.3319	51.0326	0
172012	BHABA2 220.00	HIMACHAL	1.02	1.03	1	40.8261	8.3345	40.8261	-0.0472
172012	BHABA2 220.00	HIMACHAL	1.02	1.03	1	40.8261	8.3345	40.8261	-0.0472
172012	BHABA2 220.00	HIMACHAL	1.02	1.03	1	40.8261	8.3345	40.8261	-0.0472
174000	BASPA4 400.00	HIMACHAL	1.042	1.0496	1	102.0652	-12.2803	102.0652	-15
174000	BASPA4 400.00	HIMACHAL	1.042	1.0496	1	102.0652	-12.2803	102.0652	-15
174000	BASPA4 400.00	HIMACHAL	1.042	1.0496	1	102.0652	-12.2803	102.0652	-15
174015	SAINJ 400.00	HIMACHAL	1.038	1.01	1	43.8881	-15	43.8881	-15
		TOTAL	**25.302**	**25.4948**	**25**	**939.0003**	**-8.4816**	**939.0003**	**-60.1416**
JAMU-KASHMIR									
Bus Number	Bus Name	Area Name	Base Case	With Recommended Capacitors	In Service	Base Case		With Recommended Capacitors	
			VSched (pu)	VSched (pu)		PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)	PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)
181004	LOWERJHELUM1132.00	JAMUKASH	0.98	0.98	1	13.39	-2.1714	13.39	0
181004	LOWERJHELUM1132.00	JAMUKASH	0.98	0.98	1	13.39	-2.1714	13.39	0
181004	LOWERJHELUM1132.00	JAMUKASH	0.98	0.98	1	13.39	-2.1714	13.39	0
181008	UDAMPUR1 132.00	JAMUKASH	0.99	0.97	1	4.2714	-1.38	4.2714	0
181008	UDAMPUR1 132.00	JAMUKASH	0.99	0.97	1	4.2714	-1.38	4.2714	0
181008	UDAMPUR1 132.00	JAMUKASH	0.99	0.97	1	4.2714	-1.38	4.2714	0
181008	UDAMPUR1 132.00	JAMUKASH	0.99	0.97	1	4.2714	-1.38	4.2714	0
181019	UPPERSIND 132.00	JAMUKASH	1.005	0.985	1	8.8	-2.8006	8.8	0
181019	UPPERSIND 132.00	JAMUKASH	1.005	0.985	1	20	-6.365	20	0
181019	UPPERSIND 132.00	JAMUKASH	1.005	0.985	1	20	-6.365	20	0
184000	BAGLIHAR4 400.00	JAMUKASH	1.05	1.038	1	126.0064	0	126.0064	-20
184000	BAGLIHAR4 400.00	JAMUKASH	1.05	1.038	1	125.1521	0	125.1521	-20
184000	BAGLIHAR4 400.00	JAMUKASH	1.05	1.038	1	125.1521	0	125.1521	-20
184008	BAGLIHAR-2 400.00	JAMUKASH	1.05	1.05	1	126.0064	0	126.0064	-39
184008	BAGLIHAR-2 400.00	JAMUKASH	1.05	1.05	1	125.1521	0	125.1521	-39
184008	BAGLIHAR-2 400.00	JAMUKASH	1.05	1.05	1	125.1521	0	125.1521	-39
		TOTAL			**16**	**858.6768**	**-27.5648**	**858.6768**	**-177**

ANNEXURE-III-B

Active and Reactive generation profile of ISGS

SINGRAUL									
Bus Number	Bus Name	Area Name	Base Case	With Recommended Capacitors	In Service	Base Case		With Recommended Capacitors	
			VSched (pu)	VSched (pu)		PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)	PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)
154056	SINGRL4 400.00	SINGRAUL	1.032	1.0324	1	118.0469	-4.7352	118.0469	-4.965
154056	SINGRL4 400.00	SINGRAUL	1.032	1.0324	1	118.0469	-4.7352	118.0469	-4.965
154056	SINGRL4 400.00	SINGRAUL	1.032	1.0324	1	118.0469	-4.7352	118.0469	-4.965
154056	SINGRL4 400.00	SINGRAUL	1.032	1.0324	1	118.0469	-4.7352	118.0469	-4.965
154056	SINGRL4 400.00	SINGRAUL	1.032	1.0324	1	117.82	-4.7261	117.82	-4.9555
154056	SINGRL4 400.00	SINGRAUL	1.032	1.0324	1	284.9963	-11.432	284.9963	-11.9869
154056	SINGRL4 400.00	SINGRAUL	1.032	1.0324	1	284.9963	-11.432	284.9963	-11.9869
		TOTAL	**7.224**	**7.2268**	**7**	**1160.0002**	**-46.5309**	**1160.000**	**-48.7893**
RIHAND-G									
Bus Number	Bus Name	Area Name	Base Case	With Recommended Capacitors	In Service	Base Case		With Recommended Capacitors	
			VSched (pu)	VSched (pu)		PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)	PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)
154057	RIHAND-G 400.00	RIHAND-G	1.03	1.0307	1	454	-8.4881	454	-1.4418
154057	RIHAND-G 400.00	RIHAND-G	1.03	1.0307	1	454	-8.4881	454	-1.4418
154057	RIHAND-G 400.00	RIHAND-G	1.03	1.0307	1	507	-9.479	507	-1.6101
154057	RIHAND-G 400.00	RIHAND-G	1.03	1.0307	1	507	-9.479	507	-1.6101
		TOTAL	**4.12**	**4.1228**	**4**	**1922**	**-35.9342**	**1922**	**-6.1038**
DADRI_C									
Bus Number	Bus Name	Area Name	Base Case	With Recommended Capacitors	In Service	Base Case		With Recommended Capacitors	
			VSched (pu)	VSched (pu)		PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)	PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)
152104	DADRI_TH 220.00	DADRI_C	1.02	1.033	1	176.9761	-1.5675	176.9761	-4.1836
152104	DADRI_TH 220.00	DADRI_C	1.02	1.033	1	176.9761	-1.5675	176.9761	-4.1836
152104	DADRI_TH 220.00	DADRI_C	1.02	1.033	1	176.9761	-1.5675	176.9761	-4.1836
152104	DADRI_TH 220.00	DADRI_C	1.02	1.033	1	177.0719	-1.5683	177.0719	-4.1859
		TOTAL	**4.08**	**4.132**	**4**	**708.0002**	**-6.2708**	**708.0002**	**-16.7367**
DADR-NCR									
Bus Number	Bus Name	Area Name	Base Case	With Recommended Capacitors	In Service	Base Case		With Recommended Capacitors	
			VSched (pu)	VSched (pu)		PGen (MW)	QGen (MVAr)	PGen (MW)	QGen (MVAr)

						(+export/-import)	(+export/-import)	(+export/-import)	(+export/-import)
154061	DADR-NCR 400.00	DADR-NCR	1.021	1.029	1	470	-49.295	470	-48.0445
154061	DADR-NCR 400.00	DADR-NCR	1.021	1.029	1	470	-49.295	470	-48.0445
		TOTAL	**2.042**	**2.058**	**2**	**940**	**-98.59**	**940**	**-96.089**

UNCHAHAR

Bus Number	Bus Name	Area Name	Base Case	With Recommended Capacitors	In Service	Base Case		With Recommended Capacitors	
			VSched (pu)	VSched (pu)		PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)	PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)
152127	UNCHAHR2 220.00	UNCHAHAR	1.03	1.03	1	144.8	-20.8691	144.8	-22.9386
152127	UNCHAHR2 220.00	UNCHAHAR	1.03	1.03	1	144.8	-20.8691	144.8	-22.9386
152127	UNCHAHR2 220.00	UNCHAHAR	1.03	1.03	1	144.8	-20.8691	144.8	-22.9386
152127	UNCHAHR2 220.00	UNCHAHAR	1.03	1.03	1	144.8	-20.8691	144.8	-22.9386
152127	UNCHAHR2 220.00	UNCHAHAR	1.03	1.03	1	144.8	-20.8691	144.8	-22.9386
		TOTAL	**5.15**	**5.15**	**5**	**724**	**-104.3455**	**724**	**-114.693**

IGSTPS

Bus Number	Bus Name	Area Name	Base Case	With Recommended Capacitors	In Service	Base Case		With Recommended Capacitors	
			VSched (pu)	VSched (pu)		PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)	PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)
124023	JHAJJAR4 400.00	IGSTPS	1.03	1.03	1	374	-21.95	374	-22.9849
124023	JHAJJAR4 400.00	IGSTPS	1.03	1.03	1	374	-21.95	374	-22.9849
124023	JHAJJAR4 400.00	IGSTPS	1.03	1.03	1	374	-21.95	374	-22.9849
		TOTAL	**3.09**	**3.09**	**3**	**1122**	**-65.85**	**1122**	**-68.9547**

SHRECEM

Bus Number	Bus Name	Area Name	Base Case	With Recommended Capacitors	In Service	Base Case		With Recommended Capacitors	
			VSched (pu)	VSched (pu)		PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)	PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)
134031	SHRECEM 400.00	SHRE_CEM	1	1	1	75	0	75	-50
134031	SHRECEM 400.00	SHRE_CEM	1	1	1	75	0	75	-50
		TOTAL	**2**	**2**	**2**	**150**	**0**	**150**	**-100**

DADRI-G

Bus Number	Bus Name	Area Name	Base Case	With Recommended Capacitors	In Service	Base Case		With Recommended Capacitors	
			VSched (pu)	VSched (pu)		PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)	PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)
152103	DADRI_G2 220.00	DADRI-G	1.008	1.008	1	115	-39.057	115	-39.057
152103	DADRI_G2 220.00	DADRI-G	1.008	1.008	1	115	-46.353	115	-46.353
		TOTAL	**2.016**	**2.016**	**2**	**230**	**-85.41**	**230**	**-85.41**

AURAIYA

Bus Number	Bus Name	Area Name	Base Case	With Recommended Capacitors	In Service	Base Case		With Recommended Capacitors	
			VSched (pu)	VSched (pu)		PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)	PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)
154060	AURYA2 220.00	AURAIYA	1.005	1.005	1	107.85	-33.357	107.85	-33.357
		TOTAL	**1.005**	**1.005**	**1**	**107.85**	**-33.357**	**107.85**	**-33.357**
NAPS									
Bus Number	Bus Name	Area Name	Base Case	With Recommended Capacitors		Base Case		With Recommended Capacitors	
			VSched (pu)	VSched (pu)	In Service	PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)	PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)
152105	NAPP2 220.00	NAPS	0.95	0.95	1	201.3	-66	201.3	-66
152105	NAPP2 220.00	NAPS	0.95	0.95	1	201.3	-66	201.3	-66
		TOTAL	**0.95**	**1.9**	**2**	**402.6**	**-132**	**402.6**	**-132**
RAPS-B									
Bus Number	Bus Name	Area Name	Base Case	With Recommended Capacitors	In Service	Base Case		With Recommended Capacitors	
			VSched (pu)	VSched (pu)		PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)	PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)
132146	RAPS_B2 220.00	RAPS-B	1.042	1.0453	1	201.3	6.1664	201.3	-3.6769
132146	RAPS_B2 220.00	RAPS-B	1.042	1.0453	1	201.3	6.1664	201.3	-3.6769
		TOTAL	**2.084**	**2.0906**	**2**	**402.6**	**12.3328**	**402.6**	**-7.3538**
RAPS-C									
Bus Number	Bus Name	Area Name	Base Case	With Recommended Capacitors	In Service	Base Case		With Recommended Capacitors	
			VSched (pu)	VSched (pu)		PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)	PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)
134030	RAPS_C4 400.00	RAPS-C	1.046	1.0416	1	201.3	2.2514	201.3	-5.02
134030	RAPS_C4 400.00	RAPS-C	1.046	1.0416	1	201.3	2.2514	201.3	-5.02
		TOTAL	**2.092**	**2.0832**	**2**	**402.6**	**4.5028**	**402.6**	**-10.04**
CHAMER-1									
Bus Number	Bus Name	Area Name	Base Case	With Recommended Capacitors	In Service	Base Case		With Recommended Capacitors	
			VSched (pu)	VSched (pu)		PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)	PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)
174001	CHAMERA-1 400.00	CHAMER-1	1.05	1.045	1	180	15.0979	180	0
174001	CHAMERA-1 400.00	CHAMER-1	1.05	1.045	1	180	15.0979	180	0
174001	CHAMERA-1 400.00	CHAMER-1	1.05	1.045	1	180	15.0979	180	0
		TOTAL	**3.15**	**3.135**	**3**	**540**	**45.2937**	**540**	**0**
CHAMER-2									

Bus Number	Bus Name	Area Name	Base Case	With Recommended Capacitors	In Service	Base Case		With Recommended Capacitors	
			VSched (pu)	VSched (pu)		PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)	PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)
174002	CHAMERA-2 400.00	CHAMER-2	1.05	1.04	1	95	-20	95	-20
174002	CHAMERA-2 400.00	CHAMER-2	1.05	1.04	1	95	-20	95	-20
174002	CHAMERA-2 400.00	CHAMER-2	1.05	1.04	1	95	-20	95	-20
		TOTAL	**3.15**	**3.12**	**3**	**285**	**-60**	**285**	**-60**
CHAMER-3									
Bus Number	Bus Name	Area Name	Base Case	With Recommended Capacitors	In Service	Base Case		With Recommended Capacitors	
			VSched (pu)	VSched (pu)		PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)	PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)
172020	CHAMER-3 220.00	CHAMER-3	1.05	1.05	1	76.6667	-20.3312	76.6667	-18.4816
172020	CHAMER-3 220.00	CHAMER-3	1.05	1.05	1	76.6667	-20.3312	76.6667	-18.4816
172020	CHAMER-3 220.00	CHAMER-3	1.05	1.05	1	76.6667	-20.3312	76.6667	-18.4816
		TOTAL	**3.15**	**3.15**	**3**	**230.0001**	**-60.9936**	**230.0001**	**-55.4448**
BAIRASIU									
Bus Number	Bus Name	Area Name	Base Case	With Recommended Capacitors	In Service	Base Case		With Recommended Capacitors	
			VSched (pu)	VSched (pu)		PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)	PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)
172018	BAIRASIUL2 220.00	BAIRASIU	1.0302	1.0302	1	37	3.1029	37	-4.6649
172018	BAIRASIUL2 220.00	BAIRASIU	1.0302	1.0302	1	37	3.1029	37	-4.6649
172018	BAIRASIUL2 220.00	BAIRASIU	1.0302	1.0302	1	37	3.1029	37	-4.6649
		TOTAL	**3.0906**	**3.0906**	**3**	**111**	**9.3087**	**111**	**-13.9947**
SALAL									
Bus Number	Bus Name	Area Name	Base Case	With Recommended Capacitors	In Service	Base Case		With Recommended Capacitors	
			VSched (pu)	VSched (pu)		PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)	PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)
182009	SALAL2 220.00	SALAL	1.05	1.034	1	115	0	115	0
182009	SALAL2 220.00	SALAL	1.05	1.034	1	115	0	115	0
182009	SALAL2 220.00	SALAL	1.05	1.034	1	115	0	115	0
182009	SALAL2 220.00	SALAL	1.05	1.034	1	115	0	115	0
182009	SALAL2 220.00	SALAL	1.05	1.034	1	115	0	115	0
182009	SALAL2 220.00	SALAL	1.05	1.034	1	115	0	115	0
		TOTAL	**6.3**	**6.204**	**6**	**690**	**0**	**690**	**0**
TANAKPUR									
Bus Number	Bus Name	Area Name	Base Case	With Recommended Capacitors	In Service	Base Case		With Recommended Capacitors	
			VSched (pu)	VSched (pu)		PGen (MW)	QGen (MVAr)	PGen (MW)	QGen (MVAr)

						(+export/-import)	(+export/-import)	(+export/-import)	(+export/-import)
162019	TANAKPUR2 220.00	TANAKPUR	0.98	1.013	1	27	-9.42	27	-0.7693
162019	TANAKPUR2 220.00	TANAKPUR	0.98	1.013	1	27	-9.42	27	-0.7693
162019	TANAKPUR2 220.00	TANAKPUR	0.98	1.013	1	27	-9.42	27	-0.7693
		TOTAL	**2.94**	**3.039**	**3**	**81**	**-28.26**	**81**	**-2.3079**
URI-1									
Bus Number	Bus Name	Area Name	Base Case	With Recommended Capacitors	In Service	Base Case		With Recommended Capacitors	
			VSched (pu)	VSched (pu)		PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)	PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)
184001	URIG-1 400.00	URI-1	1.04	1.05	1	120	0	120	-15.0408
184001	URIG-1 400.00	URI-1	1.04	1.05	1	120	0	120	-15.0408
184001	URIG-1 400.00	URI-1	1.04	1.05	1	120	0	120	-15.0408
184001	URIG-1 400.00	URI-1	1.04	1.05	1	120	0	120	-15.0408
		TOTAL	**4.16**	**4.2**	**4**	**480**	**0**	**480**	**-60.1632**
URI-2									
Bus Number	Bus Name	Area Name	Base Case	With Recommended Capacitors	In Service	Base Case		With Recommended Capacitors	
			VSched (pu)	VSched (pu)		PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)	PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)
184007	URIG-2 400.00	URI-2	1.04	1.04	1	60	0	60	-10
184007	URIG-2 400.00	URI-2	1.04	1.04	1	60	0	60	-7
184007	URIG-2 400.00	URI-2	1.04	1.04	1	60	0	60	-4
184007	URIG-2 400.00	URI-2	1.04	1.04	1	60	0	60	-10
		TOTAL	**4.16**	**4.16**	**4**	**240**	**0**	**240**	**-31**
DHAULIGA									
Bus Number	Bus Name	Area Name	Base Case	With Recommended Capacitors	In Service	Base Case		With Recommended Capacitors	
			VSched (pu)	VSched (pu)		PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)	PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)
162024	DHAULI2 220.00	DHAULIGA	0.9825	0.9825	1	69.5	-14.9161	69.5	-13.2285
162024	DHAULI2 220.00	DHAULIGA	0.9825	0.9825	1	69.5	-14.9161	69.5	-13.2285
162024	DHAULI2 220.00	DHAULIGA	0.9825	0.9825	1	70	-15.0234	70	-13.3237
162024	DHAULI2 220.00	DHAULIGA	0.9825	0.9825	1	70	-15.0234	70	-13.3237
		TOTAL	**3.93**	**3.93**	**4**	**279**	**-59.879**	**279**	**-53.1044**
DULHASTI									
Bus Number	Bus Name	Area Name	Base Case	With Recommended Capacitors	In Service	Base Case		With Recommended Capacitors	
			VSched (pu)	VSched (pu)		PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)	PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)
184006	DULHASTI 400.00	DULHASTI	1.05	1.05	1	109.1028	0	109.1028	-50.1164
184006	DULHASTI 400.00	DULHASTI	1.05	1.05	1	109.9486	0	109.9486	-50.5049
184006	DULHASTI 400.00	DULHASTI	1.05	1.05	1	109.9486	0	109.9486	-50.5049

		TOTAL	**3.15**	**3.15**	**3**	**329**	**0**	**329**	**-151.1262**
SEWA-II									
Bus Number	Bus Name	Area Name	Base Case	With Recommended Capacitors	In Service	Base Case		With Recommended Capacitors	
			VSched (pu)	VSched (pu)		PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)	PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)
181045	SEWA-II 132.00	SEWA-II	1.01	1.05	1	44.333	-12	44.333	-2.5434
181045	SEWA-II 132.00	SEWA-II	1.01	1.05	1	44.333	-12	44.333	-2.5434
181045	SEWA-II 132.00	SEWA-II	1.01	1.05	1	44.333	-12	44.333	-2.5434
		TOTAL	**3.03**	**3.15**	**3**	**132.999**	**-36**	**132.999**	**-7.6302**
JHAKRI									
			Base Case	With Recommended Capacitors	In Service	Base Case		With Recommended Capacitors	
Bus Number	Bus Name	Area Name	VSched (pu)	VSched (pu)		PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)	PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)
174008	NATHPA4 400.00	JHAKRI	1.04	1.05	1	270	-17.826	270	-17.4204
174008	NATHPA4 400.00	JHAKRI	1.04	1.05	1	270	-17.826	270	-17.4204
174008	NATHPA4 400.00	JHAKRI	1.04	1.05	1	270	-17.826	270	-17.4204
174008	NATHPA4 400.00	JHAKRI	1.04	1.05	1	270	-17.826	270	-17.4204
174008	NATHPA4 400.00	JHAKRI	1.04	1.05	1	270	-17.826	270	-17.4204
174008	NATHPA4 400.00	JHAKRI	1.04	1.05	1	270	-17.826	270	-17.4204
		TOTAL	**6.24**	**6.3**	**6**	**1620**	**-106.956**	**1620**	**-104.5224**
RAMPUR HEP									
Bus Number	Bus Name	Area Name	Base Case	With Recommended Capacitors	In Service	Base Case		With Recommended Capacitors	
			VSched (pu)	VSched (pu)		PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)	PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)
174009	RAMPUR 400.00	RAMPUR HEP	1.04	1.05	1	69	-1.0743	69	-10.3354
174009	RAMPUR 400.00	RAMPUR HEP	1.04	1.05	1	69	-1.0743	69	-10.3354
174009	RAMPUR 400.00	RAMPUR HEP	1.04	1.05	1	69	-1.0743	69	-10.3354
174009	RAMPUR 400.00	RAMPUR HEP	1.04	1.05	1	69	-1.0743	69	-10.3354
174009	RAMPUR 400.00	RAMPUR HEP	1.04	1.05	1	69	-1.0743	69	-10.3354
174009	RAMPUR 400.00	RAMPUR HEP	1.04	1.05	1	69	-1.0743	69	-10.3354
		TOTAL	**6.24**	**6.3**	**6**	**414**	**-6.4458**	**414**	**-62.0124**
TEHRI									
Bus Number	Bus Name	Area Name	Base Case	With Recommended Capacitors	In Service	Base Case		With Recommended Capacitors	
			VSched (pu)	VSched (pu)		PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)	PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)
164003	TEHRI4 400.00	TEHRI	1.04	1.05	1	152.5	-17.8339	152.5	-9.8226
164003	TEHRI4 400.00	TEHRI	1.04	1.05	1	152.5	-17.8339	152.5	-9.8226
164003	TEHRI4 400.00	TEHRI	1.04	1.05	1	152.5	-17.8339	152.5	-9.8226

164003	TEHRI4 400.00	TEHRI	1.04	1.05	1	152.5	-17.8339	152.5	-9.8226
		TOTAL	**4.16**	**4.2**	**4**	**610**	**-71.3356**	**610**	**-39.2904**

KOTESWAR

Bus Number	Bus Name	Area Name	Base Case	With Recommended Capacitors	In Service	Base Case		With Recommended Capacitors	
			VSched (pu)	VSched (pu)		PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)	PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)
164004	KOTESHWA 400.00	KOTESWAR	1.016	1.016	1	90	-30	90	-30
		TOTAL	**1.016**	**1.016**	**1**	**90**	**-30**	**90**	**-30**

BHAKRA

Bus Number	Bus Name	Area Name	Base Case	With Recommended Capacitors	In Service	Base Case		With Recommended Capacitors	
			VSched (pu)	VSched (pu)		PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)	PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)
111113	GANGUWAL 132.00	BHAKRA	0.957	0.957	1	10.4695	5.9484	10.4695	0
111113	GANGUWAL 132.00	BHAKRA	0.957	0.957	1	8.9732	5.0983	8.9732	0
111113	GANGUWAL 132.00	BHAKRA	0.957	0.957	1	8.9732	5.0983	8.9732	0
111114	KOTLA 132.00	BHAKRA	0.949	0.949	1	10.7022	6.7009	10.7022	0
111114	KOTLA 132.00	BHAKRA	0.949	0.949	1	8.8569	5.5455	8.8569	0
111114	KOTLA 132.00	BHAKRA	0.949	0.949	1	8.8569	5.5455	8.8569	0
170004	BHAKRA-L 66.000	BHAKRA	1.02	1.006	1	40.1224	18.89	40.1224	0.0369
170004	BHAKRA-L 66.000	BHAKRA	1.02	1.006	1	40.1224	18.89	40.1224	0.0369
172015	BHAKRA_L 220.00	BHAKRA	0.974	1.0122	1	42.2199	24.4123	42.2199	-1.3103
172015	BHAKRA_L 220.00	BHAKRA	0.974	1.0122	1	42.2199	24.4123	42.2199	-1.3103
172015	BHAKRA_L 220.00	BHAKRA	0.974	1.0122	1	42.2199	24.4123	42.2199	-1.3103
172016	BHAKRA_R 220.00	BHAKRA	0.975	1.0135	1	58.2527	6.8169	58.2527	-0.9389
172016	BHAKRA_R 220.00	BHAKRA	0.975	1.0135	1	58.2527	6.8169	58.2527	-0.9389
172016	BHAKRA_R 220.00	BHAKRA	0.975	1.0135	1	58.2527	6.8169	58.2527	-0.9389
172016	BHAKRA_R 220.00	BHAKRA	0.975	1.0135	1	58.2527	6.8169	58.2527	-0.9389
172016	BHAKRA_R 220.00	BHAKRA	0.975	1.0135	1	58.2527	6.8169	58.2527	-0.9389
		TOTAL	**15.555**	**15.8341**	**16**	**554.999**	**179.038**	**554.9999**	**-8.5516**

DEHAR

Bus Number	Bus Name	Area Name	Base Case	With Recommended Capacitors	In Service	Base Case		With Recommended Capacitors	
			VSched (pu)	VSched (pu)		PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)	PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)
172017	DEHAR 220.00	DEHAR	0.995	1.024	1	93.3333	6.504	93.3333	-0.8554
172017	DEHAR 220.00	DEHAR	0.995	1.024	1	93.3333	6.504	93.3333	-0.8554
174007	DEHAR 400.00	DEHAR	1.02	1.036	1	93.3333	9.0982	93.3333	-2.2817
174007	DEHAR 400.00	DEHAR	1.02	1.036	1	93.3333	9.0982	93.3333	-2.2817
174007	DEHAR 400.00	DEHAR	1.02	1.036	1	93.3333	9.0982	93.3333	-2.2817
174007	DEHAR 400.00	DEHAR	1.02	1.036	1	93.3333	9.0982	93.3333	-2.2817
		TOTAL	**6.07**	**6.192**	**6**	**559.9998**	**49.4008**	**559.9998**	**-10.8376**

PONG

Bus Number	Bus Name	Area Name	Base Case	With Recommended Capacitors	In Service	Base Case		With Recommended Capacitors	

			VSched (pu)	VSched (pu)		PGen (MW) (+export/- import)	QGen (MVAr) (+export/- import)	PGen (MW) (+export/- import)	QGen (MVAr) (+export/- import)
172021	PONG 220.00	PONG	1.015	1.0135	1	50	-4.593	50	0
172021	PONG 220.00	PONG	1.015	1.0135	1	50	-4.593	50	0
172021	PONG 220.00	PONG	1.015	1.0135	1	50	-4.593	50	0
		TOTAL	3.045	3.0405	3	150	-13.779	150	0
ADHYDRO									
Bus Number	Bus Name	Area Name	Base Case	With Recommended Capacitors	In Service	Base Case		With Recommended Capacitors	
			VSched (pu)	VSched (pu)		PGen (MW) (+export/- import)	QGen (MVAr) (+export/- import)	PGen (MW) (+export/- import)	QGen (MVAr) (+export/- import)
172022	ADHYDRO 220.00	ADHYDRO	1.036	1.045	1	75	7.114	75	-8.66
172022	ADHYDRO 220.00	ADHYDRO	1.036	1.045	1	75	7.114	75	-8.66
		TOTAL	**2.072**	**2.09**	**2**	**150**	**14.228**	**150**	**-17.32**
KARCHAMW									
Bus Number	Bus Name	Area Name	Base Case	With Recommended Capacitors	In Service	Base Case		With Recommended Capacitors	
			VSched (pu)	VSched (pu)		PGen (MW) (+export/- import)	QGen (MVAr) (+export/- import)	PGen (MW) (+export/- import)	QGen (MVAr) (+export/- import)
174010	KARCHAMW 400.00	KARCHAMW	1.042	1.05	1	250	2.5804	250	-31.8419
174010	KARCHAMW 400.00	KARCHAMW	1.042	1.05	1	250	2.5804	250	-31.8419
174010	KARCHAMW 400.00	KARCHAMW	1.042	1.05	1	250	2.5804	250	-31.8419
174010	KARCHAMW 400.00	KARCHAMW	1.042	1.05	1	250	2.5804	250	-31.8419
		TOTAL	**4.168**	**4.2**	**4**	**1000**	**10.3216**	**1000**	**-127.3676**
BUDHIL									
Bus Number	Bus Name	Area Name	Base Case	With Recommended Capacitors	In Service	Base Case		With Recommended Capacitors	
			VSched (pu)	VSched (pu)		PGen (MW) (+export/- import)	QGen (MVAr) (+export/- import)	PGen (MW) (+export/- import)	QGen (MVAr) (+export/- import)
172000	BUDHIL 220.00	BUDHIL	1.047	1.05	1	35	-10.5	35	-8.022
172000	BUDHIL 220.00	BUDHIL	1.047	1.05	1	35	-10.5	35	-8.022
		TOTAL	**2.094**	**2.1**	**2**	**70**	**-21**	**70**	**-16.044**
KOLDAM									
Bus Number	Bus Name	Area Name	Base Case	With Recommended Capacitors	In Service	Base Case		With Recommended Capacitors	
			VSched (pu)	VSched (pu)		PGen (MW) (+export/- import)	QGen (MVAr) (+export/- import)	PGen (MW) (+export/- import)	QGen (MVAr) (+export/- import)
174013	KOLDAM 400.00	KOLDAM	1.04	1.05	1	192	34.9782	192	-10.75
174013	KOLDAM 400.00	KOLDAM	1.04	1.05	1	192	34.9782	192	-10.75

174013	KOLDAM 400.00	KOLDAM	1.04	1.05	1	192	34.9782	192	-10.75
174013	KOLDAM 400.00	KOLDAM	1.04	1.05	1	192	34.9782	192	-10.75
		TOTAL	**4.16**	**4.2**	**4**	**768**	**139.912**	**768**	**-43**

KISHANGANGA

Bus Number	Bus Name	Area Name	Base Case	With Recommended Capacitors	In Service	Base Case		With Recommended Capacitors	
			VSched (pu)	VSched (pu)		PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)	PGen (MW) (+export/-import)	QGen (MVAr) (+export/-import)
182015	KISHANGANGA 220.00	KISHANGANGA	1	1	1	58.3969	0	58.3969	0
182015	KISHANGANGA 220.00	KISHANGANGA	1	1	1	58.3969	0	58.3969	0
182015	KISHANGANGA 220.00	KISHANGANGA	1	1	1	53.2061	0	53.2061	0
		TOTAL	**3**	**3**	**3**	**169.9999**	**0**	**169.9999**	**0**

ANNEXURE-IV

Summary of Shunt Reactor

Bus Number	Bus Name	Id	Area Name	BASE CASE FILE		COMPENSATED FILE	
				In Service	Reactor (MVAr)	In Service	Reactor (MVAr)
114002	MAKHU 400.00	R1	PUNJAB	0	-72.56	0	-65.3
114003	MUKTSAR 400.00	R1	PUNJAB	0	-72.56	**1**	-65.3
114004	NAKODAR 400.00	R1	PUNJAB	0	-72.56	**1**	-65.3
124001	KHEDAR 400.00	R1	HARYANA	0	-45.35	**1**	-45.35
132018	BHILWA-2 220.00	R1	RAJASTHA	0	-16.1	0	-16.1
132030	SIROHI 220.00	R1	RAJASTHA	0	-20.1	0	-20.1
132033	JODHPU-2 220.00	R1	RAJASTHA	0	-14.6	0	-14.6
132037	AMARSAGA 220.00	R1	RAJASTHA	0	-16.1	0	-16.1
132159	RAMGARH_GSS 220.00	R1	RAJASTHA	0	-18.14	**1**	-18.14
134000	MERTA 400.00	R1	RAJASTHA	0	-45.35	**1**	-45.35
134001	AKAL-4 400.00	R1	RAJASTHA	1	-158.73	1	-158.73
134003	HERAPU-4 400.00	R1	RAJASTHA	0	-46.09	0	-46.09
134004	RATANGAR 400.00	R1	RAJASTHA	0	-113.38	1	-130
134005	HINDAU-4 400.00	R1	RAJASTHA	0	-113.38	0	-113.38
134007	CHABRA-4 400.00	R1	RAJASTHA	0	-90.7	**1**	-90.7
134008	KALISI-4 400.00	R1	RAJASTHA	0	-113.33	**1**	-113.33
134010	KAWAI 400.00	R1	RAJASTHA	0	-114.28	**1**	-114.28
134011	DEEDWANA 400.00	R1	RAJASTHA	0	-45.35	**1**	-45.35
134014	BHADLA 400.00	R1	RAJASTHA	0	-113.38	0	-113.38
134016	PHAGI_400 400.00	R1	RAJASTHA	0	-113.38	0	-113.38
134017	BIKANE-4 400.00	R1	RAJASTHA	0	-158.72	1	-152
134020	SIKAR 400.00	R1	RAJASTHA	0	-72.56	1	-85
134032	CHITTORGARH 400.00	R1	RAJASTHA	0	-72.56	0	-72.56
134033	RAMGARH_GSS 400.00	R1	RAJASTHA	1	-113.38	1	-113.38
134037	BABAI 400.00	R1	RAJASTHA	0	-72.56	0	-72.56
134038	SURATGARH_SC400.00	R1	RAJASTHA	0	-185.96	0	-185.96
134039	KANKANI 400.00	R1	RAJASTHA	1	-72.56	1	-72.56
134041	BHENSARA 400.00	R1	RAJASTHA	1	-113.38	1	-130
137000	PHAGI 765.00	R1	RAJASTHA	0	-240	1	-240
154001	UNNAO4 400.00	R1	UTTARPRA	0	-57.14	1	-57.14
154002	BARELI4 400.00	R1	UTTARPRA	0	-57.14	1	-112
154005	PARICHHA 400.00	R1	UTTARPRA	1	-113.38	1	-113.38
154006	ALIGARH 400.00	R1	UTTARPRA	0	-57.14	0	-57.14
154007	GORAK_UP 400.00	R1	UTTARPRA	0	-113.38	0	-113.38
154008	LUCKN_UP 400.00	R1	UTTARPRA	0	-45.35	0	-45.35
154009	MURADAB4 400.00	R1	UTTARPRA	0	-90.7	0	-90.7

154013	PANKI4 400.00	R1	UTTARPRA	0	-45.35	0	-45.35
154014	ANPARA4 400.00	R1	UTTARPRA	0	-114.28	0	-114.28
154019	SARNATH4 400.00	R1	UTTARPRA	0	-113.37	0	-113.37
154021	AZAMGAR4 400.00	R1	UTTARPRA	0	-45.35	0	-45.35
154022	SULTANP4 400.00	R1	UTTARPRA	1	-72.6	1	-72.6
154023	MAU4 400.00	R1	UTTARPRA	0	-113.38	0	-113.38
154063	REWAROAD 400.00	R1	UTTARPRA	0	-113.4	1	-113.4
154066	MURADNGR NEW400.00	R1	UTTARPRA	0	-57.14	0	-57.14
154069	SIKANDRABAD 400.00	R1	UTTARPRA	0	-113.38	0	-113.38
154073	FATEHBD_AGRA400.00	R1	UTTARPRA	0	-113.67	0	-113.67
154074	ORAI4 400.00	R1	UTTARPRA	1	-57.14	1	-57.14
154075	MEJA 400.00	R1	UTTARPRA	0	-113.38	1	-113.38
154076	BANDA 400.00	R1	UTTARPRA	1	-57.14	1	-57.14
154078	UNCHAHAR 400.00	R1	UTTARPRA	0	-72.56	0	-72.56
154079	MATHURA 400.00	R1	UTTARPRA	0	-72.56	0	-72.56
154081	HAPUR 400.00	R1	UTTARPRA	0	-113.67	0	-113.67
154082	NEHTAUR 400.00	R1	UTTARPRA	0	-113.38	1	-113.38
154089	MASAULI 400.00	R1	UTTARPRA	1	-113.38	1	-170
154090	TANDA_EXT 400.00	R1	UTTARPRA	1	-113.37	1	-113.37
157000	ANPARAC 765.00	R1	UTTARPRA	1	-189	1	-189
157002	UNNAO7 765.00	R1	UTTARPRA	0	-189	0	-189
157009	LALITPUR-TPS765.00	R1	UTTARPRA	0	-330	0	-330
157011	GR.NOIDA 765.00	R1	UTTARPRA	0	-240	0	-240
157013	FATEHBD_AGRA765.00	R1	UTTARPRA	0	-240	0	-240
157014	BARA-TPS 765.00	R1	UTTARPRA	1	-330	1	-330
162018	PITHORGA 220.00	R1	UTTARAKH	0	-20.2	0	-20.2
164000	RISHIKE4 400.00	R1	UTTARAKH	0	-45.35	0	-45.35
164006	SRINAGAR_UK 400.00	R1	UTTARAKH	1	-72.56	1	-72.56

ANNEXURE-V

Capacitor bank distribution to downstream network – General Case Study

A. Study for Dhamtaan 132 kV

The general distribution network for Dhamtaan a 132 kV substation is considered for study as under in Fig.A. This 132 kV substation have both configuration-1 (132/33/11kV) and configuration-2 (132/11kV). Red ink marked portion is 11kV distribution systems and green ink marked portion is 33 kV above network.

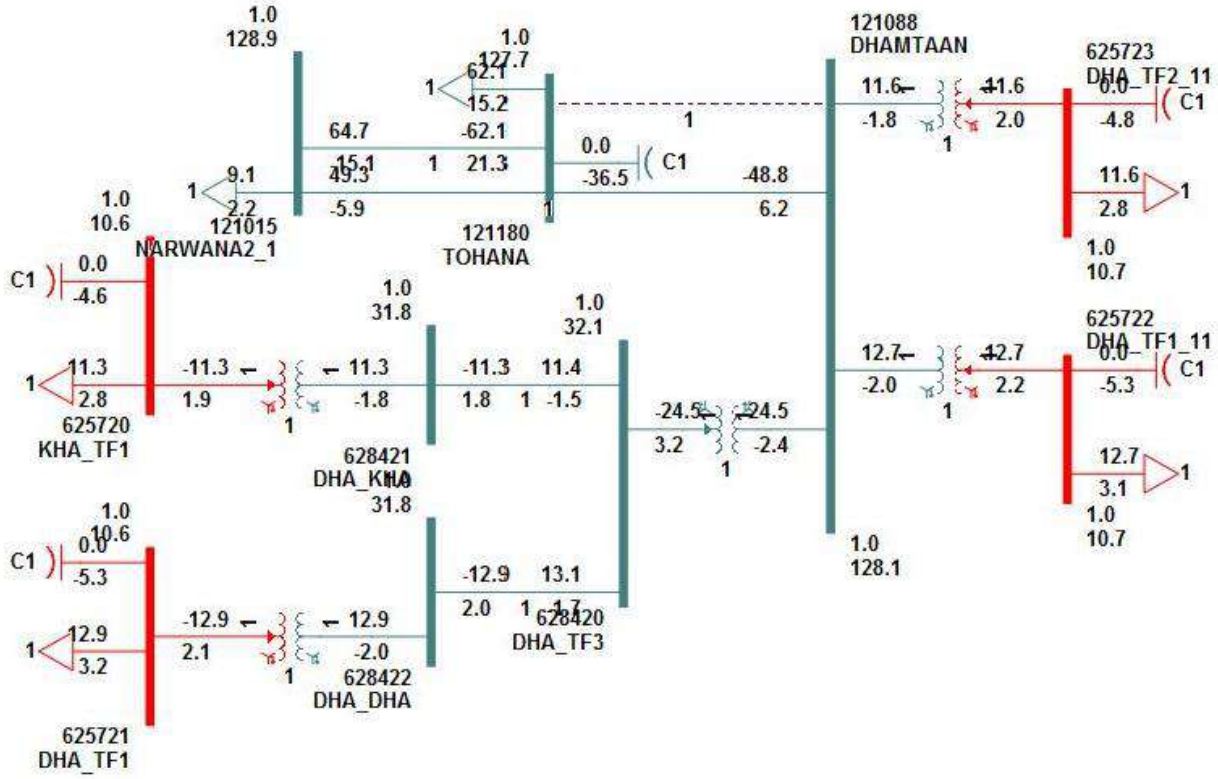

Fig.A General distribution network for configuration Dhamtaan (121088)

The amount compensation (Qem) required at 11 kV buses to boost the bus voltage to desired voltages in step wise rise manner are listed in Table-14.

Table-14.:Compensation for step change in voltage at downstream buses in Config-1 & 2

Compensation found at downstream 11kV buses (in MVAR)														
11kV Downstream Bus Number	**V initial (pu)**	**0.85 pu**	**0.86 pu**	**0.87 pu**	**0.88 pu**	**0.89 pu**	**0.9 pu**	**0.91 pu**	**0.92 pu**	**0.93 pu**	**0.94 pu**	**0.95 pu**	**0.96 pu**	**0.97 pu**
121088(132kV)														
625720	0.7548	4.86	5.15	5.42	5.65	5.84	6.03	6.21	6.4	6.58	6.77	6.95	7.13	7.31
625721	0.7478	6.27	6.52	6.76	6.95	7.11	7.27	7.42	7.58	7.73	7.89	8.04	8.2	8.35
625722	0.8049	0.49	1.3	2.06	2.72	3.32	3.89	4.45	5	5.55	6.08	6.61	7.13	7.64
625723	0.8076	0.75	0.74	1.52	2.2	2.81	3.4	3.97	4.53	5.09	5.64	6.17	6.7	7.22

Although in above, the compensation is identified for a very low voltage profile. In Northern region the voltage profile is not so low and it varies from 0.85 to 0.95 p.u.

B. Study for Rai_1_132 KV

The above study mentioned in section(a) of Annexure-V , has been extended for a another 132 kV Rai substation given in Fig. B. This substation have total 6, no. of 11kV substations in configuration 1 and configuration 2.

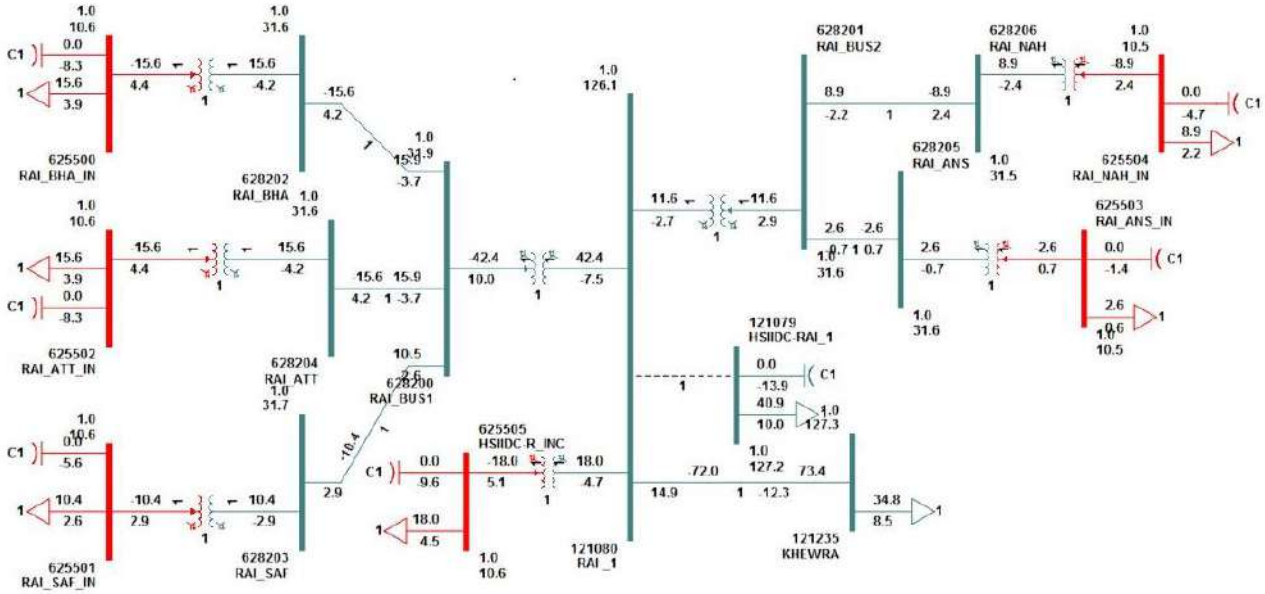

Fig.B General distribution network for configuration RAI _1 (121080)

Annexure-VI Detailed Tie Line Flow

A) **FROM AREA 1001 PUNJAB**

TO AREA 1002 HARYANA

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT	X-- NAME --X	BASKV	BUS#-SCT	X-- NAME --X	BASKV	CKT	MW	MVAR
111110	ROPAR	132.00*	121001	PINJORE	132.00	1	46.7	-6.9
111110	ROPAR	132.00*	121001	PINJORE	132.00	2	46.7	-6.9

TOTAL FROM AREA 1001 TO AREA 1002 93.5 -13.9

TO AREA 1007 HIMACHAL

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT	X-- NAME --X	BASKV	BUS#-SCT	X-- NAME --X	BASKV	CKT	MW	MVAR
111015	CHOHAL	132.00*	171006	HAMIRP-2	132.00	1	-53.6	0.3
111089	JOGINDERNAGA	132.00	171007	BASSI1	132.00*	2	-24.0	11.0
111112	KANGR-PS	132.00*	171003	KANGRA1	132.00	1	-9.4	20.2
112019	RSD	220.00*	172019	JASSOR2	220.00	1	54.9	-12.9

TOTAL FROM AREA 1001 TO AREA 1007 -32.1 18.6

TO AREA 1008 JAMUKASH

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT	X-- NAME --X	BASKV	BUS#-SCT	X-- NAME --X	BASKV	CKT	MW	MVAR
112018	SARNA	220.00	182004	HIRANAGAR2	220.00*	1	-102.0	8.2
112018	SARNA	220.00	182005	UDAMPUR2	220.00*	1	-80.9	6.0
112019	RSD	220.00	182004	HIRANAGAR2	220.00*	1	-59.6	10.0
112019	RSD	220.00	182004	HIRANAGAR2	220.00*	2	-59.6	10.0

TOTAL FROM AREA 1001 TO AREA 1008 -302.0 34.2

TO AREA 1009 CHANDIGA

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT	X-- NAME --X	BASKV	BUS#-SCT	X-- NAME --X	BASKV	CKT	MW	MVAR
110048	MOHALI-II	66.000*	190000	CHANDIGA_S	3966.000	1	25.1	-4.5
110048	MOHALI-II	66.000*	190000	CHANDIGA_S	3966.000	2	25.1	-4.5

110048 MOHALI-II 66.000* 190010 CHANDIGA_S5666.000 1 25.3 -2.4

110048 MOHALI-II 66.000* 190010 CHANDIGA_S5666.000 2 25.3 -2.4

TOTAL FROM AREA 1001 TO AREA 1009 100.7 -13.8

TO AREA 1020 NR_ISTS_PUN

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

110001 SANGRUR 66.000 112104 SANGRUR 220.00* 2 -40.7 -12.7

110001 SANGRUR 66.000 112104 SANGRUR 220.00* 3 -30.5 -9.5

110001 SANGRUR 66.000* 112104 SANGRUR 220.00 4 -30.5 -6.8

110027 DASUYA 66.000 112106 DASUYA 220.00* 1 -74.0 -25.3

112006 NAKODAR 220.00* 112101 JALAN-PG 220.00 1 -314.7 -37.4

112007 KARTARPUR 220.00* 112101 JALAN-PG 220.00 1 -269.3 -33.1

112018 SARNA 220.00* 112106 DASUYA 220.00 1 66.8 -12.5

112018 SARNA 220.00* 112106 DASUYA 220.00 2 66.8 -12.5

112064 KAPURTHALA 220.00* 112101 JALAN-PG 220.00 1 -76.0 -23.0

112064 KAPURTHALA 220.00* 112101 JALAN-PG 220.00 2 -76.0 -23.0

112064 KAPURTHALA 220.00 112106 DASUYA 220.00* 3 -2.6 5.3

112064 KAPURTHALA 220.00 112106 DASUYA 220.00* 4 -2.6 5.3

112096 AMRIT-PG 220.00 114008 AMRITSAR 400.00* 1 -212.2 -68.9

112096 AMRIT-PG 220.00 114008 AMRITSAR 400.00* 2 -212.2 -68.9

112096 AMRIT-PG 220.00 114008 AMRITSAR 400.00* 3 -336.8 -109.3

112097 MALER-PG 220.00 114011 MALERKOT 400.00* 1 -175.9 -50.7

112097 MALER-PG 220.00 114011 MALERKOT 400.00* 2 -175.9 -50.7

112097 MALER-PG 220.00 114011 MALERKOT 400.00* 3 -279.2 -80.5

112098 MOGA-PG 220.00 114007 MOGA 400.00* 1 -296.2 -65.4

112098 MOGA-PG 220.00 114007 MOGA 400.00* 2 -296.2 -65.4

112098 MOGA-PG 220.00 114007 MOGA 400.00* 3 -148.1 -32.7

112098 MOGA-PG 220.00 114007 MOGA 400.00* 4 -186.6 -41.2

112099 LUDHIANA 220.00 114009 LUDHIANA 400.00* 1 -212.1 -58.9

112099 LUDHIANA 220.00 114009 LUDHIANA 400.00* 2 -212.1 -58.9

112099 LUDHIANA 220.00 114009 LUDHIANA 400.00* 3 -212.1 -58.9

112099 LUDHIANA 220.00 114009 LUDHIANA 400.00* 4 -336.7 -93.5

112100 PATIA-PG 220.00 114012 PATIALA 400.00* 1 -140.7 -43.9

112100 PATIA-PG 220.00 114012 PATIALA 400.00* 2 -140.7 -43.9

112100 PATIA-PG 220.00 114012 PATIALA 400.00* 3 -223.4 -69.7

112102 JALANDHAR-BB220.00* 112106 DASUYA 220.00 2 -92.9 -4.0

112126 ALAWALPUR 220.00* 112106 DASUYA 220.00 1 -95.9 -4.1

114000 TALWANDISABO400.00* 114007 MOGA 400.00 T1 313.3 18.4

114002 MAKHU 400.00* 114008 AMRITSAR 400.00 T1 61.5 -9.0

114002 MAKHU 400.00* 114008 AMRITSAR 400.00 T2 61.5 -9.0

114004 NAKODAR 400.00 114007 MOGA 400.00* T1 -30.5 53.9

114013 PATRAN_400 400.00* 114012 PATIALA 400.00 S1 -167.7 -21.5

114013 PATRAN_400 400.00* 114012 PATIALA 400.00 S2 -167.7 -21.5

TOTAL FROM AREA 1001 TO AREA 1020 -4699.1 -1243.7

TO AREA 1021 NR_ISTS_HAR

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

114004 NAKODAR 400.00 124026 KURUKSHETRA_400.00* Q1 -164.2 107.3

114006 RAJPURA 400.00* 124022 BHIWANI 400.00 M1 85.9 -53.5

114013 PATRAN_400 400.00 124013 KAITHAL-PG 400.00* S1 40.6 5.4

114013 PATRAN_400 400.00 124013 KAITHAL-PG 400.00* S2 40.6 5.4

TOTAL FROM AREA 1001 TO AREA 1021 2.9 64.7

TO AREA 1026 NR_ISTS_HP

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

112047 MOHALI-1 220.00* 172013 NALLAGAR 220.00 1 -131.5 -6.4

112047 MOHALI-1 220.00* 172013 NALLAGAR 220.00 2 -131.5 -6.4

TOTAL FROM AREA 1001 TO AREA 1026 -262.9 -12.9

TO AREA 1027 NR_ISTS_JK

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

112018 SARNA 220.00 182011 KISHENPUR 220.00* 1 -118.6 -1.7

112018 SARNA 220.00 182011 KISHENPUR 220.00* 2 -118.6 -1.7

TOTAL FROM AREA 1001 TO AREA 1027 -237.1 -3.3

TO AREA 1041 NRIST-BB

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

110002 JAMALPUR 66.000 112107 JAMALPUR 220.00* 1 -49.3 -12.4

110002 JAMALPUR 66.000 112107 JAMALPUR 220.00* 2 -49.3 -12.4

110002 JAMALPUR 66.000 112107 JAMALPUR 220.00* 3 -49.3 -12.4

111041 JAMALPUR21 132.00 112107 JAMALPUR 220.00* 1 -69.7 -7.8

111041 JAMALPUR21 132.00 112107 JAMALPUR 220.00* 2 -69.7 -7.8

112001 DANDHAR1 220.00 112107 JAMALPUR 220.00* 1 55.8 -7.4

112001 DANDHAR1 220.00 112107 JAMALPUR 220.00* 2 55.8 -7.4

112033 GOBINDGARH-2220.00 112103 GANGUWAL 220.00* 2 -81.4 -7.9

112081 MOHALI-S 220.00 112103 GANGUWAL 220.00* 1 -125.5 -8.4

112102 JALANDHAR-BB220.00* 112107 JAMALPUR 220.00 1 32.6 -4.3

112102 JALANDHAR-BB220.00* 112107 JAMALPUR 220.00 2 32.6 -4.3

112113 BHARI 220.00 112103 GANGUWAL 220.00* 1 -76.3 -6.7

112115 MAJRA 220.00* 112103 GANGUWAL 220.00 1 -126.2 -14.0

TOTAL FROM AREA 1001 TO AREA 1041 -520.0 -113.2

TO AREA 1050 NR_ISTS

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

112004 LEHRAMOHABBA220.00* 112105 BARNALAB2 220.00 1 76.4 -16.8

112043 BARNALA-PS 220.00 112105 BARNALAB2 220.00* 1 13.3 -4.0

TOTAL FROM AREA 1001 TO AREA 1050 89.7 -20.7 TO AREA 1215 BHAKRA

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

111110 ROPAR 132.00 111114 KOTLA 132.00* 1 -42.9 3.6

111110 ROPAR 132.00 111114 KOTLA 132.00* 2 -42.9 3.6

111110 ROPAR 132.00 111114 KOTLA 132.00* 3 -42.9 3.6

112012 MAHILPUR 220.00 172016 BHAKRA_R 220.00* 1 -44.0 0.4

112012 MAHILPUR 220.00 172016 BHAKRA_R 220.00* 2 -44.0 0.4

TOTAL FROM AREA 1001 TO AREA 1215 -216.6 11.8

TO AREA 1216 DEHAR

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

114006 RAJPURA 400.00 174007 DEHAR 400.00* M1 -73.7 78.0

TOTAL FROM AREA 1001 TO AREA 1216 -73.7 78.0

TO AREA 1217 PONG

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

112102 JALANDHAR-BB220.00* 172021 PONG 220.00 2 -77.4 -7.8

112126 ALAWALPUR 220.00* 172021 PONG 220.00 1 -72.7 -8.0

TOTAL FROM AREA 1001 TO AREA 1217 -150.1 -15.8

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TOTAL FROM AREA 1001 PUNJAB -6207.0 -1230.1

B) **FROM AREA 1002 HARYANA**

TO AREA 1001 PUNJAB

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

121001 PINJORE 132.00 111110 ROPAR 132.00* 1 -46.7 6.9

121001 PINJORE 132.00 111110 ROPAR 132.00* 2 -46.7 6.9

TOTAL FROM AREA 1002 TO AREA 1001 -93.5 13.9

TO AREA 1003 RAJASTHA

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT	X-- NAME --X	BASKV	BUS#-SCT	X-- NAME --X	BASKV	CKT	MW	MVAR
121023	SIRSA2_1	132.00*	131006	AMRAPURA	132.00	1	-8.8	1.8

TOTAL FROM AREA 1002 TO AREA 1003 -8.8 1.8

TO AREA 1004 DELHI

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT	X-- NAME --X	BASKV	BUS#-SCT	X-- NAME --X	BASKV	CKT	MW	MVAR
122078	PANIPAT	220.00*	142004	NARELA_D	220.00	1	56.9	-6.3
122078	PANIPAT	220.00*	142004	NARELA_D	220.00	2	56.9	-6.3
122078	PANIPAT	220.00*	142004	NARELA_D	220.00	3	56.9	-6.3
124006	DEEPALPUR	400.00*	144006	BAWANA4	400.00	S1	43.1	27.5

TOTAL FROM AREA 1002 TO AREA 1004 213.8 8.6

TO AREA 1007 HIMACHAL

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT	X-- NAME --X	BASKV	BUS#-SCT	X-- NAME --X	BASKV	CKT	MW	MVAR
122096	PINJORE	220.00	172004	BADDI2	220.00*	1	-56.0	-6.4
122096	PINJORE	220.00*	172009	KUNIHAR2	220.00	1	-19.8	-1.7

TOTAL FROM AREA 1002 TO AREA 1007 -75.8 -8.1

TO AREA 1009 CHANDIGA

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT	X-- NAME --X	BASKV	BUS#-SCT	X-- NAME --X	BASKV	CKT	MW	MVAR
120002	DHULKOTE	66.000*	190004	CHANDIGA_S2866.000		1	4.9	-1.5
120002	DHULKOTE	66.000*	190004	CHANDIGA_S2866.000		2	4.9	-1.5

TOTAL FROM AREA 1002 TO AREA 1009 9.8 -3.0

TO AREA 1021 NR_ISTS_HAR

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT	X-- NAME --X	BASKV	BUS#-SCT	X-- NAME --X	BASKV	CKT	MW	MVAR

122000 FATEHABAD-PG220.00 124010 FATEHABAD 400.00* 1 -144.1 -22.8

122000 FATEHABAD-PG220.00 124010 FATEHABAD 400.00* 2 -144.1 -22.8

122000 FATEHABAD-PG220.00 124010 FATEHABAD 400.00* 3 -144.1 -22.8

122020 FATEHABAD_HV220.00* 122075 HISAR-PG2 220.00 1 -12.0 -5.7

122020 FATEHABAD_HV220.00* 122075 HISAR-PG2 220.00 2 -12.0 -5.7

122028 IA-HISAR 220.00* 122075 HISAR-PG2 220.00 1 -222.3 -28.1

122028 IA-HISAR 220.00* 122075 HISAR-PG2 220.00 2 -222.3 -28.1

122059 SAGWAN 220.00* 122075 HISAR-PG2 220.00 1 -71.6 -10.8

122059 SAGWAN 220.00* 122075 HISAR-PG2 220.00 2 -71.6 -10.8

122061 RAIWALI 220.00* 122076 PANCHKULAPG2220.00 1 -184.6 -34.7

122061 RAIWALI 220.00* 122076 PANCHKULAPG2220.00 2 -184.6 -34.7

122070 ABDULLAPUR_P220.00 124012 ABDULLAPUR 400.00* 1 -179.1 -40.0

122070 ABDULLAPUR_P220.00 124012 ABDULLAPUR 400.00* 2 -179.1 -40.0

122070 ABDULLAPUR_P220.00 124012 ABDULLAPUR 400.00* 3 -179.1 -40.0

122070 ABDULLAPUR_P220.00 124012 ABDULLAPUR 400.00* 4 -179.1 -40.0

122071 KAITHAL-PG2 220.00 124013 KAITHAL-PG 400.00* 1 -161.4 -40.3

122071 KAITHAL-PG2 220.00 124013 KAITHAL-PG 400.00* 2 -161.4 -40.3

122071 KAITHAL-PG2 220.00 124013 KAITHAL-PG 400.00* 3 -161.4 -40.3

122072 BAHDURG_PG2 220.00 124016 BAHADURG-PG 400.00* 1 -105.5 -29.3

122072 BAHDURG_PG2 220.00 124016 BAHADURG-PG 400.00* 2 -167.5 -46.5

122074 SONEPAT-PG2 220.00 124018 SONEPAT-PG 400.00* 1 -191.1 -42.7

122074 SONEPAT-PG2 220.00 124018 SONEPAT-PG 400.00* 2 -191.1 -42.7

122086 GURGAON-72_P220.00 124017 GURGAON-PG 400.00* 1 -114.1 -25.0

122086 GURGAON-72_P220.00 124017 GURGAON-PG 400.00* 2 -114.1 -24.9

122086 GURGAON-72_P220.00* 124017 GURGAON-PG 400.00 3 -181.2 -26.2

122086 GURGAON-72_P220.00* 124017 GURGAON-PG 400.00 4 -181.2 -26.2

122089 MANESAR-PG2 220.00 124019 MANESAR-PG 400.00* 1 -176.8 -39.7

122089 MANESAR-PG2 220.00 124019 MANESAR-PG 400.00* 2 -176.8 -39.7

122102 PRITHALA 220.00 124028 PRITHALA 400.00* 1 0.0 0.0

122103 KADARPUR 220.00 124029 KADARPUR 400.00* 1 0.0 -0.0

122103 KADARPUR 220.00 124029 KADARPUR 400.00* 2 0.0 -0.0

124001 KHEDAR 400.00 124010 FATEHABAD 400.00* T2 270.5 -7.6
124002 DAULATABAD_4400.00* 124017 GURGAON-PG 400.00 T1 179.6 15.8
124002 DAULATABAD_4400.00* 124017 GURGAON-PG 400.00 T2 179.6 15.8
124003 KIRORI 400.00 124000 JIND_4 400.00* T1 -267.0 -32.4
124003 KIRORI 400.00 124000 JIND_4 400.00* T2 -267.0 -32.4

124005 NAWADA 400.00 124027 BALLABH_2ND 400.00* B1 -133.4 -178.6
124006 DEEPALPUR 400.00* 124012 ABDULLAPUR 400.00 S1 -174.1 -81.9
124007 KABULPUR 400.00 124016 BAHADURG-PG 400.00* T1 164.9 9.5
124007 KABULPUR 400.00* 124021 BHIWN-PG 400.00 T1 -42.0 -34.3

124009 NUHIYANWALI 400.00 124010 FATEHABAD 400.00* T1 -75.8 29.1 124030 SOHNAROAD 400.00 124017 GURGAON-PG 400.00* T1 144.7 18.2

124030 SOHNAROAD 400.00 124017 GURGAON-PG 400.00* T2 144.7 18.2

124030 SOHNAROAD 400.00* 124019 MANESAR-PG 400.00 T1 70.1 -10.4

124030 SOHNAROAD 400.00* 124019 MANESAR-PG 400.00 T2 70.1 -10.4

124030 SOHNAROAD 400.00* 124029 KADARPUR 400.00 Q1 -429.5 11.4

TOTAL FROM AREA 1002 TO AREA 1021 -4378.0 -1120.7

TO AREA 1022 NR_ISTS_RAJ

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

122011 REWARI 220.00* 132141 BHIWADI 220.00 1 -53.6 -5.4

122011 REWARI 220.00* 132141 BHIWADI 220.00 2 -53.6 -5.4

122049 MAU_HR 220.00* 132141 BHIWADI 220.00 1 -51.6 -3.1

122090 HSIIDC-BAWAL220.00* 132141 BHIWADI 220.00 1 -45.9 -10.2

124999 DHANONDABYPA400.00 134026 NEEMR-PG 400.00* 1 137.9 -5.2

124999 DHANONDABYPA400.00 134026 NEEMR-PG 400.00* 2 137.9 -5.2

TOTAL FROM AREA 1002 TO AREA 1022 71.1 -34.5

TO AREA 1041 NRIST-BB

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

120000 JAGADHARI_BB66.000 122085 JAGADHARI 220.00* 1 -21.0 -0.8

120000 JAGADHARI_BB66.000 122085 JAGADHARI 220.00* 2 -22.2 -0.8

120000 JAGADHARI_BB66.000 122085 JAGADHARI 220.00* 3 -21.3 -0.8

120002 DHULKOTE 66.000 122083 DHULKOTE 220.00* 1 -29.6 -6.0

120002 DHULKOTE 66.000 122083 DHULKOTE 220.00* 2 -29.8 -6.0

120003 BALABGR1 66.000 122080 BALLABGARH 220.00* 1 -30.0 -8.4

120003 BALABGR1 66.000 122080 BALLABGARH 220.00* 2 -30.0 -8.4

120003 BALABGR1 66.000 122080 BALLABGARH 220.00* 3 -30.0 -8.4

121010 KURUKSHETRA_132.00 122077 KURUKSHETRA 220.00* 1 -20.4 -2.1

121010 KURUKSHETRA_132.00 122077 KURUKSHETRA 220.00* 2 -20.4 -2.1

121010 KURUKSHETRA_132.00 122077 KURUKSHETRA 220.00* 3 -24.0 -2.5

121010 KURUKSHETRA_132.00 122077 KURUKSHETRA 220.00* 4 -26.8 -2.8

121021 HISAR_BBMB 132.00 122081 HISAR-BB 220.00* 1 -42.0 -11.5

121021 HISAR_BBMB 132.00 122081 HISAR-BB 220.00* 2 -39.2 -10.7

121021 HISAR_BBMB 132.00 122081 HISAR-BB 220.00* 3 -36.5 -10.0

121202 DADRI_2_HV_B132.00 122084 CHARKHIDADRI220.00* 1 -114.5 -27.3

121202 DADRI_2_HV_B132.00 122084 CHARKHIDADRI220.00* 2 -95.4 -22.8

121214 NARELA_BB 132.00 142046 NARELA_BB 220.00* 1 -10.8 -2.2

121214 NARELA_BB 132.00 142046 NARELA_BB 220.00* 2 -20.7 -4.3

122002 BADSHAHPUR 220.00* 122082 SAMAYPUR 220.00 1 -13.4 -18.8

122002 BADSHAHPUR 220.00* 122082 SAMAYPUR 220.00 2 -13.4 -18.7

122015 MAHINDERGARH220.00* 122084 CHARKHIDADRI220.00 1 -114.1 -17.2

122015 MAHINDERGARH220.00* 122084 CHARKHIDADRI220.00 2 -113.6 -17.1

122017 PALWAL 220.00* 122082 SAMAYPUR 220.00 1 -71.8 -12.8

122017 PALWAL 220.00* 122082 SAMAYPUR 220.00 2 -71.8 -12.8

122019 PALLI 220.00* 122082 SAMAYPUR 220.00 1 -66.1 -38.4

122019 PALLI 220.00* 122082 SAMAYPUR 220.00 2 -66.1 -38.4

122028 IA-HISAR 220.00 122081 HISAR-BB 220.00* 1 85.8 16.8

122028 IA-HISAR 220.00 122081 HISAR-BB 220.00* 2 79.1 15.7

122041 BAPORA 220.00 122079 BHIWANI 220.00* 1 -49.2 -11.8

122041 BAPORA 220.00 122079 BHIWANI 220.00* 2 -49.2 -11.8
122042 JINDAL_STEEL220.00 122081 HISAR-BB 220.00* 1 -99.1 -27.2
122056 LULA_AHIR 220.00 122084 CHARKHIDADRI220.00* 1 196.2 -10.9

122073 FARIDABAD_NT220.00 122082 SAMAYPUR 220.00* 1 -0.0 2.6

122073 FARIDABAD_NT220.00 122082 SAMAYPUR 220.00* 2 -0.0 2.6

122078 PANIPAT 220.00 122077 KURUKSHETRA 220.00* 1 101.2 0.5

122078 PANIPAT 220.00* 122083 DHULKOTE 220.00 1 12.1 -12.6

122078 PANIPAT 220.00* 122083 DHULKOTE 220.00 2 12.1 -12.6

122078 PANIPAT 220.00* 122084 CHARKHIDADRI220.00 1 -20.6 -2.2

122078 PANIPAT 220.00 124024 PANIPAT_BB 400.00* 1 -316.3 -58.1

122078 PANIPAT 220.00 124024 PANIPAT_BB 400.00* 2 -316.3 -58.1

TOTAL FROM AREA 1002 TO AREA 1041 -1559.3 -478.9

TO AREA 1050 NR_ISTS

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

124005 NAWADA 400.00* 154059 GNOIDA4 400.00 B1 -180.5 72.0

124999 DHANONDABYPA400.00* 124025 MAHIN_HV 400.00 T1 -663.5 -69.5

124999 DHANONDABYPA400.00* 124025 MAHIN_HV 400.00 T2 -663.5 -69.5

TOTAL FROM AREA 1002 TO AREA 1050 -1507.5 -67.0

TO AREA 1105 IGSTPS

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

124002 DAULATABAD_4400.00 124023 JHAJJAR4 400.00* T1 -266.3 27.0

124002 DAULATABAD_4400.00 124023 JHAJJAR4 400.00* T2 -264.2 26.9

TOTAL FROM AREA 1002 TO AREA 1105 -530.5 53.9

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TOTAL FROM AREA 1002 HARYANA -7858.4 -1634.1

C) **FROM AREA 1003 RAJASTHA**

TO AREA 1002 HARYANA

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

131006 AMRAPURA 132.00 121023 SIRSA2_1 132.00* 1 8.8 -1.8

TOTAL FROM AREA 1003 TO AREA 1002 8.8 -1.8

TO AREA 1004 DELHI

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

132107 MIA-ALWA 220.00* 142045 BADARPR2 220.00 1 -5.6 -10.9

TOTAL FROM AREA 1003 TO AREA 1004 -5.6 -10.9

TO AREA 1005 UTTARPRA

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

132011 BHARATPUR 220.00* 152115 AGRA-PG 220.00 1 -176.5 1.5

TOTAL FROM AREA 1003 TO AREA 1005 -176.5 1.5

TO AREA 1021 NR_ISTS_HAR

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

137000 PHAGI 765.00* 127000 BHIWN-PG_7 765.00 B1 582.7 -53.5

137000 PHAGI 765.00* 127000 BHIWN-PG_7 765.00 B2 582.8 -53.5

TOTAL FROM AREA 1003 TO AREA 1021 1165.5 -107.1

TO AREA 1022 NR_ISTS_RAJ

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

130000 KANKROLI_SVC18.400 134029 KANKROLI_SVC400.00* 1 0.0 -0.0

132000 DAUSA 220.00* 132140 BASSI 220.00 1 -120.8 -3.9

132000 DAUSA 220.00* 132140 BASSI 220.00 2 -120.8 -3.9

132002 BHIWA-RS 220.00* 132141 BHIWADI 220.00 1 -125.8 -35.9

132002 BHIWA-RS 220.00* 132141 BHIWADI 220.00 2 -125.8 -35.9

132006 KUKAS 220.00* 132140 BASSI 220.00 1 -90.4 -11.4

132007 KANKR-PG 220.00 134022 KANKROLI 400.00* 1 -125.3 -15.6

132007 KANKR-PG 220.00 134022 KANKROLI 400.00* 2 -125.3 -15.6

132007 KANKR-PG 220.00 134022 KANKROLI 400.00* 3 -125.3 -15.6

132009 RATANGAR 220.00* 132144 SIKAR-PG 220.00 1 -23.5 -3.5

132009 RATANGAR 220.00* 132144 SIKAR-PG 220.00 2 -23.5 -3.5

132025 KOTPU-RS 220.00* 132142 KOTPU-PG 220.00 2 -117.3 -18.9

132036 NEEMR-RS 220.00 132141 BHIWADI 220.00* 1 21.0 15.8

132036 NEEMR-RS 220.00* 132143 NEEMR-PG 220.00 1 -142.2 -19.8

132055 SIKAR-RS 220.00* 132144 SIKAR-PG 220.00 1 -183.3 -45.4

132055 SIKAR-RS 220.00* 132144 SIKAR-PG 220.00 2 -183.3 -45.4

132075 BAGRU 220.00* 132140 BASSI 220.00 1 -60.6 -19.0

132093 DUNI 220.00* 132145 JAIPUR_PG 220.00 1 66.4 -27.6

132096 INDIRAGN 220.00* 132140 BASSI 220.00 1 -47.8 -23.2

132104 KUNDAKID 220.00* 132140 BASSI 220.00 1 -108.5 -15.0

132105 MANOHARP 220.00* 132142 KOTPU-PG 220.00 1 -49.8 -15.8

132121 SEZJAIP 220.00* 132145 JAIPUR_PG 220.00 1 -80.5 -4.8

132127 CHAKSU 220.00 132145 JAIPUR_PG 220.00* 1 -163.4 -12.8

132137 KUSHKHER 220.00 132141 BHIWADI 220.00* 1 -112.3 9.6

132137 KUSHKHER 220.00 132143 NEEMR-PG 220.00* 1 -47.9 -4.7

132138 BHINM-PG 220.00 134021 BHINMAL 400.00* 1 -97.1 -4.9

132138 BHINM-PG 220.00 134021 BHINMAL 400.00* 2 -97.1 -4.9

132139 KOTA 220.00 134023 KOTA 400.00* 1 97.8 -9.7

132139 KOTA 220.00 134023 KOTA 400.00* 2 97.8 -9.7

132150 BANSUR 220.00* 132142 KOTPU-PG 220.00 1 -48.5 -7.0

132150 BANSUR 220.00* 132142 KOTPU-PG 220.00 2 -48.5 -7.0

132153 BEHROR 220.00 132143 NEEMR-PG 220.00* 1 -59.4 1.3

132153 BEHROR 220.00 132143 NEEMR-PG 220.00* 2 -59.4 1.3

132155 VATIKA 220.00* 132145 JAIPUR_PG 220.00 1 -74.7 1.2

132155 VATIKA 220.00* 132145 JAIPUR_PG 220.00 2 -74.7 1.2

132161 GONER 220.00 132145 JAIPUR_PG 220.00* 1 -49.7 -5.6

134000 MERTA 400.00* 134023 KOTA 400.00 T2 -153.1 -3.7

134002 BARMER-4 400.00 134021 BHINMAL 400.00* T1 213.4 56.3

134002 BARMER-4 400.00 134021 BHINMAL 400.00* T2 213.3 56.3
134003 HERAPU-4 400.00* 134025 BASSI 400.00 T1 -32.0 -16.9
134003 HERAPU-4 400.00* 134025 BASSI 400.00 T2 -32.9 -16.6

134007 CHABRA-4 400.00* 134027 ANTA-4 400.00 T1 101.0 -25.3
134008 KALISI-4 400.00* 134027 ANTA-4 400.00 Q1 167.1 -74.0
134008 KALISI-4 400.00* 134027 ANTA-4 400.00 Q2 167.1 -74.0

134010 KAWAI 400.00* 134027 ANTA-4 400.00 Q1 267.9 -40.5

134010 KAWAI 400.00* 134027 ANTA-4 400.00 Q2 267.9 -40.5

134012 AJMER 400.00 134036 AJMER_PG 400.00* T1 -75.8 116.5

134012 AJMER 400.00 134036 AJMER_PG 400.00* T2 -75.8 116.5

134014 BHADLA 400.00* 134042 BIKANER_PG 400.00 Q1 13.5 -15.0
134015 JODHPU-4 400.00 134022 KANKROLI 400.00* T1 130.4 35.4
134016 PHAGI_400 400.00* 134025 BASSI 400.00 T1 292.5 -23.6
134016 PHAGI_400 400.00* 134025 BASSI 400.00 T2 292.5 -23.6 134017 BIKANE-4 400.00 134042 BIKANER_PG 400.00* Q1 -75.1 101.3
134017 BIKANE-4 400.00 134042 BIKANER_PG 400.00* Q2 -75.1 101.3
134019 KOTPUT 400.00* 132142 KOTPU-PG 220.00 1 132.7 22.7

134019 KOTPUT 400.00* 132142 KOTPU-PG 220.00 2 132.7 22.7

134019 KOTPUT 400.00 134024 BHIWADI 400.00* T1 -95.8 59.3

134019 KOTPUT 400.00 134025 BASSI 400.00* T1 -170.3 -20.3
134020 SIKAR 400.00* 132144 SIKAR-PG 220.00 1 115.7 28.4
134020 SIKAR 400.00* 132144 SIKAR-PG 220.00 2 115.7 28.4

134020 SIKAR 400.00* 132144 SIKAR-PG 220.00 3 184.6 39.7

134020 SIKAR 400.00 134025 BASSI 400.00* T1 -60.2 81.1

134020 SIKAR 400.00 134025 BASSI 400.00* T2 -60.2 81.1

134020 SIKAR 400.00 134026 NEEMR-PG 400.00* T1 23.1 84.2

134020 SIKAR 400.00 134026 NEEMR-PG 400.00* T2 23.1 84.2

134032 CHITTORGARH 400.00* 134022 KANKROLI 400.00 T1 26.1 -3.6

134032 CHITTORGARH 400.00 134035 CHITTOR_PG 400.00* Q1 -28.1 113.0

134032 CHITTORGARH 400.00 134035 CHITTOR_PG 400.00* Q2 -28.1 113.0

134034 CHHABRA_SC 400.00* 134027 ANTA-4 400.00 Q1 129.1 -32.4

134034 CHHABRA_SC 400.00* 134027 ANTA-4 400.00 Q2 129.1 -32.4

137001 ANTA 765.00* 134027 ANTA-4 400.00 1 -334.4 -22.2

137001 ANTA 765.00* 134027 ANTA-4 400.00 2 -334.4 -22.2

137001 ANTA 765.00* 134027 ANTA-4 400.00 3 -334.4 -22.2

TOTAL FROM AREA 1003 TO AREA 1022 -1457.8 416.9

TO AREA 1024 NR_ISTS_UP

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

134020 SIKAR 400.00 154034 AGRA 400.00* T1 -125.1 93.3

134020 SIKAR 400.00 154034 AGRA 400.00* T2 -125.1 93.3

TOTAL FROM AREA 1003 TO AREA 1024 -250.3 186.6

TO AREA 1041 NRIST-BB

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

132014 KHETRI 220.00 122084 CHARKHIDADRI220.00* 1 -9.5 3.9

132014 KHETRI 220.00 122084 CHARKHIDADRI220.00* 2 -9.5 3.9

132090 CHIRAWA 220.00 122081 HISAR-BB 220.00* 1 -14.5 2.3

TOTAL FROM AREA 1003 TO AREA 1041 -33.5 10.1

TO AREA 1050 NR_ISTS

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

134014 BHADLA 400.00* 134043 BHADLA-PG 400.00 Q1 -11.6 86.6

134014 BHADLA 400.00* 134043 BHADLA-PG 400.00 Q2 -11.6 86.6

TOTAL FROM AREA 1003 TO AREA 1050 -23.3 173.3

TO AREA 1106 SHRE_CEM

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

134000 MERTA 400.00* 134031 SHRECEM 400.00 T1 -256.5 136.2

TOTAL FROM AREA 1003 TO AREA 1106 -256.5 136.2

TO AREA 1151 ANTA

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

132018 BHILWA-2 220.00* 132168 ANTA2 220.00 1 -5.7 -15.2

132018 BHILWA-2 220.00* 132168 ANTA2 220.00 2 -5.7 -15.2

132022 SAKATPUR 220.00* 132168 ANTA2 220.00 1 43.7 -17.6

132051 DAHRA 220.00* 132168 ANTA2 220.00 1 9.2 -38.0

132052 SAWAIMAD 220.00* 132168 ANTA2 220.00 1 -75.0 -6.0

132125 LALSOT 220.00* 132168 ANTA2 220.00 1 -51.4 -14.1

TOTAL FROM AREA 1003 TO AREA 1151 -84.9 -106.0

TO AREA 1155 RAPS-B

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

132022 SAKATPUR 220.00* 132146 RAPS_B2 220.00 1 -122.7 -14.2

132029 CHITTORG_GSS220.00* 132146 RAPS_B2 220.00 1 -53.2 -13.1

132029 CHITTORG_GSS220.00* 132146 RAPS_B2 220.00 2 -53.2 -13.1

132091 DEBARI 220.00 132146 RAPS_B2 220.00* 1 -83.8 5.3

TOTAL FROM AREA 1003 TO AREA 1155 -313.0 -35.1

TO AREA 1156 RAPS-C

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

134032 CHITTORGARH 400.00 134030 RAPS_C4 400.00* T1 -248.1 39.4

TOTAL FROM AREA 1003 TO AREA 1156 -248.1 39.4

TO AREA 3014 MP

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

132004 RANPUR 220.00 322089 BHANPURA 220.00* 1 29.6 16.7

132032 MODAK 220.00 322089 BHANPURA 220.00* 1 -15.7 -4.1

TOTAL FROM AREA 1003 TO AREA 3014 13.9 12.7

TO AREA 3035 WR_ISTS_MP

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

137000 PHAGI 765.00 327003 GWALIOR-PG 765.00* B1 -718.2 205.1

137000 PHAGI 765.00 327003 GWALIOR-PG 765.00* B2 -734.7 198.2

TOTAL FROM AREA 1003 TO AREA 3035 -1452.9 403.2

TOTAL FROM AREA 1003 RAJASTHA -3113.9 1119.2

D) **FROM AREA 1005 UTTARPRA**

TO AREA 1003 RAJASTHA

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

152115 AGRA-PG 220.00 132011 BHARATPUR 220.00* 1 176.5 -1.5

TOTAL FROM AREA 1005 TO AREA 1003 176.5 -1.5

TO AREA 1004 DELHI

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

152005 NOIDA20S 220.00 142032 GAZIPUR_DL 220.00* 1 -40.1 -92.3

152005 NOIDA20S 220.00* 142045 BADARPR2 220.00 1 -49.6 10.8

152170 BOTANICAL GA220.00* 142045 BADARPR2 220.00 1 -60.6 14.4

TOTAL FROM AREA 1005 TO AREA 1004 -150.3 -67.1

TO AREA 1006 UTTARAKH

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

151021 NEHTOR1 132.00* 161031 KALAGARH 132.00 1 -32.1 -2.4

151249 KIRATPUR 132.00 161015 MANGLORE 132.00* 1 25.5 -0.6

151414 PILIBHI1 132.00* 161013 KHATIMAH 132.00 1 33.3 1.9

151419 AFZALGARH 132.00* 161031 KALAGARH 132.00 1 -46.1 -6.6

151511 SHERKOT 132.00* 161031 KALAGARH 132.00 1 -27.2 -3.8

152026 BAKNTPR2 220.00* 162005 PANTNAG2 220.00 1 88.9 21.7

152026 BAKNTPR2 220.00* 162018 PITHORGA 220.00 1 -74.5 16.9

152041 SAHARNP2 220.00* 162016 KHODRIHE 220.00 2 -85.7 3.4

152043 NARA2 220.00* 162008 RORKEE2 220.00 1 -1.4 6.1

152150 SARSAWAN 220.00* 162016 KHODRIHE 220.00 1 -83.8 2.4

154009 MURADAB4 400.00* 164001 KASHIPU4 400.00 T1 -37.0 -45.1

154065 ALAKHNANDA 400.00* 164006 SRINAGAR_UK 400.00 T1 95.6 44.4

154065 ALAKHNANDA 400.00* 164006 SRINAGAR_UK 400.00 T2 95.6 44.4

154082 NEHTAUR 400.00* 164000 RISHIKE4 400.00 T1 -54.6 -77.5

154082 NEHTAUR 400.00* 164001 KASHIPU4 400.00 T1 -170.9 -92.7

TOTAL FROM AREA 1005 TO AREA 1006 -274.4 -87.6

TO AREA 1021 NR_ISTS_HAR

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

154087 ALIGARH (PG)400.00 124028 PRITHALA 400.00* Q1 215.4 35.1

154087 ALIGARH (PG)400.00 124028 PRITHALA 400.00* Q2 215.4 35.1

TOTAL FROM AREA 1005 TO AREA 1021 430.8 70.3

TO AREA 1023 NR_ISTS_DEL

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

157022 ALGRH_JHATIK765.00* 147000 JHATI-PG 765.00 B1 721.3 -135.2

TOTAL FROM AREA 1005 TO AREA 1023 721.3 -135.2

TO AREA 1024 NR_ISTS_UP

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT	X-- NAME --X	BASKV	BUS#-SCT	X-- NAME --X	BASKV	CKT	MW	MVAR
151220	RAEBRL_P	132.00	152101	RAEBAREI	220.00*	1	-90.9	-17.6
151220	RAEBRL_P	132.00	152101	RAEBAREI	220.00*	2	-90.9	-17.6
152052	MAINPUR2	220.00*	152102	KANPU-PG	220.00	1	-60.0	0.6
152055	PANKI2	220.00*	152102	KANPU-PG	220.00	2	-163.3	-11.9
152056	NAUBSTA2	220.00*	152102	KANPU-PG	220.00	1	-164.5	-45.5
152067	CBGANJ2	220.00	162017	SITARGAN	220.00*	1	35.9	10.2
152095	MEERUT	220.00	154024	MEERUT	400.00*	1	-174.1	-26.6
152095	MEERUT	220.00	154024	MEERUT	400.00*	2	-174.1	-26.6
152095	MEERUT	220.00	154024	MEERUT	400.00*	3	-174.1	-26.6
152095	MEERUT	220.00	154024	MEERUT	400.00*	4	-272.3	-33.9
152096	FATEH-PG	220.00	154049	FATEH-PG	400.00*	1	-150.2	-33.8
152096	FATEH-PG	220.00	154049	FATEH-PG	400.00*	2	-150.2	-33.8
152097	LUCKNOW	220.00	154040	LUCK4-PG	400.00*	1	-197.0	-63.2
152097	LUCKNOW	220.00	154040	LUCK4-PG	400.00*	2	-197.0	-63.2
152098	MAINPURI-PG	220.00	154047	MAINPURI	400.00*	1	-132.6	-17.5
152098	MAINPURI-PG	220.00	154047	MAINPURI	400.00*	2	-132.6	-17.5
152098	MAINPURI-PG	220.00	154047	MAINPURI	400.00*	3	-210.8	-17.3
152099	ALLAHABA	220.00	154053	ALLAHABA	400.00*	1	-171.6	-36.5
152099	ALLAHABA	220.00	154053	ALLAHABA	400.00*	2	-171.6	-36.5
152099	ALLAHABA	220.00	154053	ALLAHABA	400.00*	3	-171.6	-36.5
152100	GORAK-PG	220.00	154036	GORAKHPU	400.00*	1	-89.0	-10.5
152100	GORAK-PG	220.00	154036	GORAKHPU	400.00*	2	-89.0	-10.5
152100	GORAK-PG	220.00	154036	GORAKHPU	400.00*	3	-89.0	-10.5
152106	SHAHJAHAN4	220.00	154050	SHAHJ-PG	400.00*	1	-31.8	-11.4
152106	SHAHJAHAN4	220.00	154050	SHAHJ-PG	400.00*	2	-49.7	-17.8
152114	BAGPAT-PG	220.00	154070	BAGPAT	400.00*	1	-196.4	-44.1
152114	BAGPAT-PG	220.00	154070	BAGPAT	400.00*	2	-196.4	-44.1
152115	AGRA-PG	220.00	154034	AGRA	400.00*	1	-233.8	-20.0
152115	AGRA-PG	220.00	154034	AGRA	400.00*	2	-233.8	-20.0
152117	SAHARANPR-PG	220.00*	154071	SAHARNPUR400	400.00	1	-86.5	-19.3

152117 SAHARANPR-PG220.00* 154071 SAHARNPUR400400.00 2 -86.5 -19.3

152124 ORAI 42 220.00* 152102 KANPU-PG 220.00 1 66.7 -23.3

152136 RANIYA 220.00* 152102 KANPU-PG 220.00 1 -102.3 -16.5

152139 SOHAWAL42 220.00 154048 SOHAW-PG 400.00* 1 -137.9 -24.5

152139 SOHAWAL42 220.00 154048 SOHAW-PG 400.00* 2 -137.9 -24.5

152149 CG CITY 220.00 152101 RAEBAREI 220.00* 1 -103.3 9.8

152155 BACHRAWAN 220.00 152101 RAEBAREI 220.00* 1 -149.5 -7.4
152156 SIKANDRA 220.00* 152102 KANPU-PG 220.00 1 -9.3 -21.7
154000 AGRAUP4 400.00* 154034 AGRA 400.00 T2 -291.7 53.3
154001 UNNAO4 400.00* 154040 LUCK4-PG 400.00 T1 148.1 -34.8
154001 UNNAO4 400.00* 154040 LUCK4-PG 400.00 T2 148.1 -34.8
154002 BARELI4 400.00* 154025 BAREL-PG 400.00 Q1 29.0 -170.7
154002 BARELI4 400.00* 154025 BAREL-PG 400.00 Q2 29.0 -170.7

154007 GORAK_UP 400.00* 154036 GORAKHPU 400.00 T1 -91.6 -30.4

154007 GORAK_UP 400.00* 154036 GORAKHPU 400.00 T2 -91.6 -30.4
154008 LUCKN_UP 400.00* 154025 BAREL-PG 400.00 T1 74.0 -47.2
154008 LUCKN_UP 400.00* 154040 LUCK4-PG 400.00 T1 5.2 -64.1
154009 MURADAB4 400.00* 154025 BAREL-PG 400.00 T1 -179.7 -23.9
154009 MURADAB4 400.00* 154025 BAREL-PG 400.00 T2 -177.8 -24.2
154010 MUZAFRN4 400.00* 154024 MEERUT 400.00 T1 -224.7 14.7
154013 PANKI4 400.00* 154037 KANPUR 400.00 T1 -236.1 12.6

154013 PANKI4 400.00* 154037 KANPUR 400.00 T2 -238.4 10.9

154017 ROSA-TP2 400.00* 154050 SHAHJ-PG 400.00 T1 -19.8 -55.7

154017 ROSA-TP2 400.00* 154050 SHAHJ-PG 400.00 T2 -19.8 -55.7

154019 SARNATH4 400.00 154067 VARANASI-PG 400.00* Q1 -51.8 -0.9

154019 SARNATH4 400.00 154067 VARANASI-PG 400.00* Q2 -51.8 -0.9

154022 SULTANP4 400.00* 154040 LUCK4-PG 400.00 T1 18.3 -93.3
154023 MAU4 400.00* 154054 BAL74-PG 400.00 T1 -128.6 -10.1
154023 MAU4 400.00* 154054 BAL74-PG 400.00 T2 -128.6 -10.1

154073 FATEHBD_AGRA400.00 154034 AGRA 400.00* T1 226.9 101.8

154075 MEJA 400.00* 154053 ALLAHABA 400.00 T1 185.5 -88.5

154075 MEJA 400.00* 154053 ALLAHABA 400.00 T2 185.5 -88.5

154077 MAINPURI_765400.00* 154047 MAINPURI 400.00 T1 200.1 -42.7

154077 MAINPURI_765400.00* 154047 MAINPURI 400.00 T2 204.2 -43.3

154077 MAINPURI_765400.00 157015 MAINPURI_765765.00* 2 -391.6 121.3
154078 UNCHAHAR 400.00* 154049 FATEH-PG 400.00 T1 -40.4 -27.5
154078 UNCHAHAR 400.00* 154049 FATEH-PG 400.00 T2 -40.4 -27.5

154081 HAPUR 400.00 157016 HAPUR 765.00* 1 -821.2 12.0

154086 ORAI (PG) 400.00 157017 ORAI 765.00* 1 -566.7 159.8

154086 ORAI (PG) 400.00 157017 ORAI 765.00* 2 -566.7 159.8
154087 ALIGARH (PG)400.00 157018 ALIGARH 765.00* 1 -215.8 -3.7
154087 ALIGARH (PG)400.00 157018 ALIGARH 765.00* 2 -215.8 -3.7

157011 GR.NOIDA 765.00* 157008 MERUT-PG 765.00 B1 625.4 8.9 157011 GR.NOIDA 765.00* 157015 MAINPURI_765765.00 B1 -455.7 91.4

157011 GR.NOIDA 765.00* 157016 HAPUR 765.00 B1 821.9 122.1

157014 BARA-TPS 765.00* 157015 MAINPURI_765765.00 B2 853.3 -146.8

157019 ALGRH_GNOIDA765.00 157018 ALIGARH 765.00* H1 -1789.2 -68.9
157020 ALGRH_AGRA 765.00* 157007 AGRA-PG 765.00 B1 -778.4 -144.9
157020 ALGRH_AGRA 765.00 157018 ALIGARH 765.00* H1 778.3 173.0
157021 ALGRH_KANPUR765.00* 157012 KANPUR_GIS 765.00 B1 64.3 -388.4
157021 ALGRH_KANPUR765.00 157018 ALIGARH 765.00* H1 -64.3 65.1
157022 ALGRH_JHATIK765.00 157018 ALIGARH 765.00* H1 -721.4 162.8
TOTAL FROM AREA 1005 TO AREA 1024 -8971.5 -1549.4

TO AREA 1025 NR_ISTS_UTT

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

154010 MUZAFRN4 400.00 164002 ROORKEE 400.00* T1 80.2 -6.1

TOTAL FROM AREA 1005 TO AREA 1025 80.2 -6.1

TO AREA 1050 NR_ISTS

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

151424 AGRA_SOUTH 132.00 154058 AGRA_SOUTH 400.00* 1 -117.5 -39.7

151424 AGRA_SOUTH 132.00 154058 AGRA_SOUTH 400.00* 2 -117.5 -39.7

151424 AGRA_SOUTH 132.00 154058 AGRA_SOUTH 400.00* 3 -117.5 -39.7

152002 GNOIDA2 220.00 154059 GNOIDA4 400.00* 1 -254.2 -40.8

152002 GNOIDA2 220.00 154059 GNOIDA4 400.00* 2 -159.8 -28.7

152002 GNOIDA2 220.00 154059 GNOIDA4 400.00* 3 -254.2 -40.8

152002 GNOIDA2 220.00 154059 GNOIDA4 400.00* 4 -254.2 -40.8

154068 GR. NOIDA74 400.00* 154059 GNOIDA4 400.00 Q1 69.5 29.3

154068 GR. NOIDA74 400.00* 154059 GNOIDA4 400.00 Q2 69.5 29.3

154073 FATEHBD_AGRA400.00 154058 AGRA_SOUTH 400.00* T1 176.3 59.5

154073 FATEHBD_AGRA400.00 154058 AGRA_SOUTH 400.00* T2 176.3 59.5

TOTAL FROM AREA 1005 TO AREA 1050 -783.4 -92.5

TO AREA 1100 SINGRAUL

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

154008 LUCKN_UP 400.00* 154056 SINGRL4 400.00 T1 -271.1 -3.0

154014 ANPARA4 400.00* 154056 SINGRL4 400.00 T1 106.9 34.9

TOTAL FROM AREA 1005 TO AREA 1100 -164.2 31.9

TO AREA 1103 DADR-NCR

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

154066 MURADNGR NEW400.00* 154100 DADRI SPLIT 400.00 T1 -70.0 40.1

TOTAL FROM AREA 1005 TO AREA 1103 -70.0 40.1

TO AREA 1104 UNCHAHAR

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

152064 FATEHPR2 220.00* 152127 UNCHAHR2 220.00 1 -85.4 11.8

152064 FATEHPR2 220.00* 152127 UNCHAHR2 220.00 2 -85.4 11.8

154078 UNCHAHAR 400.00* 152127 UNCHAHR2 220.00 1 80.8 55.0

TOTAL FROM AREA 1005 TO AREA 1104 -89.9 78.6

TO AREA 1152 AURAIYA

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

152049 SIKANDR2 220.00* 154060 AURYA2 220.00 1 -36.6 -14.9

152049 SIKANDR2 220.00* 154060 AURYA2 220.00 2 -36.6 -14.9

TOTAL FROM AREA 1005 TO AREA 1152 -73.1 -29.8

TO AREA 1153 NAPS

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

152003 ATRAULI2 220.00* 152105 NAPP2 220.00 1 -7.2 34.8

152030 SAMBHAL 220.00 152105 NAPP2 220.00* 1 -194.0 -8.5

152033 SIMBOLI2 220.00 152105 NAPP2 220.00* 1 -67.5 26.4

152045 KHURJA2 220.00 152105 NAPP2 220.00* 1 -79.7 55.9

152121 DEBAI 220.00 152105 NAPP2 220.00* 2 -54.1 18.9

TOTAL FROM AREA 1005 TO AREA 1153 -402.5 127.6

TO AREA 1205 TANAKPUR

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

152067 CBGANJ2 220.00 162019 TANAKPUR2 220.00* 1 10.6 5.2

TOTAL FROM AREA 1005 TO AREA 1205 10.6 5.2

TO AREA 1208 DHAULIGA

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

152026 BAKNTPR2 220.00* 162024 DHAULI2 220.00 1 -100.6 19.0

TOTAL FROM AREA 1005 TO AREA 1208 -100.6 19.0

TO AREA 2002 JHARKHAND

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

151065 RIHND1 132.00 221019 GARWAH 132.00* 1 63.7 -28.6

TOTAL FROM AREA 1005 TO AREA 2002 63.7 -28.6

TO AREA 2051 ER_ISTS_BIH

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

152065 SAHUPU_N 220.00 212014 PUSAULI2 220.00* 1 -32.7 18.7

TOTAL FROM AREA 1005 TO AREA 2051 -32.7 18.7

TOTAL FROM AREA 1005 UTTARPRA -9629.6 -1606.3

E) **FROM AREA 1006 UTTARAKH**

TO AREA 1005 UTTARPRA

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

161013 KHATIMAH 132.00 151414 PILIBHI1 132.00* 1 -33.3 -1.9

161015 MANGLORE 132.00* 151249 KIRATPUR 132.00 1 -25.5 0.6

161031 KALAGARH 132.00 151021 NEHTOR1 132.00* 1 32.1 2.4

161031 KALAGARH 132.00 151419 AFZALGARH 132.00* 1 46.1 6.6

161031 KALAGARH 132.00 151511 SHERKOT 132.00* 1 27.2 3.8

162005 PANTNAG2 220.00 152026 BAKNTPR2 220.00* 1 -88.9 -21.7

162008 RORKEE2 220.00 152043 NARA2 220.00* 1 1.4 -6.1

162016 KHODRIHE 220.00 152041 SAHARNP2 220.00* 2 85.7 -3.4

162016 KHODRIHE 220.00 152150 SARSAWAN 220.00* 1 83.8 -2.4

162018 PITHORGA 220.00 152026 BAKNTPR2 220.00* 1 74.5 -16.9

164000 RISHIKE4 400.00 154082 NEHTAUR 400.00* T1 54.6 77.5

164001 KASHIPU4 400.00 154009 MURADAB4 400.00* T1 37.0 45.1

164001 KASHIPU4 400.00 154082 NEHTAUR 400.00* T1 170.9 92.7

164006 SRINAGAR_UK 400.00 154065 ALAKHNANDA 400.00* T1 -95.6 -44.4

164006 SRINAGAR_UK 400.00 154065 ALAKHNANDA 400.00* T2 -95.6 -44.4

TOTAL FROM AREA 1006 TO AREA 1005 274.4 87.6

TO AREA 1007 HIMACHAL

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

162016 KHODRIHE 220.00* 172011 GIR1_220 220.00 1 20.5 13.7

TOTAL FROM AREA 1006 TO AREA 1007 20.5 13.7

TO AREA 1024 NR_ISTS_UP

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

161029 SITARGAN 132.00 162017 SITARGAN 220.00* 1 -26.5 -6.7

161029 SITARGAN 132.00 162017 SITARGAN 220.00* 2 -26.5 -6.7

161029 SITARGAN 132.00 162017 SITARGAN 220.00* 3 -26.5 -6.7

164001 KASHIPU4 400.00 154055 BARELI74 400.00* Q1 -165.6 51.4

164001 KASHIPU4 400.00 154055 BARELI74 400.00* Q2 -165.6 51.4

TOTAL FROM AREA 1006 TO AREA 1024 -410.7 82.8

TO AREA 1025 NR_ISTS_UTT

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

162023 DEHRADUN-PG 220.00 164007 DEHRADUN-PG 400.00* 1 -87.9 -17.3

162023 DEHRADUN-PG 220.00 164007 DEHRADUN-PG 400.00* 2 -87.9 -17.3

164000 RISHIKE4 400.00 164002 ROORKEE 400.00* T1 -121.6 -30.3

164001 KASHIPU4 400.00* 164002 ROORKEE 400.00 Q1 11.9 -64.3

164001 KASHIPU4 400.00* 164002 ROORKEE 400.00 Q2 11.9 -64.3

TOTAL FROM AREA 1006 TO AREA 1025 -273.6 -193.6

TO AREA 1050 NR_ISTS

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

162008 RORKEE2 220.00 162020 ROORK-PG 220.00* 1 -176.9 -48.2

162025 PIRANKALIYAR220.00 162020 ROORK-PG 220.00* 1 -38.7 -26.4

TOTAL FROM AREA 1006 TO AREA 1050 -215.6 -74.6

TO AREA 1208 DHAULIGA

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

162018 PITHORGA 220.00* 162024 DHAULI2 220.00 1 -175.5 36.2

TOTAL FROM AREA 1006 TO AREA 1208 -175.5 36.2

TOTAL FROM AREA 1006 UTTARAKH -780.4 -47.9

F) **INTERCHANGE FROM AREA 1004 DELHI**

TO AREA 1002 HARYANA

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

142004 NARELA_D 220.00 122078 PANIPAT 220.00* 1 -56.9 6.3

142004 NARELA_D 220.00 122078 PANIPAT 220.00* 2 -56.9 6.3

142004 NARELA_D 220.00 122078 PANIPAT 220.00* 3 -56.9 6.3

144006 BAWANA4 400.00 124006 DEEPALPUR 400.00* S1 -43.1 -27.5

TOTAL FROM AREA 1004 TO AREA 1002 -213.8 -8.6

TO AREA 1003 RAJASTHA

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

142045 BADARPR2 220.00 132107 MIA-ALWA 220.00* 1 5.6 10.9

TOTAL FROM AREA 1004 TO AREA 1003 5.6 10.9

TO AREA 1005 UTTARPRA

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

142032 GAZIPUR_DL 220.00* 152005 NOIDA20S 220.00 1 40.1 92.3

142045 BADARPR2 220.00 152005 NOIDA20S 220.00* 1 49.6 -10.8

142045 BADARPR2 220.00 152170 BOTANICAL GA220.00* 1 60.6 -14.4

TOTAL FROM AREA 1004 TO AREA 1005 150.3 67.1

TO AREA 1021 NR_ISTS_HAR

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

144000 BAWANA-G 400.00* 124016 BAHADURG-PG 400.00 T1 -55.4 -40.2

144000 BAWANA-G 400.00* 124021 BHIWN-PG 400.00 T1 -120.8 -49.3

144006 BAWANA4 400.00* 124012 ABDULLAPUR 400.00 S1 -154.0 -91.6

TOTAL FROM AREA 1004 TO AREA 1021 -330.2 -181.1

TO AREA 1023 NR_ISTS_DEL

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

142012 MANDOLA 220.00 144003 MANDOLA 400.00* 1 -269.9 -42.1

142012 MANDOLA 220.00 144003 MANDOLA 400.00* 2 -269.9 -42.1

142012 MANDOLA 220.00 144003 MANDOLA 400.00* 3 -269.9 -42.1

142012 MANDOLA 220.00 144003 MANDOLA 400.00* 4 -269.9 -42.1

142033 MAHARANIBAGH220.00 144002 MAHARANI 400.00* 1 -123.0 -2.9

142033 MAHARANIBAGH220.00 144002 MAHARANI 400.00* 2 -123.0 -2.9

142033 MAHARANIBAGH220.00 144002 MAHARANI 400.00* 3 -195.2 -4.6

142033 MAHARANIBAGH220.00 144002 MAHARANI 400.00* 4 -195.2 -4.6

142048 TUGHLAKBAD 220.00 144009 TUGHLKABAD 400.00* 1 -148.5 -26.2

142048 TUGHLAKBAD 220.00 144009 TUGHLKABAD 400.00* 2 -148.5 -26.2

142048 TUGHLAKBAD 220.00 144009 TUGHLKABAD 400.00* 3 -148.5 -26.2

142048 TUGHLAKBAD 220.00 144009 TUGHLKABAD 400.00* 4 -148.5 -26.2

144006 BAWANA4 400.00* 144012 MANDOLA_2ND 400.00 B1 86.0 -31.2

144006 BAWANA4 400.00* 144012 MANDOLA_2ND 400.00 B2 86.0 -31.2

144007 BAMNOLI14 400.00* 144005 JHATIK_S 400.00 B1 -614.1 -30.4

144007 BAMNOLI14 400.00* 144005 JHATIK_S 400.00 B2 -614.1 -30.4

144007 BAMNOLI14 400.00* 144009 TUGHLKABAD 400.00 B1 178.9 -35.8

144007 BAMNOLI14 400.00* 144009 TUGHLKABAD 400.00 B2 178.9 -35.8

144008 MUNDKA 400.00* 144004 JHATI-PG 400.00 B1 -178.8 30.5

144008 MUNDKA 400.00* 144004 JHATI-PG 400.00 B2 -178.8 30.5

TOTAL FROM AREA 1004 TO AREA 1023 -3366.4 -422.0

TO AREA 1041 NRIST-BB

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

142004 NARELA_D 220.00* 142046 NARELA_BB 220.00 1 31.5 6.5

142045 BADARPR2 220.00 122080 BALLABGARH 220.00* 1 -24.6 15.1

142045 BADARPR2 220.00 122080 BALLABGARH 220.00* 2 -24.6 15.1

TOTAL FROM AREA 1004 TO AREA 1041 -17.8 36.7

TO AREA 1103 DADR-NCR

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

144001 HARSHVIHAR 400.00 154061 DADR-NCR 400.00* T2 -351.4 -23.4

144001 HARSHVIHAR 400.00 154100 DADRI SPLIT 400.00* T1 -203.9 -74.0

TOTAL FROM AREA 1004 TO AREA 1103 -555.3 -97.4

TO AREA 1105 IGSTPS

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

144008 MUNDKA 400.00 124023 JHAJJAR4 400.00* T1 -295.8 7.5

144008 MUNDKA 400.00 124023 JHAJJAR4 400.00* T2 -295.8 7.5

TOTAL FROM AREA 1004 TO AREA 1105 -591.5 15.1

TOTAL FROM AREA 1004 DELHI -4919.1 -579.3

G) **FROM AREA 1007 HIMACHAL**

TO AREA 1001 PUNJAB

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

171003 KANGRA1 132.00 111112 KANGR-PS 132.00* 1 9.4 -20.2

171006 HAMIRP-2 132.00 111015 CHOHAL 132.00* 1 53.6 -0.3

171007 BASSI1 132.00* 111089 JOGINDERNAGA132.00 2 24.0 -11.0

172019 JASSOR2 220.00 112019 RSD 220.00* 1 -54.9 12.9

TOTAL FROM AREA 1007 TO AREA 1001 32.1 -18.6

TO AREA 1002 HARYANA

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

172004 BADDI2 220.00* 122096 PINJORE 220.00 1 56.0 6.4

172009 KUNIHAR2 220.00 122096 PINJORE 220.00* 1 19.8 1.7

TOTAL FROM AREA 1007 TO AREA 1002 75.8 8.1

TO AREA 1006 UTTARAKH

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

172011 GIR1_220 220.00 162016 KHODRIHE 220.00* 1 -20.5 -13.7

TOTAL FROM AREA 1007 TO AREA 1006 -20.5 -13.7

TO AREA 1020 NR_ISTS_PUN

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

172025 NEHRIAN 220.00 112101 JALAN-PG 220.00* 1 28.8 10.7

172025 NEHRIAN 220.00 112101 JALAN-PG 220.00* 2 28.8 10.7

TOTAL FROM AREA 1007 TO AREA 1020 57.7 21.5

TO AREA 1026 NR_ISTS_HP

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

172001 HAMIRPUR42 220.00 174006 HAMIRPUR 400.00* 1 -84.3 -11.0

172001 HAMIRPUR42 220.00 174006 HAMIRPUR 400.00* 2 -84.3 -11.0

172005 UPARNANG 220.00 172013 NALLAGAR 220.00* 1 -114.8 -34.5

172005 UPARNANG 220.00 172013 NALLAGAR 220.00* 2 -114.8 -34.5

172023 PHOZAL 220.00 172013 NALLAGAR 220.00* 1 121.8 -4.3

TOTAL FROM AREA 1007 TO AREA 1026 -276.5 -95.3

TO AREA 1203 BAIRASIU

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

172019 JASSOR2 220.00 172018 BAIRASIUL2 220.00* 1 -56.1 3.7

TOTAL FROM AREA 1007 TO AREA 1203 -56.1 3.7

TO AREA 1216 DEHAR

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

171023 KNGO_SPL 132.00* 171029 DEHAR1 132.00 1 -16.0 -4.3

172003 KANGOO2 220.00 172017 DEHAR 220.00* 1 -33.0 -6.0

TOTAL FROM AREA 1007 TO AREA 1216 -49.0 -10.3

TO AREA 1217 PONG

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

172019 JASSOR2 220.00 172021 PONG 220.00* 1 52.2 -8.0

TOTAL FROM AREA 1007 TO AREA 1217 52.2 -8.0

TO AREA 1218 ADHYDRO

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

172026 PATLI_PHOZAL220.00 172022 ADHYDRO 220.00* 1 -54.1 4.8

TOTAL FROM AREA 1007 TO AREA 1218 -54.1 4.8

TO AREA 1219 KARCHAMW

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

174000 BASPA4 400.00 174010 KARCHAMW 400.00* S1 153.0 -7.0

174000 BASPA4 400.00 174010 KARCHAMW 400.00* S2 153.0 -7.0

TOTAL FROM AREA 1007 TO AREA 1219 306.1 -13.9

TO AREA 1222 PARBATI-3

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

174015 SAINJ 400.00* 174012 PARBTI-3 400.00 Q1 20.6 -7.7

TOTAL FROM AREA 1007 TO AREA 1222 20.6 -7.7

TO AREA 1223 PARBATI-2

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

174015 SAINJ 400.00* 174011 PARBT-II 400.00 Q1 23.3 -7.3

TOTAL FROM AREA 1007 TO AREA 1223 23.3 -7.3

TOTAL FROM AREA 1007 HIMACHAL 111.5 -136.8

H) **FROM AREA 1008 JAMUKASH**

TO AREA 1001 PUNJAB

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

182004 HIRANAGAR2 220.00* 112018 SARNA 220.00 1 102.0 -8.2

182004 HIRANAGAR2 220.00* 112019 RSD 220.00 1 59.6 -10.0

182004 HIRANAGAR2 220.00* 112019 RSD 220.00 2 59.6 -10.0
182005 UDAMPUR2 220.00* 112018 SARNA 220.00 1 80.9 -6.0
TOTAL FROM AREA 1008 TO AREA 1001 302.0 -34.2

TO AREA 1027 NR_ISTS_JK

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

182000 ZAINKOTE2 220.00* 182007 WAGOORA 220.00 1 -29.6 -19.7

182000 ZAINKOTE2 220.00* 182007 WAGOORA 220.00 2 -29.6 -19.7
182001 RAMBAN 220.00 182011 KISHENPUR 220.00* 1 -25.4 -7.3
182003 BARN2 220.00 182011 KISHENPUR 220.00* 1 -73.9 -10.2

182003 BARN2 220.00 182011 KISHENPUR 220.00* 2 -73.8 -10.2
182004 HIRANAGAR2 220.00* 182013 SAMBA 220.00 1 -294.1 -69.3
182005 UDAMPUR2 220.00 182011 KISHENPUR 220.00* 1 -100.0 -16.6
182005 UDAMPUR2 220.00 182011 KISHENPUR 220.00* 2 -100.0 -16.6

182016 AMARGARH 220.00 184009 AMARGARH 400.00* 1 -80.9 -27.8

182016 AMARGARH 220.00 184009 AMARGARH 400.00* 2 -80.9 -27.8

184000 BAGLIHAR4 400.00* 184002 KISHENPUR 400.00 T1 376.3 -60.0

184008 BAGLIHAR-2 400.00* 184002 KISHENPUR 400.00 T1 188.2 -58.5

184008 BAGLIHAR-2 400.00* 184002 KISHENPUR 400.00 T2 188.2 -58.5

TOTAL FROM AREA 1008 TO AREA 1027 -135.6 -402.3

TO AREA 1050 NR_ISTS

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

181001 MIRBAZAR 132.00* 182006 MIRBAZAR 220.00 1 -53.6 -14.6

181001 MIRBAZAR 132.00* 182006 MIRBAZAR 220.00 2 -53.6 -14.6

181027 PAMPORE1 132.00 182008 PAMPORE2 220.00* 1 -88.6 -32.9

181027 PAMPORE1 132.00 182008 PAMPORE2 220.00* 2 -88.6 -32.9

181027 PAMPORE1 132.00 182008 PAMPORE2 220.00* 3 -88.6 -32.9

181035 GLADINI1 132.00 182010 JAMMU2 220.00* 1 -279.7 -46.1

182001 RAMBAN 220.00* 182006 MIRBAZAR 220.00 1 25.4 16.8

TOTAL FROM AREA 1008 TO AREA 1050 -627.2 -157.3

TO AREA 1210 SEWA-II

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

181000 KATHUA1 132.00* 181045 SEWA-II 132.00 1 -39.5 -0.8

181010 MAHANPUR 132.00 181045 SEWA-II 132.00* 1 -20.0 -1.8

181038 HERANAGAR1 132.00 181045 SEWA-II 132.00* 1 -36.6 4.8

181038 HERANAGAR1 132.00 181045 SEWA-II 132.00* 2 -36.6 4.8

TOTAL FROM AREA 1008 TO AREA 1210 -132.7 7.0

TO AREA 1225 KISHANGANGA

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

182014 DELINA 220.00 182015 KISHANGANGA 220.00* 1 -56.7 -6.0

182014 DELINA 220.00 182015 KISHANGANGA 220.00* 2 -56.7 -6.0

TOTAL FROM AREA 1008 TO AREA 1225 -113.4 -12.0

TOTAL FROM AREA 1008 JAMUKASH -706.8 -598.8

I) **FROM AREA 1009 CHANDIGA**

TO AREA 1001 PUNJAB

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

190000 CHANDIGA_S3966.000 110048 MOHALI-II 66.000* 1 -25.1 4.5

190000 CHANDIGA_S3966.000 110048 MOHALI-II 66.000* 2 -25.1 4.5

190010 CHANDIGA_S5666.000 110048 MOHALI-II 66.000* 1 -25.3 2.4

190010 CHANDIGA_S5666.000 110048 MOHALI-II 66.000* 2 -25.3 2.4

TOTAL FROM AREA 1009 TO AREA 1001 -100.7 13.8

TO AREA 1002 HARYANA

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

190004 CHANDIGA_S2866.000 120002 DHULKOTE 66.000* 1 -4.9 1.5

190004 CHANDIGA_S2866.000 120002 DHULKOTE 66.000* 2 -4.9 1.5

TOTAL FROM AREA 1009 TO AREA 1002 -9.8 3.0

TO AREA 1026 NR_ISTS_HP

X------ FROM AREA BUS ------X X------- TO AREA BUS -------X

BUS#-SCT X-- NAME --X BASKV BUS#-SCT X-- NAME --X BASKV CKT MW MVAR

192000 KISHANGA_CHA220.00* 172013 NALLAGAR 220.00 1 -105.6 -18.5

192000 KISHANGA_CHA220.00* 172013 NALLAGAR 220.00 2 -105.6 -18.5

TOTAL FROM AREA 1009 TO AREA 1026 -211.2 -36.9

TOTAL FROM AREA 1009 CHANDIGA -321.7 -20.1

Annexure-VII Minutes of Meting and E-Mail Correspondence with NRPC

Dr. Manohar Singh
to me

11:24 AM (3 minutes ago)

From: Reeturaj Pandey [mailto:pandeyr.cea@gov.in]
Sent: Saturday, February 5, 2022 7:37 PM
To: Dr MANOHAR SINGH
Cc: NARESH BHANDARI; Mr. SAUMITRA MAZUMDAR; Kaushik Panditrao
Subject: Re: Submission of Report-reg.

महोदय/महोदया,
Sir/Madam,

Report may be prepared and submitted within a week's time.

सादर/Regards
ऋतुराज पाण्डेय/Reeturaj Pandey
कार्यपालक अभियंता (संरक्षण एवं प्रणाली अध्ययन)/
Executive Engineer (Protection & System Studies)
उत्तर क्षेत्रीय विद्युत् समिति सचिवालय/
Northern Regional Power Committee Secretariat
नई दिल्ली/New Delhi

From: "Dr MANOHAR SINGH" <manoharsingh@cpri.in>
To: "Reeturaj Pandey" <pandeyr.cea@gov.in>
Sent: Friday, February 4, 2022 3:14:23 PM
Subject: tuned the results _NR _Cap Study

Dear Sir,

We re-looked into comments received from NRLDC. We are experiencing that present compensated file is now highly sensitive and too much tuning over it is resulting in re-distribution of reactive power among the local pool of central generating units in HP and JK.

However, we attempted further tuning, which has some minor reflection on connected state generators in general without any much change in identified Capacitors.

The tuned file has reached at a stage, where any further tuning in reactive power exchange from any one generator is resulting supply/absorption by nearby connected generating units.

The units wise Comment as under:

1. Himachal Pradesh: Baspa, jhakri,koldam,Karcham: we tuned reactive power at Jhakari, Koldam., Bapsa close to Base case file and it has resulted in more absorption at Karcham. Absorption at Karcham is 127 MVAr which is well within Capability of Generating Units at Karcham Power House.

2. Jammu & Kashmir: Baglihar, Salal, Uri-I,Uri-II, Dulhasti: In Provided Base case file the reactive limits are kept at Zero and it is found that voltage URI-1, Uri-II, Dhulhasthi, AMARGARH , **BAGLIHAR-2 & BAGLIHAR-4 etc** is higher than IEGC Grid Code. Attempts are made to bring down the voltage within IEGC grid code by relaxing the reactive power limit of these machines in JK . This resulted in absorption of reactive power at these machines which is well within Capability of Generating Units. (Since there are no reactors to control over voltage)

3. ISGS: Dadri-C and Dadri NCR these machines are tuned close to Base case .

4. The tuned file has voltage within IEGC limits and machines reactive power support is not utilized for voltage control in state utility network. Surplus reactive power is absorbed by a few machines within their units wise capability.

5. The compensation at sensitive mode in state utility at 132/66 buses will result in voltage profile improvement and this may be above than 1.01 p. u (within IEGC) due to redistribution of reactive power flow in network.

The tuned result for above machines are listed in attachment.

I hope the above details response will be helpful to take a call over preparation of final report.

Best regards
Manohar Singh

From: Reeturaj Pandey [mailto:pandeyr.cea@gov.in]
Sent: Thursday, February 3, 2022 4:46 PM
To: Dr MANOHAR SINGH
Cc: Mr. SAUMITRA MAZUMDAR; Kaushik Panditrao
Subject: Fwd: tuned the results _NR _Cap Study

महोदय/महोदया,
Sir/Madam,

Please comment on suggestions of NRLDC.
Matter may be taken on priority.

सादर/Regards
ऋतुराज पाण्डेय/Reeturaj Pandey
कार्यपालक अभियंता (संरक्षण एवं प्रणाली अध्ययन)/
Executive Engineer (Protection & System Studies)
उत्तर क्षेत्रीय विद्युत् समिति सचिवालय/
Northern Regional Power Committee Secretariat
नई दिल्ली/New Delhi

From: "suruchi jain" <suruchi.jain@posoco.in>
To: "Reeturaj Pandey" <pandeyr.cea@gov.in>
Cc: "Mr. SAUMITRA MAZUMDAR" <seo-nrpc@nic.in>, "alok kumar" <alok.kumar@posoco.in>
Sent: Thursday, February 3, 2022 4:08:57 PM
Subject: Re: tuned the results _NR _Cap Study

Hi,

some of the generator still need tuning i.e especially in

Himachal Pradesh: Baspa, Dulhasti,jhakri,koldam,karcham
Jammu & Kashmir: Baglihar, Salal, Uri-I,Uri-II
ISGS: Dadri-C and Dadri NCR

In addition, after compensation, voltage at some of the nodes are exceeding 1.01 p.u. which need to avoid. If in basecase, pre compensated voltage is less than 1.0p.u. ...please ensure that after compensation it shouldn't exceed 1.01p.u.

regards

From: Reeturaj Pandey <pandeyr.cea@gov.in>
Sent: Monday, January 24, 2022 1:03:38 PM
To: Suruchi Jain (सुरुचि जैन)
Cc: Mr. SAUMITRA MAZUMDAR; Alok Kumar (आलोक कुमार)
Subject: Fwd: tuned the results _NR _Cap Study

महोदय/महोदया,
Sir/Madam,

In continuation of decisions of meeting held on 05.01.2022 (MoM attached), CPRI has tuned base-case as per discussion and has submitted results in excel sheet attached.
It may be verified whether CPRI has tuned as per comments of NRLDC representative recorded in MoM. May be intimated at the earliest, so that CPRI may be asked to prepare final report.

Note: Excel sheet may not be shared out of NRLDC.

सादर / Regards
ऋतुराज पाण्डेय / Reeturaj Pandey
कार्यपालक अभियंता (प्रचालन/ संरक्षण)/ Executive Engineer (Operation/ Protection)
उत्तर क्षेत्रीय विद्युत् समिति सचिवालय/ Northern Regional Power Committee Secretariat
नई दिल्ली / New Delhi

From: "Dr MANOHAR SINGH" <manoharsingh@cpri.in>
To: "Reeturaj Pandey" <pandeyr.cea@gov.in>
Sent: Thursday, January 20, 2022 11:20:19 AM
Subject: tuned the results _NR _Cap Study

Dear Sir,

We have tuned the results as per our discussion and as mentioned in Trailing mail. The identified additional compensation for Punjab is now 1195 MVar against 1412 MVar. For other states in general it is unchanged .

The dynamic support of state machines is kept close to base file. The central generation in HP and JK has been in absorbing mode as compare to base file for a few Power plants, due to less drawl of reactive power to neighboring states.

The NRLDC may use the attached compensated file for tuning the reactive power absorption of central generation in HP and JK .

I hope now these results will be acceptable .

Kindly give your concurrence on results for formulation of final report.

Best regards
Manohar Singh

From: Reeturaj Pandey [mailto:pandeyr.cea@gov.in]
Sent: Wednesday, January 5, 2022 6:16 PM
To: Dr MANOHAR SINGH; sonna_bh@yahoo.com; suruchi.jain@posoco.in; ase-sldcop@pstcl.org; smart.saxena@gmail.com; sehpsldc@gmail.com; sldc.scadaxen@gmail.com; asif@posoco.in; xen2.pp@rvpn.co.in; dtldata@gmail.com; sldcmintoroad@gmail.com; managersogd@gmail.com; sinha.surendra123@gmail.com; se.pp@rvpn.co.in; sldcharyanacr@gmail.com; Vinayak_shaily@ptcul.org; sldc1@rediffmail.com; choudhary.rohit2012@gmail.com
Cc: NARESH BHANDARI; Mr. SAUMITRA MAZUMDAR; Kaushik Panditrao ; Vipul Kumar; alok.kumar@posoco.in
Subject: MoM of the meeting held on 05.01.2022 for discussion on CPRI final report on 'System Study for Capacitor requirement in NR for the year 2019-20'-reg.

महोदय/महोदया,
Sir/Madam,

Please find attached minutes of the meeting held on 05.01.2022 at 11:30 AM.

सादर / Regards
ऋतुराज पाण्डेय / Reeturaj Pandey
कार्यपालक अभियंता (प्रचालन/ संरक्षण)/ Executive Engineer (Operation/ Protection)
उत्तर क्षेत्रीय विद्युत् समिति / Northern Regional Power Committee
नई दिल्ली / New Delhi

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

सं.:उ.क्षे.वि.स./प्रचालन/01/106/2022/101-102 दिनांक:05.01.2022

विषय : MoM of the meeting held on 05.01.2022 for discussion on CPRI final report on 'System Study for Capacitor requirement in NR for the year 2019-20'-reg.

Please find attached minutes of the meeting held on 05.01.2022 at 11:30 AM.

संलग्नक: यथोपरि

05/01/2021.
(सौमित्र मजूमदार)
अधीक्षण अभियंता (प्रचालन)

सेवा में,
1. Dr. Manohar Singh, Engineering Officer, CPRI
2. Capacitor Requirement Study Sub-Group Members

18-ए, शहीद जीत सिंह मार्ग, कटवरिया सराय, नई दिल्ली दूरभाष:011-26513265 ई-मेल: seo-nrpc@nic.in वेबसाईट: www.nrpc.gov.in
18-A, Shaheed Jeet Singh Marg, Katwaria Sarai, New Delhi-110016 Phone: 011-26513265 e-mail: seo-nrpc@nic.in Website: www.nrpc.gov.in

MoM of the meeting held on 05.01.2022 for discussion on CPRI final report on 'System Study for Capacitor requirement in NR for the year 2019-20'

The meeting was held on 05.01.2022 at 11:30 AM through Video Conferencing. It was attended by representatives of Punjab, Uttarakhand, Himachal Pradesh, Delhi, Rajasthan, NRLDC & NRPC Sectt.

CPRI representative made a presentation on results of base-case (tuned by NRLDC) run. Data relating to states and Northern region was shown to participants which included voltage profile, generation profile, recommended capacitor, node summary table, shunt reactor table, net power flow etc.

After getting the feedback of states and NRLDC, it was identified that there is only one issue with results i.e., Q_{gen} (Reactive Power Generation of Machines). On the basis of feedback of NRLDC, it was decided that CPRI shall tune the Q_{gen} value taking help of NRLDC. Tuning may be done for some machines of Punjab (such as Talwandi Sabo), Uttarakhand (such as Shravanti), Himachal Pradesh, and Jammu. CPRI shall also tune Q_{gen} of Central Sector machines such as Salal, Rampur, Bhakra, Dehar etc. These Q_{gen} tunings shall be done in spirit to relieve machines from absorbing MVARs and to avoid over compensation in system due to recommended capacitors.

SE (O), NRPC requested CPRI to complete the task in time bound manner. CPRI submitted 20th Jan, 2022 as target date.

Himachal representative asked for a copy of presentation (excel sheet). It was decided that the results will be shared with states/members after the completion of above tuning.

Meeting ended with the vote of thanks.

*****

FW: System Study for Capacitor requirement in NR for the year 2019-20-reg. Inbox x

Dr. Manohar Singh <manoharsingh@cpri.in> Wed, Dec 1, 2021, 10:29 AM
to me

From: Reeturaj Pandey [mailto:pandeyr.cea@gov.in]
Sent: Tuesday, November 30, 2021 2:07 PM
To: Dr MANOHAR SINGH
Cc: Amit Jain; NARESH BHANDARI; Mr. SAUMITRA MAZUMDAR; Kaushik Panditrao
Subject: System Study for Capacitor requirement in NR for the year 2019-20-reg.

महोदय/महोदया,
Sir/Madam,

This has reference to meeting held on 06.08.2021 on the subject matter, MoM of the same was sent vide mail dtd 09.08.2021. In the meeting, it was decided that Sept, 2020 report shall be taken as reference report and states were requested to submit comments w.r.t. this report (FROM BASE CASE 11.07.2018 00:45 HRS) only. It was decided that NRPC Sectt. shall send Compiled comments to CPRI.

Base-case and Sept 2020 report received from CPRI vide mail dtd 10.08.2021 was sent to states for comments. States submitted their comments and there was a meeting on 06.09.2021 among NRPC, NRLDC, and states, wherein some additional data was asked from states. States submitted the same, and then, as per decisions of the meeting (dtd 06.09.2021) the base-case was sent to NRLDC for initial tuning based on data received from states and discussion held in meeting on 06.09.2021. The same Comments/data from states is attached as **NX-I** herewith.

As per decisions of meeting held on 06.08.2021, **compiled comments (NX-I)** of states/NRLDC is attached alogwith **tuned base-case** received from NRLDC (on 23.11.2021) for correction in CPRI Sept 2020 report.
It is also pertinent to mention that initial compiled comments of states was sent vide mail dtd 28.05.2021.

CPRI is requested to submit corrected report at the earliest.

सादर / Regards
ऋतुराज पाण्डेय / Reeturaj Pandey
कार्यपालक अभियंता (प्रचालन/ संरक्षण)/ Executive Engineer (Operation/ Protection)
उत्तर क्षेत्रीय विद्युत समिति / Northern Regional Power Committee
नई दिल्ली / New Delhi

From: asif@posoco.in
To: "Mr. SAUMITRA MAZUMDAR" <seo-nrpc@nic.in>
Cc: nallarasan@posoco.in, "surajit banerjee" <surajit.banerjee@posoco.in>, "alok kumar" <alok.kumar@posoco.in>, "suruchi jain" <suruchi.jain@posoco.in>, "riza naqvi" <riza.naqvi@posoco.in>, gauravmalviya@posoco.in
Sent: Tuesday, November 23, 2021 11:50:21 AM
Subject: Re: Basecase for Capacitor Study by CPRI

****The authenticity of this message cannot be vouched for. It may be spoofed. Please treat hyperlinks and attachments in this email with caution****

Sir,

Please find the attached Basecase for Capacitor Study, same may be shared with CPRI.
Case has been further tuned by incorporating capacitors details of Rajasthan and Capacitors kept ON/OFF as per Rajasthan input.

सादर एवं धन्यवाद | Thanks & regards
इब्तेसाम आसिफ | Ibtesam Asif
सहायक प्रबंधक | Assistant Manager (SO - II)
उत्तरीय क्षेत्रीय भार प्रेषण केंद्र | NRLDC
पावर सिस्टम ऑपरेशन कारपोरेशन | POSOCO

From: Ibtesam Asif
Sent: 10 November 2021 19:34
To: seo-nrpc@nic.in
Cc: N Nallarasan (एन नल्लारासन); Surajit Banerjee (सुरजीत बनर्जी); Alok Kumar (आलोक कुमार); Suruchi Jain (सुरुचि जैन); Riza Naqvi (रिज़ा नकवी); Gaurav Malviya (गौरव मालवीय)
Subject: Basecase for Capacitor Study by CPRI

Sir,

Please find the attached Basecase for Capacitor Study, same may be shared with CPRI.
Basecase has been tuned considering the feedback/inputs received from states (Punjab, Delhi, Rajasthan, HP and UP) and considering NRLDC SCADA data of 11th July 2018.

सादर एवं धन्यवाद | Thanks & regards
इब्तेसाम आसिफ | Ibtesam Asif
सहायक प्रबंधक | Assistant Manager (SO - II)
उत्तरीय क्षेत्रीय भार प्रेषण केंद्र | NRLDC
पावर सिस्टम ऑपरेशन कारपोरेशन | POSOCO

FW: System Study for Capacitor requirement in NR for the year 2019-20'-reg. Inbox ×

Dr. Manohar Singh 9:49 AM (23 minutes ago)
to me

From: Dr. Manohar Singh [mailto:manoharsingh@cpri.in]
Sent: Thursday, September 23, 2021 1:00 PM
To: 'Mr. SAUMITRA MAZUMDAR'
Cc: 'Bhaavya Pandey'; 'Amit Jain'; 'Reeturaj Pandey'
Subject: System Study for Capacitor requirement in NR for the year 2019-20'-reg.

Dear Sir

Referring: The meeting dated 6.8.2021 & MOM attached with email,

It has been decided in the meeting mentioned above that report submitted by CPRI in September 2020 for the base case PSSE file of date 11.7.2018 at 00.45 hrs will be considered for the comments if any.

It was also decided and informed that complied comments after the examination by NRPC will be submitted to CPRI by 31.8.2021. We are still awaiting for the comments.

As we all are aware that this project is running for many years and respected Member Secretary-NRPC, clearly mentioned in the meeting that this project shall be closed in all aspects by the end of October 2021. The simulation study result and report preparation based on any given base case file requires extensive time and effort, therefore, it is humbly requested to NRPC to please confine the comments with respect to September 2020 report for the base case of 11.7.2018 at 00.45 hrs only.

In view of this, we request to NRPC to please expedite report reviewing (for Sept. 2020 report for the base case of 11.7.2018 at 00.45 hrs) and send the comments to CPRI at the earliest.

Best Regards

Manohar Singh

From: Bhaavya Pandey [mailto:bhaavya.cea@nic.in]
Sent: Monday, August 9, 2021 6:08 PM
To: Dr MANOHAR SINGH
Cc: Reeturaj Pandey
Subject: Fwd: Meeting notice for discussion on report submitted by CPRI on 'System Study for Capacitor requirement in NR for the year 2019-20'-reg.

Dear Sir,

Kindly confirm whether the base case file shared in the trailing email is the same file as agreed upon in the meeting held on 06.08.21, i.e. 11.07.2018 at 00:45 hrs.

From: "Bhaavya Pandey" <bhaavya.cea@nic.in>
To: "Suruchi jain" <Suruchi.jain@posoco.in>, dtldata@gmail.com, "xen2 pp" <xen2.pp@rvpn.co.in>, "se pp" <se.pp@rvpn.co.in>, "smart saxena" <smart.saxena@gmail.com>, sldcharyanacr@gmail.com, ase-sldcop@pstcl.org, "Vinayak shaily" <Vinayak_shaily@ptcul.org>, sldc1@rediffmail.com, "sldc scadaxen" <sldc.scadaxen@gmail.com>, "choudhary rohit2012" <choudhary.rohit2012@gmail.com>, "Dr MANOHAR SINGH" <manoharsingh@cpri.in>
Cc: "Reeturaj Pandey" <pandeyr.cea@gov.in>
Sent: Monday, August 9, 2021 2:02:35 PM
Subject: Re: Meeting notice for discussion on report submitted by CPRI on 'System Study for Capacitor requirement in NR for the year 2019-20'-reg.

Dear Sub-Group Members,

Kind reference is invited to the meeting held on 06.08.21 for discussion on Capacitor Requirement Study. In this regard, kindly find attached the Minutes of the Meeting for your perusal. A copy of base-case file as well as the reference report (September version) is also attached for your ready reference. Utilities and NRLDC may kindly furnish their comments on September 2020 Report at the latest by 24.08.2021.

From: "Bhaavya Pandey" <bhaavya.cea@nic.in>
To: "Suruchi jain" <Suruchi.jain@posoco.in>, dtldata@gmail.com, "xen2 pp" <xen2.pp@rvpn.co.in>, "se pp" <se.pp@rvpn.co.in>, "smart saxena" <smart.saxena@gmail.com>, sldcharyanacr@gmail.com, ase-sldcop@pstcl.org, "Vinayak shaily" <Vinayak_shaily@ptcul.org>, sldc1@rediffmail.com, "sldc scadaxen" <sldc.scadaxen@gmail.com>, "choudhary rohit2012" <choudhary.rohit2012@gmail.com>, "Dr MANOHAR SINGH" <manoharsingh@cpri.in>
Cc: "NARESH BHANDARI" <ms-nrpc@nic.in>, "Mr. SAUMITRA MAZUMDAR" <seo-nrpc@nic.in>, "Reeturaj Pandey" <pandeyr.cea@gov.in>
Sent: Wednesday, August 4, 2021 11:53:19 AM
Subject: Re: Meeting notice for discussion on report submitted by CPRI on 'System Study for Capacitor requirement in NR for the year 2019-20'-reg.

In reference to the trailing email, the link for the upcoming sub-group meeting scheduled on **06.08.21 at 11:00 a.m** is as follows:

Capacitor sub-group meetinghttps://nrldcposoco.webex.com/nrldcposoco/j.php?MTID=maf57e337848e7ba79d8e305a10d50faa
11:00 AM,06/08/2021

From: "Bhaavya Pandey" <bhaavya.cea@nic.in>
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Cc: "NARESH BHANDARI" <ms-nrpc@nic.in>, "Mr. SAUMITRA MAZUMDAR" <seo-nrpc@nic.in>, "Reeturaj Pandey" <pandeyr.cea@gov.in>
Sent: Monday, August 2, 2021 3:16:25 PM
Subject: Meeting notice for discussion on report submitted by CPRI on 'System Study for Capacitor requirement in NR for the year 2019-20'-reg.

Kind reference is invited to the attached meeting notice. In continuation of decisions of 185th OCC, a meeting is scheduled on **06.08.21 at 11:00 a.m.** through Video Conferencing on the subject matter. In the meeting, issues highlighted by the sub-group members on the report submitted by CPRI and reply thereon of CPRI will be discussed. A copy of point-wise reply as received from CPRI on the members' observation/comments is also attached for ready reference.

Link and password for joining the video conferencing meeting will be shared via e-mail to all the participants in due course.

Regards,
Bhaavya Pandey
Assistant Executive Engineer (Operation)
Northern Regional Power Committee

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

सं.:उ.क्षे.वि.स./प्रचालन/01/106/2021/ दिनांक: 09.08.2021

विषय : MoM of the meeting held on 06.08.2021 for discussing CPRI Report on 'System Study for Capacitor requirement in NR for the year 2019-20'.

Please find attached minutes of the meeting held on 06.08.21 at 11:00 a.m. for discussing CPRI Report on 'System Study for Capacitor requirement in NR for the year 2019-20'.

संलग्नक: यथोपरि

09/08/2021

(सौमित्र मजूमदार)
अधीक्षण अभियंता (प्रचालन)

सेवा में,

1. Dr. Manohar Singh, Engineering Officer, CPRI
2. Capacitor Requirement Study Sub-Group Members

18-ए, शहीद जीत सिंह मार्ग, कटवरिया सराय, नई दिल्ली दूरभाष:011-26513265 ई-मेल: seo-nrpc@nic.in वेबसाईट: www.nrpc.gov.in
18-A, Shaheed Jeet Singh Marg, Katwaria Sarai, New Delhi-110016 Phone: 011-26513265 e-mail: seo-nrpc@nic.in Website: www.nrpc.gov.in

MoM of the meeting held on 06.08.2021 for discussing CPRI Report on 'System Study for Capacitor requirement in NR for the year 2019-20'

The meeting was held on 06.08.2021 at 11:00 a.m. under the chairmanship of MS, NRPC through Video Conferencing. It was attended by members of the sub-group (constituted for studying the CPRI report), CPRI representatives, and officials from NRPC Sectt & NRLDC.

Comments of the sub-group on the latest version of CPRI report was deliberated in detail. After weighing the merits of the original & both revisions of the report, following were decided:

i) First Report submitted by CPRI in September, 2020 shall be considered as the reference report. Further, only one scenario i.e., NR peak may be considered for the study as per the agreed scope of work. CPRI confirmed that the base-case of 11.07.2018 at 00:45 hrs. received from NRPC Sectt has been used for preparing September, 2020 report.

ii) Comments from all utilities and NRLDC on September 2020 report must be submitted to NRPC Sectt, latest by 24.08.2021.

iii) NRPC Sectt, after examination, shall share with CPRI the compiled comments of the utilities and NRLDC, latest by 31.08.2021.

iv) Thereafter, CPRI shall submit its reply on the compiled comments sent by NRPC Sectt, latest by 15.09.2021

CPRI shall timely confirm whether or not the comments/observation are acceptable. In cases where any clarity is required in regard to the observations of the utilities / NRLDC, the same may be communicated to NRPC Sectt at the earliest upon receiving the comments.

CPRI was also requested to address the typographical and other miscellaneous errors already highlighted by the sub-group members w.r.t. February 2021 revision, in the September 2020 report wherever applicable.

It was decided that Final Report and its findings shall be finalized in all aspects by October, 2021 and participants were requested to furnish their valuable comments as per agreed upon timeline.

The meeting ended with the vote of thanks.

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Annexure-2

DETAILED PROJECT REPORT

FOR

400KV, 220KV, 132KV & 66KV

ADDITIONAL TRANSMISSION WORKS AT

400KV, 220KV & 132KV SUBSTATIONS

For the year

2023-24/2024-25/2025-26

For System Improvement

&

Power Dispersal

DPR- XXXIX

PUNJAB STATE TRANSMISSION CORPORATION LTD.

SEPTEMBER, 2022

Scope of works for 400kv, 220KV, 132KV and 66KV Transmission Works at 400kv, 220KV & 132KV Substations for the year *2023-24/2024-25/2025-26*

Sub-Stations works

Name of Sub-stn.	160 MVA 220/66KV T/F	100 MVA 220/66KV T/F	100 MVA 220/132 KV T/F	Bays			
				400 KV	220 KV	132 KV	66 KV
220KV SAMADH BHAI			1		4+ 1T/F + 1B/C	1T/F	
220KV BHADSON		2			6 + 2T/F + 1B/C		2T/F
220KV CHOURWALA	2				4+ 2T/F + 1B/C		2T/F
220KV JANDIALA GURU			2		2 + 2T/F + 1B/C	2T/F	
220KV TANDA		1	1		2 + 2T/F + 1B/C	1T/F	1T/F
220KV GORAYA		1			4*+2+1T/F		1T/F
220KV SULTANPUR					2		
TOTAL	**2**	**4**	**4**		**22+4*+10T/F +5B/C**	**4 T/F**	**6 T/F**

Net Capacity addition will be 1120 MVA due to addition of above T/Fs.

***Subject to approval of Power Sub-committee of BBMB for LILO of both circuits of BBMB Jalandhar-Jamalpur line at Goraya**

220KV Transmission Lines in Ckt. Kms.

Sr. No.	Name of Line	Length in Ckt. Kms.
1	LILO of both circuits of 220 kV Baghapurana – Bajakhana line (LILO Length - 8km, 0.4Sq").	8
2	D/C line from 400 kV PGCIL Patiala (16km, 0.4Sq") and D/C line from 220 kV Amloh (12km, 0.4Sq").	12
3	LILO of both circuits of 400 kV Rajpura – 220 kV Gobindgarh-1 line (HTLS) (8 km, 0.4Sq" HTLS equivalent)	8
4	LILO of 220 kV Butari – Verpal circuit on multi-circuit Tower/Modern techniques at Jandiala Guru (4km, 0.4Sq")	4
5	LILO of S/C 220 kV BBMB Jalandhar-Dasuya line (4.5Km, 0.4Sq")	4.5
6	Connectivity of 220KV Noormehel with 220KV Goraya with D/C line (length - 25km, 0.4Sq") And	25

	(LILO of both circuits of BBMB Jalandhar-Jamalpur line at Goraya subject to approval of Power Sub-committee of BBMB)	
7	LILO of one circuit 220 kV Kanjli-Science city at 220 kV Sultanpur with Moose conductor (28Kms, 0.5 Sq")	28
	Total	**89.5**

PREAMBLE

This proposal covers the Detailed Project Report for 400KV, 220KV, 132KV and 66KV Transmission Works at various 132KV, 220KV & 400KV GRID Sub-Stations for 2023-24/2024-25/2025-26 for system improvement and power dispersal.

****

The total estimated cost of the project based on 2022-23 price level is as follows:-

		(Rs. in Crores)
1.	*Transmission system cost*	**371.077**

Contents

List of Annexures

PROJECT REPORT FOR400KV, 220KV, 132KV & 66KV TRANSMISSION WORKS AT 400KV, 220KV& 132KV SUBSTATIONS FOR *2023-24/2024-25/2025-26* FOR SYSTEM IMPROVEMENT AND POWER DISPERSAL .

1.0 BACKGROUND

The electrical power demand is increasing at a very fast pace in the developing State of Punjab. Peak demand during paddy/summer season of 2022-23 has been recorded as 14311 MW. The projected maximum demand for paddy season of 2023-24 is about 15811 MW whereas as per the EPS projection data, the maximum demand of Punjab for 2023-24 is 16431 MW.

To provide relief to existing overloaded transmission system and to cater to the new loads of consumers in the State, continuous system up gradation/augmentation is required. For this purpose a number of new substations along with their associated transmission lines are required to be created. In addition transformation capacity at many existing 132KV, 220KV & 400KV Sub-stations is required to be augmented to feed the existing as well as upcoming loads within prescribed voltage parameters, besides ensuring supply to A.P. consumers as per P.C. Schedule and to improve system reliability. With this end in view, a number of 400KV, 220KV, and some 132KV and 66KV transmission works have already been planned for the years 2023–24 to 2025-26. This project report covers various substations are being upgraded from 66 KV/132 KV to 220 KV and other connectivity arrangement of transmission lines for the years 2023–24 to 2025-26 through Capital Investment Plan & Business Plan of PSTCL for MYT 3rd Control period from FY - 2023 to 2026.

2.0 DESCRIPTION OF TRANSMISSION SYSTEM

The details of Transmission System which are covered in this report are given in **Annexure-I.** These cover 2 Nos. 160MVA, 220/66KV T/F, 4 Nos. 100MVA, 220/66KV T/F, 4 Nos. 100MVA, 220/132KV Auto T/F and associated 220KV bays and 89.5 circuit-km of 220KV Transmission lines.

3.0 PROJECT OBJECTIVES

The objective of the project is to create additional transmission capacity to cater to additional loads, to give relief to overloaded sub-stations and to increase reliability of supply in the areas served by the substations covered in the scheme and to increase power evacuation capacity.

3.1 Project Highlights

a)	Project	400KV, 220KV, 132KV & 66KV Transmission Works at 400KV, 220KV and 132KV Substations for 2023–24 to 2025-26 for S.I. & Power Dispersal.
b)	Location of the project	Punjab
c)	Beneficiary State	Punjab
d)	Project cost	Rs. 371.077 Crore
e)	Commissioning schedules	During the year 2023-24/2024-25/2025-26

3.2 Scope of works

The scheme shall have scope of work as per Annexure-I and same is summarized as under:-

Transmission System for 2023–24 to 2025-26 for System Improvement and Power Dispersal.

3.2.1 Sub-Stations works

Name of Sub-stn.	**160 MVA 220/66KV T/F**	**100 MVA 220/66KV T/F**	**100 MVA 220/132 KV T/F**	**Bays**			
				400 KV	**220 KV**	**132 KV**	**66 KV**
220KV SAMADH BHAI			1		4+ 1T/F + 1B/C	1T/F	
220KV BHADSON		2			6 + 2T/F + 1B/C		2T/F
220KV CHOURWALA	2				4+ 2T/F + 1B/C		2T/F
220KV JANDIALA GURU			2		2 + 2T/F + 1B/C	2T/F	
220KV TANDA		1	1		2 + 2T/F + 1B/C	1T/F	1T/F
220KV GORAYA		1			4*+2+1T/F		1T/F
220KV SULTANPUR					2		
TOTAL	**2**	**4**	**4**		**22+4*+10T/F +5B/C**	**4 T/F**	**6 T/F**

Net Capacity addition will be 1120 MVA due to addition of above T/Fs.

***Subject to approval of Power Sub-committee of BBMB for LILO of both circuits of BBMB Jalandhar-Jamalpur line at Goraya**

220KV Transmission Lines in Ckt. Kms.

Sr. No.	Name of Line	Length in Ckt. Kms.
1	LILO of both circuits of 220 kV Baghapurana – Bajakhana line (LILO Length - 8km, 0.4Sq").	8
2	D/C line from 400 kV PGCIL Patiala (16km, 0.4Sq") and D/C line from 220 kV Amloh (12km, 0.4Sq").	12
3	LILO of both circuits of 400 kV Rajpura – 220 kV Gobindgarh-1 line (HTLS) (8 km, 0.4Sq" HTLS equivalent)	8
4	LILO of 220 kV Butari – Verpal circuit on multi-circuit Tower/Modern techniques at Jandiala Guru (4km, 0.4Sq")	4
5	LILO of S/C 220 kV BBMB Jalandhar-Dasuya line (4.5Km, 0.4Sq")	4.5
6	Connectivity of 220KV Noormehel with 220KV Goraya with D/C line (length - 25km, 0.4Sq") And (LILO of both circuits of BBMB Jalandhar-Jamalpur line at Goraya subject to approval of Power Sub-committee of BBMB)	25
7	LILO of one circuit 220 kV Kanjli-Science city at 220 kV Sultanpur with Moose conductor (28Kms, 0.5 Sq")	28
	Total	**89.5**

4 TARGET BENEFICIARIES

The target beneficiary of this project is State of Punjab.

5 PROJECT STRATEGY

The various elements of the transmission scheme have been evolved based on present and future load requirements and as well as for dispersal of power from various power projects and for improving reliability of power supply.

6 LEGAL FRAME WORK

It is proposed to execute the above entire transmission scheme as per provision contained in the Indian Electricity Act, 2003 and the rules made there under and the Electricity (Supply) Act, 1910 and 1948 in so far as these are applicable

7 ENVIRONMENTAL IMPACT ASSESSMENT

7.1 Forest involvement /clearance

As per the practice, preliminary route selection is done based on such documents as the Forest Atlas and the Survey of India maps using "bee" line method, followed by field verification through walk over survey. All possible steps are taken to avoid the route alignment through forests. In cases where it becomes unavoidable due to the geography of terrain, the alignment is made in such a way that the route through the forests is the barest minimum.

For selection of optimum route, following points are taken into consideration:-

- The route of the proposed transmission line does not involve any human rehabilitation.
- Any monument of cultural or historical importance is not getting affected.
- The route does not create any threat to the survival of any community.
- It does not affect any Public Utility Services like Playground, School, other establishments etc.
- It does not pass through any sanctuaries, National Park, etc.
- It does not infringe with areas of natural resources.

No major forest stretches are likely to be encountered for erection of the lines covered in the project. However, exact position shall be known after walkover survey and finalization of route plan. However, social forestry along the roads and rivers may be involved at a few locations involving road or river crossings. Necessary provisions for getting forest clearance for such locations will be made as per requirements based on actual basis.

The various clearances like forest, PTCC, railway crossing etc. where ever required are processed simultaneously after approval of route plan of the transmission lines. The works are carried out accordingly. It may be mentioned that all clearance are normally available by the time the lines are to be commissioned.

7.2 Social issues /R&R measures

As per prevailing law, land below transmission line is not required to be acquired; only compensation for land for transmission tower is given for which provisions are made on normative basis. Since the works covered in the scheme are only augmentation works at existing 132KV and 220KV substations no land requirement is envisaged.

8 TECHNOLOGY ISSUES

8.1 Salient features of 245KV class S/Stn. equipment and facilities

The design and specification of Substation equipment are to be governed by following factors:-

8.1.1 Insulation Coordination

The following insulation levels are proposed to be adopted for 245KV system.

a)	Impulse withstand voltage for transformer and reactors for other equipment	950 KVP
b)	Switching surge withstand voltage	1050KVP
c)	Minimum creepage distance	6125mm
d)	Max. fault current	40KA
e)	Duration of fault	1 Second

8.1.2 Steady State Stability

The steady State stability is the ability of a system to return /remain in the state of equilibrium when subjected to small or gradual changes of disturbances. The steady state stability limit is the maximum power that can flow through some lines in the system when the entire or part of

the system to which the stability limit refers is subjected to a small disturbance without loss of stability.

The steady state stability limit is usually quantified by measuring the relative angular displacement (also called as swing curve) between the two buses (nodes) in a system.

In an integrated power system consisting of large number of generators, loads and lines etc., a maximum relative angular separation of about 30 degree between the two buses may be assumed to be acceptable (safe) limit for maintaining the steady state stability of the system.

8.1.3 Substation Equipment

The switchgear shall be designed and specified to withstand operating conditions and duty requirements. The specifications for Power Transformers, circuit breakers, isolators, current transformers, capacitor voltage transformers, Surge Arrestors shall be as per applicable IEC standards and the switchgear shall be designed and specified to withstand operating conditions and duty requirements. The detailed specifications will be issued alongwith tender documents at the time of floating N.I.T.

Sub-station Support Facilities

Facilities required for O&M of substations like AC&DC power supplies, fire fighting system, oil evacuating, filtering, testing & filling apparatus, lighting &communication and Control Room generally exist at the substations. However, any extension of such facilities, if required will be specified at the time of floating N.I.T.

Protection & Control

The protective relaying system shall be provided for transmission lines, power transformers and bus bars to minimize the damage to the equipments in the event of fault and abnormal conditions. Necessary specification for distance line protections, transformer differential protection, bus bar protection and local breaker backup protection shall be given at the time of floating N.I.T.

8.2 Salient features of Transmission lines

The primary consideration for design and estimation of transmission lines are walkover/preliminary survey based on topographical map/forest map of India.

8.2.1 Conductors

For 220KV D/C line generally ACSR 'Zebra' or ACSR 'Moose' conductor will be used as specified in the details of lines whereas for 132KV lines ACSR 'Panther' conductor will be used.

8.2.2 Earthwire

Single 7/3.15mm galvanized steel Earthwire shall be used on the line.

8.2.3 Grounding

The tower footing resistance shall be kept below 10 ohms. Normally pipe type grounding shall be used.

8.2.4 Insulator and Hardware fittings

Specifications for insulators and Hardware fittings shall be given at the time of N.I.T

8.2.5 Line Accessories

i) Mid Span compression joint for conductor/Earthwire

Mid span compression joint suitable for conductor/Earthwire shall be used for joining two lengths of conductor/Earthwire. The minimum slipping strength of the joint after compression shall not be less than 95% of the UTS of conductor/ Earthwire.

ii) Repair sleeve for conductor

Repair sleeve shall be used only for repairing not more than two strands broken in the outer layer of conductor. It shall be of compression type in two parts with provision of seat sliding of keeper piece.

iii) Flexible copper bond for Earthwire

Flexible copper bonds shall be used for good electrical continuity between the Earth-wire and the tower. Two bonds per suspension tower and four bonds per tension tower shall be used.

iv) Vibration dampers for conductor/Earthwire

Stockbridge vibration dampers shall be used to reduce the maximum dynamic strain caused by Aeolian vibrations to a value of 150 Micro-strain.

9 MEANS OF FINANCE AND PROJECT BUDGET

9.1 Project Cost Estimate

9.1.1 The estimated cost of the project based on Cost Data of different substations, line bays and other related items for the year 2022-23 as finalized by Dy. CE/Transmission (Design) under CE/TS works out to be Rs. 371.077 Crore

The details of cost estimate for the equipment are given in **Annexure-I.**

The cost estimates are inclusive of applicable EC @ 15% and IDC @ 4%.

9.2 Funding arrangement

9.2.1 Phased fund requirement

The anticipated year wise fund requirement for the project is as under:-

Year	Rs. In Crore
2023-24	64.55
2024-25	131.45
2025-26	175.08
Total	**371.077**

9.2.2 Mode of Financing

The project is proposed to be funded through equity share (10%) by PSTCL and loans/bonds (90%). The works covered in this scheme are not covered under any other Scheme & are not being posed for finance from any other financial institution. Hypothecations of Future/Existing Assets & Escrow cover is proposed for security mechanism.

9.2.3 Mode of Execution

The transmission line works are generally got executed by outsourcing labour component only. Material for these works is procured **departmentally.** The substation works will be got executed **departmentally** only.

10.0 COST BENEFIT ANALYSIS

The details of cost benefit analysis are given in **Annexure-II** as per which %age gross return works out to be **27.89%** and payback period is **3.58 years**.

11.0 TIME FRAME

Transmission works covered in the project report are targeted for completion during 3 years 2023-24/2024-25/2025-26. Therefore 10% cost escalation has been considered.

12.0 DETAILED TECHNICAL ADVANTAGES/JUSTIFICATION

Advantages/Justification for additional transmission system covered in the project in general are given below:-

i. To cater to additional loads.
ii. To provide relief to existing Transmission Substations and Lines.
iii. To increase the reliability of the equipment and consequently of the Transmission System.
iv. To disperse additional power availability.
v. To improve the reliability and security of the transmission system.

Annexure – I					
220KV, 132KV & 66KV additional system improvement/power dispersal works at 220KV & 132KV Sub-Stns. for the year *2023-24, 2024-25 and 2025-26*					
Sr. No.	**Plg. List No.**	**Name of Work/Sub-stn.**	**Detailed Scope of Work/Cost Break-up**	**Cost (Rs. in crores)**	**Total Cost (Rs. in crores)**
1.	4.	**Upgradation of 132 kV Samadh Bhai to 220 kV level** Creation of 220kV Samadh Bhai with 1x100MVA, 220/132kV T/F (4 line bays, 1 T/F bay & 1no. Bus Coupler Bay)	COST FOR 220KV SUB-STATION WITH 1x100MVA, 220/132KV T/F TO BE FED FROM 220KV LINE SC ON DC TOWERS (1 Line Bay, 1 T/F Bay and 1 B/C Bay). **(Annex-A)**	20.4953	33.76
			COST OF 220KV LINE BAY **(Annex LB-220) X 3 (i.e. No. of Line Bays)**	3.6861	
		LILO of both circuits of 220 kV Baghapurana – Bajakhana line (LILO Length - 8km, 0.4Sq").	COST FOR 220KV DC LINE ON DC TOWERS WITH 'ZEBRA' ACSR CONDUCTOR NOMINAL ALUMINIUM AREA 420mm^2, **(Annex-I1- I5) X 8 KM (i.e. LILO length)**	9.5816	
			TOTAL	**33.763**	
2.	8.	**Upgradation of 66 kV Bhadson to 220 kV level.** Creation of 220kV Bhadson with 2x100MVA, 220/66kV T/F (6 line bays (2 at Amloh and 4 at Bhadson), 2 T/F bays & 1no. Bus Coupler Bay)	COST FOR 220KV SUB-STATION WITH 2x100MVA, 220/66KV T/Fs TO BE FED BY LILO OF EXISTING 220KV DC LINE (4 LINE BAYS, 2 T/F BAYS AND 1 B/C BAY). **(Annex-B)**	32.5471	64.49
			(Less) cost of 100MVA, 220/66KV T/Fs. **(Annex-B)**	-6.0458	
			Approx. cost of installation of dismantled 100 MVA, 220/66 kV T/f	2.0000	
			COST OF 220KV LINE BAY **(Annex LB-220) X 2 (i.e. No. of Line Bays)**	2.4574	
		D/C line from 400 kV PGCIL Patiala (16km, 0.4Sq") and D/C line from 220 kV Amloh (12km, 0.4Sq").	COST FOR 220KV DC LINE ON DC TOWERS WITH 'ZEBRA' ACSR CONDUCTOR NOMINAL ALUMINIUM AREA 420mm^2, **(Annex-I1- I5) X 28 KM (i.e. total length)**	33.5356	
			TOTAL	**64.4943**	
3	9	**Upgradation of 66 kV Chourwala to 220 kV level** Creation of 220kV Chourwala with 2x160MVA, 220/66kV T/F (4 line bays, 2 T/F bays & 1no. Bus Coupler Bay)	COST FOR 220KV SUB-STATION WITH 1x160MVA, 220/66KV T/F TO BE FED BY LILO OF 220KV DC LINE (4 LINE BAYS, 1 T/F BAY AND 1 B/C BAY). **(Annex-C)**	26.9924	57.18
			COST FOR ADDITIONAL 160MVA, 220/66KV T/F AT 220 KV SUB-STATION. **(Annex-D)**	12.3612	

		LILO of both circuits of 400 kV Rajpura – 220 kV Gobindgarh-1 line (HTLS) (8 km, 0.4Sq" HTLS equivalent)	COST FOR 220KV DC LINE ON DC TOWERS WITH TWIN MOOSE ACSR CONDUCTOR NOMINAL ALUMINUM AREA (2x520mm^2), **(Annex-J1- J5) X 8 KM (i.e. LILO length)**	17.8224	
			Total	**57.176**	
4	12	**Upgradation of 132 kV Jandiala Guru to 220 kV level** Creation of 220kV Jandiala Guru with 2x100MVA, 220/132kV T/F (2 line bays, 2 T/F bays & 1no. Bus Coupler Bay)	COST FOR 220KV SUB-STATION WITH 1x100MVA, 220/132KV T/F TO BE FED FROM 220KV LINE SC ON DC TOWERS (1 Line Bay, 1 T/F Bay and 1 B/C Bay). **(Annex-A)**	20.4953	35.12
			COST OF 220KV LINE BAY **(Annex LB-220) X 1 (i.e. No. of Line Bays)**	1.2287	
			Approx. cost of installation of 100 MVA, 220/132 kV T/f shifted from Butari	2.00	
			COST FOR ADDITIONAL 100MVA, 220/132 KV T/F AT 220KV SUB-STATION. **(Annex-F)**	10.23	
			(Less) cost of 100MVA, 220/132KV T/Fs. **(Annex-F)**	-6.5397	
		LILO of 220 kV Butari – Verpal circuit on multi-circuit Tower/Modern techniques at Jandiala Guru (4km, 0.4Sq")	COST FOR 220KV DC LINE ON MULTI CIRCUIT TOWERS WITH 'ZEBRA' ACSR CONDUCTOR NOMINAL ALUMINIUM AREA 420mm^2 **(Annex-K1- K5) X 4 KM (i.e. LILO length)**	7.708	
			Total	**35.1223**	
5	13	**Upgradation of 132 kV Tanda to 220 kV level** Creation of 220kV Tanda with 1x100MVA, 220/132kV T/F and 1x100MVA, 220/66KV T/F (2 line bays, 2 T/F bays & 1no. Bus Coupler Bay)	COST FOR 220KV SUB-STATION WITH 1x100MVA, 220/66KV T/F TO BE FED BY LILO OF ONE CKT OF 220KV DC LINE (2 LINE BAYS, 1 T/F BAY AND 1 B/C BAY). **(Annex-H)**	21.0872	36.71
			COST FOR ADDITIONAL 100MVA, 220/132 KV T/F AT 220KV SUB-STATION. **(Annex-F)**	10.23	
		LILO of S/C 220 kV BBMB Jalandhar-Dasuya line (4.5Km, 0.4Sq")	COST FOR 220KV DC LINE ON DC TOWERS WITH 'ZEBRA' ACSR CONDUCTOR NOMINAL ALUMINIUM AREA 420mm^2, **(Annex-I1- I5) X 4.5 KM (i.e. LILO length)**	5.38965	
			TOTAL	**36.7068**	
6	17	**220KV S/S Goraya (Addl. 220/66KV 100MVA T/F for N-1 compliance)** Connectivity of 220KV Noormehel	COST FOR ADDITIONAL 100MVA, 220/66KV T/F AT 220KV SUB-STATION. **(Annex-G)**	9.1157	43.97

		with 220KV Goraya with D/C line (length - 25km, 0.4Sq") (LILO of both circuits of BBMB Jalandhar-Jamalpur line at Goraya subject to approval of Power Sub-committee of BBMB)	COST OF 220KV LINE BAY **(Annex LB-220) X 4 (i.e. No. of Line Bays)**	4.9148	
			COST FOR 220KV DC LINE ON DC TOWERS WITH 'ZEBRA' ACSR CONDUCTOR NOMINAL ALUMINIUM AREA 420mm^2, **(Annex-I1- I5) X 25 KM (i.e. length)**	29.9425	
			TOTAL	**43.973**	
7	20	**220 kV Sultanpur** LILO of one circuit 220 kV Kanjli-Science city at 220 kV Sultanpur with Moose conductor (28Kms, 0.5 Sq")	COST OF 220KV LINE BAY **(Annex LB-220) X 2 (i.e. No. of Line Bays)**	2.4574	40.60
			COST FOR 220KV DC LINE ON DC TOWERS WITH 'MOOSE ACSR CONDUCTOR NOMINAL ALUMINIUM AREA 520mm^2. **(Annex-M1- M5) X 28 KM (i.e. LILO length)**	38.1388	
			TOTAL	**40.5962**	
Total Cost					**311.83**
Employee Cost @ 15%					**46.7745**
IDC @ 4%					**12.4732**
Project Cost					**371.077**

Project Cost = Rs. 371.077 Crore
Cost Escalation @ 10% = Rs. 37.1077 Crore
Cost Escalation is calculated @ 10% although it is not a part of project cost.

ANNEXURE-II

COST BENEFIT ANALYSIS

For 400KV, 220KV,132KV& 66KV Works at 400KV, 220KV& 132KV Sub-stations for 2023-24/2024-25/2025-26

CALCULATION OF BENEFITS DUE TO THE SCHEME.

a)	Additional Load that can be served after the erection of new sub-stations/augmentation of existing sub-stations, by addition/ replacement Transformers as per Annexure-I	= 1120 MVA
b)	Expected Sale/Dispersal of additional Energy (in kWh) (a/1000)xLFxPFx8760 (a/1000)x0.5x0.9x8760	= 4415.04 MU
c)	Transmission Tariff of the State for FY 2022-23 as per Tariff order of PSTCL for FY 2022-23 in Rs. Per unit.	= Rs. 0.2345
d)	Value of benefits during the year due to transportation of additional energy	= Rs. 103.53 Crore
e)	Total Scheme cost as per Annexure-I.	= Rs. 371.077 Crore
f)	Percentage Gross Return (Total benefit/Total Cost)* 100	= 27.89%
g)	Pay Back period	= 3.58 **years**

DETAILS OF COST FOR 220KV SUB-STATION WITH 1x100MVA, 220/132KV T/F TO BE FED FROM 220KV LINE SC ON DC TOWERS (1 Line Bay, 1 T/F Bay and 1 B/C Bay). THIS COST DATA HAS BEEN PREPARED FOR ESTIMATION PURPOSES ONLY.

Sr. No.	Description.	Cost Reference	Qty.	Qty.	Rate (Rs. in Lacs)	Amount (Rs. in Lacs)
A)	**POWER TRANSFORMERS**					
1)	1X100MVA, 220KV/132KV T/Fs.	A (5)	1 No.	1	653.97	653.97
	Total 'A'					**653.97**
B)	**220KV SWITCHGEAR EQUIPMENT**					
1	SF-6 Ckt. Breaker.	E (3)	3 No.	3	12.54	37.62
2	C.Ts.	C (3)(ii)	3 Sets (9)	9	3.08	27.72
3	P.Ts. for bus.	B (3)	2 Sets(6).	6	3.05	18.3
4	L.As.	H (3)	2 Sets(6)	6	0.53	3.18
5	Isolator with Earth Switch including Insulators.	G (4)	1 No	1	5.49	5.49
6	Isolator with Insulators	F(5)	6 No.	6	4.75	28.5
7	**C&R panel for:**					0
i)	T/F bay	N (2)	1 No.	1	7.02	7.02
ii)	Line bay	N (1)	1 No.	1	7.92	7.92
iii)	B/C bay.	N (3)	1 No.	1	5.97	5.97
iv)	Bus Bar Protection	O (i)	1 No.	1	9.87	9.87
8	Steel structures.	T (1)	50 MT	50	0.9	45
9	Earthing material.		Lot		L/S	4.62
10	Bus bar & connecting material.		Lot		L/S	8.66
11	Power & control cables.		Lot		L/S	11.55
	Total 'B'					**221.42**
C)	**MISC. ITEMS**					
1	Fire fighting equipment.		Lot		L/S	4.62
	Total 'C'					**4.62**

D)	**132KV SWITCHGEAR EQUIPMENT**					
1	SF-6 Ckt. Breaker.	E(2)	1No.	1	5.44	5.44
2	Isolators with solid core insulators.	F (4)	4 No.	4	2.37	9.48
3	C.Ts.	C(2) (ii)	1Sets(3)	3	1.53	4.59
4	L.As.	H (2)	1 Set(3)	3	0.36	1.08
5	Bus P.Ts.	B (2)	2Sets(6)	6	1.4	8.4
6	C&R Panel For:					0
i)	T/F bay	N (5)	1 No.	1	5.92	5.92
ii)	Bus Coupler bay	N (10)	1 No.	1	5.84	5.84
7	Steel structures.	T (1)	20 MT	20	0.90	18
8	Earthing material.		Lot		L/S	2.77
9	Bus bar & connecting material.		Lot		L/S	4.62
10	Power & control cables.		Lot		L/S	4.62
	Total 'D'					**70.76**
E)	**11KV EQUIPMENT**					
1	11/0.415KV, 200KVA T/F	U	1 No.	1	2.34	2.34
2	11KV U/G cables.		Lot		L/S	1.73
	Total 'E'					**4.07**
F)	**220KV/415V EQUIPMENT**					
1	a) 220KV / 415 Volts AC switch Board consisting of 15 switch metering and protective equipment alongwith one bus coupler.	M (1)	1 Set	1	1.95	1.95
2	220V, 300AH					
	a)DC Battery	J(2)8.95	2 Set	2	12.28	24.56
	b)Battery Charger	K(2)1.48				
	c)DCDB.	L(2)0.76				
	Total 'F'					**26.51**
G	**Material for Cap Banks**					
1	C&R Panel For Cap bank	N(7)	1No.	1	2.68	2.68
2	132 KV Cap Banks without NCT	I (3)	2 No.	2	20.07	40.14
3	CT	C (2) (ii)	1Set(3)	3	1.53	4.59
4	SF-6 Breaker	E (2)	1 No.	1	5.44	5.44
5	Isolator with insulators	F (4)	2 No.	2	2.37	4.74
6	Isolator with Earth Switch with solid core insulators.	G (3)	2 No.	2	2.86	5.72
7	132KV NCT for Capacitor Bank	D (9) (ii)	2 No.	2	0.99	1.98

8	Structure for 132KV NCT (for Capacitor Bank)	D(10) (ii)	2 No.	2	0.27	0.54
	Total 'G'					**65.83**
	Sub-Total (a) = A+B+C+D+E+F+G					**1047.18**
	Transportation, Erection charges, storage & contingency etc.					**115.19**
	@ 11% on (a)					
	Grand Total					**1162.37**

Rs 1162.37 Lacs only.

		(Rs in Lacs)
	Cost of Electrical equipments including Erection Charges, Stores and contingency etc.	1162.37
2	Cost of Land	350
3	Cost of Switch house building and the other civil works* in the switchyard	515
4	PLCC equipment for 1 line bays	22.16
	Total	**2049.53**

Rs 2049.53 Lacs only.

Note: 1. For Land rates, collector rates have been considered.
2. *The other civil works in Switchyard include switch gear foundations, gravel spreading, outdoor trenches, boundary wall with gates, Laying of earth mats, approach road, drains and PCC flooring etc.

FY- 2022-23 **ANNEXURE-B**

DETAILS OF COST FOR 220KV SUB-STATION WITH 2x100MVA, 220/66KV T/Fs TO BE FED BY LILO OF EXISTING 220KV DC LINE (4 LINE BAYS, 2 T/F BAYS AND 1 B/C BAY). THIS COST DATA HAS BEEN PREPARED FOR ESTIMATION PURPOSES ONLY.						
Sr. No.	**Description**	**Cost Reference**	**Qty.**	**Qty.**	**Rate**	**Amount**
					(₹ in Lacs)	**(₹ in Lacs)**
A)	**100MVA, 220/66KV T/Fs.**	**A (4)**	2 Nos.	2	604.58	1209.16
	Total 'A'					**1209.16**
B)	**220KV SWITCHGEAR EQUIPMENT**					
1	220KV SF-6 ckt. Breaker.	**E (3)**	7 Nos.	7	12.54	87.78
2	CTs.	C (3) (i)	7 Sets(21)	21	3.08	64.68
3	P.Ts for buses.	B (3)	6 Nos.	6	3.05	18.3
4	L.As.	H (3)	6 Sets(18)	18	0.53	9.54
5	Isolator with Earth Switch including Insulators.	G (4)	4 No.	4	5.49	21.96
6	Isolators with Insulators	F (5)	14 No.	14	4.75	66.5
7	Control &Relay Panel for:					0
i)	T/F bays.	N (2)	2 Nos.	2	7.02	14.04
ii)	220KV line bays.	N (1)	4 Nos.	4	7.92	31.68
iii)	220KV Bus Coupler bays.	N (3)	1 No.	1	5.97	5.97
iv)	Bus Bar Protection	O (2)	1 No.	1	21.57	21.57
9	Steel structures.	T (1)	150MT	150	0.90	135
10	Earthing material.		Lot		L/S	9.24
11	Bus bar & connecting material.		Lot		L/S	21.37
12	Power & control cables.		Lot		L/S	21.37
	Total 'B'					**529**
C)	**MISC. EQUIPMENT**					

1	Fire fighting equipment.		Lot		L/S	4.62
	Total 'C'					**4.62**
FY 2022-23						**A**
D)	**66KV SWITCHGEAR EQUIPMENT**					
1	1250 Amps., 40KA, SF-6 Ckt. Breaker	E (1)	3 No.	3	4.41	13.23
2	1250 Amps. Isolators with Insulator .	F (2)	6 No.	6	1.50	9
3	C.Ts.	C (1) (ii)	3Sets(9)	9	0.94	8.46
4	L.As.	H (1)	2Set(6)	6	0.21	1.26
5	Bus P.Ts.	B (1)	2 Sets(6)	6	0.80	4.8
6	C&R Panel For:					0
i)	T/F bay	N (9) (ii)	2 No.	2	3.79	7.58
ii)	Bus Coupler bay	N (10)	1 No.	1	5.84	5.84
7	Steel structures.	T (1)	30 MT	30	0.90	27
8	Earthing material.		Lot		L/S	2.89
9	Bus bar & connecting material.		Lot		L/S	4.62
10	Power & control cables.		Lot		L/S	4.62
	Total 'D'					**89.30**
E)	**11KV EQUIPMENT**					
1	11/0.415KV, 200KVA T/Fs.	U	1 No.	1	2.34	2.34
2	11KVU/G cable		Lot			1.73
	Total 'E'					**4.07**
F)	**220V/415V EQUIPMENT.**					
1	220/415 volts AC switch Board consisting of 15 Switch metering & protective equipment alongwith one Bus coupler.	M (1)	1 Set	1	1.95	1.95
2	220V, 300AH					
	a)DC Battery	J (2)9.57	2 Set	2	12.28	24.56
	b)Battery Charger	K (2)1.80				
	c)DCDB.	L (2)0.91				
	Total 'F'					**26.51**
G	**Material for Capacitor Bank**					

1	C&R Panel For Cap bank	N (11)	2No.	2	2.68	5.36
2	66 KV Cap Banks without NCT	I (2)	4 No.	4	14.97	59.88
3	CT	C (1) (ii)	2Set(6)	6	0.94	5.64
4	SF-6 Breaker	E (1)	2 No.	2	4.41	8.82
5	800Amp Isolator with solid core Insulators	F (1)	2 No.	2	0.99	1.98
6	800 Amp Isolator with Earth Switch with solid core Insulators	G (1)	4 No.	4	1.47	5.88
7	66KV NCT for Capacitor Bank	D (9) (i)	4 No.	4	0.57	2.28
8	Structure for 66KV NCT (for Capacitor bank)	D (10) (i)	4 No.	4	0.18	0.72
	Total 'G'					**90.56**
FY-2022-23					**A**	
	Sub-Total (a) = A+B+C+D+E+F+G					**1953.22**
	Transportation, Erection charges, storage & contingency etc. @ 11% on (a)					**214.85**
	Grand Total:					**2168.07**

Rs 2168.07 Lacs only.

		(Rs in Lacs)
1	Cost of Electrical equipments including Erection Charges, Stores and contingency etc.	2168.07
2	Cost of Land	350
3	Cost of Switch house building and the other civil works* in the switchyard.	648
4	PLCC equipment for 4 no. line bays (4x22.16)	88.64
	Total	**3254.71**

Say Rs 3254.71 Lacs only.

Note: 1. For Land rates, collector rates have been considered.

2. *The other civil works in Switchyard include switch gear foundations, gravel spreading, outdoor trenches, boundary wall with gates, Laying of earth mats, approach road, drains and PCC flooring etc.

FY- 2022-23 **ANNEXURE-C**

DETAILS OF COST FOR 220KV SUB-STATION WITH 1x160MVA, 220/66KV T/F TO BE FED BY LILO OF 220KV DC LINE (4 LINE BAYS, 1 T/F BAY AND 1 B/C BAY). THIS COST DATA HAS BEEN PREPARED FOR ESTIMATION PURPOSES ONLY.

Sr. No.	Description	Cost Ref.	Qty.	Qty.	Rate (Rs. in Lacs)	Amount Rs. in Lacs)
A)	**1x160MVA, 220/66KV T/Fs.**	**A (6)**	1 No.	1	856.32	856.32
	Total 'A'					**856.32**
B)	**220KV SWITCHGEAR EQUIPMENT**					
1	1600 Amps. 40KA, RC SF-6 ckt. Breaker.	E (3)	6 Nos.	6	12.54	75.24
2	CTs.	C (3) (i)	6 Sets(18)	18	3.08	55.44
3	P.Ts for bus.	B (3)	6 Nos.	6	3.05	18.3
4	L.As.	H (3)	5 Sets(15)	15	0.53	7.95
5	Isolators with Earth Switch including Insulators	G (4)	4 No.	4	5.49	21.96
6	Isolators with Insulators	F (5)	12 No.	12	4.75	57
7	Control &Relay Panel:					0
i)	T/F bays.	N (2)	1 No.	1	7.02	7.02
ii)	Line bays.	N (1)	4 Nos.	4	7.92	31.68
iii)	B/C bays.	N (3)	1 No.	1	5.97	5.97
iv)	Bus Bar Protection	O (2)	1 No.	1	21.57	21.57
8	Steel structures.	T (1)	125MT	125	0.9	112.5
9	Earthing material.		Lot		L/S	8.09
10	Bus bar & connecting material.		Lot		L/S	17.66
11	Power & control cables.		Lot		L/S	17.66
	Total 'B'					**458.04**
C)	**MISC. EQUIPMENT**					
1	Firefighting equipment.		Lot		L/S	4.62
	Total 'C'					**4.62**
	FY-2022-23					**A**

D)	**66KV SWITCHGEAR EQUIPMENT**					
1	2000 Amps.,31.5KA, RC SF-6,Ckt. Breaker	E (1)	2 Nos.	2	4.41	8.82
2	2000 Amps. Isolator with solid core Insulators	F (3)	4 Sets	4	1.77	7.08
3	C.Ts.	C (1) (i)	2 Sets (6No.)	6	1.2	7.20
4	L.As.	H (1)	1 Set (3 No.)	3	0.21	0.63
5	Bus PTs.	B (1)	2 Sets (6 No.)	6	0.8	4.80
6	Control &Relay Panel:					
i)	For T/F bays	N (9)(ii)	1 No.	1	3.79	3.79
ii)	For Bus Coupler bays	N (10)	1No.	1	5.84	5.84
7	Steel structures.	T (1)	20MT	20	0.9	18.00
8	Earthing material.		Lot		L/S	3.47
9	Bus bar & connecting material.		Lot		L/S	5.78
10	Power control cables.		Lot		L/S	5.78
	Total 'D'				L/S	**71.19**
E)	**11KV EQUIPMENT**					
1	11/0.415KV, 200KVA St.T/Fs.	U	1 No.	1	2.34	2.34
2	11KV U/G cables.		Lot		L/S	1.73
	Total 'E'					**4.07**
F)	**220V/415V EQUIPMENT.**					
1	a) 220V/415 volts AC switch consisting of 15 switch metering & protective equipment alongwith one bus coupler.	M (1)	1 Set	1	1.95	1.95
2	220V, 300AH					
	a)DC Battery	J(2) 9.57	2Set	2	12.28	24.56
	b)Battery Charger	K(2) 1.80				
	c)DCDB.	L(2) 0.91				
	Total 'F'					**26.51**
G	**Material for Cap Banks**					
1	C&R Panel For Cap bank	N (11)	1No.	1	2.68	2.68
2	66 KV Cap Banks without NCT	I (2)	3 No.	3	14.97	44.91
3	CT	C (1) (ii)	1Set(3)	3	3.08	9.24
4	SF-6 Breaker	E (1)	1 No.	1	4.41	4.41
5	800Amp Isolator with solid	F (1)	2 No.	2	0.99	1.98

	core Insulators					
6	800 Amp Isolator with Earth Switch and solid core Insulators	G (1)	3 No.	3	1.47	4.41
7	66KV NCT for capacitor bank	D (9) (i)	3 No.	3	0.57	1.71
8	Structure for 66KV NCT (for capacitor bank)	D (10)(i)	3 No.	3	0.18	0.54
	Total 'G'					**69.88**
	Sub-Total (a) = A+B+C+D+E+F+G					**1490.63**
	Transportation , Erection charges, storage & contingency etc. @ 11% on (a)					**163.97**
	Grand Total:					**1654.60**

		(R in Lacs)
1	Cost of Electrical equipments including Erection Charges, Storage and contingency etc.	1654.60
2	Cost of Land	350
3	Cost of Switch house building and the other civil works* in the switchyard.	606
4	PLCC equipment for 4 line bays (4x22.16)	88.64
	Total	**2699.24**

Rs 2699.24 Lacs only.

Note: 1. For Land rates, collector rates have been considered.
2. *The other civil works in Switchyard include switch gear foundations, gravel spreading, outdoor trenches, boundary wall with gates, Laying of earth mats, approach road, drains and PCC flooring etc.

FY- 2022-23 ANNEXURE-D

DETAILS OF COST FOR ADDITIONAL 160MVA, 220/66KV T/F AT 220 KV SUB-STATION. THIS COST DATA HAS BEEN PREPARED FOR ESTIMATION PURPOSES ONLY.

Sr. No.	Description	Cost Reference	Qty.		Rates (Rs in Lacs)	Amount (Rs in Lacs)
A)	**POWER TRANSFORMER**					
	160MVA, 220/66KV T/Fs.	A (6)	1 No.	1	856.32	856.32
	Total 'A'					**856.32**
B)	**220KV SWITCHGEAR EQUIPMENT**					
1	220KV SF-6, ckt. Breaker.	E (3)	1 No.	1	12.54	12.54
2	CTs.	C (3) (i)	1 Set(3)	3	3.08	9.24
3	L.As. for T/Fs.	H (3)	1 Set(3)	3	0.53	1.59
4	Isolator with Insulators	F (5)	2 No.	2	4.75	9.5
5	Control & Relay panel for T/F bay.	N (2)	1 No.	1	7.02	7.02
6	Steel structures.	T (1)	25MT	25	0.90	22.5
7	Earthing material		Lot		L/S	1.16
8	Bus bar & connecting material.		Lot		L/S	3.47
9	Control cables.		Lot		L/S	3.47
	Total 'B'					**70.49**
C)	**66KV EQUIPMENT**					
1	66KV SF-6, ckt. Breaker.	E (1)	1 No.	1	4.41	4.41
2	2000 Amp Isolator with solid core Insulators.	F (3)	2 No	2	1.77	3.54
3	CTs.	C (1) (i)	1 Set(3)	3	1.20	3.6
4	L.As.	H (1)	1 Set(3)	3	0.21	0.63
5	Control &Relay Panel for T/F bay.	N (9) (ii)	1 No.	1	3.79	3.79
6	Steel structures.	T (1)	25MT	25	0.90	22.5
7	Earthing material		Lot		L/S	0.81
8	Bus bar & connecting material.		Lot		L/S	1.45

9	Augmentation of 66KV Bus bars to Quadrupled conductor		Lot		L/S	10
10	Control cables.		Lot		L/S	1.45
	Total 'C'					**52.18**
	FY-2022-23					**A**
D)	**Material for Cap Banks**					
1	C&R Panel For Cap bank	N (11)	1No.	1	2.68	2.68
2	66 KV Cap Banks without NCT	I (2)	3 No.	3	14.97	44.91
3	CT	C (1)(ii)	1Set(3)	3	0.94	2.82
4	SF-6 Breaker	E (1)	1 No.	1	4.41	4.41
5	800Amp Isolator with solid core Insulators	F (1)	2 No.	2	0.99	1.98
6	800 Amp Isolator with Earth Switch and solid core Insulators	G (1)	3 No.	3	1.47	4.41
7	NCT 66KV for capacitor bank	D (9) (i)	3 No.	3	0.57	1.71
8	Structure for 66KV NCT (for capacitor bank)	D (10) (i)	3 No.	3	0.18	0.54
	Total 'D'					**63.46**
	Sub-Total (a) = A+B+C+D					**1042.45**
	Transportation, Erection charges, storage & contingency etc. @ 11% on (a)					**114.67**
	Grand Total:					**1157.12**

Rs 1157.12 Lacs only.

		(Rs in Lacs)
1	Cost of Electrical equipments including Erection Charges, Storage and contingency etc.	1157.12
2	Cost of extension in switchyard building and other civil works in the yard	79
	Total	**1236.12**

Say Rs 1236.12 Lacs only

Note: 1. *The other civil works in Switchyard include switch gear foundations, gravel spreading, outdoor trenches, boundary wall with gates, Laying of earth mats, approach road, drains and PCC flooring etc.

DETAILS OF COST FOR 220KV SUB-STATION WITH 1x100MVA, 220/132KV T/F TO BE FED FROM 220KV LINE SC ON DC TOWERS (1 Line Bay, 1 T/F Bay and 1 B/C Bay). THIS COST DATA HAS BEEN PREPARED FOR ESTIMATION PURPOSES ONLY.

Sr. No.	Description.	Cost Reference	Qty.	Qty.	Rate (Rs. in Lacs)	Amount (Rs. in Lacs)
A)	**POWER TRANSFORMERS**					
1)	1X100MVA, 220KV/132KV T/Fs.	A (5)	1 No.	1	653.97	653.97
	Total 'A'					**653.97**
B)	**220KV SWITCHGEAR EQUIPMENT**					
1	SF-6 Ckt. Breaker.	E (3)	3 No.	3	12.54	37.62
2	C.Ts.	C (3)(ii)	3 Sets (9)	9	3.08	27.72
3	P.Ts. for bus.	B (3)	2 Sets(6).	6	3.05	18.3
4	L.As.	H (3)	2 Sets(6)	6	0.53	3.18
5	Isolator with Earth Switch including Insulators.	G (4)	1 No	1	5.49	5.49
6	Isolator with Insulators	F(5)	6 No.	6	4.75	28.5
7	**C&R panel for:**					0
i)	T/F bay	N (2)	1 No.	1	7.02	7.02
ii)	Line bay	N (1)	1 No.	1	7.92	7.92
iii)	B/C bay.	N (3)	1 No.	1	5.97	5.97
iv)	Bus Bar Protection	O (i)	1 No.	1	9.87	9.87
8	Steel structures.	T (1)	50 MT	50	0.9	45
9	Earthing material.		Lot		L/S	4.62
10	Bus bar & connecting material.		Lot		L/S	8.66
11	Power & control cables.		Lot		L/S	11.55
	Total 'B'					**221.42**
C)	**MISC. ITEMS**					
1	Fire fighting equipment.		Lot		L/S	4.62
	Total 'C'					**4.62**

D)	**132KV SWITCHGEAR EQUIPMENT**					
1	SF-6 Ckt. Breaker.	E(2)	1No.	1	5.44	5.44
2	Isolators with solid core insulators.	F (4)	4 No.	4	2.37	9.48
3	C.Ts.	C(2) (ii)	1Sets(3)	3	1.53	4.59
4	L.As.	H (2)	1 Set(3)	3	0.36	1.08
5	Bus P.Ts.	B (2)	2Sets(6)	6	1.4	8.4
6	C&R Panel For:					0
i)	T/F bay	N (5)	1 No.	1	5.92	5.92
ii)	Bus Coupler bay	N (10)	1 No.	1	5.84	5.84
7	Steel structures.	T (1)	20 MT	20	0.90	18
8	Earthing material.		Lot		L/S	2.77
9	Bus bar & connecting material.		Lot		L/S	4.62
10	Power & control cables.		Lot		L/S	4.62
	Total 'D'					**70.76**
E)	**11KV EQUIPMENT**					
1	11/0.415KV, 200KVA T/F	U	1 No.	1	2.34	2.34
2	11KV U/G cables.		Lot		L/S	1.73
	Total 'E'					**4.07**
F)	**220KV/415V EQUIPMENT**					
1	a) 220KV / 415 Volts AC switch Board consisting of 15 switch metering and protective equipment alongwith one bus coupler.	M (1)	1 Set	1	1.95	1.95
2	220V, 300AH					
	a)DC Battery	J(2)8.95	2 Set	2	12.28	24.56
	b)Battery Charger	K(2)1.48				
	c)DCDB.	L(2)0.76				
	Total 'F'					**26.51**
G	**Material for Cap Banks**					
1	C&R Panel For Cap bank	N(7)	1No.	1	2.68	2.68
2	132 KV Cap Banks without NCT	I (3)	2 No.	2	20.07	40.14
3	CT	C (2) (ii)	1Set(3)	3	1.53	4.59
4	SF-6 Breaker	E (2)	1 No.	1	5.44	5.44
5	Isolator with insulators	F (4)	2 No.	2	2.37	4.74
6	Isolator with Earth Switch with solid core insulators.	G (3)	2 No.	2	2.86	5.72
7	132KV NCT for Capacitor Bank	D (9) (ii)	2 No.	2	0.99	1.98

8	Structure for 132KV NCT (for Capacitor Bank)	D(10) (ii)	2 No.	2	0.27	0.54
	Total 'G'					**65.83**
	Sub-Total (a) = A+B+C+D+E+F+G					**1047.18**
	Transportation, Erection charges, storage & contingency etc.					**115.19**
	@ 11% on (a)					
	Grand Total					**1162.37**

Rs 1162.37 Lacs only.

		(Rs in Lacs)
	Cost of Electrical equipments including Erection Charges, Stores and contingency etc.	1162.37
2	Cost of Land	350
3	Cost of Switch house building and the other civil works* in the switchyard	515
4	PLCC equipment for 1 line bays	22.16
	Total	**2049.53**

Rs 2049.53 Lacs only.

Note: 1. For Land rates, collector rates have been considered.
2. *The other civil works in Switchyard include switch gear foundations, gravel spreading, outdoor trenches, boundary wall with gates, Laying of earth mats, approach road, drains and PCC flooring etc.

FY- 2022-23 **ANNEXURE-F**

DETAILS OF COST FOR ADDITIONAL 100MVA, 220/132 KV T/F AT 220KV SUB-STATION. THIS COST DATA HAS BEEN PREPARED FOR ESTIMATION PURPOSES ONLY.

Sr. No.	Description	Cost Ref.	Qty.	Qty.	Rate (Rs. in Lacs)	Amount (Rs. in Lacs)
A)	**POWER TRANSFORMER**					
	100MVA, 220/132KV T/Fs.	A (5)	1 No.	1	653.97	653.97
	Total 'A'					**653.97**
B)	**220KV SWITCHGEAR EQUIPMENT**					
1	220KV SF-6, ckt. Breaker.	E (3)	1 No.	1	12.54	12.54
2	CTs.	C (3)(ii)	1 Set(3)	3	3.08	9.24
3	L.As. for T/Fs.	H (3)	1 Set(3)	3	0.53	1.59
4	Isolator with Insulators	F (5)	2 No.	2	4.75	9.5
5	Control & Relay panel for T/F bay.	N(2)	1 No.	1	7.02	7.02
6	Steel structures.	T (1)	25MT	25	0.9	22.5
7	Earthing material		Lot		L/S	1.16
8	Bus bar & connecting material.		Lot		L/S	3.47
9	Power & control cables.		Lot		L/S	3.47
	Total 'B'					**70.49**
C)	**132KV SWITCHGEAR EQUIPMENT**					
1	SF-6 Ckt. Breaker.	E (2)	1No.	1	5.44	5.44
2	132 KV 800 Amp Isolator	F (4)	2 No.	2	2.37	4.74
3	C.Ts.	C (2) (i)	1 Sets (3)	3	1.53	4.59
4	L.As.	H (2)	1 Set(3)	3	0.36	1.08
5	Bus P.Ts	B (2)	2 Sets (6)	6	1.40	8.4
6	C&R Panel For:					0

i)	T/F bay	N (5)	1 No.	1	5.92	5.92
7	Steel structures.	T (1)	20 MT	20	0.9	18
8	Earthing material.		Lot		L/S	2.77
9	Bus bar & connecting material.		Lot		L/S	4.62
10	Power & control cables.		Lot		L/S	4.62
	Total 'C'					**60.18**
	FY-2021-22					**A**
D)	**Material for Cap Banks**					
1	C&R Panel For Cap bank	N (7)	1No.	1	2.68	2.68
2	132 KV Cap Banks without NCT	I (3)	2 No.	2	20.07	40.14
3	CT	C (2)(ii)	1Set(3)	3	1.53	4.59
4	SF-6 Breaker	E (2)	1 No.	1	5.44	5.44
5	800Amp Isolator with solid core Insulators	F (4)	2 No.	2	2.37	4.74
6	800 Amp Isolator with Earth Switch and solid core Insulators	G (3)	2 No.	2	2.86	5.72
7	132 KV NCT for Capacitor Bank	D (9) (ii)	2 No.	2	0.99	1.98
8	Structure for 132KV NCT (for Capacitor Bank)	D (10)(ii)	2 No.	2	0.27	0.54
	Total 'D'					**65.83**
	Sub-Total (a)= A+B+C+D					**850.47**
	Transportation , Erection charges, storage & contingency etc. @ 11% on (a)					**93.55**
	Grand Total:					**944.02**

Rs 944.02 Lacs only.

		(R in Lacs)
1	Cost of Electrical equipments including Erection Charges, Storage and contingency etc.	944.02
2	Cost of extension in Switchyard building and other civil works* in the yard area	79
	Total	**1023.02**

Say Rs 1023.02 Lacs only

FY- 2022-23 **ANNEXURE-G**

DETAILS OF COST FOR ADDITIONAL 100MVA, 220/66KV T/F AT 220KV SUB-STATION. THIS COST DATA HAS BEEN PREPARED FOR ESTIMATION PURPOSES ONLY.

Sr. No.	Description	Cost Ref.	Qty.		Rate (R in Lacs)	Amount (R in Lacs)
A)	**POWER TRANSFORMER**					
	100MVA, 220/66KV T/Fs.	**A (4)**	1 No.	1	604.58	604.58
	Total 'A'					**604.58**
B)	**220KV SWITCHGEAR EQUIPMENT**					
1	220KV SF-6, ckt. Breaker.	E (3)	1 No.	1	12.54	12.54
2	CTs.	C (3) (ii)	1 Set(3)	3	3.08	9.24
3	L.As. for T/Fs.	H (3)	1 Set(3)	3	0.53	1.59
4	Isolators with Insulators.	F (5)	2 No.	2	4.75	9.5
5	Control & Relay panel for T/F bay.	N (2)	1 No.	1	7.02	7.02
6	Steel structures.	T(1)	25MT	25	0.9	22.5
7	Earthing material		Lot		L/S	1.16
8	Bus bar & connecting material.		Lot		L/S	3.47
9	Power & control cables.		Lot		L/S	3.47
	Total 'B'					**70.49**
C)	**66KV EQUIPMENT**					
1	66KV SF-6, ckt. Breaker.	E (1)	1 No.	1	4.41	4.41
2	1250 Amps. Isolators with Insulators.	F (2)	2 No	2	1.50	3
3	CTs.	C (1) (ii)	1 Set(3)	3	0.94	2.82
4	L.As.	H (1)	1 Set(3)	3	0.21	0.63
5	Control &Relay Panel for T/F bay.	N (9)(ii)	1 No.	1	3.79	3.79
6	Steel structures.	T(1)	1.5MT	1.5	0.9	1.35
7	Earthing material		Lot		L/S	0.81
8	Bus bar& connecting material.		Lot		L/S	1.45

9	Augmentation of 66 KV Bus bar to quadruple conductor		Lot		L/S	10
10	Power & control cables.		Lot		L/S	1.45
	Total 'C'					**29.71**
	FY-2022-23					**A**
D	**Material for Cap Banks**					
1	C&R Panel For Cap bank	N (11)	1No.	1	2.68	2.68
2	66 KV Cap Banks without NCT	I (2)	2 No.	2	14.97	29.94
3	CT	C (1) (ii)	1Set(3)	3	0.94	2.82
4	SF-6 Breaker	E (1)	1 No.	1	4.41	4.41
5	800Amp Isolator with solid core Insulators	F (1)	1 No.	1	0.99	0.99
6	800 Amp Isolator with Earth Switch and solid core Insulators.	G (1)	2 No.	2	1.47	2.94
7	66KV NCT for capacitor Bank	D (9) (i)	2 No.	2	0.57	1.14
8	Structure for 66KV NCT (for Capacitor Bank).	D (10) (i)	2 No.	2	0.18	0.36
	Total 'D'					**45.28**
	Sub-Total (a) = A+B+C+D					**750.06**
	Transportation, Erection charges, storage & contingency etc.					**82.51**
	@ 11% on (a)					
	Grand Total:					**832.57**

Rs 832.57 Lacs only.

		(Rs in Lacs)
1	Cost of Electrical equipments including Erection Charges, Storage and contingency etc.	832.57
2	Cost of extension in Switch house building and the other civil works* in the yard area.	79
	Total	**911.57**

Say Rs 911.57 Lacs only

FY- 2022-23 **ANNEXURE-H**

DETAILS OF COST FOR 220KV SUB-STATION WITH 1x100MVA, 220/66KV T/F TO BE FED BY LILO OF ONE CKT OF 220KV DC LINE (2 LINE BAYS, 1 T/F BAY AND 1 B/C BAY). THIS COST DATA HAS BEEN PREPARED FOR ESTIMATION PURPOSES ONLY.

Sr. No.	Description	Cost Ref.	Qty.	Qty.	Rate (Rs. in Lacs)	Amount (Rs. in Lacs)
A)	**1x100MVA, 220/66KV T/Fs.**	**A (4)**	1 No.	1	604.58	604.58
	Total 'A'					**604.58**
B)	**220KV SWITCHGEAR EQUIPMENT**					
1	1600 Amps. 40KA, RC SF-6 ckt. Breaker.	E (3)	4 Nos.	4	12.54	50.16
2	CTs.	C (3) (ii)	4Sets(12)	12	3.08	36.96
3	P.Ts for bus.	B (3)	6 Nos.	6	3.05	18.3
4	L.As.	H (3)	3Sets (9)	9	0.53	4.77
5	Isolators with Earth Switch including Insulators.	G (4)	2 No.	2	5.49	10.98
6	Isolators with Insulators.	F (5)	8 No.	8	4.75	38
7	Control &Relay Panel:					
i)	T/F bays.	N (2)	1 No.	1	7.02	7.02
ii)	Line bays.	N (1)	2 Nos.	2	7.92	15.84
iii)	B/C bays.	N(3)	1 No.	1	5.97	5.97
iv)	Bus Bar Protection	O (2)	1 No.	1	21.57	21.57
8	Steel structures.	T(1)	50MT	50	0.9	45
9	Earthing material.		Lot		L/S	8.09
10	Bus bar & connecting material.		Lot		L/S	17.33
11	Power & control cables.		Lot		L/S	17.36
	Total 'B'					**297.35**
C)	**MISC. EQUIPMENT**					
1	Fire fighting equipment.		Lot		L/S	4.62
	Total 'C'					**4.62**
	FY-2022-23					**A**
D)	**66KV SWITCHGEAR EQUIPMENT**					

1	1250 Amps.,40KA, RC SF-6, Ckt. Breaker	E (1)	2 Nos.	2	4.41	8.82
2	1250 Amps. Isolators with Insulators.	F (2)	4 Sets	4	1.50	6
3	C.Ts.	C (1) (i)	2 Sets(6No.)	6	1.2	7.2
4	L.As.	H (1)	1 Set (3No.)	3	0.21	0.63
5	Bus PTs.	B (1)	2 Sets (6 No.)	6	0.80	4.8
6	Control &Relay Panel:					
i)	For T/F bays	N (9)(ii)	1 No.	1	3.79	3.79
ii)	For Bus Coupler bays	N (10)	1No.	1	5.84	5.84
7	Steel structures.	T (1)	20MT	20	0.90	18
8	Earthing material.		Lot		L/S	3.47
9	Bus bar & connecting material.		Lot		L/S	5.78
10	Power control cables.		Lot		L/S	5.78
	Total 'D'					**70.11**
E)	**11KV EQUIPMENT**					
1	11/0.415KV, 200KVA St. T/Fs.	U	1 No.	1	2.34	2.34
2	11KV U/G cables.		Lot		L/S	1.73
	Total 'E'					**4.07**
F)	**220V/415V EQUIPMENT.**					
1	a) 220V/415 volts AC switch consisting of 15 switch metering & protective equipment alongwith one bus coupler.	M (1)	1 Set	1	1.95	1.95
2	220V, 300AH	J(2) 9.57	2 Set	2	12.28	24.56
	a)DC Battery	K (2) 1.80				
	b)Battery Charger	L (2) 0.91				
	c)DCDB.					
	Total 'F'					**26.51**
G	**Material for Cap Banks**					
1	C&R Panel For Cap bank	N (11)	1No.	1	2.68	2.68
2	66 KV Cap Banks without NCT	I (2)	2 No.	2	14.97	29.94
3	CT	C (1) (ii)	1Set(3)	3	0.94	2.82
4	SF-6 Breaker	E (1)	1 No.	1	4.41	4.41
5	800Amp Isolator with solid core Insulators	F (1)	2 No.	2	0.99	1.98

6	800 Amp Isolator with Earth Switch and solid core Insulators	G (1)	2 No.	2	1.47	2.94
7	66KV NCT for Capacitor bank	D (9) (i)	2 No.	2	0.57	1.14
8	Structure for 66KV NCT (for Capacitor bank)	D (10) (i)	2 No.	2	0.18	0.36
	Total 'G'					**46.27**
	Sub-Total (a) = A+B+C+D+E+F+G					**1053.51**
	Transportation, Erection charges, storage & contingency etc. @ 11% on (a)					**115.89**
	Grand Total:					**1169.40**

Rs 1169.40 Lacs only.

		(Rs in Lacs)
	Cost of Electrical equipments including Erection Charges, Storage and contingency etc.	1169.40
2	Cost of Land	350
3	Cost of Switch house building and the other civil works* in the switchyard	545
	PLCC equipment for 2 line bays (2*22.16)	44.32
	Total	**2108.72**

Rs 2108.72 Lacs only.

Note: 1. For Land rates, collector rates have been considered.

2. *The other civil works in Switchyard include switch gear foundations, gravel spreading, outdoor trenches, boundary wall with gates, Laying of earth mats, approach road, drains and PCC flooring etc.

FY 2022-23 **I-1 to I-5**

DETAIL OF COST FOR 220KV DC LINE ON DC TOWERS WITH 'ZEBRA' ACSR CONDUCTOR NOMINAL ALUMINIUM AREA 420mm^2, FOR CALCULATING THE COST PER KM RUN OF LINE, 10KM OF LINE HAS BEEN CONSIDERED. THIS COST DATA HAS BEEN PREPARED FOR ESTIMATION PURPOSES ONLY.

1	**TOWER STRUCTURES**		Lacs
	Span.	350 Mtrs.	
	Total No. of towers in 10 Kms (allowing 2 Towers for short span and one for other end).	10x1000/350 = 28.57 Nos. Say 29+2+1=32 Nos.	
	Angle towers (taking 30% of total No. of towers).	10 Nos.	
	No. of straight towers.	32-10 = 22 Nos.	
	Average weight of Angle towers.	11.6 MT	
	Average weight of straight towers.	6.5 MT	
	Total weight	10x11.6+22x6.5 =116+143=259 MT	
	Add 20% for extension & templates.	51.80 MT	
	Total tonnage.	259+51.80= 310.80MT	
	Cost @ Rs. 89916/- per MT.		279.46
	G.I. Nuts & Bolts @ 3.5% of Tower Material	10.88 MT	
	Cost @ Rs 117250 per MT.		12.76
	Total:		**292.22**

FY-2022-23 **I-2**

2	**ACSR**		Lacs
	Size of ACSR	420mm^2 ACSR	
	Length of ACSR (allowing 1.5% for sag & wastage).	3x10x1.015x2 = 60.90Kms	
	Cost @ Rs 350808/- per Km.		213.64
3	**GROUNDWIRE**		
	Size of single earthwire 110Kgs quality.	7/3.15mm	
	Length of ground wire (allowing 1.5% for sag & wastage).	10x1.015 = 10.15 Kms.	
	Cost @ Rs 40225/- per Km		4.08
4	**STRING ASSEMBLIES**		
i)	No. of S.S. String assemblies complete with suspension clamps and 14 Disc Insulators of 70 KN EMS.	20x3x2 = 120 Nos.	

	(1280+14x678) = Cost @ Rs. 10772/-		12.93
ii)	No. of D.S. String assemblies complete with suspension clamps and 28 disc insulators of 70 KN EMS.	2x3x2 = 12 Nos.	
	(2077+28x678) = Cost @ Rs 21061/-		2.53
iii)	No. of S.T. String assemblies complete with tension clamps and 15 disc insulators of 160 KN EMS.	6x6x2 = 72 Nos.	
	(2470+15x958) = Cost @ Rs. 16840/-		12.12
iv)	No. of D.T. String assemblies complete with T-clamps and 30 disc insulators of 160 KN EMS.	4x6x2 = 48 Nos.	
	(3712+30x958) = Cost @ Rs. 32452/-		7.79
	Total		**35.37**

5	**ACSR ACCESSORIES**		Lacs
i)	No. of armoured rod sets complete with ferrules.	22x6 = 132 Nos.	
	Cost @ Rs 1767 per set.	132x1767 = 233244	
ii)	No. of Mid Span compression joints (assuming average drum length 1100 Mtrs.).	61x1000/1100 = 55.47 Nos. Say 56 Nos.	
	Cost @ Rs 637 per joint.	35672	
iii)	4 RSB Vibration dampers.	2x6x32 = 384 Nos.	
	Cost @ Rs 645	247680	
iv)	Repair sleeves.	10 Nos.	
	Cost @ Rs234/-	2340	
	Total:	**518,936.00**	**5.19**
6)	**GROUNDWIRE ACCESSORIES**		
i)	No. of bonding pieces for suspension and tension towers.	22+10x2 = 42 Nos.	
	Cost @ Rs. 363/-	42x363 = 15,246/-	
ii)	No. of 4 RSB vibration dampers for earthwire	2x32 = 64 Nos.	
	Cost @ Rs 370/-	23680	
iii)	No. of suspension clamps.	22 Nos.	
	Cost @ Rs 357/-	7854	
iv)	No. of dead end body including linking devices.	10x2 = 20 Nos.	
	Cost @ Rs 285/-	20x285 = 5700	
v)	No. of Mid Span compression joints /St joints (assuming average drum length 1600 Mtrs.).	10x1000/1600 = 6.25 Nos. Say 7 Nos.	
	Cost @ Rs. 44	7x44 = 308	

	Total:		**52788**		**0.53**
7)	**TOWER FIXTURES**				
Sr. No.	Material	Unit	No. of Fixture	Rate (in Rs.)	Amount (in Rs.)
1	Earthing sets.	Set	32	1159	37,088.00
2	Danger plates.	No.	32	195	6,240.00
3	Number plates.	No.	32	182	5,824.00
4	Bird guards for suspension towers (Set of 3).	Set	As per Assumption 4		
5	Phase plates (set).	Set	64	331	21,184.00
6	Anti-climbing devices.	No.	As per Assumption 4		
7	Circuit Plates (set of Two).	Set	32	363	11,616.00
8	Barbed wire (No. of Towers x 10kg)	Kg	320	91	29,120.00
	Total:				**111,072.00**
					1.11 lacs

FY-2022-23 **I-4**

8 CONCRETE FOR TOWER FOUNDATIONS

Type of Towers	**No. of towers.**	**Cement (Bag) (50kg) @ 236/-**	**Sand in (Cum) @ 1724/-**	**Crusher in (Cum) @1656/-**	**Steel in (Kgs) @ 78/-**
A) STRAIGHT TOWERS	22Nos.				
Qty. required for one tower		102	6.97	13.91	1073
Amount.					
Sub-Total	**142817.24**				
cost for 22 Nos. Towers.	31.42 lacs				
B) ANGLE TOWERS 30^{o}	6Nos.				
Qty. reqd. for 1 No.		238	15.61	31.22	2781
Amount.					
Sub-Total	**351697.96**				
cost for 6 Nos. Towers.	21.10 lacs				
C) ANGLE TOWERS 60^{0}	4 Nos.				
Qty. reqd. for 1 No.		302	19.48	38.58	2810
Amount.					

Sub-Total	**387924.00**				
cost for 4 Nos. Towers.	15.52 lacs				
Total (a+b+c)	**68.04**				
5% extra for wastage & 10% for wet locations.	10.21				
Total:	**78.25**	**lacs**			

FY-2022-23 **I-5**

ABSTRACT OF COST

Sr. No.	**Particulars**	**Cost (in Rs.) lacs**
1	Tower structures	292.22
2	ACSR	213.64
3	Groundwire.	4.08
4	String assemblies.	35.37
5	ACSR accessories.	5.19
6	Groundwire accessories.	0.53
7	Tower Fixtures.	1.11
8	Concrete for foundations.	78.25
9	**Sub-Total**	**630.39**
10	Erection charges @ 20% of material cost.	126.08
11	Transportation chargers @ 2.5%	15.76
12	Cost of 10 Kms run of completely erected line.	772.23
13	Cost of the one Km run of line.	77.22

Say Rs. 77.22 Lacs only

1.	Cost of one Km Line.	77.22	
2.	Cost of other Misc. Expenditure for Erection of one Km Transmission Line.		

i.	Preliminary Expenses for one Km. line (For GEO referencing, survey, preparation of key plan, route plan, profile etc and supply of prints thereof)	0.14	
ii.	Cost of Land under Towers of one Km Trans. Line. (Area in Sq. mtr x No. of Towers x rates per Sq. mtr) (100x4x826).	3.30	
iii.	Crop Compensation charges for one Km distance under 220/132 KV Transmission line.	2.06	
iv	Forest Clearance Charges for one Km line	0.78	
v.	Compensation charges for private trees for one Km distance under 220/132 KV Transmission lines.	0.71	
vi.	PTCC and Re- Engineering charges for one Km. line	0.16	
vii	Railway Crossing Charges for one km. line.	35.40	
	Total	**119.77**	

Say Rs. 119.77 Lacs Only

FY 2022-23 **J1 to J5**

DETAIL OF COST FOR 220KV DC LINE ON DC TOWERS WITH TWIN MOOSE ACSR CONDUCTOR NOMINAL ALUMINUM AREA (2x520mm^2), FOR CALCULATING THE COST PER KM RUN OF LINE, 10KM OF LINE HAS BEEN CONSIDERED. THIS COST DATA HAS BEEN PREPARED FOR ESTIMATION PURPOSES ONLY.

1	**TOWER STRUCTURES**		lacs
	Span.	160 Mtrs.	
	Total No. of towers in 10 Kms (allowing 2 Towers for short span and one for other end).	10x1000/160 = 62.5 Nos. Say 63+2+1=66 Nos.	
	Angle towers (taking 30% of total No. of towers).	20 Nos.	
	No. of straight towers.	66-20 = 46 Nos.	
	Average weight of Angle towers.	11.6 MT	
	Average weight of straight towers.	6.5 MT	
	Total weight	11.6x20+6.5x46 = 232+299 = 531 MT	
	Add 20% for extension & templates.	106.20 MT	
	Total tonnage.	637.20 MT	
	Cost of fabricated galvanized steel @ Rs. 89916 MT.	89916	572.94
	G.I. Nuts & Bolts @ 3.5% of Tower material	22.30 MT	
	Cost @ Rs 117250 per MT.		26.15
	Total:		599.09

FY-2022-23 **J-2**

2	**ACSR**		Lacs
	Length of ACSR (allowing 1.5% for sag & wastage).	520 mm^2 ACSR 2x2x3x10x1.015 = 121.80 Kms.	
	Cost @ Rs 455692 per Km.	121.8	555.03
3	**GROUNDWIRE**		

	Size of single earthwire 110Kgs quality. Length of ground wire (allowing 1.5% for sag & wastage).	7/3.15mm 10x1.015 = 10.15 Kms.	
	Cost @ Rs 40225 per Km	10.15x40225	4.08
4	**STRING ASSEMBLIES**		
i)	No. of S.S. String assemblies complete with suspension clamps and 14 Disc Insulators of 90 KN EMS.	44x2x3 = 264 Nos.	
	(2560+14x742) = Cost @ Rs. 12948		34.18
ii)	No. of D.S. String assemblies complete with suspension clamps and 28 Disc Insulators of 90 KN EMS.	2x3x2 = 12 Nos.	
	(5124+28x742) = Cost @ Rs.25900		3.11
iii)	No. of S.T. String assemblies complete with tension clamps and 15 disc insulators of 160KN EMS.	16x6x2 = 192 Nos.	
	(4940+15x958) = Cost @ Rs 19310		37.08
iv)	No. of D.T. String assemblies complete with T-clamps and 30 disc insulators of 160KN EMS.	4x6x2 = 48 Nos.	
	(8882+30x958) = Cost @ Rs 37622		18.06
	Total:		92.43

FY-2022-23 **J-3**

5	**ACSR ACCESSORIES**		lacs
i)	No. of armoured rod sets complete with ferrules.	2x2x46x3 = 552 Nos.	
	Cost @ Rs 1875/- per set.	552x1875 =1035000	
ii)	No. of Mid Span compression joints (assuming average drum length 1100 Mtrs.).	2x61.2x1000/1100 = 111.27 Nos. Say 112 Nos.	
	Cost @ Rs 870/- per joint.	97440	
iii)	4 RSB vibration dampers.	2x2x6x66 = 1584 Nos.	
	Cost @ Rs 820/-	1584x820 = 1298880	

iv)	Bundle Spacers.	1050 Nos.	
	Cost @ Rs 965/-	1050x965 = 10,13,250/-	
v)	Rigid Spacers	20x6x2 = 240 Nos.	
	Cost @ Rs. 579/-	240x579 = 1,38,960/-	
vi)	Repair sleeves 20 Nos.	20 Nos.	
	Cost @ Rs 346/-	6920	
	Total:	3590450	35.90
6)	**GROUNDWIRE ACCESSORIES**		
i)	No. of bonding pieces for suspension and tension towers.	46+20x2 = 86 Nos.	
	Cost @ Rs. 363/-	86x363 = 31,218/-	
ii)	4 RSB Vibration dampers for earthwire.	2x66 = 132 Nos.	
	Cost @ Rs 370/-	48840	
iii)	No. of suspension clamps.	46 Nos.	
	Cost @ Rs 357/-	16422	
iv)	No. of dead end body including linking devices.	20x2 = 40 Nos.	
	Cost @ Rs 285	40x285= 11400/-	
v)	No. of Mid Span compression joints/straight joints (assuming average drum length 1600 Mtrs.).	10x1000/1600 = 6.25 Nos. Say 7 Nos.	
	Cost @ Rs. 44/-	7x44 = 308/-	
	Total:	108188	1.08

FY-2022-23 **J-4**

7) TOWER FIXTURES						Lacs
Sr. No.	Material	Unit	No. of Fixtures.	Rate (in Rs.)	Amount (in Rs.)	
1	Earthing sets	Set	66	1159	76494	
2	Danger plates.	No.	66	195	12870	
3	Number plates.	No.	66	182	12012	
4	Bird guards for suspension towers (set 3 Nos.)	No.	As per Assumption No. 4			
5	Anti-climbing devices.	No.	As per Assumption No. 4			
6	Circuit Plates.(set of Two)	Set	66	363	23958	
7	Barbed wire (No. of Towers x 10kg)	Kg	660	91	60060	

8	Phase Plate (Set of 3)	set	66	331	21846	
	Total:				207240.00	2.07

8. CONCRETE FOR TOWER FOUNDATIONS

Type of Towers	No. of towers.	Cement (Bag) (50Kg)@ 236	Sand in (Cum) @ 1724/-	Crusher in (Cum) @ 1656/-	Steel in (Kgs.) @ 78/-
A) STRAIGHT TOWERS	46 Nos.				
Qty. reqd. for 1 No.		102	6.97	13.91	1073
Amount.					
Sub Total	142817.24				
Cost for 46 Nos. Towers.	65.70				
B) ANGLE TOWERS 30^{o}	10 Nos.				
Qty. reqd. for 1 No.		266	15.61	31.22	2781
Amount.					
Sub Total	358305.96				
Cost for 10 Nos. Towers.	35.83				
C) ANGLE TOWERS 60^{0}	10 Nos.				
Qty. reqd. for 1 No.		302	19.48	38.58	2810
Amount.					
Sub Total	387924				
Cost for 10 Nos. Towers.	38.79				
Total (a+b+c)	140.32				
5% extra for wastage & 10% for wet locations.	21.05				
Total:	161.37	Lacs			

J-5

FY-2022-23

ABSTRACT OF COST

Sr. No.	Particulars	Cost (In Rs.)		
1	Tower Structures	599.09		
2	ACSR	555.03		
3	Groundwire.	4.08		
4	String assemblies.	92.43		
5	ACSR accessories.	35.90		
6	Groundwire accessories.	1.08		
7	Tower Fixtures.	2.07		
8	Concrete for foundations.	161.37		
9	Sub-Total	1,451.05		
10	Erection charges @20% of material cost.	290.21		
11	Transportation charges @ 2.5%	36.28		
12	Cost of 10 Kms run of completely erected line.	1,777.54		
13	Cost of the one Km run of line.	177.75		
	Say Rs 177.75 Lacs only.			

.	Cost of one Km Line.	177.75	
.	Cost of other Misc. Expenditure for Erection of one Km Transmission Line.		
i.	Preliminary Expenses for one Km. line (For GEO referencing, survey, preparation of key plan, route plan, profile etc and supply of prints thereof)	0.14	
ii.	Cost of Land under Towers of one Km Trans. Line. (Area in Sq. mtr x No. of Towers x rates per Sq. mtr) (100x7x826).	5.78	
iii.	Crop Compensation charges for one Km. distance under 220/132 KV Transmission line.	2.06	
iv	Forest Clearance Charges for one Km line	0.78	
v.	Compensation charges for private trees for one Km distance under 220/132 KV Transmission lines.	0.71	
vi.	PTCC and Re- Engineering charges for one Km. line	0.16	
vii	Railway Crossing Charges for one Km. line.	35.40	
Total	Total:	222.78	
	Say Rs. 222.78 Lacs only		

FY-2022-23 **K-1 to K-5**

DETAIL OF COST FOR 220KV DC LINE ON MULTI CIRCUIT TOWERS WITH 'ZEBRA' ACSR CONDUCTOR NOMINAL ALUMINIUM AREA 420mm^2, FOR CALCULATING THE COST PER KM RUN OF LINE, 10KM OF LINE HAS BEEN CONSIDERED. THIS COST DATA HAS BEEN PREPARED FOR ESTIMATION PURPOSES ONLY.			
1	**TOWER STRUCTURES**		Lacs
	Span.	200 Mtrs.	
	Total No. of towers in 10 Kms (allowing 2 Towers for short span and one for other end).	10x1000/200 = 50 Nos. Say 50+2+1=53 Nos.	
	Angle towers (taking 30% of total No. of towers).	16 Nos.	
	No. of straight towers.	53-16 = 37 Nos.	
	Average weight of Angle towers.	18.10 MT	
	Average weight of straight towers.	9.5 MT	
	Total weight	16x18.10+37x9.5 =289.60+351.5=641.10 MT	
	Add 20% for extension & templates.	128.22 MT	
	Total tonnage.	614.10+128.22= 769.32MT	
	Cost @ Rs.89916 per MT.	769.32x89916	691.74
	G.I. Nuts & Bolts @ 3.5% of Tower Material	26.93 MT	
	Cost @ Rs 117250 per MT.		31.58
	Total:		723.32

FY 2022-23 **K-2**

2	**ACSR**		Lacs
	Size of ACSR	420mm^2 ACSR	
	Length of ACSR (allowing 1.5% for sag & wastage).	3x10x1.015x2 = 60.90 Kms.	
	Cost @ Rs 350808 per Km.		213.64
3	**GROUNDWIRE**		
	Size of single earthwire 110Kgs quality.	7/3.15mm	
	Length of ground wire (allowing 1.5% for sag & wastage).	10x1.015 = 10.15 Kms.	
	Cost @ Rs 40225 per Km		4.08
4	**STRING ASSEMBLIES**		

i)	No. of S.S. String assemblies complete with suspension clamps and 14 Disc Insulators of 70 KN EMS.	35x3x2 = 210 Nos.	
	(1280+14x678) = Cost @ Rs.10772		22.62
ii)	No. of D.S. String assemblies complete with suspension clamps and 28 disc insulators of 70 KN EMS.	2x3x2 = 12 Nos.	
	(2077+28x678) = Cost @ Rs21061		2.53
iii)	No. of S.T. String assemblies complete with tension clamps and 15 disc insulators of 160 KN EMS.	12x6x2 = 144 Nos.	
	(2470+15x958) = Cost @ Rs. 16840		24.25
iv)	No. of D.T. String assemblies complete with T-clamps and 30 disc insulators of 160 KN EMS.	4x6x2 = 48 Nos.	
	(3712+30x958) = Cost @ Rs 32452		15.58
	Total:		**64.98**

FY 2022-23 **K-3**

5	**ACSR ACCESSORIES**		Lacs	
i)	No. of armoured rod sets complete with ferrules.	37x6 = 222 Nos.		
	Cost @ Rs1767 per set.	222x1767= 392274		
ii)	No. of Mid Span compression joints (assuming average drum length 1100 Mtrs.).	61x1000/1100 = 55.47 Nos. Say 56 Nos.		
	Cost @ Rs 637 per joint.	35672		
iii)	4 RSB Vibration dampers.	2x6x53 = 636 Nos.		
	Cost @ Rs 645	410220		
iv)	Repair sleeves.	10 Nos.		
	Cost @ Rs 234	10x234= 2340		
	Total:	**840506**	**8.41**	
6)	**GROUNDWIRE ACCESSORIES**			
i)	No. of bonding pieces for suspension and tension towers.	37+16x2 = 69 Nos.		
	Cost @ Rs. 363/-	69x363 = 25,047/-		
ii)	No. of 4 RSB vibration dampers for earthwire	2x53 = 106 Nos.		

	Cost @ Rs 370	39220		
iii)	No. of suspension clamps.	37 Nos.		
	Cost @ Rs 357	13209		
iv)	No. of dead end body including linking devices.	16x2 = 32 Nos.		
	Cost @ Rs 285	32x285 = 9120		
v)	No. of Mid Span compression joints (assuming average drum length 1600 Mtrs.).	10x1000/1600 = 6.25 Nos. Say 7 Nos.		
	Cost @ Rs. 44	7x44= 308		
	Total:	**86904**	**0.87**	

7) TOWER FIXTURES			No. of	Rate	Amount
Sr. No.	Material	Unit	Fixtures.	(in Rs.)	(in Rs.)
1	Earthing sets.	Set	53	1159	61427.00
2	Danger plates.	No.	53	195	10335.00
3	Number plates.	No.	53	182	9646.00
4	Bird guards for suspension towers (Set of 3).	Set	As per Assumption No. 4		
5	Phase plates (set).	Set	106	331	35086.00
6	Anti-climbing devices.	No.	As per Assumption No. 4		
7	Circuit Plates (set of Two).	Set	106	363	38478.00
8	Barbed wire (No. of Towers x 10 kg)	Kg	530	91	48230.00
	Total:				**203202.00**
	Say 2.03 lacs				

FY 2022-23 **K-4**

8.CONCRETE FOR TOWER FOUNDATIONS

Type of Towers	**No. of towers.**	**Cement (Bag) (50Kg) @ Rs. 236**	**Sand in (Cum) @ Rs. 1724/-**	**Crusher in (Cum)@ 1656/-**	**Steel in (Kgs) @ Rs. 78/-**
A) STRAIGHT TOWERS	37Nos.				
Qty. reqd. for 1 No.		149	10.18	20.33	1568
Amount.					
Sub-Total	208684.80				

cost for 37 Nos. Towers.	77.21				
B) ANGLE TOWERS 30^{o}	9Nos.				
Qty. reqd. for 1 No.		371	24.36	51.83	4339
Amount.					
Sub-Total	553825.12				
cost for 9 Nos. Towers.	49.84				
C) ANGLE TOWERS 60^{0}	7 Nos.				
Qty. reqd. for 1 No.		471	30.4	60.2	4385
Amount.					
Sub-Total	605286.8				
cost for 7 Nos. Towers.	42.37				
Total (a+b+c)	169.43				
5% extra for wastage & 10% for wet locations.	25.41				
Total:	**194.84**	**Lacs**			

FY 2022-23 **K-5**

ABSTRACT OF COST

Sr. No.	Particulars	Cost (in Rs.) Lacs		
1	Towers structures	723.32		
2	ACSR	213.64		
3	Groundwire.	4.08		
4	String assemblies.	64.98		
5	ACSR accessories.	8.41		
6	Groundwire accessories.	0.87		
7	Tower Fixtures.	2.03		
8	Concrete for foundations.	194.84		
9	Sub-Total	1,212.17		
10	Erection charges @ 20% of			

	material cost.	242.43		
11	Transportation charges @ 2.5%	30.30		
12	Cost of 10 Kms run of completely erected line.	1,484.91		
13	Cost of the one Km run of line.	148.49		
	Say Rs. 148.49 Lacs only			
			Lacs	
1.	Cost of one Km Line.		148.49	
2.	Cost of other Misc. Expenditure for Erection of one Km Transmission Line.			
i.	Preliminary Expenses for one Km. line (For GEO referencing, survey, preparation of key plan, route plan, profile etc and supply of prints thereof)		0.14	
ii.	Cost of Land under Towers of one Km Trans. Line. (Area in Sq. mtr x No. of Towers x rates per Sq. mtr) (100x6x826).		4.96	
iii.	Crop Compensation charges for one Km. distance under 220/132 KV Transmission line.		2.06	
iv	Forest Clearance Charges for one Km line		0.78	
v.	Compensation charges for private trees for one Km distance under 220/132 KV Transmission lines.		0.71	
vi.	PTCC and Re- Engineering charges for one Km. line		0.16	
vii	Railway Crossing Charges for one Km. line.		35.40	
otal	**Total:**		**192.70**	
	Say Rs. 192.70 Lacs only			

FY 2022-23 **L-1 to L-5**

DETAIL OF COST FOR 220KV SC LINE ON DC TOWERS WITH ZEBRA ACSR CONDUCTOR NOMINAL ALUMINIUM AREA 420mm^2, FOR CALCULATING THE COST PER KM RUN OF LINE, 10KM OF LINE HAS BEEN CONSIDERED. THIS COST DATA HAS BEEN PREPARED FOR ESTIMATION PURPOSES ONLY.

1	**TOWER STRUCTURES**		Lacs
	Span.	350 Mtrs.	
	Total No. of towers in 10 Kms (allowing 2 Towers for short span and one for other end).	10x1000/350 = 28.57 Nos. Say 29+2+1=32 Nos.	
	Angle towers (taking 30% of total No. of towers).	10 Nos.	
	No. of straight towers.	32-10 = 22 Nos.	
	Average weight of Angle towers.	11.6 MT	
	Average weight of straight towers.	6.5 MT	
	Total weight	11.6x10+6.5x22 = 116+143=259 MT	
	Add 20% for extension & templates.	51.80 MT	
	Total tonnage.(MT)	310.80	
	Cost of fabricated galvanized steel @ Rs 89916/MT.	310.80x89916	279.46
	G.I. Nuts & Bolts, 3.5% of Tower material Cost @ Rs 117250/- per MT.	10.88MT	12.76
	Total:		**292.22**

FY-2022-23 **L-2**

2	**ACSR**		Lacs
	Size of ACSR.	420mm^2 Zebra ACSR"	
	Length of ACSR (allowing 1.5% for sag & wastage).	3x10x1.015 = 30.45 Kms.	
	Cost @ Rs 350808/- per Km.		106.82
3	**GROUNDWIRE**		
	Size of single earthwire 110Kgs quality.	7/3.15mm	
	Length of ground wire (allowing 1.5% for sag & wastage).	10x1.015 = 10.15 Kms.	
	Cost @ 40225 Rs / Km		4.08
4	**STRING ASSEMBLIES**		

i)	No. of S.S. String assemblies complete with suspension clamps and 14 Disc Insulators of 70 KN EMS.	20x3 = 60 Nos.	
	(1280+14x678) = Cost @ Rs. 10772/-		6.46
ii)	No. of D.S. String assemblies complete with suspension clamps and 28 disc insulators of 70 KN EMS.	2x3 = 6 Nos.	
	(2077+28x678) = Cost @ Rs 21061/-		1.26
iii)	No. of S.T. String assemblies complete with tension clamps and 15 disc insulators of 160 KN EMS.	6x6 = 36 Nos.	
	(2470+15x958) = Cost @ Rs. 16840/-		6.06
iv)	No. of D.T. String assemblies complete with T-clamps and 30 disc insulators of 160 KN EMS.	4x6 = 24 Nos.	
	(3712+30x958) = Cost @ Rs 32452		7.79
	Total:		**21.58**

FY-2022-23 **L-3**

5	**ACSR ACCESSORIES**		**Lacs**
i)	No. of armoured rod sets complete with ferrules.	22x3 = 66 Nos.	
	Cost @ Rs 1767 per set.	66x1767 = 1,16,622	
ii)	No. of Mid Span compression joints (assuming average drum length 1100 Mtrs.).	30.45x1000/1100 = 27.68 Nos. Say 28 Nos.	
	Cost @ Rs 637 per joint.	17836	
iii)	4 RSB Vibration dampers.	2x3x32 = 192 Nos.	
	Cost @Rs 645	123840	
iv)	Repair sleeves.	5 Nos.	
	Cost @ Rs 234	1170	
	Total:	**259,468.00**	**2.59**
6)	**GROUNDWIRE ACCESSORIES**		
i)	No. of bonding pieces for suspension and tension towers.	22+10x2 = 42 Nos.	
	Cost @ Rs. 363/-	42x363 = 15,246/-	
ii)	No. of suspension clamps.	22 Nos.	

	Cost @ Rs 357/-	7854	
iii)	No. of dead end body including linking devices.	10x2 = 20 Nos.	
	Cost @ Rs 285/-	5700	
iv)	No. of Mid Span compression joints/St joints (assuming average drum length 1600 Mtrs.).	10x1000/1600 = 6.25 Nos.	
	Cost @ Rs. 44/-	Say 7 Nos. 7x44 = 308	
v)	4 RSB Vibration damper 64 Nos. @ Rs 370	23680	
	Total:	**52788**	**0.53**

7) TOWER FIXTURES

Sr. No.	Material	Unit	No. of Fixtures.	Rate (in Rs.)	Amount (in Rs.)
1	Earthing sets.	Set	32	1159	37,088.00
2	Danger plates.	No.	32	195	6,240.00
3	Number plates.	No.	32	182	5,824.00
4	Bird guards for suspension towers. (Set of 3 Nos.)	Set	As per Assumption No. 4		
5	Phase plates (set).	Set	32	331	10592
6	Anti-climbing devices.	No.	As per Assumption No. 4		
7	Circuit Plates.	No.	32	363	11,616.00
8	Barbed wire (Total no. of Towers x 10kg)	Kg	320	91	29,120.00
	Total:				**100,480.00**
					1.0 lacs

FY-2022-23 **L-4**

CONCRETE FOR TOWER FOUNDATIONS

Type of Towers	No. of towers.	Cement (Bag) (50kg)	Sand in (Cum)	Crusher in (Cum)	Steel in (Kgs)
Rate per Unit.		**236**	**1724**	**1656**	**78**
A) STRAIGHT TOWERS	22 Nos.				
Qty. reqd. for 1 No.		102	6.97	13.91	1073
Amount.					
Sub-Total	**142817.24**				

Cost for 22 No. Towers.	31.42 lacs				
B) ANGLE TOWERS 30^{o}	6 Nos.				
Qty. reqd. for 1 No.		238	15.61	31.22	2781
Amount.					
Sub-Total	**351697.96**				
Cost for 6 No. Towers.	21.10 lacs				
C) ANGLE TOWERS 60^{0}	4 Nos.				
Qty. reqd. for 1 No.		302	19.48	38.58	2810
Amount.					
Sub-Total.	**387924.00**				
Cost for 4 No. Towers.	15.52 lacs				
Total (a+b+c)	**68.04**				
5% extra for wastage & 10% for wet locations.	10.21				
Total:	**78.25 lacs**				

FY-2022-23 **L-5**

ABSTRACT OF COST

Sr. No.	Particular	Cost (in Rs) Lacs	Lacs	
1	Tower Structures	292.22		
2	ACSR	106.82		
3	Groundwire.	4.08		
4	String assemblies.	21.58		
5	ACSR accessories.	2.59		
6	Groundwire accessories.	0.53		
7	Tower Fixtures.	1.00		
8	Concrete for foundations.	78.25		
9	**Sub-Total**	**507.07**		
10	Erection charges @ 20% of material cost.	101.41		

11	Transportation charges @ 2.5%	12.68		
12	Cost of 10 Kms run of completely erected line.	621.16		
13	Cost of the one Km run of line.	62.12		
	Say Rs. 62.12 Lacs only			

1.	Cost of one Km Line.	Rs. 62.12	
2.	Cost of other Misc. Expenditure for Erection of one Km Transmission Line.		
i.	Preliminary Expenses for one Km. line (For GEO referencing, survey, preparation of key plan, route plan, profile etc and supply of prints thereof)	Rs. 0.14	
ii.	Cost of Land under Towers of one Km Trans. Line (Area in Sq. mtr x No. of Towers x rates per Sq. mtr) (100x4x826).	Rs. 3.30	
iii.	Crop Compensation charges for one Km distance under 220/132 KV Transmission line.	Rs. 2.06	
iv	Forest Clearance Charges for one Km line	Rs. 0.78	
v.	Compensation charges for private trees for one Km distance under 220/132 KV Transmission lines.	Rs. 0.71	
vi.	PTCC and Re- Engineering charges for one Km. line	Rs. 0.16	
vii	Railway Crossing Charges for one Km. Line.	Rs. 35.40	
	Total	**Rs. 104.67**	
	Say Rs. 104.67 Lacs only		

BASED ON RATES FOR THE FY 2022-23

DETAIL OF COST FOR 220KV DC LINE ON DC TOWERS WITH 'MOOSE ACSR CONDUCTOR NOMINAL ALUMINIUM AREA 520mm^2, FOR CALCULATING THE COST PER KM RUN OF LINE,10KM OF LINE HAS BEEN CONSIDERED. THIS COST DATA HAS BEEN PREPARED FOR ESTIMATION PURPOSES ONLY.

1	**TOWER STRUCTURES**		Lacs
	Span.	300 Mtrs.	
	Total No. of towers in 10 Kms (allowing 2 towers for short span and one for other end).	10x1000/300 = 33.33 Nos. Say 34+2+1= 37 Nos.	
	Angle towers (taking 30% of total No. of towers).	11 Nos.	
	No. of straight towers.	37-11 = 26 Nos.	
	Average weight of Angle towers.	11.6 MT	
	Average weight of straight towers.	6.5 MT	
	Total weight	11.6x11+6.5x26 = 169 127.60+169 = 296.6 MT	
	Add 20% for extension & templates.	59.32 MT	
	Total tonnage.(MT)	355.92	
	Cost of fabricated galvanized steel @ Rs 89916/ MT.	355.92	320.03
	G.I. Nuts & Bolts 3.5% of tower material Cost @ Rs 117250/- per MT.	12.46 MT	14.61
	Total:		**334.64**
2	**ACSR**		
	Length of ACSR (allowing 1.5% for sag & wastage).	520mm^2 ACSR 2x3x10x1.015 = 60.90	
	Cost @ Rs 455692	455692	277.52
3	**GROUNDWIRE**		
	Size of single earthwire 110 Kgs. Quality.	7/3.15mm	
	Length of groundwire (allowing 1.5% for sag & wastage).	10x1.015 = 10.15 Kms.	
	Cost @40225 KM		4.08
FY-2022-23			**M-2**
4	**STRING ASSEMBLIES**		Lacs

i)	No. of S.S. String assemblies complete with suspension clamps and 14 Disc Insulators of 90 KN EMS.	24x3x2 = 144 Nos.	
	(1280+14x742) = Cost @ Rs. 11668	11668	16.80
ii)	No. of D.S. String assemblies complete with suspension clamps and 28 disc insulators of 90 KN EMS.	2x3x2 = 12 Nos.	
	(2562+28x742) = Cost @ Rs23338/-	23338	2.80
iii)	No. of S.T. String assemblies complete with tension clamps and 15 disc insulators of 160KN. EMS.	7x6x2 = 84 Nos.	
	(2470+15x958) = Cost @ Rs.16840/-	16840	14.15
iv)	No. of D.T. String assemblies complete with T-clamps and 30 disc insulators of 160 KN EMS.	4x6x2 = 48 Nos.	
	(4441+30x958) = Cost @ Rs 33181	33181	15.92
	Total:		**49.67**
5	**ACSR ACCESSORIES**		
i)	No. of armoured rod sets complete with ferrules.	26x6 = 156 Nos.	
	Cost @ Rs 1875/- per set.	156x1875 = 292500	
ii)	No. of Mid Span compression joints (assuming average drum length 1100 Mtrs.).	61.2x1000/1100= 55.64 Say 56 Nos.	
	Cost @ Rs 870/- per joint.	56x870=48720	
iii)	4 RSB Vibration dampers.	2x6x37 = 444 Nos.	
	Cost @ Rs 820/-	444x820 = 364080	
iv)	Repair sleeves. Cost @ Rs 346/-	10x346 = 3460	
	Total:	**708,760.00**	**7.09**

FY-2022-23 **M-3**

6	**GROUNDWIRE ACCESSORIES**		Lacs
i)	No. of bonding pieces for suspension and tension towers.	26+11x2= 48 Nos.	
	Cost @ Rs. 363/-	48x363 = 17,424/-	
ii)	No. of 4 RSB vibration dampers.	2x37 = 74 Nos.	
	Cost @ Rs 370/-	74x370 = 27380	
iii)	No. of suspension clamps.	26 Nos.	
	Cost @ Rs 357/-	26x357 = 9282	

iv)	No. of dead end body including linking devices.			11x2 = 22 Nos.		
	Cost @ Rs 285/-			22x285 = 6270		
v)	No. of compression joints/straight joints (assuming average drum length 1600 Mtrs.).			10x1000/1600 = 6.25 Nos. Say 7 Nos.		
	Cost @ Rs. 44/-			7x44 = 308		
	Total:			**60664**		**0.61**
7) TOWER FIXTURES						
Sr. No.	**Material**	**Unit**	**No. of Fixtures**	**Rate (in Rs.)**	**Amount (in Rs.)**	
1	Earthing sets.	Set	37	1159	42883	
2	Danger plates.	No.	37	195	7215	
3	Number plates.	No.	37	182	6734	
4	Bird guards for suspension towers (set 3 Nos.)	Set	As per Assumption No. 4			
5	Anti-climbing devices.	No.				
6	Phase Plates (set)	Set	74	331	24494	
7	Circuit Plates.(Set of Two)	Set	37	363	13431	
8	Barbed wire (No. of Towersx10kg)	Kg.	370	91	33670	
	Total:				**128,427.00**	**1.28**

FY-2022-23 **M-4**

8.CONCRETE FOR TOWER FOUNDATIONS

Type of Towers	**No. of towers.**	**Cement (Bag) (50kg)@ 236**	**Sand in (Cum) @ 1724**	**Crusher in (Cum) @ 1656**	**Steel in (Kgs) @ 78**
A) STRAIGHT TOWERS	26 Nos.				
Qty. reqd. for 1 No.		102	6.97	13.91	1073
Amount.					
Sub-Total	**142817.24**				
cost for 26 Nos. Towers.	37.13				
B) ANGLE TOWERS 30^{o}	6 Nos.				
Qty. reqd. for 1 No.		266	15.61	31.22	2781
Amount.					
Sub-Total	**358305.96**				

cost for 6 Nos. Towers.	21.50				
C) ANGLE TOWERS 60^0	5 Nos.				
Qty. reqd. for 1 No.		302	19.48	38.58	2810
Amount.					
Sub-Total .	**387924**				
Cost for 5 Nos. Towers.	19.40				
Total (a+b+c)	**78.03**				
5% extra for wastage & 10% for wet locations.	11.70				
Total:	**89.73**				

FY-2022-23 **M-5**

ABSTRACT OF COST

Sr. No.	Particulars	Cost (In Rs.) Lacs	
1	Tower Structures	334.64	
2	ACSR	277.52	
3	Groundwire	4.08	
4	String assemblies.	49.67	
5	ACSR accessories.	7.09	
6	Groundwire accessories.	0.61	
7	Tower Fixtures.	1.28	
8	Concrete for foundations.	89.73	
9	**Sub-Total**	**764.62**	
10	Erection charges @20% of material cost	152.92	
11	Transportation chargers @ 2.5%	19.12	
12	Cost of 10 Kms run of completely erected line.	936.66	
13	Cost of the one Km run of line.	93.66	
	Rs 93.66 Lacs only		

1.	Cost of one Km Line.	Rs. 93.66
2.	Cost of other Misc. Expenditure for Erection of one Km Transmission Line.	
i.	Preliminary Expenses for one Km, line (For GEO referecing survey, preparation for key plan, route plan, profile etc and supply of prints thereof)	Rs. 0.14

ii.	Cost of Land under Towers of one Km Trans. Line. (Area in Sq. mtr x No. of Towers x rates per Sq. mtr) (100x4x826).	Rs. 3.30
iii.	Crop Compensation charges for one Km. distance under 220/132 KV Transmission line.	Rs. 2.06
iv	Forest Clearance Charges for one Km line.	Rs. 0.78
v	Compensation charges for private trees for one km. distance under 220/132KV transmission lines	Rs. 0.71
vi	PTCC and Re-Engineering charges for one Km. line	Rs. 0.16
vii	Railway Crossing Charges for one Km. Line	35.40
	Total	**136.21**
Say Rs. 136.21 Lacs only		

FY- 2022-23

BREAK UP ESTIMATE COST OF 220KV LINEBAY

Sr. No.	Description	Cost ref.	Qty.	Qty.	Rate Rs. in Lacs)	Amount (Rs. in Lacs)
1	1600 Amps., 40KA RC 220KV ckt. Breaker.	E (3)	1 No.	1	12.54	12.54
2	Isolators with Earth Switch and Insulators.	G(4)	1 No.	1	5.49	5.49
3	220KV CTs.	C(3)(ii)	1 set (3)	3	3.08	9.24
4	220KV C&R Panel.	N (1)	1 No.	1	7.92	7.92
5	Isolators with Insulators.	F (5)	2 Set	2	4.75	9.5
6	Steel structures for single bus.	T (1)	12 MT	12	0.90	10.8
7	Control cables.		L/S		Lot	5.2
8	Bus bar & connecting material		L/S		Lot	5.2
9	Earthing material.		L/S		Lot	2.77
i)	**Sub Total (a)**					**68.66**
ii)	Transportation , Civil Works , Erection charges, storage & contingency etc. @ 11% on (a)	Annex-I				**7.55**
	Grand Total:					**76.21**

Rs 76.21 Lacs only.

		(Rs. in Lacs)
1.	Cost of Electrical equipments including Erection Charges, Stores and contingency etc.	**76.21**
2	Cost of Land.	**NIL**
3	Cost of Civil Works	**24.50**
4	Cost of PLCC equipment for 1 line bay	**22.16**
	Total	**122.87**

Rs 122.87 Lacs only

Note: Land rates are taken as NIL because a space required for one bay is covered under Land required for 220/132 KV Sub-Station, cost of which is already covered under Cost of land for the substation.

Annexure-3

DETAILED PROJECT REPORT

FOR

400KV, 220KV, 132KV & 66KV

ADDITIONAL TRANSMISSION WORKS AT

400KV, 220KV & 132KV SUBSTATIONS

For the year

2023-24/2024-25/2025-26

For System Improvement

&

Power Dispersal

DPR- XL

PUNJAB STATE TRANSMISSION CORPORATION LTD.

SEPTEMBER, 2022

Scope of works for 220KV, 132KV and 66KVTransmission Works at 220KV & 132KV Substations for 2023-24/2024-25/*2025-26*

Sub-Stations works

Name of Sub-stn.	100 MVA 220/132 KV T/F	100 MVA 220/66 KV T/F	12.5 MVA 66/ 11 KV T/F	20 MVA, 66/11 KV T/F	160 MVA 220/66 KV T/F	12.5 MVA 132/ 11 KV T/F	20 MVA 132/ 11 KV T/F	Bays		
								220 KV	132 KV	66 KV
220KV JADLA								2		
220KV PGCIL PANCHKULA (BARWALA) - DERABASSI LINE								2		
220KV HOSHIARPUR								4		
220 kV BANGA (NAWASHEHER)		2						2 T/F		
220 kV MGG-3					2					
220 kV S/S JHOKE HARIHAR		1						1 T/F		1T/F
220 kV BOTTIANWALA				1						1T/F
220 kV HOSHIARPUR (HOSHIARPUR-CHOHAL LOADING)				2						2T/F
TOTAL		**3**		**3**	**2**			**8+3 T/F**		**4 T/F**

Net Capacity addition will be 335 MVA due to addition of above T/Fs after considering dismantled transformers.

220KV Transmission Lines in Ckt. Kms.

Sr. No.	Name of Line	Length in Ckt. Kms.
1	LILO of MISS Ganguwal- Dhanansu at Jadla (2 km, 0.4")	2
2	220KV PGCIL Panchkula (Barwala)-Derabassi Line (D/C) (14km, 0.4Sq")	14
3	2nd source connectivity to Hoshiarpur via D/C on D/C line 220 kV Dasuya-Hoshiarpur (40 km, 0.4 sq") & using existing D/C on D/C Towers	40
	Total	**56**

PREAMBLE

This proposal covers the Detailed Project Report for 400KV, 220KV, 132KV and 66KV Transmission Works at various 132KV, 220KV & 400KV GRID Sub-Stations for 2023-24/2024-25/2025-26 for system improvement and power dispersal.

****

The total estimated cost of the project based on 2022-23 price level is as follows:-

		(Rs. in Crores)
1.	*Transmission system cost*	**304.997**

Contents

List of Annexures

PROJECT REPORT FOR400KV, 220KV, 132KV & 66KV TRANSMISSION WORKS AT 400KV, 220KV& 132KV SUBSTATIONS FOR 2023-24/2024-25/2025-26 FOR SYSTEM IMPROVEMENT AND POWER DISPERSAL .

1.0 BACKGROUND

The electrical power demand is increasing at a very fast pace in the developing State of Punjab. Peak demand during paddy/summer season of 2022-23 has been recorded as 14311 MW. The projected maximum demand for paddy season of 2023-24 is about 15811 MW whereas as per the EPS projection data, the maximum demand of Punjab for 2023-24 is 16431 MW.

To provide relief to existing overloaded transmission system and to cater to the new loads of consumers in the State, continuous system up gradation/augmentation is required. For this purpose a number of new substations along with their associated transmission lines are required to be created. In addition transformation capacity at many existing 132KV, 220KV & 400KV Sub-stations is required to be augmented to feed the existing as well as upcoming loads within prescribed voltage parameters, besides ensuring supply to A.P. consumers as per P.C. Schedule and to improve system reliability. With this end in view, a number of 400KV, 220KV, and some 132KV and 66KV transmission works have already been planned for the years 2023–24 to 2025-26. This project report covers various substations are being upgraded from 66 KV/132 KV to 220 KV and other connectivity arrangement of transmission lines for the years 2023–24 to 2025-26 through Capital Investment Plan & Business Plan of PSTCL for MYT 3rd Control period from FY - 2023 to 2026.

2.0 DESCRIPTION OF TRANSMISSION SYSTEM

The details of Transmission System which are covered in this report are given in **Annexure-I.** These cover 2 Nos. 160MVA, 220/66KV T/F, 3 Nos. 100MVA, 220/66KV T/F, 3 Nos. 20MVA, 66/11 KV T/F and associated 220KV bays and 66kV Bays and 56 circuit-km of 220KV Transmission lines.

3.0 PROJECT OBJECTIVES

The objective of the project is to create additional transmission capacity to cater to additional loads, to give relief to overloaded sub-stations and to increase reliability of supply in the areas served by the substations covered in the scheme and to increase power evacuation capacity.

3.1 Project Highlights

a)	Project	400KV, 220KV, 132KV & 66KV Transmission Works at 400KV, 220KV and 132KV Substations for 2023–24 to 2025-26 for S.I. & Power Dispersal.
b)	Location of the project	Punjab
c)	Beneficiary State	Punjab
d)	Project cost	Rs. 304.997 Crore
e)	Commissioning schedules	During the year 2023-24/2024-25/2025-26

3.2 Scope of works

The scheme shall have scope of work as per Annexure-I and same is summarized as under:-

Transmission System for 2023–24 to 2025-26 for System Improvement and Power Dispersal.

3.2.1 Sub-Stations works

Name of Sub-stn.	100 MVA 220/132 KV T/F	100 MVA 220/66 KV T/F	12.5 MVA 66/ 11 KV T/F	20 MVA, 66/11 KV T/F	160 MVA 220/66 KV T/F	12.5 MVA 132/ 11 KV T/F	20 MVA 132/ 11 KV T/F	Bays		
								220 KV	132 KV	66 KV
220KV JADLA								2		
220KV PGCIL PANCHKULA (BARWALA) - DERABASSI LINE								2		
220KV HOSHIARPUR								4		
220 kV BANGA (NAWASHEHER)		2						2 T/F		
220 kV MGG-3					2					
220 kV S/S JHOKE HARIHAR		1						1 T/F		1T/F
220 kV BOTTIANWALA				1						1T/F
220 kV HOSHIARPUR (HOSHIARPUR-CHOHAL LOADING)				2						2T/F
TOTAL		**3**		**3**	**2**			**8+3 T/F**		**4 T/F**

Net Capacity addition will be 335 MVA due to addition of above T/Fs after considering dismantled transformers.

220KV Transmission Lines in Ckt. Kms.

Sr. No.	Name of Line	Length in Ckt. Kms.
1	LILO of MISS Ganguwal- Dhanansu at Jadla (2 km, 0.4")	2
2	220KV PGCIL Panchkula (Barwala)-Derabassi Line (D/C) (14km, 0.4Sq")	14
3	2nd source connectivity to Hoshiarpur via D/C on D/C line 220 kV Dasuya-Hoshiarpur (40 km, 0.4 sq") & using existing D/C on D/C Towers	40
	Total	**56**

4 TARGET BENEFICIARIES

The target beneficiary of this project is State of Punjab.

5 PROJECT STRATEGY

The various elements of the transmission scheme have been evolved based on present and future load requirements and as well as for dispersal of power from various power projects and for improving reliability of power supply.

6 LEGAL FRAME WORK

It is proposed to execute the above entire transmission scheme as per provision contained in the Indian Electricity Act, 2003 and the rules made there under and the Electricity (Supply) Act, 1910 and 1948 in so far as these are applicable

7 ENVIRONMENTAL IMPACT ASSESSMENT

7.1 Forest involvement /clearance

As per the practice, preliminary route selection is done based on such documents as the Forest Atlas and the Survey of India maps using "bee" line method, followed by field verification through walk over survey. All possible steps are taken to avoid the route alignment through forests. In cases where it becomes unavoidable due to the geography of terrain, the alignment is made in such a way that the route through the forests is the barest minimum.

For selection of optimum route, following points are taken into consideration:-

- The route of the proposed transmission line does not involve any human rehabilitation.
- Any monument of cultural or historical importance is not getting affected.
- The route does not create any threat to the survival of any community.
- It does not affect any Public Utility Services like Playground, School, other establishments etc.
- It does not pass through any sanctuaries, National Park, etc.
- It does not infringe with areas of natural resources.

No major forest stretches are likely to be encountered for erection of the lines covered in the project. However, exact position shall be known after walkover survey and finalization of route plan. However, social forestry along the roads and rivers may be involved at a few locations involving road or river crossings. Necessary provisions for getting forest clearance for such locations will be made as per requirements based on actual basis.

The various clearances like forest, PTCC, railway crossing etc. where ever required are processed simultaneously after approval of route plan of the transmission lines. The works are carried out accordingly. It may be mentioned that all clearance are normally available by the time the lines are to be commissioned.

7.2 Social issues /R&R measures

As per prevailing law, land below transmission line is not required to be acquired; only compensation for land for transmission tower is given for which provisions are made on normative basis. Since the works covered in the scheme are only augmentation works at existing 132KV and 220KV substations no land requirement is envisaged.

8 TECHNOLOGY ISSUES

8.1 Salient features of 245KV class S/Stn. equipment and facilities

The design and specification of Substation equipment are to be governed by following factors:-

8.1.1 Insulation Coordination

The following insulation levels are proposed to be adopted for 245KV system.

a)	Impulse withstand voltage for transformer and reactors for other equipment	950 KVP
b)	Switching surge withstand voltage	1050KVP
c)	Minimum creepage distance	6125mm
d)	Max. fault current	40KA
e)	Duration of fault	1 Second

8.1.2 Steady State Stability

The steady State stability is the ability of a system to return /remain in the state of equilibrium when subjected to small or gradual changes of disturbances. The steady state stability limit is the maximum power that can flow through some lines in the system when the entire or part of the system to which the stability limit refers is subjected to a small disturbance without loss of stability.

The steady state stability limit is usually quantified by measuring the relative angular displacement (also called as swing curve) between the two buses (nodes) in a system.

In an integrated power system consisting of large number of generators, loads and lines etc., a maximum relative angular separation of about 30 degree between the two buses may be assumed to be acceptable (safe) limit for maintaining the steady state stability of the system.

8.1.3 Substation Equipment

The switchgear shall be designed and specified to withstand operating conditions and duty requirements. The specifications for Power Transformers, circuit breakers, isolators, current transformers, capacitor voltage transformers, Surge Arrestors shall be as per applicable IEC standards and the switchgear shall be designed and specified to withstand operating conditions and duty requirements. The detailed specifications will be issued alongwith tender documents at the time of floating N.I.T.

Sub-station Support Facilities

Facilities required for O&M of substations like AC&DC power supplies, fire fighting system, oil evacuating, filtering, testing & filling apparatus, lighting &communication and Control Room generally exist at the substations. However, any extension of such facilities, if required will be specified at the time of floating N.I.T.

- **Protection & Control**

The protective relaying system shall be provided for transmission lines, power transformers and bus bars to minimize the damage to the equipments in the event of fault and abnormal conditions. Necessary specification for distance line protections, transformer differential protection, bus bar protection and local breaker backup protection shall be given at the time of floating N.I.T.

8.2 Salient features of Transmission lines

The primary consideration for design and estimation of transmission lines are walkover/preliminary survey based on topographical map/forest map of India.

8.2.1 Conductors

For 220KV D/C line generally ACSR 'Zebra' or ACSR 'Moose' conductor will be used as specified in the details of lines whereas for 132KV lines ACSR 'Panther' conductor will be used.

8.2.2 Earthwire

Single 7/3.15mm galvanized steel Earthwire shall be used on the line.

8.2.3 Grounding

The tower footing resistance shall be kept below 10 ohms. Normally pipe type grounding shall be used.

8.2.4 Insulator and Hardware fittings

Specifications for insulators and Hardware fittings shall be given at the time of N.I.T

8.2.5 Line Accessories

i) Mid Span compression joint for conductor/Earthwire

Mid span compression joint suitable for conductor/Earthwire shall be used for joining two lengths of conductor/Earthwire. The minimum slipping strength of the joint after compression shall not be less than 95% of the UTS of conductor/ Earthwire.

ii) Repair sleeve for conductor

Repair sleeve shall be used only for repairing not more than two strands broken in the outer layer of conductor. It shall be of compression type in two parts with provision of seat sliding of keeper piece.

iii) Flexible copper bond for Earthwire

Flexible copper bonds shall be used for good electrical continuity between the Earth-wire and the tower. Two bonds per suspension tower and four bonds per tension tower shall be used.

iv) Vibration dampers for conductor/Earthwire

Stockbridge vibration dampers shall be used to reduce the maximum dynamic strain caused by Aeolian vibrations to a value of 150 Micro-strain.

9 MEANS OF FINANCE AND PROJECT BUDGET

9.1 Project Cost Estimate

9.1.1 The estimated cost of the project based on Cost Data of different substations, line bays and other related items for the year 2022-23 as finalized by Dy. CE/Transmission (Design) under CE/TS works out to be Rs. **304.997 Crore**

The details of cost estimate for the equipment are given in **Annexure-I.**

The cost estimates are inclusive of applicable EC @ 15% and IDC @ 4%.

9.2 Funding arrangement

9.2.1 Phased fund requirement

The anticipated year wise fund requirement for the project is as under:-

Year	Rs. In Crore
2023-24	75.83
2024-25	80.19
2025-26	148.97
Total	**304.997**

9.2.2 Mode of Financing

The project is proposed to be funded through equity share (10%) by PSTCL and loans/bonds (90%). The works covered in this scheme are not covered under any other Scheme & are not being posed for finance from any other financial institution. Hypothecations of Future/Existing Assets & Escrow cover is proposed for security mechanism.

9.2.3 Mode of Execution

The transmission line works are generally got executed by outsourcing labour component only. Material for these works is procured **departmentally.** The substation works will be got executed **departmentally** only.

10.0 COST BENEFIT ANALYSIS

The details of cost benefit analysis are given in **Annexure-II** as per which %age gross return works out to be **10.15%** and payback period is **9.85 years**.

11.0 TIME FRAME

Transmission works covered in the project report are targeted for completion during 3 years 2023-24/2024-25/2025-26. Therefore 10% cost escalation has been considered.

12.0 DETAILED TECHNICAL ADVANTAGES/JUSTIFICATION

Advantages/Justification for additional transmission system covered in the project in general are given below:-

i. To cater to additional loads.
ii. To provide relief to existing Transmission Substations and Lines.
iii. To increase the reliability of the equipment and consequently of the Transmission System.
iv. To disperse additional power availability.
v. To improve the reliability and security of the transmission system.

Annexure – I					
220KV, 132KV & 66KV additional system improvement/power dispersal works at 220KV & 132KV Sub-Stns. for the year 2023-24/2024-25/2025-26					
Sr. No.	**Plg. List No.**	**Name of Work/Sub-stn.**	**Detailed Scope of Work/Cost Break-up**	**Cost**	**Amount (Rs. in crores)**
1	22	**220 KV Jadla** LILO of MISS Ganguwal-Dhanansu at Jadla (2 km, 0.4")	COST OF 220KV LINE BAY **(Annex LB-220) X 2 (i.e. No. of Line Bays)**	2.4574	4.85
			COST FOR 220KV DC LINE ON DC TOWERS WITH 'ZEBRA' ACSR CONDUCTOR NOMINAL ALUMINIUM AREA 420mm^2 **(Annex-E1-EI5) X 2 KM (i.e. LILO length)**	2.3954	
			TOTAL	**4.8528**	
2	23	**220KV PGCIL Panchkula (Barwala) - Derabassi Line** 220KV PGCIL Panchkula (Barwala)-Derabassi Line (D/C) (14km, 0.4Sq")	COST OF 220KV LINE BAY **(Annex LB-220) X 2 (i.e. No. of Line Bays)**	2.4574	22.23
			COST FOR 220KV DC LINE ON DC TOWERS WITH 'ZEBRA' ACSR CONDUCTOR NOMINAL ALUMINIUM AREA 420mm^2 **(Annex-E1-EI5) X14 KM (i.e. line length)**	16.7678	
			Approximate cost of 220KV Bay at 400KV Sub-station Panchkula (PGCIL) (Value Taken From Design office) **(1.5cr) X 2 (i.e. no. of Bays)**	3.00	
			TOTAL	**22.2252**	
3	29	**220 kV Hoshiarpur** 2nd source connectivity to Hoshiarpur via D/C on D/C line 220 kV Dasuya-Hoshiarpur (40 km, 0.4 sq") & using existing D/C on D/C Towers	COST OF 220KV LINE BAY **(Annex LB-220) X 4 (i.e. No. of Line Bays)**	4.9148	52.82
			COST FOR 220KV DC LINE ON DC TOWERS WITH 'ZEBRA' ACSR CONDUCTOR NOMINAL ALUMINIUM AREA 420mm^2 **(Annex-E1-EI5) X 40 KM (i.e. line length)**	47.908	
			TOTAL	**52.8228**	
4	30	**220 KV Banga (Nawasheher)** Replacement of 2 x 50MVA 132/66 kV transformers with 2x100MVA 220/66 kV transformers	COST FOR ADDITIONAL 100MVA, 220/66KV T/F AT 220KV SUB-STATION **(Annex A) X 2**	**18.2314**	18.23
5	40	**220 KV MGG-3** Aug. of 2 x 100 220/66 kV T/f with 2 x 160MVA 220/66 kV T/F	COST FOR REPLACEMENT OF 100MVA, 220/66KV T/F WITH 160MVA, 220/66KV T/F AT 220KV SUB-STATION. **(Annex B) X 2**	**21.0762**	21.08
6	43	**220 KV Jhoke Harihar** 1 No. Additional 220/66 kV 100 MVA T/F	COST FOR ADDITIONAL 100MVA, 220/66KV T/F AT 220KV SUB-STATION **(Annex A)**	**9.1157**	9.12

7	46	**220 kV Bottianwala** Aug. of 66/11 kV, 12.5 MVA T/f to 20 MVA	COST FOR REPLACEMENT OF 12.5MVA, 66/11 KV T/F WITH 20MVA, 66/11KV T/F HAVING 4 NOS. EXTRA 11KV O/G FEEDERS **(Annex C)**	**2.7339**	2.73
8	58	**220 kV Hoshiarpur (Hoshiarpur-Chohal Loading)** To replace 12.5 MVA and 20 MVA, 132/11 kV T/fs with 2X20 MVA, 66/11 kV T/Fs	COST AT 66KV SUB-STATION FOR REPLACEMENT OF 20 MVA, 132/11 KV TRANSFORMER WITH 20 MVA, 66/11 KV TRANSFORMER. **(Annex D) X 2**	**5.248**	5.24
9	68	**Miscellaneous** Augmentation of bus bars, extension in control room building, providing room for second source for station battery etc.		30	30
10	69	**Miscellaneous** Augmentation/additions of T/Fs at 220/132/66 Kv S/Stns of PSTCL.		30	30
11	70	**Miscellaneous** Additional 220/132/66 kV line bays related with feasibility cases or as per PSPCL/PSTCL Requirement		30	30
12	71	**Miscellaneous** Unforeseen emergency works		30	30
TOTAL					**256.3**
Employee Cost @ 15%					**38.445**
IDC @ 4%					**10.252**
Project Cost					**304.997**

Project Cost = Rs. 304.997 Crore
Cost Escalation @ 10% = Rs. 30.4997 Crore
Cost Escalation is calculated @ 10% although it is not a part of project cost.

ANNEXURE-II

COST BENEFIT ANALYSIS

For 400KV, 220KV,132KV& 66KV Works at 400KV, 220KV& 132KV Sub-stations for 2023-24/2024-25/2025-26

CALCULATION OF BENEFITS DUE TO THE SCHEME.

a)	Additional Load that can be served after the erection of new sub-stations/augmentation of existing sub-stations, by addition/ replacement Transformers as per Annexure-I	= 335 MVA
b)	Expected Sale/Dispersal of additional Energy (in kWh) (a/1000)xLFxPFx8760 (a/1000)x0.5x0.9x8760	= 1320.57 MU
c)	Transmission Tariff of the State for FY 2022-23 as per Tariff order of PSTCL for FY 2022-23 in Rs. Per unit.	= Rs. 0.2345
d)	Value of benefits during the year due to transportation of additional energy	= Rs. 30.97 Crore
e)	Total Scheme cost as per Annexure-I.	= Rs. 304.997 Crore
f)	Percentage Gross Return (Total benefit/Total Cost)* 100	= 10.15%
g)	Pay Back period	= 9.85 **years**

FY- 2022-23 **ANNEXURE-A**

DETAILS OF COST FOR ADDITIONAL 100MVA, 220/66KV T/F AT 220KV SUB-STATION. THIS COST DATA HAS BEEN PREPARED FOR ESTIMATION PURPOSES ONLY.

Sr. No.	Description	Cost Ref.	Qty.		Rate (R in Lacs)	Amount (R in Lacs)
A)	**POWER TRANSFORMER**					
	100MVA, 220/66KV T/Fs.	**A (4)**	1 No.	1	604.58	604.58
	Total 'A'					**604.58**
B)	**220KV SWITCHGEAR EQUIPMENT**					
1	220KV SF-6, ckt. Breaker.	E (3)	1 No.	1	12.54	12.54
2	CTs.	C (3) (ii)	1 Set(3)	3	3.08	9.24
3	L.As. for T/Fs.	H (3)	1 Set(3)	3	0.53	1.59
4	Isolators with Insulators.	F (5)	2 No.	2	4.75	9.5
5	Control & Relay panel for T/F bay.	N (2)	1 No.	1	7.02	7.02
6	Steel structures.	T(1)	25MT	25	0.9	22.5
7	Earthing material		Lot		L/S	1.16
8	Bus bar & connecting material.		Lot		L/S	3.47
9	Power & control cables.		Lot		L/S	3.47
	Total 'B'					**70.49**
C)	**66KV EQUIPMENT**					
1	66KV SF-6, ckt. Breaker.	E (1)	1 No.	1	4.41	4.41
2	1250 Amps. Isolators with Insulators.	F (2)	2 No	2	1.50	3
3	CTs.	C (1) (ii)	1 Set(3)	3	0.94	2.82
4	L.As.	H (1)	1 Set(3)	3	0.21	0.63
5	Control &Relay Panel for T/F bay.	N (9)(ii)	1 No.	1	3.79	3.79
6	Steel structures.	T(1)	1.5 MT	1.5	0.9	1.35
7	Earthing material		Lot		L/S	0.81
8	Bus bar& connecting material.		Lot		L/S	1.45
9	Augmentation of 66 KV Bus bar to quadruple conductor		Lot		L/S	10

10	Power & control cables.		Lot		L/S	1.45
	Total 'C'					**29.71**
	FY-2022-23					**A**
D	**Material for Cap Banks**					
1	C & R Panel For Cap bank	N (11)	1 No.	1	2.68	2.68
2	66 KV Cap Banks without NCT	I (2)	2 No.	2	14.97	29.94
3	CT	C (1) (ii)	1 Set(3)	3	0.94	2.82
4	SF-6 Breaker	E (1)	1 No.	1	4.41	4.41
5	800Amp Isolator with solid core Insulators	F (1)	1 No.	1	0.99	0.99
6	800 Amp Isolator with Earth Switch and solid core Insulators.	G (1)	2 No.	2	1.47	2.94
7	66KV NCT for capacitor Bank	D (9) (i)	2 No.	2	0.57	1.14
8	Structure for 66KV NCT (for Capacitor Bank).	D (10) (i)	2 No.	2	0.18	0.36
	Total 'D'					**45.28**
	Sub-Total (a) = A+B+C+D					**750.06**
	Transportation, Erection charges, storage & contingency etc.					**82.51**
	@ 11% on (a)					
	Grand Total:					**832.57**

Rs 832.57 Lacs only.

		(Rs in Lacs)
1	Cost of Electrical equipments including Erection Charges, Storage and contingency etc.	832.57
2	Cost of extension in Switch house building and the other civil works* in the yard area.	79
	Total	**911.57**

Say Rs 911.57 Lacs only

FY- 2022-23 **ANNEXURE-B**

DETAILS OF COST FOR REPLACEMENT OF 100MVA, 220/66KV T/F WITH 160MVA, 220/66KV T/F AT 220KV SUB-STATION. THIS COST DATA HAS BEEN PREPARED FOR ESTIMATION PURPOSES ONLY.

Sr. No.	Description	Cost Reference	Qty.	Qty.	Rates (R in Lacs)	Amount (Rs. in Lacs)
A)	**POWER TRANSFORMER**					
	160MVA, 220/66KV T/Fs.	A (6)	1 No.	1	856.32	856.32
	Total 'A'					**856.32**
B)	**220KV SWITCHGEAR EQUIPMENT**					
1	CTs.	C (3)(i)	1 Set(3)	3	3.08	9.24
2	Control cables.		Lot		L/S	3.47
	Total 'B'					**12.71**
C)	**66KV EQUIPMENT**					
1	66 KV 2000 Amp Isolator with solid core Insulators	F (3)	2 No	2	1.77	3.54
2	CTs. (2000/1)	C (1) (i)	1 Set(3)	3	1.20	3.6
3	Bus bar & connecting material. (Quadra Configuration)		Lot		L/S	2.89
4	Control cables.		Lot		L/S	1.45
	Total 'C'					**11.48**
D)	**Material for Cap Banks**					
1	C&R Panel For Cap bank	N (11)	1 No.	1	2.68	2.68
2	66 KV Cap Banks without NCT	I (2)	3 No.	3	14.97	44.91
3	CT	C (1) (ii)	1Set(3)	3	0.94	2.82
4	SF-6 Breaker	E (1)	1 No.	1	4.41	4.41
5	800Amp Isolator with solid core Insulators	F (1)	2 No.	2	0.99	1.98
6	800 Amp Isolator with Earth Switch and solid core Insulators	G (1)	3 No.	3	1.47	4.41
7	66 KV NCT for capacitor Bank	D (9) (i)	3 No.	3	0.57	1.71
8	Structure for 66KV NCT (Capacitor bank)	D (10)(i)	3 No.	3	0.18	0.54
	Total 'D'					**63.46**
	Sub-Total (a)=A+B+C+D					**943.97**

	Transportation, Erection charges, storage & contingency etc. @ 11% on (a)					**103.84**
	Grand Total:					**1047.81**

	1047.81
Cost of civil works	6
Total	**1053.81**

Say Rs 1053.81 Lacs only

FY- 2022-23 **ANNEXURE-C**

DETAILS OF COST FOR REPLACEMENT OF 12.5MVA, 66/11 KV TRANSFORMER WITH 20MVA, 66/11KV TRANSFORMER HAVING 4 NOS. EXTRA 11KV O/G FEEDERS. THIS COST DATA HAS BEEN PREPARED FOR ESTIMATION PURPOSES ONLY.

Sr. No.	Description	Cost ref.	Qty.	Qty.	Rate (Rs. in Lacs)	Amount (Rs. in Lacs)
A)	**POWER TRANSFORMER**					
	20MVA, 66/11KV T/Fs.	**A (1)**	1 No.	1	209.20	209.2
	Total 'A'					**209.2**
B)	**MATERIAL REQUIRED FOR TRNASFORMER**					
1	Multi ratio and multi core CTs.	C (1)(i)	1 Set(3)	3	1.20	3.6
2	11KV NCT.		1 No.	1	0.24	0.24
	Total 'B'					**3.84**
C)	**11KV EQUIPMENT**					
1	11KV incoming ckt. Breaker.	P(1)	1 No.	1	5.82	5.82
2	11KV O/G VCB .	P (2)	4 Nos.	4	4.14	16.56
3	11KV Single core U/G cable 300mm^2 (1x3x80+4x3x100) =1440Mtr	R (1)	1.440Km	1.44	4.74	6.83
4	Bus bar & connecting material.		Lot		L/S	1.16
5	Control cables.		Lot		L/S	2.89
	Total 'C'					**33.26**
	Total A+B+C					**246.30**
	Transportation , Civil Works , Erection charges, storage & contingency etc. @ 11% on (a)					**27.09**
	Total:					**273.39**
	cost of land					0.00
	Grand Total:					**273.39**

Say Rs 273.39 Lacs only.

FY- 2022-23 RATES **ANNEXURE-D**

DETAILS OF COST AT 66KV SUB-STATION FOR REPLACEMENT OF 20MVA, 132/11KV TRANSFORMER WITH 20MVA, 66/11KV TANSFORMER. THIS COST DATA HAS BEEN PREPARED FOR ESTIMATION PURPOSES ONLY.

Sr. No.	Description	Cost ref.	Qty.	Qty.	Rate (Rs. in Lacs)	Amount (Rs. in Lacs)
A)	**POWER TRANSFORMER**					
	20MVA, 66/11KV T/Fs.	**A (1)**	1 No.	1	209.2	209.2
	Total 'A'					**209.2**
B)	**MATERIAL REQUIRED FOR TRNASFORMER**					
1	Lightening arrestors.	H(1)	1 Set(3)	3	0.21	0.63
2	Multi ratio and multi core CTs.	C (1)(i)	1 Set(3)	3	1.20	3.6
3	11KV NCT.		1 No.	1	0.24	0.24
	Total 'B'					**4.47**
C)	**MATERIAL REQUIRED FOR 66KV T/F BAY**					
1	66KV SF-6, ckt. Breaker for T/Fs.	E(1)	1 No.	1	4.41	4.41
2	Isolator with Earth Switch and Insulators.	G(2)	1 No.	1	1.54	1.54
3	1250 Amp Isolators with Insulators	F(2)	1 No.	1	1.50	1.5
4	LA's for Bus	H(1)	1 set (3)	3	0.21	0.63
5	C&R T/F Panel.	N(9)(ii)	1 No.	1	5.92	5.92
6	Steel structures.	T(1)	5MT	5	0.90	4.5
7	Bus bar connecting material.		Lot		L/S	1.45
8	Control cables.		Lot		L/S	1.62
9	Earthing material.		Lot		L/S	1.16
	Total 'C'					**22.73**
	Total: A+B+C					**236.40**

	Transportation , Civil Works , Erection charges, storage & contingency etc. @ 11% on (a)					**26.00**
	Total:					**262.40**
	cost of land					0.00
	Grand Total:					**262.40**

Say Rs 262.40 Lacs only.

FY 2022-23 **E-1 to E-5**

DETAIL OF COST FOR 220KV DC LINE ON DC TOWERS WITH 'ZEBRA' ACSR CONDUCTOR NOMINAL ALUMINIUM AREA 420mm^2, FOR CALCULATING THE COST PER KM RUN OF LINE, 10KM OF LINE HAS BEEN CONSIDERED. THIS COST DATA HAS BEEN PREPARED FOR ESTIMATION PURPOSES ONLY.

1	**TOWER STRUCTURES**		Lacs
	Span.	350 Mtrs.	
	Total No. of towers in 10 Kms (allowing 2 Towers for short span and one for other end).	10x1000/350 = 28.57 Nos. Say 29+2+1=32 Nos.	
	Angle towers (taking 30% of total No. of towers).	10 Nos.	
	No. of straight towers.	32-10 = 22 Nos.	
	Average weight of Angle towers.	11.6 MT	
	Average weight of straight towers.	6.5 MT	
	Total weight	10x11.6+22x6.5 =116+143=259 MT	
	Add 20% for extension & templates.	51.80 MT	
	Total tonnage.	259+51.80= 310.80MT	
	Cost @ Rs. 89916/- per MT.		279.46
	G.I. Nuts & Bolts @ 3.5% of Tower Material	10.88 MT	
	Cost @ Rs 117250 per MT.		12.76
	Total:		**292.22**

FY-2022-23 **E-2**

2	**ACSR**		Lacs
	Size of ACSR	420mm^2 ACSR	
	Length of ACSR (allowing 1.5% for sag & wastage).	3x10x1.015x2 = 60.90Kms	
	Cost @ Rs 350808/- per Km.		213.64
3	**GROUNDWIRE**		
	Size of single earthwire 110Kgs quality.	7/3.15mm	
	Length of ground wire (allowing 1.5% for sag & wastage).	10x1.015 = 10.15 Kms.	
	Cost @ Rs 40225/- per Km		4.08
4	**STRING ASSEMBLIES**		

i)	No. of S.S. String assemblies complete with suspension clamps and 14 Disc Insulators of 70 KN EMS.	20x3x2 = 120 Nos.	
	(1280+14x678) = Cost @ Rs. 10772/-		12.93
ii)	No. of D.S. String assemblies complete with suspension clamps and 28 disc insulators of 70 KN EMS.	2x3x2 = 12 Nos.	
	(2077+28x678) = Cost @ Rs 21061/-		2.53
iii)	No. of S.T. String assemblies complete with tension clamps and 15 disc insulators of 160 KN EMS.	6x6x2 = 72 Nos.	
	(2470+15x958) = Cost @ Rs. 16840/-		12.12
iv)	No. of D.T. String assemblies complete with T-clamps and 30 disc insulators of 160 KN EMS.	4x6x2 = 48 Nos.	
	(3712+30x958) = Cost @ Rs. 32452/-		7.79
	Total		**35.37**

FY-2022-23 **E-3**

5	**ACSR ACCESSORIES**		Lacs
i)	No. of armoured rod sets complete with ferrules.	22x6 = 132 Nos.	
	Cost @ Rs 1767 per set.	132x1767 = 233244	
ii)	No. of Mid Span compression joints (assuming average drum length 1100 Mtrs.).	61x1000/1100 = 55.47 Nos. Say 56 Nos.	
	Cost @ Rs 637 per joint.	35672	
iii)	4 RSB Vibration dampers.	2x6x32 = 384 Nos.	
	Cost @ Rs 645	247680	
iv)	Repair sleeves.	10 Nos.	
	Cost @ Rs234/-	2340	
	Total:	**518,936.00**	**5.19**
6)	**GROUNDWIRE ACCESSORIES**		
i)	No. of bonding pieces for suspension and tension towers.	22+10x2 = 42 Nos.	
	Cost @ Rs. 363/-	42x363 = 15,246/-	
ii)	No. of 4 RSB vibration dampers for earthwire	2x32 = 64 Nos.	
	Cost @ Rs 370/-	23680	

iii)	No. of suspension clamps.	22 Nos.	
	Cost @ Rs 357/-	7854	
iv)	No. of dead end body including linking devices.	10x2 = 20 Nos.	
	Cost @ Rs 285/-	20x285 = 5700	
v)	No. of Mid Span compression joints /St joints (assuming average drum length 1600 Mtrs.).	10x1000/1600 = 6.25 Nos. Say 7 Nos.	
	Cost @ Rs. 44	7x44 = 308	
	Total:	**52788**	**0.53**

7) TOWER FIXTURES

Sr. No.	Material	Unit	No. of Fixture	Rate (in Rs.)	Amount (in Rs.)
1	Earthing sets.	Set	32	1159	37,088.00
2	Danger plates.	No.	32	195	6,240.00
3	Number plates.	No.	32	182	5,824.00
4	Bird guards for suspension towers (Set of 3).	Set	As per Assumption 4		
5	Phase plates (set).	Set	64	331	21,184.00
6	Anti-climbing devices.	No.	As per Assumption 4		
7	Circuit Plates (set of Two).	Set	32	363	11,616.00
8	Barbed wire (No. of Towers x 10kg)	Kg	320	91	29,120.00
	Total:				**111,072.00**
					1.11 lacs

FY-2022-23 **E-4**

8 CONCRETE FOR TOWER FOUNDATIONS

Type of Towers	No. of towers.	Cement (Bag) (50kg) @ 236/-	Sand in (Cum) @ 1724/-	Crusher in (Cum) @1656/-	Steel in (Kgs) @ 78/-
A) STRAIGHT TOWERS	22Nos.				

Qty. required for one tower		102	6.97	13.91	1073
Amount.					
Sub-Total	**142817.24**				
cost for 22 Nos. Towers.	31.42 lacs				
B) ANGLE TOWERS 30^{o}	6Nos.				
Qty. reqd. for 1 No.		238	15.61	31.22	2781
Amount.					
Sub-Total	**351697.96**				
cost for 6 Nos. Towers.	21.10 lacs				
C) ANGLE TOWERS 60^{0}	4 Nos.				
Qty. reqd. for 1 No.		302	19.48	38.58	2810
Amount.					
Sub-Total	**387924.00**				
cost for 4 Nos. Towers.	15.52 lacs				
Total (a+b+c)	**68.04**				
5% extra for wastage & 10% for wet locations.	10.21				
Total:	**78.25**	**lacs**			

FY-2022-23 **E-5**

ABSTRACT OF COST

Sr. No.	**Particulars**	**Cost (in Rs.) lacs**
1	Tower structures	292.22
2	ACSR	213.64
3	Groundwire.	4.08
4	String assemblies.	35.37
5	ACSR accessories.	5.19
6	Groundwire accessories.	0.53
7	Tower Fixtures.	1.11

8	Concrete for foundations.	78.25		
9	**Sub-Total**	**630.39**		
10	Erection charges @ 20% of material cost.	126.08		
11	Transportation chargers @ 2.5%	15.76		
12	Cost of 10 Kms run of completely erected line.	772.23		
13	Cost of the one Km run of line.	77.22		

Say Rs. 77.22 Lacs only

1.	Cost of one Km Line.	77.22	
2.	Cost of other Misc. Expenditure for Erection of one Km Transmission Line.		
i.	Preliminary Expenses for one Km. line (For GEO referencing, survey, preparation of key plan, route plan, profile etc and supply of prints thereof)	0.14	
ii.	Cost of Land under Towers of one Km Trans. Line. (Area in Sq. mtr x No. of Towers x rates per Sq. mtr) (100x4x826).	3.30	
iii.	Crop Compensation charges for one Km distance under 220/132 KV Transmission line.	2.06	
iv	Forest Clearance Charges for one Km line	0.78	
v.	Compensation charges for private trees for one Km distance under 220/132 KV Transmission lines.	0.71	
vi.	PTCC and Re- Engineering charges for one Km. line	0.16	
vii	Railway Crossing Charges for one km. line.	35.40	
	Total	**119.77**	

Say Rs. 119.77 Lacs Only

LB-220

FY- 2022-23

BREAK UP ESTIMATE COST OF 220KV LINEBAY

Sr. No.	Description	Cost ref.	Qty.	Qty.	Rate Rs. in Lacs)	Amount (Rs. in Lacs)
1	1600 Amps., 40KA RC 220KV ckt. Breaker.	E (3)	1 No.	1	12.54	12.54
2	Isolators with Earth Switch and Insulators.	G(4)	1 No.	1	5.49	5.49
3	220KV CTs.	C(3)(ii)	1 set (3)	3	3.08	9.24
4	220KV C&R Panel.	N (1)	1 No.	1	7.92	7.92
5	Isolators with Insulators.	F (5)	2 Set	2	4.75	9.5
6	Steel structures for single bus.	T (1)	12 MT	12	0.90	10.8
7	Control cables.		L/S		Lot	5.2
8	Bus bar & connecting material		L/S		Lot	5.2
9	Earthing material.		L/S		Lot	2.77
i)	**Sub Total (a)**					**68.66**
ii)	Transportation , Civil Works , Erection charges, storage & contingency etc. @ 11% on (a)	Annex-I				**7.55**
	Grand Total:					**76.21**

Rs 76.21 Lacs only.

		(Rs. in Lacs)
1.	Cost of Electrical equipments including Erection Charges, Stores and contingency etc.	**76.21**
2	Cost of Land.	**NIL**
3	Cost of Civil Works	**24.50**
4	Cost of PLCC equipment for 1 line bay	**22.16**
	Total	**122.87**

Rs 122.87 Lacs only

Note: Land rates are taken as NIL because a space required for one bay is covered under Land required for 220/132 KV Sub-Station, cost of which is already covered under Cost of land for the substation.

Annexure-4

DETAILED PROJECT REPORT

FOR

400KV, 220KV, 132KV & 66KV

ADDITIONAL TRANSMISSION WORKS AT

400KV, 220KV &132KV SUBSTATIONS

For the year

2023-24/2024-25/2025-26

For System Improvement

&

Power Dispersal

DPR- XLI

PUNJAB STATE TRANSMISSION CORPORATION LTD.

SEPTEMBER 2022

Scope of works for 220KV, 132KV and 66KVTransmission Works at 220KV & 132KV Substations for *2023-24/2024-25/2025-26*

Sub-Stations works

Name of Sub-stn.	100 MVA 220/ 132 KV T/F	100 MVA 220/66 KV T/F	12.5 MVA 66/ 11 KV T/F	20 MVA, 66/11 KV T/F	500 MVA, 400/ 220KV T/F	160 MVA 220/66 KV T/F	12.5 MVA 132/ 11 KV T/F	20 MVA 132/ 11 KV T/F	Bays			
									400 KV	220 KV	132 KV	66 KV
220KV GNDTP						1				1T/F		1T/F
220KV GILL ROAD LUDHIANA						2				2T/F+ 4+1 B/C Bay		2T/F
400KV RAJPURA					1				1T/F	1T/F		
S/C ON D/C LINE FROM 400KV DHURI TO 220KV BHAWANIGARH										2		
220KV BUTARI										2		
220KV MAUR		1								1T/F		1T/F
220KV KARTARPUR						1						
220KV TALWANDI SABO				1								
220KV BAGHAPURANA				1								
132KV BHOGPUR								1				
132KV SOSAN							1				1T/F	
220KV DEVIGARH			1									1T/F
132KV CHAMKAUR SAHIB			1									1T/F
132KV KOTAKPURA-1				1								
220KV KOTKAROR			1									1T/F
220KV BADNI KALAN				1								1T/F
220KV BARNALA (HANDIAYA)			1									1T/F
220KV DHANAULA			1									1T/F
220KV PAKHOWAL				1								
TOTAL		**1**	**5**	**5**	**1**	**4**	**1**	**1**	**1T/F**	**8+ 5T/F + 1BC**	**1 T/F**	**10 T/F**

Net Capacity addition will be 1192.5 MVA due to addition of above T/Fs after considering dismantled transformers.

220KV & 132KVTransmission Lines in Ckt. Kms.

Sr. No.	Name of Line	Length in Ckt. Kms.
1	D/C line (6km, 0.4Sq") from 220 kV Ferozepur Road Ludhiana on multi circuit towers/modern techniques.	6

2	Connecting 132 kV Civil lines ASR with 132 kV Verka. (overhead 15 km + 1 km modern techniques)	16
3	Connecting 132 kV Civil lines ASR with 132 kV Mal Mandi. (overhead 26 km + 1 km underground)	27
4	S/C on D/C line from 400 kV Dhuri to 220 kV Bhawanigarh. Bay available at 400 kV Dhuri (18 km)	18
	Total	**67**

PREAMBLE

This proposal covers the Detailed Project Report for 220KV, 132KV and 66KV Transmission Works at various 132KV, 220KV GRID Sub-Stations for 2023-24/2024-25/2025-26 for system improvement and power dispersal.

****

The total estimated cost of the project based on 2022-23 price level is as follows:-

		(Rs. in Crores)
1.	*Transmission system cost*	**327.2**

Contents

List of Annexure

PROJECT REPORT FOR 220KV, 132KV & 66KV TRANSMISSION WORKS AT 220KV & 132KVSUBSTATIONS FOR *2023-24/2024-25/2025-26* FOR SYSTEM IMPROVEMENT AND POWER DISPERSAL

1.0 BACKGROUND

The electrical power demand is increasing at a very fast pace in the developing State of Punjab. Peak demand during paddy/summer season of 2022-23 has been recorded as 14311 MW. The projected maximum demand for paddy season of 2023-24 is about 15811 MW whereas as per the EPS projection data, the maximum demand of Punjab for 2023-24 is 16431 MW.

To provide relief to existing overloaded transmission system and to cater to the new loads of consumers in the State, continuous system up gradation/augmentation is required. For this purpose a number of new substations along with their associated transmission lines are required to be created. In addition transformation capacity at many existing 132KV, 220KV & 400KV Sub-stations is required to be augmented to feed the existing as well as upcoming loads within prescribed voltage parameters, besides ensuring supply to A.P. consumers as per P.C. Schedule and to improve system reliability. With this end in view, a number of 400KV, 220KV, and some 132KV and 66KV transmission works have already been planned for the years 2023–24 to 2025-26. This project report covers various substations are being upgraded from 66 KV/132 KV to 220 KV and other connectivity arrangement of transmission lines for the years 2023–24 to 2025-26 through Capital Investment Plan & Business Plan of PSTCL for MYT 3rd Control period from FY - 2023 to 2026.

2.0 DESCRIPTION OF TRANSMISSION SYSTEM

The details of Transmission System which are covered in this report are given in **Annexure-I.** These cover 1 No. 100MVA, 220/66KV T/F, 5 No. 12.5 MVA, 66/11 KV T/F, 5 No. 20 MVA, 66/11 KV T/F, 1 No. 500MVA, 400/220 KV T/F, 4 No. 160MVA, 220/66KV T/F, 1 No. 12.5 MVA, 132/11 KV T/F, 1 No. 20 MVA, 132/11 KV T/F and associated 400KV, 220KV, 132KV and 66KV bays and 67 circuit Km of 220KV & 132KV Transmission lines.

3.0 PROJECT OBJECTIVES

The objective of the project is to create additional transmission capacity to cater to additional loads, to give relief to overloaded sub-stations and to increase reliability of supply in the areas served by the substations covered in the scheme and to increase power evacuation capacity.

3.1 Project Highlights

a)	Project	400KV, 220KV, 132KV & 66KV Transmission Works at 400KV, 220KV and 132KV Substations for 2023–24 to 2025-26 for S.I. & Power Dispersal.
b)	Location of the project	Punjab
c)	Beneficiary State	Punjab
d)	Project cost	Rs. 327.2 Crore
e)	Commissioning schedules	During the year 2023-24/2024-25/2025-26

3.2 Scope of works

The scheme shall have scope of work as per Annexure-I and same is summarized as under:-

Transmission System for 2023–24 to 2025-26 for System Improvement and Power Dispersal.

3.2.1 Sub-Stations works

Name of Sub-stn.	100 MVA 220/ 132 KV T/F	100 MVA 220/66 KV T/F	12.5 MVA 66/ 11 KV T/F	20 MVA, 66/11 KV T/F	500 MVA, 400/ 220KV T/F	160 MVA 220/66 KV T/F	12.5 MVA 132/ 11 KV T/F	20 MVA 132/ 11 KV T/F	Bays			
									400 KV	220 KV	132 KV	66 KV
220KV GNDTP						1				1T/F		1T/F
220KV GILL ROAD LUDHIANA						2				2T/F+ 4+1 B/C Bay		2T/F
400KV RAJPURA					1				1T/F	1T/F		
S/C ON D/C LINE FROM 400KV DHURI TO 220KV BHAWANIGARH										2		
220KV BUTARI										2		
220KV MAUR		1								1T/F		1T/F
220KV KARTARPUR						1						
220KV TALWANDI SABO				1								
220KV BAGHAPURANA				1								
132KV BHOGPUR								1				
132KV SOSAN							1				1T/F	
220KV DEVIGARH			1									1T/F
132KV CHAMKAUR SAHIB			1									1T/F
132KV KOTAKPURA-1				1								
220KV KOTKAROR			1									1T/F
220KV BADNI KALAN				1								1T/F
220KV BARNALA (HANDIAYA)			1									1T/F

220KV DHANAULA			1									1T/F
220KV PAKHOWAL				1								
TOTAL		**1**	**5**	**5**	**1**	**4**	**1**	**1**	**1T/F**	**8+ 5T/F + 1BC**	**1 T/F**	**10 T/F**

Net Capacity addition will be 1192.5 MVA due to addition of above T/Fs after considering dismantled transformers.

220KV Transmission Lines in Ckt. Kms.

Sr. No.	Name of Line	Length in Ckt. Kms.
1	D/C line (6km, 0.4Sq") from 220 kV Ferozepur Road Ludhiana on multi circuit towers/modern techniques.	6
2	Connecting 132 kV Civil lines ASR with 132 kV Verka. (overhead 15 km + 1 km modern techniques)	16
3	Connecting 132 kV Civil lines ASR with 132 kV Mal Mandi. (overhead 26 km + 1 km underground)	27
4	S/C on D/C line from 400 kV Dhuri to 220 kV Bhawanigarh. Bay available at 400 kV Dhuri (18 km)	18
	Total	**67**

TARGET BENEFICIARIES

The target beneficiary of this project is State of Punjab.

5 PROJECT STRATEGY

The various elements of the transmission scheme have been evolved based on present and future load requirements and as well as for dispersal of power from various power projects and for improving reliability of power supply.

6 LEGAL FRAME WORK

It is proposed to execute the above entire transmission scheme as per provision contained in the Indian Electricity Act, 2003 and the rules made there under and the Electricity (Supply) Act, 1910 and 1948 in so far as these are applicable

7 ENVIRONMENTAL IMPACT ASSESSMENT

7.1 Forest involvement /clearance

As per the practice, preliminary route selection is done based on such documents as the Forest Atlas and the Survey of India maps using "bee" line method, followed by field verification through walk over survey. All possible steps are taken to avoid the route alignment through forests. In cases where it becomes unavoidable due to the geography of terrain, the alignment is made in such a way that the route through the forests is the barest minimum.

For selection of optimum route, following points are taken into consideration:-

- The route of the proposed transmission line does not involve any human rehabilitation.
- Any monument of cultural or historical importance is not getting affected.
- The route does not create any threat to the survival of any community.
- It does not affect any Public Utility Services like Playground, School, other establishments etc.
- It does not pass through any sanctuaries, National Park, etc.
- It does not infringe with areas of natural resources.

No major forest stretches are likely to be encountered for erection of the lines covered in the project. However, exact position shall be known after walkover survey and finalization of route plan. However, social forestry along the roads and rivers may be involved at a few locations involving road or river crossings. Necessary provisions for getting forest clearance for such locations will be made as per requirements based on actual basis.

The various clearances like forest, PTCC, railway crossing etc. where ever required are processed simultaneously after approval of route plan of the transmission lines. The works are carried out accordingly. It may be mentioned that all clearance are normally available by the time the lines are to be commissioned.

7.2 Social issues /R&R measures

As per prevailing law, land below transmission line is not required to be acquired; only compensation for land for transmission tower is given for which provisions are made on normative basis. Since the works covered in the scheme are only augmentation works at existing 132KV and 220KV substations no land requirement is envisaged.

8 TECHNOLOGY ISSUES

8.1 Salient features of 245KV class S/Stn. equipment and facilities

The design and specification of Substation equipment are to be governed by following factors:-

8.1.1 Insulation Coordination

The following insulation levels are proposed to be adopted for 245KV system.

a)	Impulse withstand voltage for transformer and reactors for other equipment	950 KVP
b)	Switching surge withstand voltage	1050KVP
c)	Minimum creepage distance	6125mm
d)	Max. fault current	40KA
e)	Duration of fault	1 Second

8.1.2 Steady State Stability

The steady State stability is the ability of a system to return /remain in the state of equilibrium when subjected to small or gradual changes of disturbances. The steady state stability limit is

the maximum power that can flow through some lines in the system when the entire or part of the system to which the stability limit refers is subjected to a small disturbance without loss of stability.

The steady state stability limit is usually quantified by measuring the relative angular displacement (also called as swing curve) between the two buses (nodes) in a system.

In an integrated power system consisting of large number of generators, loads and lines etc., a maximum relative angular separation of about 30 degree between the two buses may be assumed to be acceptable (safe) limit for maintaining the steady state stability of the system.

8.1.3 Substation Equipment

The switchgear shall be designed and specified to withstand operating conditions and duty requirements. The specifications for Power Transformers, circuit breakers, isolators, current transformers, capacitor voltage transformers, Surge Arrestors shall be as per applicable IEC standards and the switchgear shall be designed and specified to withstand operating conditions and duty requirements. The detailed specifications will be issued alongwith tender documents at the time of floating N.I.T.

Sub-station Support Facilities

Facilities required for O&M of substations like AC&DC power supplies, fire fighting system, oil evacuating, filtering, testing & filling apparatus, lighting &communication and Control Room generally exist at the substations. However, any extension of such facilities, if required will be specified at the time of floating N.I.T.

Protection & Control

The protective relaying system shall be provided for transmission lines, power transformers and bus bars to minimize the damage to the equipments in the event of fault and abnormal conditions. Necessary specification for distance line protections, transformer differential protection, bus bar protection and local breaker backup protection shall be given at the time of floating N.I.T.

8.2 Salient features of Transmission lines

The primary consideration for design and estimation of transmission lines are walkover/preliminary survey based on topographical map/forest map of India.

8.2.1 Conductors

For 220KV D/C line generally ACSR 'Zebra' or ACSR 'Moose' conductor will be used as specified in the details of lines whereas for 132KV lines ACSR 'Panther' conductor will be used.

8.2.2 Earthwire

Single 7/3.15mm galvanized steel Earthwire shall be used on the line.

8.2.3 Grounding

The tower footing resistance shall be kept below 10 ohms. Normally pipe type grounding shall be used.

8.2.4 Insulator and Hardware fittings

Specifications for insulators and Hardware fittings shall be given at the time of N.I.T

8.2.5 Line Accessories

i) Mid Span compression joint for conductor/Earthwire

Mid span compression joint suitable for conductor/Earthwire shall be used for joining two lengths of conductor/Earthwire. The minimum slipping strength of the joint after compression shall not be less than 95% of the UTS of conductor/ Earthwire.

ii) Repair sleeve for conductor

Repair sleeve shall be used only for repairing not more than two strands broken in the outer layer of conductor. It shall be of compression type in two parts with provision of seat sliding of keeper piece.

iii) Flexible copper bond for Earthwire

Flexible copper bonds shall be used for good electrical continuity between the Earth-wire and the tower. Two bonds per suspension tower and four bonds per tension tower shall be used.

iv) Vibration dampers for conductor/Earthwire

Stockbridge vibration dampers shall be used to reduce the maximum dynamic strain caused by Aeolian vibrations to a value of 150 Micro-strain.

9 MEANS OF FINANCE AND PROJECT BUDGET

9.1 Project Cost Estimate

9.1.1 The estimated cost of the project based on Cost Data of different substations, line bays and other related items for the year 2022-23 as finalized by Dy. CE/Transmission (Design) under CE/TS works out to be Rs. **327.2 Crore.**

The details of cost estimate for the equipment are given in **Annexure-I.**

The cost estimates are inclusive of applicable EC @ 15% and IDC @ 4%.

9.2 Funding arrangement

9.2.1 Phased fund requirement

The anticipated year wise fund requirement for the project is as under:-

Year	Rs. In Crore
2023-24	106.83
2024-25	148.03
2025-26	72.34
Total	**327.2**

9.2.2 Mode of Financing

The project is proposed to be funded through equity share (10%) by PSTCL and loans/bonds (90%). The works covered in this scheme are not covered under any other Scheme & are not being posed for finance from any other financial institution. Hypothecations of Future/Existing Assets & Escrow cover is proposed for security mechanism.

9.2.3 Mode of Execution

The transmission line works are generally got executed by outsourcing labour component only. Material for these works is procured **departmentally.** The substation works will be got executed **departmentally** only. The 400 kV transmission works are executed on Turnkey basis.

10.0 COST BENEFIT ANALYSIS

The details of cost benefit analysis are given in **Annexure-II** as per which %age gross return works out to be **33.69%** and payback period is **2.97 years**.

11.0 TIME FRAME

Transmission works covered in the project report are targeted for completion during 3 years 2023-24/2024-25/2025-26. Therefore 10% cost escalation has been considered.

12.0 DETAILED TECHNICAL ADVANTAGES/JUSTIFICATION

Advantages/Justification for additional transmission system covered in the project in general are given below:-

i. To cater to additional loads.
ii. To provide relief to existing Transmission Substations and Lines.
iii. To increase the reliability of the equipment and consequently of the Transmission System.
iv. To disperse additional power availability.
v. To improve the reliability and security of the transmission system.

Annexure – I					
220KV, 132KV & 66KV additional system improvement/power dispersal works at 220KV & 132KV Sub-Stns. for the year *2023-24/2024-25/2025-26*					
Sr. No.	**Plg. List No.**	**Name of Work/Sub-stn.**	**Detailed Scope of Work/Cost Break-up**	**Cost**	**Amount (Rs. in crores)**
1	1	**220 KV GNDTP** Additional 160 MVA, 220/66 kV transformer including 66kV bus bar extension (2 x 50 MVA 132/66KV will be spared)	COST FOR ADDITIONAL 160MVA, 220/66KV T/F AT 220 KV SUB-STATION.**(Annex A)**	12.3612	12.36
2	28	**S/C on D/C line from 400 kV Dhuri to 220 kV Bhawanigarh. Bay available at 400 kV Dhuri (18 km)**	COST FOR 220KV SC LINE ON DC TOWERS WITH ZEBRA ACSR CONDUCTOR NOMINAL ALUMINIUM AREA 420mm^2, FOR CALCULATING THE COST PER KM RUN OF LINE, 10KM OF LINE HAS BEEN CONSIDERED.**(Annex-J1-J5) X 18 KM (i.e. LILO length)**	18.8406	20.07
			COST OF 220KV LINE BAY **(Annex LB-220) X 1 (i.e. No. of Line Bays)**	1.2287	
			Total	**20.0693**	
3	41	**220 KV Maur** Addl. 220/66 kV 100 MVA T/F.	COST FOR ADDITIONAL 100MVA, 220/66KV T/F AT 220KV SUB-STATION. **(Annex-B)**	9.1157	9.12
4	42	**220 KV Kartarpur** Aug. of 100 MVA, 220/66 kV T/f to 160 MVA	COST FOR REPLACEMENT OF 100MVA, 220/66KV T/F WITH 160MVA, 220/66KV T/F AT 220KV SUB-STATION. **(Annex-C)**	10.5381	10.53
5	44	**220 KV Maur** Addl. 66/11 KV, 20 MVA T/F	COST FOR ADDITIONAL 20MVA, 66/11KV TRANSFORMER HAVING 4 NOS. EXTRA 11KV O/G FEEDERS AT 66KV SUB-STATION. **(Annex-D)**	299.32	3.00
6	45	**220 kV Talwandi sabo** Aug. of 66/11 kV, 12.5 MVA T/f to 20 MVA	COST FOR REPLACEMENT OF 12.5 MVA, 66/11 KV TRANSFORMER WITH 20 MVA, 66/11 KV TRANSFORMER HAVING 4 NOS. EXTRA 11 KV O/G FEEDERS. **(Annex-E)**	2.7339	2.73
7	47	**220 kV Baghapurana** Aug. of 66/11 kV, 12.5 MVA T/f to 20 MVA	COST FOR REPLACEMENT OF 12.5 MVA, 66/11 KV TRANSFORMER WITH 20 MVA, 66/11 KV TRANSFORMER HAVING 4 NOS. EXTRA 11 KV O/G FEEDERS. **(Annex-E)**	2.7339	2.73
8	48	**132 kV Bhogpur** Aug. of 132/11 kV, 12.5 MVA to 20 MVA	COST FOR 132 KV SUB-STATION WITH REPLACEMENT OF 12.5 MVA, 132/11 KV TRANSFORMER WITH 20 MVA, 132/11 KV TRANSFORMER WITH 4 Nos. EXTRA 11 KV O/G FEEDERS. **(Annex-F)**	2.6047	2.60
9	49	**132 kV Sosan** Addl 12.5 MVA, 132/11 V T/F with CR Extension	COST FOR 132KV SUB-STATION WITH ADDITIONAL 12.5MVA, 132/11KV TRANSFORMER WITH 8 NO. 11KV O/G FEEDERS AT EXISTING S/STN. **(Annex-G)**	3.5587	3.55
10	50	**220 kV Devigarh** Addl 66/11 kV, 12.5 MVA T/F with CR Extension	COST FOR 66KV SUB-STATION WITH ADDITIONAL 12.5 MVA, 66/11KV TRANSFORMER HAVING 4 NOS. EXTRA 11KV O/G FEEDERS. **(Annex-H)**	2.9931	3.00

11	51	**132 kV Chamkaur Sahib** 1 No. 12.5 MVA, 66/11 kV T/F with CR extension	COST FOR 66KV SUB-STATION WITH ADDITIONAL 12.5 MVA, 66/11KV TRANSFORMER HAVING 4 NOS. EXTRA 11KV O/G FEEDERS. **(Annex-H)**	2.9931	3.00
12	52	**132 kV Kotakpura-1** Aug. of 12.5 MVA, 132/11 kV T/f to 20 MVA, 66/11 kV T/F	COST AT 66KV SUB-STATION FOR REPLACEMENT OF 20MVA, 132/11KV TRANSFORMER WITH 20MVA, 66/11KV TRANSFORMER. **(Annex-I)**	2.6240	2.62
13	53	**220 kV Kotkaror** Addl. 66/11 kV, 12.5 MVA T/f including CR Extension	COST FOR 66KV SUB-STATION WITH ADDITIONAL 12.5 MVA, 66/11KV TRANSFORMER HAVING 4 NOS. EXTRA 11KV O/G FEEDERS. **(Annex-H)**	2.9931	3.00
14	54	**220 kV Badni Kalan** Addl. 66/11 kV, 20 MVA T/f including CR Extension	COST FOR ADDITIONAL 20MVA, 66/11KV TRANSFORMER HAVING 4 NOS. EXTRA 11KV O/G FEEDERS AT 66KV SUB-STATION. **(Annex-D)**	2.9932	3.00
15	55	**220 kV Barnala (Handiaya)** Addl. 10/12.5MVA, 66/11 kV T/F	COST FOR 66KV SUB-STATION WITH ADDITIONAL 12.5 MVA, 66/11KV TRANSFORMER HAVING 4 NOS. EXTRA 11KV O/G FEEDERS. **(Annex-H)**	2.9931	3.00
16	56	**220 kV Dhanaula** Addl. 10/12.5 MVA, 66/11 kV T/F with CR extension	COST FOR 66KV SUB-STATION WITH ADDITIONAL 12.5 MVA, 66/11KV TRANSFORMER HAVING 4 NOS. EXTRA 11KV O/G FEEDERS. **(Annex-H)**	2.9931	3.00
17	57	**220 kV Pakhowal** Aug. of 10/12.5 MVA, 66/11 kV with 20 MVA, 66/11 kV T/F	COST FOR REPLACEMENT OF 12.5 MVA, 66/11 KV TRANSFORMER WITH 20 MVA, 66/11 KV TRANSFORMER HAVING 4 NOS. EXTRA 11 KV O/G FEEDERS. **(Annex-E)**	2.7339	2.73
18	6	**220 KV Gill road ludhiana** a) Creation of 220kV Gill Road Ludhiana with 2X160MVA 220/66KV T/F (4 line bays (2 at Proposed Gill road and 2 at Ferozepur road), 2 T/F bays & 1no. bus coupler bay)		0.2	0.2
		b) D/C line (6km, 0.4Sq") from 220 kV Ferozepur Road Ludhiana on multi circuit towers/modern techniques.			
19	16	**220 kV S/S Bajakhana** Double bus arrangement at Bajakhana		16.50	16.50
20	24	**Strengthening of Verka-Mall Mandi Link and to establish link with Civil Lines ASR** a. Disconnecting 132 kV Verka - Mal Mandi link and 132 kV Verka - Jayantipura link.		0	0
		b. Connecting 132 kV Mal Mandi with 132 kV Jayantipur.		16.59	16.59
		c. Connecting 132 kV Civil lines ASR with 132 kV Verka (Overhead 15 km + 1 km modern techniques)		12.08	12.08

		d. Connecting 132 kV Civil lines ASR with 132 kV Mal Mandi (overhead 26 km + 1 km underground)		26.89	26.89
21	26	**400 kV Rajpura** 4th 500 MVA additional T/F		32	32
22	31	**220 kV S/S Chajjli** Augmentation of 66 kV single bus bar from double conductor to quadruple conductor		0.5	0.5
23	33	**Double bus bar arrangement at 220 kV Butari** Making 220 kV Bus of Butari as double and shifting of 220/132 kV T/F of Butari to 220 kV Jandiala		1.8	1.8
24	59	**132 kV Swadi Kalan** extension in Control room		0.30	0.30
25	60	**220 kV Malerkotla** extension in Control room		0.30	0.30
26	61	**3 No. Truck mounted hydraulic cranes i.e. Loader 05 Ton Capacity** Loaders are used for Loading/unloading of various equipment of transm,ission system, erection of various electrical substation equipment including Power transformers. The same vehcile may also be utilised as truck for shifting of material and T&P etc.		1.52	1.52
27	62	**3 No. Filteration set 6000 LPH capacity with operating voltage of 415V (3 Phase)** The filtration sets are used for dehydration and filtration of transformer oil, required during erection of all Power transformers.		1.40	1.40
28	63	**1 No. Vacuum drying Plant/ Oven For 100MVA P/T/Fs** The Vacuum Drying Plant is suitable for drying the active parts of transformers in an Autoclave by using the classical drying method.		4.00	4.00
29	64	**220 kV S/S Sahnewal** To make 66 kV double bus bar arrangement (remaining part of existing 66 kV lines) needs to be shifted to newly erected/ to be erected 66 kV line bays. Due to involvement of shifting of 66 kV lines the expenditure needs to be revised.		1.40	1.40

30	66	**Replacement of Disc Insulators of 400 kV PSTCL lines with Polymer Insulators**		10.00	10.00
31	15	**Re-arrangement to provide 2nd connectivity to 220 kV S/s Naraingarh** Disconnecting 220kV Khassa - Civil Line ASR circuit and Chogawan- Khassa circuits from Khassa and diverting them to Naraingarh 1 no. circuit between 220kV Chogawan - Nariangarh and 1no. circuit between 220kV Civil Line ASR - Nariangarh, D/c line with 12.5 Km 0.4Sq"		45.44	45.44
32	11	Double busbar arrangement at 220kv mandi gobindgarh-2		14	14
TOTAL					**274.96**
Employee Cost @ 15%					**41.244**
IDC @ 4%					**10.9984**
Project Cost					**327.2024**

Project Cost = Rs. 327.2024 Crore
Say 327.2 Crore
Cost Escalation @ 10% = Rs. 32.72 Crore
Cost Escalation is calculated @ 10% although it is not a part of project cost.

ANNEXURE-II

COST BENEFIT ANALYSIS

For 400KV, 220KV,132KV& 66KV Works at 400KV, 220KV& 132KV Sub-stations for 2023-24/2024-25/2025-26

CALCULATION OF BENEFITS DUE TO THE SCHEME.

a)	Additional Load that can be served after the erection of new sub-stations/augmentation of existing sub-stations, by addition/ replacement Transformers as per Annexure-I	= 1192.5 MVA
b)	Expected Sale/Dispersal of additional Energy (in kwh) (a/1000)xLFxPFx8760 (a/1000)x0.5x0.9x8760	= 4700.835 MU
c)	Transmission Tariff of the State for FY 2022-23 as per Tariff order of PSTCL for FY 2022-23 in Rs. Per unit.	= Rs. 0.2345
d)	Value of benefits during the year due to transportation of additional energy	= Rs. 110.234 Crore
e)	Total Scheme cost as per Annexure-I.	= Rs. 327.2 Crore
f)	Percentage Gross Return (Total benefit/Total Cost)* 100	= 33.69%
g)	Pay Back period	= 2.97 **years**

FY- 2022-23 **ANNEXURE-A**

DETAILS OF COST FOR ADDITIONAL 160MVA, 220/66KV T/F AT 220 KV SUB-STATION. THIS COST DATA HAS BEEN PREPARED FOR ESTIMATION PURPOSES ONLY.

Sr. No.	Description	Cost Reference	Qty.		Rates (Rs in Lacs)	Amount (Rs in Lacs)
A)	**POWER TRANSFORMER**					
	160MVA, 220/66KV T/Fs.	A (6)	1 No.	1	856.32	856.32
	Total 'A'					**856.32**
B)	**220KV SWITCHGEAR EQUIPMENT**					
1	220KV SF-6, ckt. Breaker.	E (3)	1 No.	1	12.54	12.54
2	CTs.	C (3) (i)	1 Set(3)	3	3.08	9.24
3	L.As. for T/Fs.	H (3)	1 Set(3)	3	0.53	1.59
4	Isolator with Insulators	F (5)	2 No.	2	4.75	9.5
5	Control & Relay panel for T/F bay.	N (2)	1 No.	1	7.02	7.02
6	Steel structures.	T (1)	25MT	25	0.90	22.5
7	Earthing material		Lot		L/S	1.16
8	Bus bar & connecting material.		Lot		L/S	3.47
9	Control cables.		Lot		L/S	3.47
	Total 'B'					**70.49**
C)	**66KV EQUIPMENT**					
1	66KV SF-6, ckt. Breaker.	E (1)	1 No.	1	4.41	4.41
2	2000 Amp Isolator with solid core Insulators.	F (3)	2 No	2	1.77	3.54
3	CTs.	C (1) (i)	1 Set(3)	3	1.20	3.6
4	L.As.	H (1)	1 Set(3)	3	0.21	0.63
5	Control &Relay Panel for T/F bay.	N (9) (ii)	1 No.	1	3.79	3.79
6	Steel structures.	T (1)	25MT	25	0.90	22.5
7	Earthing material		Lot		L/S	0.81

8	Bus bar & connecting material.		Lot		L/S	1.45
9	Augmentation of 66KV Bus bars to Quadrupled conductor		Lot		L/S	10
10	Control cables.		Lot		L/S	1.45
	Total 'C'					**52.18**
	FY-2022-23					**A**
D)	**Material for Cap Banks**					
1	C&R Panel For Cap bank	N (11)	1No.	1	2.68	2.68
2	66 KV Cap Banks without NCT	I (2)	3 No.	3	14.97	44.91
3	CT	C (1)(ii)	1Set(3)	3	0.94	2.82
4	SF-6 Breaker	E (1)	1 No.	1	4.41	4.41
5	800Amp Isolator with solid core Insulators	F (1)	2 No.	2	0.99	1.98
6	800 Amp Isolator with Earth Switch and solid core Insulators	G (1)	3 No.	3	1.47	4.41
7	NCT 66KV for capacitor bank	D (9) (i)	3 No.	3	0.57	1.71
8	Structure for 66KV NCT (for capacitor bank)	D (10) (i)	3 No.	3	0.18	0.54
	Total 'D'					**63.46**
	Sub-Total (a) = A+B+C+D					**1042.45**
	Transportation, Erection charges, storage & contingency etc. @ 11% on (a)					**114.67**
	Grand Total:					**1157.12**

Rs 1157.12 Lacs only.

		(Rs in Lacs)
1	Cost of Electrical equipments including Erection Charges, Storage and contingency etc.	1157.12
2	Cost of extension in switchyard building and other civil works in the yard	79
	Total	**1236.12**

Say Rs 1236.12 Lacs only

Note: 1. *The other civil works in Switchyard include switch gear foundations, gravel spreading, outdoor trenches, boundary wall with gates, Laying of earth mats, approach road, drains and PCC flooring etc.

FY- 2022-23 **ANNEXURE-B**

DETAILS OF COST FOR ADDITIONAL 100MVA, 220/66KV T/F AT 220KV SUB-STATION. THIS COST DATA HAS BEEN PREPARED FOR ESTIMATION PURPOSES ONLY.

Sr. No.	Description	Cost Ref.	Qty.		Rate (R in Lacs)	Amount (R in Lacs)
A)	**POWER TRANSFORMER**					
	100MVA, 220/66KV T/Fs.	**A (4)**	1 No.	1	604.58	604.58
	Total 'A'					**604.58**
B)	**220KV SWITCHGEAR EQUIPMENT**					
1	220KV SF-6, ckt. Breaker.	E (3)	1 No.	1	12.54	12.54
2	CTs.	C (3) (ii)	1 Set(3)	3	3.08	9.24
3	L.As. for T/Fs.	H (3)	1 Set(3)	3	0.53	1.59
4	Isolators with Insulators.	F (5)	2 No.	2	4.75	9.5
5	Control & Relay panel for T/F bay.	N (2)	1 No.	1	7.02	7.02
6	Steel structures.	T(1)	25MT	25	0.9	22.5
7	Earthing material		Lot		L/S	1.16
8	Bus bar & connecting material.		Lot		L/S	3.47
9	Power & control cables.		Lot		L/S	3.47
	Total 'B'					**70.49**
C)	**66KV EQUIPMENT**					
1	66KV SF-6, ckt. Breaker.	E (1)	1 No.	1	4.41	4.41
2	1250 Amps. Isolators with Insulators.	F (2)	2 No	2	1.50	3
3	CTs.	C (1) (ii)	1 Set(3)	3	0.94	2.82
4	L.As.	H (1)	1 Set(3)	3	0.21	0.63
5	Control &Relay Panel for T/F bay.	N (9)(ii)	1 No.	1	3.79	3.79
6	Steel structures.	T(1)	1.5MT	1.5	0.9	1.35
7	Earthing material		Lot		L/S	0.81
8	Bus bar& connecting material.		Lot		L/S	1.45

9	Augmentation of 66 KV Bus bar to quadruple conductor		Lot		L/S	10
10	Power & control cables.		Lot		L/S	1.45
	Total 'C'					**29.71**
	FY-2022-23					**A**
D	**Material for Cap Banks**					
1	C&R Panel For Cap bank	N (11)	1No.	1	2.68	2.68
2	66 KV Cap Banks without NCT	I (2)	2 No.	2	14.97	29.94
3	CT	C (1) (ii)	1Set(3)	3	0.94	2.82
4	SF-6 Breaker	E (1)	1 No.	1	4.41	4.41
5	800Amp Isolator with solid core Insulators	F (1)	1 No.	1	0.99	0.99
6	800 Amp Isolator with Earth Switch and solid core Insulators.	G (1)	2 No.	2	1.47	2.94
7	66KV NCT for capacitor Bank	D (9) (i)	2 No.	2	0.57	1.14
8	Structure for 66KV NCT (for Capacitor Bank).	D (10) (i)	2 No.	2	0.18	0.36
	Total 'D'					**45.28**
	Sub-Total (a) = A+B+C+D					**750.06**
	Transportation, Erection charges, storage & contingency etc.					**82.51**
	@ 11% on (a)					
	Grand Total:					**832.57**

Rs 832.57 Lacs only.

		(Rs in Lacs)
1	Cost of Electrical equipments including Erection Charges, Storage and contingency etc.	832.57
2	Cost of extension in Switch house building and the other civil works* in the yard area.	79
	Total	**911.57**

Say Rs 911.57 Lacs only

FY- 2022-23 **ANNEXURE-C**

DETAILS OF COST FOR REPLACEMENT OF 100MVA, 220/66KV T/F WITH 160MVA, 220/66KV T/F AT 220KV SUB-STATION. THIS COST DATA HAS BEEN PREPARED FOR ESTIMATION PURPOSES ONLY.

Sr. No.	Description	Cost Reference	Qty.	Qty.	Rates (R in Lacs)	Amount (Rs. in Lacs)
A)	**POWER TRANSFORMER**					
	160MVA, 220/66KV T/Fs.	A (6)	1 No.	1	856.32	856.32
	Total 'A'					**856.32**
B)	**220KV SWITCHGEAR EQUIPMENT**					
1	**CTs.**	C (3)(i)	1 Set(3)	3	3.08	9.24
2	**Control cables.**		Lot		L/S	3.47
	Total 'B'					**12.71**
C)	**66KV EQUIPMENT**					
1	**66 KV 2000 Amp Isolator with solid core Insulators**	F (3)	2 No	2	1.77	3.54
2	**CTs. (2000/1)**	C (1) (i)	1 Set(3)	3	1.20	3.6
3	**Bus bar & connecting material. (Quadra Configuration)**		Lot		L/S	2.89
4	**Control cables.**		Lot		L/S	1.45
	Total 'C'					**11.48**
D)	**Material for Cap Banks**					
1	**C&R Panel For Cap bank**	N (11)	1 No.	1	2.68	2.68
2	**66 KV Cap Banks without NCT**	I (2)	3 No.	3	14.97	44.91
3	**CT**	C (1) (ii)	1Set(3)	3	0.94	2.82
4	**SF-6 Breaker**	E (1)	1 No.	1	4.41	4.41
5	**800Amp Isolator with solid core Insulators**	F (1)	2 No.	2	0.99	1.98
6	**800 Amp Isolator with Earth Switch and solid core Insulators**	G (1)	3 No.	3	1.47	4.41
7	**66 KV NCT for capacitor Bank**	D (9) (i)	3 No.	3	0.57	1.71
8	**Structure for 66KV NCT (Capacitor bank)**	D (10)(i)	3 No.	3	0.18	0.54
	Total 'D'					**63.46**

	Sub-Total (a)=A+B+C+D					**943.97**
	Transportation, Erection charges, storage & contingency etc. @ 11% on (a)					**103.84**
	Grand Total:					**1047.81**

	1047.81
Cost of civil works	6
Total	**1053.81**

Say Rs 1053.81 Lacs only

FY- 2022-23 **ANNEXURE-D**

DETAILS OF COST FOR ADDITIONAL 20MVA, 66/11KV TRANSFORMER HAVING 4 NOS. EXTRA 11KV O/G FEEDERS AT 66KV SUB-STATION. THIS COST DATA HAS BEEN PREPARED FOR ESTIMATION PURPOSES ONLY.

Sr. No.	Description	Cost ref.	Qty.	Qty.	Rate (Rs. in Lacs)	Amount (Rs. in Lacs)
A)	**POWER TRANSFORMER**					
	20 MVA, 66/11KV T/Fs.	**A (1)**	1 No.	1	209.2	209.2
	Total 'A'					**209.2**
B)	**MATERIAL REQUIRED FOR TRNASFORMER**					
1	Lightening arrestors.	H (1)	1 Set (3)	3	0.21	0.63
2	Multi ratio and multi core CTs.	C (1)(i)	1 Set (3)	3	1.20	3.6
3	11KV NCT.		1 No.	1	0.24	0.24
	Total 'B'					**4.47**
C)	**MATERIAL REQUIRED FOR 66KV T/F BAY**					
1	66KV SF-6, ckt. Breaker for T/Fs.	E (1)	1 No.	1	4.41	4.41
2	Isolator with Earth Switch including Insulators.	G (2)	1 No.	1	1.54	1.54
3	1250 Amp Isolators with Insulators	F (2)	1 No.	1	1.50	1.5
4	L.As. for bus.	H (1)	1 Set (3)	3	0.21	0.63
5	C&R T/F Panel.	N(9)(i)	1 No.	1	5.92	5.92
6	Steel structures.	T (1)	5MT	5	0.9	4.5
7	Bus bar connecting material.		Lot		L/S	1.45
8	Control cables.		Lot		L/S	1.62
9	Earthing material.		Lot		L/S	1.16
	Total 'C'					**22.73**
	FY-2022-23					**C**
D	**11KV EQUIPMENT**					
1	11KV incoming ckt. Breaker.	P (1)	1 No.	1	5.82	5.82

2	11KV O/G VCB .	P (2)	4 Nos.	4	4.14	16.56
3	11KV Single core U/G cable 300mm^2 (1x3x80)+(4x3x100) =1440Mtr	R (1)	1.44Km	1.44	4.74	6.83
4	Bus bar & connecting material.		Lot		L/S	1.16
5	Control cables.		Lot		L/S	2.89
	Total 'D'					**33.26**
	Total: A+B+C+D					**269.66**
	Transportation , Civil Works , Erection charges, storage & contingency etc. @ 11% on (a)					**29.66**
	Total:					**299.32**
	cost of land					0.00
	Grand Total:					**299.32**

Say Rs 299.32 Lacs only.

FY- 2022-23 **ANNEXURE-E**

DETAILS OF COST FOR REPLACEMENT OF 12.5MVA, 66/11 KV TRANSFORMER WITH 20MVA, 66/11KV TRANSFORMER HAVING 4 NOS. EXTRA 11KV O/G FEEDERS. THIS COST DATA HAS BEEN PREPARED FOR ESTIMATION PURPOSES ONLY.

Sr. No.	Description	Cost ref.	Qty.	Qty.	Rate (Rs. in Lacs)	Amount (Rs. in Lacs)
A)	**POWER TRANSFORMER**					
	20MVA, 66/11KV T/Fs.	**A (1)**	1 No.	1	209.20	209.2
	Total 'A'					**209.2**
B)	**MATERIAL REQUIRED FOR TRNASFORMER**					
1	Multi ratio and multi core CTs.	C (1)(i)	1 Set(3)	3	1.20	3.6
2	11KV NCT.		1 No.	1	0.24	0.24
	Total 'B'					**3.84**
C)	**11KV EQUIPMENT**					
1	11KV incoming ckt. Breaker.	P(1)	1 No.	1	5.82	5.82
2	11KV O/G VCB .	P (2)	4 Nos.	4	4.14	16.56
3	11KV Single core U/G cable 300mm^2 (1x3x80+4x3x100) =1440Mtr	R (1)	1.440Km	1.44	4.74	6.83
4	Bus bar & connecting material.		Lot		L/S	1.16
5	Control cables.		Lot		L/S	2.89
	Total 'C'					**33.26**
	Total A+B+C					**246.30**
	Transportation , Civil Works , Erection charges, storage & contingency etc. @ 11% on (a)					**27.09**
	Total:					**273.39**
	cost of land					0.00
	Grand Total:					**273.39**

Say Rs 273.39 Lacs only.

FY-2022-23 **ANNEXURE-F**

DETAILS OF COST FOR 132KV SUB-STATION WITH REPLACEMENT OF 12.5MVA, 132/11KV TRANSFORMER WITH 20MVA, 132/11KV TRANSFORMER WITH 4 Nos. EXTRA11KV O/G FEEDERS. THIS COST DATA HAS BEEN PREPARED FOR ESTIMATION PURPOSES ONLY.

Sr. No.	Description	Cost Ref.	Qty.	Qty.	Rate (Rs. in Lacs)	Amount (Rs. in Lacs)
A)	**POWER TRANSFORMER**					
	20MVA, 132/11KV T/Fs.	A (2)	1 No.	1	195.02	195.02
	Total 'A'					**195.02**
B)	**MATERIAL REQUIRED FOR TRANSFORMER**					
1	Multi ratio and multi core CTs.	C (2) (i)	1 Set(3)	3	1.53	4.59
2	15KV NCT.	D (2)	1No.	1	0.43	0.43
	Control cables.		Lot		L/S	2.89
	Total 'B'					**7.91**
C)	**11KV EQUIPMENT**					
1	11KV O/G VCB	P (2)	4 Nos.	4	4.14	16.56
2	11KV Single core U/G cable 300mm^2 (1x3x80)+(4x3x100) = 1440M	R (1)	1.440 Km	1.44	4.74	6.83
3	Bus bar & connecting material.		Lot		L/S	2.03
4	Control cables.		Lot		L/S	2.89
	Total 'C'					**28.31**
	Sub-Total (a)= A+B+C					**231.24**
	Transportation , Erection charges, storage & contingency etc. @ 11% on (a)					**25.44**
	Grand Total:					**256.67**

Cost of electrical equipments including erection charges, storage contingencies etc. **256.67**

Cost of Civil Works **3.80**

Total **260.47**

Rs 260.47 Lacs only.

FY- 2022-23 **ANNEXURE-G**

DETAILS OF COST FOR 132KV SUB-STATION WITH ADDITIONAL 12.5MVA, 132/11KV TRANSFORMER WITH 8 NO. 11KV O/G FEEDERS AT EXISTING S/STN. THIS COST DATA HAS BEEN PREPARED FOR ESTIMATION PURPOSES ONLY.

Sr. No.	Description	Cost Ref.	Qty.	Qty.	Rate (Rs.in Lacs)	Amount (Rs. in Lacs)
A)	**POWER TRANSFORMER**					
	12.5MVA, 132/11KV T/Fs.	A (2)*	1 No.	1	195.02	195.02
	Total 'A'					**195.02**
B)	**MATERIAL REQUIRED FOR TRNASFORMER**					
1	Lightening arrestors.	H (2)	1 Set (3)	3	0.36	1.08
2	Multi ratio and multi core CTs.	C (2) (i)	1 Set (3)	3	1.53	4.59
3	15KV NCT.	D (2)	1No.	1	0.43	0.43
	Total 'B'					**6.1**
C)	**MATERIAL REQUIRED FORTRANSFORMERBAY**					
1	132KV SF-6, ckt. Breaker.	E (2)	1 No.	1	5.44	5.44
2	Isolator with Earth switch and solid core insulators.	G (3)	1 No.	1	2.86	2.86
3	Isolators with Insulators	F (4)	1 No.	1	2.37	2.37
4	L.As. for bus.	H (2)	1 Set(3)	3	0.36	1.08
5	132KV Control &Relay T/F Panel.	N (5)	1 No.	1	5.92	5.92
6	Steel structures.	T(1)	8MT	8	0.9	7.2
7	Bus bar connecting material.		Lot		L/S	2.89
8	Control cables.		Lot		L/S	2.89
9	Earthing material.		Lot		L/S	2.08
	Total 'C'					**32.73**
	2022-23					**B**

D)	**11KV EQUIPMENT**					
1	11KV incoming ckt. Breaker.	P (1)	1 No.	1	5.82	5.82
2	11KV O/G VCB	P (2)	8 Nos.	8	4.14	33.12
3	11KV Single core U/G cable 300mm^2 (1x3x80)+(8x3x100) = 2640M	R (1)	2.640 Km	2.64	4.74	12.51
4	Bus bar & connecting material.		Lot		L/S	2.03
5	Control cables.		Lot		L/S	2.89
	Total 'D'					**56.37**
E	**Material for Cap Banks**					
1	11KV C/B VCB	P (3)	1No.	1	4.10	4.1
2	11 KV Cap Banks	I (1)	2 No.	2	2.20	4.4
3	11KV RVT	V(1)	1 No.	1	0.26	0.26
	Total 'E'					**8.76**
	Sub-Total (a)=A+B+C+D+E					**298.98**
	Transportation , Erection charges, storage & contingency etc. @ 11% on (a)					**32.89**
	Grand Total:					**331.87**

Cost of electrical equipments including erection charges, storage contingencies etc. **331.87**

Cost of Civil Works **24**

Total **355.87**

Rs 355.87 Lacs only.

*** Note:** Presently 12.5 MVA, 132KV/ 11 T/Fs are not being procured by PSTCL. Hence for estimating the rate of 12.5 MVA, 132/11KV T/F the rates of 20 MVA, 132/11KV T/F i.e. R 195.02 Lacs are being used.

FY- 2022-23 **ANNEXURE-H**

DETAILS OF COST FOR 66KV SUB-STATION WITH ADDITIONAL 12.5MVA, 66/11KV TRANSFORMER HAVING 4 NOS. EXTRA 11KV O/G FEEDERS. THIS COST DATA HAS BEEN PREPARED FOR ESTIMATION PURPOSES ONLY.

Sr. No.	Description	Cost ref.	Qty.	Qty.	Rate (Rs. in Lacs)	Amount (Rs. in Lacs)
A)	**POWER TRANSFORMER**					
	12.5MVA, 66/11KV T/Fs.	**A (1)***	1 No.	1	209.2	209.2
	Total 'A'					**209.2**
B)	**MATERIAL REQUIRED FOR TRNASFORMER**					
1	Lightening arrestors.	H (1)	1 Set (3)	3	0.21	0.63
2	Multi ratio and multi core CTs.	C(1)(i)	1 Set (3)	3	1.2	3.6
3	11KV NCT.		1 No.	1	0.24	0.24
	Total 'B'					**4.47**
C)	**MATERIAL REQUIRED FOR 66KV T/F BAY**					
1	66KV SF-6, ckt. Breaker for T/Fs.	E(1)	1 No.	1	4.41	4.41
2	Isolator with Earth Switch and Insulators.	G(2)	1 No.	1	1.54	1.54
3	1250 Amp Isolators with Insulators	F(2)	1 No.	1	1.50	1.5
4	L.As. for bus.	H (1)	1 Set(3)	3	0.21	0.63
5	C&R T/F Panel.	N(9) (ii)	1 No.	1	5.92	5.92
6	Steel structures.	T (i)	5MT	5	0.90	4.5
7	Bus bar connecting material.		Lot		L/S	1.45
8	Control cables.		Lot		L/S	1.62
9	Earthing material.		Lot		L/S	1.15
	Total 'C'					**22.72**
	FY-2022-23					**C**
D	**11KV EQUIPMENT**					
1	11KV incoming ckt. Breaker.	P(i)	1 No.	1	5.82	5.82

2	11KV O/G VCB .	P(2)	4 Nos.	4	4.14	16.56
3	11KV single core U/G cable 300mm^2 (1x3x80)+(4x3x100) =240+1200= 1440Mtr	R(1)	1.44Km	1.44	4.74	6.83
4	Bus bar & connecting material.		Lot		L/S	1.16
5	Control cables.		Lot		L/S	2.89
	Total 'D'					**33.26**
	Total: A+B+C+D					**269.65**
	Transportation , Civil Works , Erection charges, storage & contingency etc. @ 11% on (a)					**29.66**
	Total:					**299.31**
	cost of land					0.00
	Grand Total:					**299.31**

Say Rs.299.31 Lacs only.

FY- 2022-23 RATES **ANNEXURE-I**

DETAILS OF COST AT 66KV SUB-STATION FOR REPLACEMENT OF 20MVA, 132/11KV TRANSFORMER WITH 20MVA, 66/11KV TANSFORMER. THIS COST DATA HAS BEEN PREPARED FOR ESTIMATION PURPOSES ONLY.

Sr. No.	Description	Cost ref.	Qty.	Qty.	Rate (Rs. in Lacs)	Amount (Rs. in Lacs)
A)	**POWER TRANSFORMER**					
	20MVA, 66/11KV T/Fs.	**A (1)**	1 No.	1	209.2	209.2
	Total 'A'					**209.2**
B)	**MATERIAL REQUIRED FOR TRNASFORMER**					
1	Lightening arrestors.	H(1)	1 Set(3)	3	0.21	0.63
2	Multi ratio and multi core CTs.	C (1)(i)	1 Set(3)	3	1.20	3.6
3	11KV NCT.		1 No.	1	0.24	0.24
	Total 'B'					**4.47**
C)	**MATERIAL REQUIRED FOR 66KV T/F BAY**					
1	66KV SF-6, ckt. Breaker for T/Fs.	E(1)	1 No.	1	4.41	4.41
2	Isolator with Earth Switch and Insulators.	G(2)	1 No.	1	1.54	1.54
3	1250 Amp Isolators with Insulators	F(2)	1 No.	1	1.50	1.5
4	LA's for Bus	H(1)	1 set (3)	3	0.21	0.63
5	C&R T/F Panel.	N(9)(ii)	1 No.	1	5.92	5.92
6	Steel structures.	T(1)	5MT	5	0.90	4.5
7	Bus bar connecting material.		Lot		L/S	1.45
8	Control cables.		Lot		L/S	1.62
9	Earthing material.		Lot		L/S	1.16
	Total 'C'					**22.73**
	Total: A+B+C					**236.40**

	Transportation , Civil Works , Erection charges, storage & contingency etc. @ 11% on (a)					**26.00**
	Total:					**262.40**
	cost of land					0.00
	Grand Total:					**262.40**

Say Rs 262.40 Lacs only.

FY 2022-23 **J-1 to J-5**

DETAIL OF COST FOR 220KV SC LINE ON DC TOWERS WITH ZEBRA ACSR CONDUCTOR NOMINAL ALUMINIUM AREA 420mm^2, FOR CALCULATING THE COST PER KM RUN OF LINE, 10KM OF LINE HAS BEEN CONSIDERED. THIS COST DATA HAS BEEN PREPARED FOR ESTIMATION PURPOSES ONLY.

1	**TOWER STRUCTURES**		Lacs
	Span.	350 Mtrs.	
	Total No. of towers in 10 Kms (allowing 2 Towers for short span and one for other end).	10x1000/350 = 28.57 Nos. Say 29+2+1=32 Nos.	
	Angle towers (taking 30% of total No. of towers).	10 Nos.	
	No. of straight towers.	32-10 = 22 Nos.	
	Average weight of Angle towers.	11.6 MT	
	Average weight of straight towers.	6.5 MT	
	Total weight	11.6x10+6.5x22 = 116+143=259 MT	
	Add 20% for extension & templates.	51.80 MT	
	Total tonnage.(MT)	310.80	
	Cost of fabricated galvanized steel @ Rs 89916/MT.	310.80x89916	279.46
	G.I. Nuts & Bolts, 3.5% of Tower material Cost @ Rs 117250/- per MT.	10.88MT	12.76
	Total:		**292.22**

FY-2022-23 **J-2**

2	**ACSR**		Lacs
	Size of ACSR.	420mm^2 Zebra ACSR"	
	Length of ACSR (allowing 1.5% for sag & wastage).	3x10x1.015 = 30.45 Kms.	
	Cost @ Rs 350808/- per Km.		106.82
3	**GROUNDWIRE**		
	Size of single earthwire 110Kgs quality.	7/3.15mm	
	Length of ground wire (allowing 1.5% for sag & wastage).	10x1.015 = 10.15 Kms.	
	Cost @ 40225 Rs / Km		4.08
4	**STRING ASSEMBLIES**		

i)	No. of S.S. String assemblies complete with suspension clamps and 14 Disc Insulators of 70 KN EMS.	20x3 = 60 Nos.	
	(1280+14x678) = Cost @ Rs. 10772/-		6.46
ii)	No. of D.S. String assemblies complete with suspension clamps and 28 disc insulators of 70 KN EMS.	2x3 = 6 Nos.	
	(2077+28x678) = Cost @ Rs 21061/-		1.26
iii)	No. of S.T. String assemblies complete with tension clamps and 15 disc insulators of 160 KN EMS.	6x6 = 36 Nos.	
	(2470+15x958) = Cost @ Rs. 16840/-		6.06
iv)	No. of D.T. String assemblies complete with T-clamps and 30 disc insulators of 160 KN EMS.	4x6 = 24 Nos.	
	(3712+30x958) = Cost @ Rs 32452		7.79
	Total:		**21.58**

FY-2022-23 **J-3**

5	**ACSR ACCESSORIES**		**Lacs**
i)	No. of armoured rod sets complete with ferrules.	22x3 = 66 Nos.	
	Cost @ Rs 1767 per set.	66x1767 = 1,16,622	
ii)	No. of Mid Span compression joints (assuming average drum length 1100 Mtrs.).	30.45x1000/1100 = 27.68 Nos. Say 28 Nos.	
	Cost @ Rs 637 per joint.	17836	
iii)	4 RSB Vibration dampers.	2x3x32 = 192 Nos.	
	Cost @Rs 645	123840	
iv)	Repair sleeves.	5 Nos.	
	Cost @ Rs 234	1170	
	Total:	**259,468.00**	**2.59**
6)	**GROUNDWIRE ACCESSORIES**		
i)	No. of bonding pieces for suspension and tension towers.	22+10x2 = 42 Nos.	
	Cost @ Rs. 363/-	42x363 = 15,246/-	
ii)	No. of suspension clamps.	22 Nos.	

	Cost @ Rs 357/-	7854	
iii)	No. of dead end body including linking devices.	10x2 = 20 Nos.	
	Cost @ Rs 285/-	5700	
iv)	No. of Mid Span compression joints/St joints (assuming average drum length 1600 Mtrs.).	10x1000/1600 = 6.25 Nos.	
	Cost @ Rs. 44/-	Say 7 Nos. 7x44 = 308	
v)	4 RSB Vibration damper 64 Nos. @ Rs 370	23680	
	Total:	**52788**	**0.53**

7) TOWER FIXTURES

Sr. No.	Material	Unit	No. of Fixtures.	Rate (in Rs.)	Amount (in Rs.)
1	Earthing sets.	Set	32	1159	37,088.00
2	Danger plates.	No.	32	195	6,240.00
3	Number plates.	No.	32	182	5,824.00
4	Bird guards for suspension towers. (Set of 3 Nos.)	Set	As per Assumption No. 4		
5	Phase plates (set).	Set	32	331	10592
6	Anti-climbing devices.	No.	As per Assumption No. 4		
7	Circuit Plates.	No.	32	363	11,616.00
8	Barbed wire (Total no. of Towers x 10kg)	Kg	320	91	29,120.00
	Total:				**100,480.00**
					1.0 lacs

FY-2022-23 **J-4**

CONCRETE FOR TOWER FOUNDATIONS

Type of Towers	No. of towers.	Cement (Bag) (50kg)	Sand in (Cum)	Crusher in (Cum)	Steel in (Kgs)
Rate per Unit.		**236**	**1724**	**1656**	**78**
A) STRAIGHT TOWERS	22 Nos.				
Qty. reqd. for 1 No.		102	6.97	13.91	1073
Amount.					
Sub-Total	**142817.24**				

Cost for 22 No. Towers.	31.42 lacs				
B) ANGLE TOWERS 30^{o}	6 Nos.				
Qty. reqd. for 1 No.		238	15.61	31.22	2781
Amount.					
Sub-Total	**351697.96**				
Cost for 6 No. Towers.	21.10 lacs				
C) ANGLE TOWERS 60^{0}	4 Nos.				
Qty. reqd. for 1 No.		302	19.48	38.58	2810
Amount.					
Sub-Total.	**387924.00**				
Cost for 4 No. Towers.	15.52 lacs				
Total (a+b+c)	**68.04**				
5% extra for wastage & 10% for wet locations.	10.21				
Total:	**78.25 lacs**				

FY-2022-23 **J-5**

ABSTRACT OF COST

Sr. No.	Particular	Cost (in Rs) Lacs	Lacs	
1	Tower Structures	292.22		
2	ACSR	106.82		
3	Groundwire.	4.08		
4	String assemblies.	21.58		
5	ACSR accessories.	2.59		
6	Groundwire accessories.	0.53		
7	Tower Fixtures.	1.00		
8	Concrete for foundations.	78.25		
9	**Sub-Total**	**507.07**		
10	Erection charges @ 20% of material cost.	101.41		

11	Transportation charges @ 2.5%	12.68		
12	Cost of 10 Kms run of completely erected line.	621.16		
13	Cost of the one Km run of line.	62.12		
	Say Rs. 62.12 Lacs only			

1.	Cost of one Km Line.	Rs. 62.12	
2.	Cost of other Misc. Expenditure for Erection of one Km Transmission Line.		
i.	Preliminary Expenses for one Km. line (For GEO referencing, survey, preparation of key plan, route plan, profile etc and supply of prints thereof)	Rs. 0.14	
ii.	Cost of Land under Towers of one Km Trans. Line (Area in Sq. mtr x No. of Towers x rates per Sq. mtr) (100x4x826).	Rs. 3.30	
iii.	Crop Compensation charges for one Km distance under 220/132 KV Transmission line.	Rs. 2.06	
iv	Forest Clearance Charges for one Km line	Rs. 0.78	
v.	Compensation charges for private trees for one Km distance under 220/132 KV Transmission lines.	Rs. 0.71	
vi.	PTCC and Re- Engineering charges for one Km. line	Rs. 0.16	
vii	Railway Crossing Charges for one Km. Line.	Rs. 35.40	
	Total	**Rs. 104.67**	
	Say Rs. 104.67 Lacs only		

LB-220

FY- 2022-23

BREAK UP ESTIMATE COST OF 220KV LINEBAY

Description	Cost ref.	Qty.	Qty.	Rate Rs. in Lacs)	Amount (Rs. in Lacs)
1600 Amps., 40KA RC 220KV ckt. Breaker.	E (3)	1 No.	1	12.54	12.54
Isolators with Earth Switch and Insulators.	G(4)	1 No.	1	5.49	5.49
220KV CTs.	C(3)(ii)	1 set (3)	3	3.08	9.24
220KV C&R Panel.	N (1)	1 No.	1	7.92	7.92
Isolators with Insulators.	F (5)	2 Set	2	4.75	9.5
Steel structures for single bus.	T (1)	12 MT	12	0.90	10.8
Control cables.		L/S		Lot	5.2
Bus bar & connecting material		L/S		Lot	5.2
Earthing material.		L/S		Lot	2.77
Sub Total (a)					**68.66**
Transportation , Civil Works , Erection charges, storage & contingency etc. @ 11% on (a)	Annex-I				**7.55**
Grand Total:					**76.21**

Rs 76.21 Lacs only.

	(Rs. in Lacs)
Cost of Electrical equipments including Erection Charges, Stores and contingency etc.	**76.21**
Cost of Land.	**NIL**
Cost of Civil Works	**24.50**
Cost of PLCC equipment for 1 line bay	**22.16**
Total	**122.87**

Rs 122.87 Lacs only

Land rates are taken as NIL because a space required for one bay is covered under Land required for 220/132 KV Sub-Station, cost of which is already covered under Cost of land for the substation.

ANNEXURE-5

DETAILED PROJECT REPORT

FOR

IMPLEMENTATION OF SUBSTATION AUTOMATION AT ALL 220KV SUBSTATIONS OF

PUNJAB STATE TRANSMISSION CORPORATION LIMITED

PSDF - SCHEME

2022-23

For System Improvement

DPR

PUNJAB STATE TRANSMISSION CORPORATION LTD.

April 2022

PREAMBLE

This proposal covers the Detailed Project Report for Provision of Substation Automation System on all 220KV Substations (97 Nos.) of PSTCL for system improvement in the State of Punjab.

****

The total estimated cost of the project is as follows:-

		(Rs. in Crores)
1.	*Cost of Substation Automation of all 220 kV Substations*	**393.98**

Contents

List of Annexures

Annexure No.	Description	Page No.
I	SCOPE AND COST OF WORKS	8

Details of Formats Enclosed

Format No.	Description	Page No.
A-1	Summary of Proposal	9
A-2	Detailed Proposal (DP)	10 to 11
A-3	Summary of detailed project report (DPR)	12 to 13
A-4	Financial implication of scheme	14 to 23
A-5	Brief details of project appraisal by CTU/STU/RPC	24
A-6	Undertaking	25

Detailed Project Report for modernisation of all existing 220 kV substations of Punjab State Transmission Corporation, Ltd. (PSTCL) by implementation of complete Substation Automation System.

1.0 BACKGROUND

Substation Automation Sysmtem (SAS) provides protection, control, automation, monitoring, and communication capabilities as a part of a comprehensive substation control and monitoring solution. Modernisation/ Upgradation of electric power substations, to serve user requirements better for more efficient communication and more comprehensive protection by installing and applying higher-performance IEDs, has become a necessity.

Power Grid Corporation of India (PGCIL) has also modernised its substations for communicating and operating from remote control rooms. PSTCL has already undertaken a pilot project of Substation Automation System of 5 No. 220 kV substations (Mohali-I, Mohali-II, Kharar, Derabassi and Lalru) and these substations are monitored and controlled locally through HMIs (Human Machine Interface) of SAS. Soon these substations can be controlled from remote control centre (RCC, which is Mohali-I in this project) which is the last stage of the project, after commissioning of requisite communication equipments.

Apart from this, in line with best practices recommended by Protmection Sub-Committee (PSC) of NRPC in operation and construction of sub-stations installation of 'Standalone automatic downloading facility in the sub-station for DR (disturbance recorder) output' and 'Centralized Event Logger' at each 220 kV and of higher voltage level substation has been mandated by Indian Electricity Grid Code Regulation, 2010 under Part-4, Section 4.6.3 System Recording Instruments. Installation of SAS will also comply with these requirements as well.

2.0 DESCRIPTION OF THE WORK

The project report covers the cost of SAS implementation of 97 No. 220 kV Substations by retrofitting BCUs, replacement of very old C&R Panels, along with replacement of all the 220/132/66 kV LE Switches and 132/66 kV isolators having manual operating mechanism with motorized ones to make them compatible for complete substation automation.

3.0 PROJECT OBJECTIVES

The objective of the project is to modernise 220 kV Substations in order to achieve remote operation from RCCs in clusters in direction to reap benefits explained in para 1.0.

3.1 Project Highlights

a)	Project	Modernisation of all 220 kV substations of PSTCL by Implementation of complete Substation Automation System
b)	Location of the project	Punjab
c)	Beneficiary State	Punjab
d)	Project cost	₹ **393.98** Crores

3.2 Scope of work

The scheme shall have scope of work as per details given in Annexure-I and same is summarized as under:-

SAS to be implemented at 97 No. 220 kV substations through turnkey basis include procurement, installation, testing and commissioning of various electrical equipments (including control cables).

4.0 TARGET BENEFICIARIES

The target beneficiary of this project is State of Punjab and the entire Northern Grid allowing safe and secure operation of the interconnected Grid.

5.0 LEGAL FRAME WORK

It is proposed to execute the above entire transmission scheme as per provisions of the Indian Electricity Act, 2003 and the rules made there under and the Electricity (Supply) Act, 1910 and 1948, in so far as these are applicable.

6 PROJECT COSTESTIMATE

The estimated cost of the project based on estimated value as detailed in Annexure-I works out to be ₹ **393.98** Crore.

6.1 BASIS OF COST ESTIMATE

Cost of SAS, isolators, LE switches, control cables & cost of erection, commissioning and testing of isolators & LE switches has been taken from previous work order of this organisation after applying suitable escalation.

6.2 FUNDING ARRANGEMENT

The project is eligible for funding as a grant under Power System Development Fund (PSDF) of Ministry of Power, Govt. of India. As per PSDF guidelines for disbursement (No. 10/1/2014-OM dated 18/9/2014), clause 6.3 (i), up to 75% grant is admissible for projects under clause 5.1 d (Renovation and Modernization (R&M) of transmission and distribution systems for relieving congestion). Balance 25% cost shall be met from self contribution by PSTCL.

6.3 MODE OF EXECUTION

Procurement of equipments/material and installation, testing and commissioning thereof will be done on turnkey basis.

7.0 TIME FRAME

The scheme covered in the project is targeted for completion by 30.06.2026.

8.0. TECHNICAL ADVANTAGES/JUSTIFICATION

As concluded from its own experience and from other utilities (PGCIL, GETCO etc.) some of the advantages of SAS have been listed out as under:

1. Helps to reduce man hours for various operation of switchgear, thereby, reduces duration of shutdowns (reduction in "windshield" time for diagnosing devices in the field and operating them from switchyard). These reduced shutdowns will not only enhance reliability and stability of system and transmission of power but also help to relieve congestion in transmission network due to outages.
2. Automatic recording of events and disturbance reports with time stamping shall be used for precise analysis of faults. Remedial measures can be taken to avoid reoccurrence of avoidable situations. Thus availability of transmission elements may be improved.
3. Requisite data regarding system operation is sent directly through gateways of SAS, thus, it obviates the requirement of RTUs in future.
4. After implementation of complete substation automation these substations will be operated in clusters and the manpower withdrawn will be deployed for maintenance of the transmission system.

ANNEXURE-1

SCOPE AND ESTIMATED COST OF PROJECT

Implementation of complete Substation Automation System at all 220 kV substations of Punjab State Transmission Corporation, Ltd. (PSTCL)

Sl. No.	Description	No. of Substations	Estimated Cost	Total Cost
1.	Approximate cost of Substation Automation System equipments for control rooms	97	₹ 2.5 Crore	**₹242.5 Crore**

Replacement of various switchyard equipments to make them compatible with SAS:

Sl. No.	Description	Quantity	Estimated Cost (in ₹)	Total Cost (in ₹)
1.	Approximate cost of changing 220 kV Isolators	661 Nos.	490000	323,890,000.00
2.	Approximate cost of changing 220 kV LE Switches	258 Nos.	554020	142,937,160.00
3.	Approximate cost of changing 132 kV Isolators	162 Nos.	275648.20*	44,655,008.40
4.	Approximate cost of changing 132 kV LE Switches	77 Nos.	310241.30*	23,888,580.10
5	Approximate cost of changing 66 kV Isolators	1388 Nos.	191392.49	265,652,776.12
6	Approximate cost of changing 66 kV LE Switches	580 Nos.	162500	94,250,000.00
Total cost of isolator/LE switches				895273524.62
7	Erection cost for isolator **			89527352.46
8	Cable Cost for replacement of all isolators and LE switches			156278994.20
9	Erection cost of cable**			15627899.42
8.	Total cost of various equipments			1156707770.70
9.	**Grand Total (including SAS)**			3581707770.70
10	**Grand Total after taking inflation @10%**			3939878547.77

Approx. **₹ 393.98 Crores**

Note: -

* Cost of Rs 25000 per isolator for 132 kV isolator and Rs 50000 per LE switch has been incorporated to make it cost of motorised as the PO is for non-motorised equipment.

** Erection cost is taken as 10% of supply cost.

To be filled the Requesting Organization / Project Entity	
1. Name of requesting Organization/Utility	Punjab State Transmission Corporation Ltd. (PSTCL)
2. Short Summary of Project / Scheme /Activity	The Scheme covers implementation of Substation Automation System at 97 Nos. 220 kV Substations of PSTCL in Punjab.
a. Name and location of the Project / Scheme /Activity	Providing Substation Automation System at 97 No. 220 kV Substations in Punjab.
b. Objective of the Project / Scheme /Activity	The objective of the project is installation of Standalone automatic downloading facility in the sub-station for DR (disturbance recorder) output and Centralized Event Logger including remote operation of 220 kV substations.
c. Authorized person for this project / Scheme/ Activity	Name : Er. Arun Garg, Dy.CE/TS(Design),PSTCL, Patiala E-mail. ID : se-trd@pstcl.org Land line No:0175- 2207774 Mobile No. : 96461-17803 Fax No. : 0175-2207774
d. Nature of Project / Scheme/ Activity : Inter – State / Intra – State (Please Specify).	Although Project is Intra – State yet is essential for secure and reliable operation of interconnected Northern Regional Grid.
e. Identified Beneficiaries.	Punjab
f. Merits of the scheme	To provide secure and reliable operation to the interconnected Grid.
g. Limitations, if any	NIL
h. Time frame for Implementation	48 months
i. Estimated cost of Project / Scheme/ Activity	**Rs. 393.98 Crore**
j. Category under which the project is classified (Please refer Para 5.1 of the Guidelines/ Procedure).	Project is classified under Para 5.1 (d) i.e. Renovation and Modernization (R&M) of transmission and distribution systems for relieving congestion.

Date:

Signature : _____

Name : _____

(Authorized Representative)

DETAILED PROPOSAL (DP)

1. Details of the Requesting Organisation/Project Entity.

1.1 Details of Organization / Entity

1.1	Name of Organization / Entity	Punjab State Transmission Corporation Limited
	Acronym or Abbreviation (if application)	PSTCL

1.2. Details of Head of the Organization

Name	:	Mr A. Venu Prasad, IAS
Designation	:	Chairman Cum Managing Director
E-mail Address	:	cmd@pstcl.org
Land line No.	:	(0175) 2212053
Fax No.	:	(0175) 2307779, (0172) 2231712
Address	:	PSTCL, Head Office, The Mall, Patiala
City	:	Patiala
Postal Code	:	147001.

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	:	Er. Arun Garg
Designation	:	Dy. Chief Engineer/TS Design.
E-mail Address	:	se-trd@pstcl.org
Land line No.	:	(0175) 2207774
Mobile No.	:	96461-17803
Fax No.	:	0175-2207774
Address	:	PSTCL, 3rd Floor, Opp. Kali Mata Mandir Shakti Sadan, Patiala.
City	:	Patiala.
Postal Code		147001.

2. Justification of the Proposal.

2.1 Analysis of the objective:-

a. Objective of the scheme is to install Standalone automatic downloading facility in the sub-station for DR (disturbance recorder) output and Centralized Event Logger including remote operation of 220 kV substations in Punjab under PSTCL.

b. The provision of these schemes shall achieve Grid connectivity standards and also ensure compliance to Indian Electricity Grid Code (IEGC) Regulations.

c. The total project cost of Rs. **393.98** crore is proposed to be funded as grant of 75% from PSDF and 25% is to be provided by self contribution.

d. The scheme shall help in achieving safe and reliable operation of interconnected grid system of Northern Region.

2.2 Indentified Source of Funding.

Funding as grant from PSDF @ 75%	=	Rs. 295.4908 Crore.
Self Contribution @ 25%	=	Rs. 98.4969 Crore.

2.3 Details of Activities for Project/scheme/Activity:- Activities under the Project involve Providing Substation Automation System at 97 No. 220 kV Substations of PSTCL whose provision is mandatory as per IEGC regulation.

2.4 Executing Agency.

The project will be got executed by PSTCL through office of Dy. C.E./TS Design, PSTCL, Patiala under CE/TS, PSTCL, Patiala.

2.5 Time line for Implementation of Project/Scheme/Activity

Duration of Project (In 48 months)

Likely Start Date July 2022

Likely Completion Date. June 2026

Date:

Signature : _____

Name : _____

(Authorized Representative)

Format - A3

Summary of Detailed Project Report (DPR)

A Detailed Project Report (DPR) may be given which should include Background, Project Objectives, Beneficiaries, On-going Technology, Management arrangements, Cost Estimates, Time Frame, Success Criteria and Sustainability.

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

Brief Summary of DPR :-

The DPR covers the cost of procurement alongwith associated control cables installation testing and commissioning of Substation Automation System for 97 No. 220 kV substations at an estimated cost of Rs. 3939878547.77/-. The total project cost involved works out to be **Rs. 393.98 Crore.**

Date:

Signature : _____

Name : _____

(Authorized Representative)

Implementation Schedule/ Milestone
Target for Physical Milestones

Timeline of Activities																		
S.No.	Description	Year	2022-2023			2023-2024				2024-2025				2025-2026				2026-2027
		Quarter	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1
1.	Pre-award activities																	
2.	Award & Detailed Engineering and Drawing Approval																	
3.	Manufacturing and Supply of Equipments																	
4.	Receipt, Erection, Testing & Commissioning of equipments																	

Dy. Chief Engineer/TS(Design)
PSTCL, Patiala.

Financial Implication of the Scheme

1. Summary

Sr. No.	Item	Amount (Rs. in Crore)
1	Total Cost Estimate	393.98
2	Funding Proposed from PSDF	295.4908
3	Contribution from Internal Sources	98.4969
4	External Borrowings	-

2. Details

2.1 Cost Estimate :- As per details given in the DPR in Annexure-I (Page No. 8). The copy of approval accorded from Board of Directors of PSTCL is placed as Format – A4 (Page-15). The supporting documents (Quotation for motorized isolators/ LE Switches and previous Work Order/ Amendment for implementation of SAS) for the basis of cost estimation for implementation of SAS are enclosed as Format A4 (Page 16 to 23)

3. Funding

3.1 Funding Proposed from PSDF as grant

75% of the total project cost i.e. Rs. 295.4908 crore.

3.2 Contribution from Internal Sources

25% of the project cost i.e. Rs. 98.4969 crore.

3.3 External Borrowings

NIL

Date:

Signature : _____

Name : _____

(Authorized Representative)

(20)

PUNJAB STATE TRANSMISSION CORPORATION LIMITED
(Regd. Office: PSEB Head Office, The Mall, Patiala-147001)
Corporate Identity Number: U40109PB2010SGC033814
www.pstcl.org (O/o Company Secretary) E-mail: comp-secy@pstcl.org
Tel./Fax No. 0175-2970047

CE (TS)
SE (W&A)
AO (TS)
Sr. P.S.
CE/TS

Subject: CE/TS Agenda Note no. 108/DS-647/TS-VII dated 13.11.2018- Regarding administrative approval for implementation of complete Substation Automation System at all 220 KV substations of PSTCL instead of standalone automatic disturbance report downloading and centralized event logger.

ASE/TS-VII

The decision taken by Board of Directors in its 51st meeting held on 26.11.2018 at VIP Guest House, Mohali, on the above subject is as under:-

"Board considered the proposal and after deliberation, it was decided as under:

4873 17/12/18

i. Based on the scope proposed in agenda note No. 98 dated 21.08.2018, administrative approval for submission of DPR to NLDC for sanction of funds was accorded. A Committee comprising CE/TS, CE/P&M and CE/SLDC was constituted to review the DPR before submission to NLDC.
ii. Approval was accorded for dropping of tender enquiry no. 80/2018-19 floated by P&M organization for implementing complete SAS on Six (6) number 220 KV substations namely Bhari, Bhawanigarh, Majra, Ladowal, Chajjli and Sandhour for the reasons given in the agenda.
iii. Necessary approval of PSERC shall also be taken for the proposed works".

AE-II 17/12/18

This is for information and necessary action under due intimation to this office please

11.12.2018
Company Secretary
PSTCL, Patiala.

To

Chief Engineer/TS,
PSTCL. Patiala.

C.O. No. 1750 /BOD/51.15 /PSTCL

Dated: 11.12.2018

(90)

pstcl

PUNJAB STATE TRANSMISSION CORPORATION LIMITED,
Regd. Office: PSEB Head Office, The Mall, Patiala-147001
Office of Chief Engineer /Transmission System,
Shakti Sadan, Patiala-147001
CIN: U40109PB2010SGC033814
Telephone: 0175-2303676 Email: ase-ts6@pstcl.org FAX 0175-2301536

PURCHASE ORDER CUM CONTRACT AGREEMENT NO. 6081 /TSD-6089/T&S-VI/ SPEC No. STQ 6070 DATED: 13.10.2020.

To

Regd. M/s Elkay Telelinks Ltd.,
Plot No. 141, Sector-24,
Faridabad- 121005 (Haryana).

Memo. No. 804 /TSD-6089/T&S-VI Dated: 13.10.2020

Subject: **Manufacture, testing and delivery of Unarmoured, FRLS PVC outer and inner sheathed, heat resistant PVC insulated annealed, tinned copper control cable against STQ-6070.**

Dear Sir (s),

With reference to your e-bid in response to our Spec. No. STQ 6070, your letter dated 29.09.2020 regarding price negotiation and this office Letter of Award sent vide Memo. No. 753 dated 07.10.2020, I am directed to place on you a detailed Purchase Order for manufacture, assembly, testing, supply & delivery of the following sizes/quantities of FRLS copper control cables at PSTCL's standard terms & conditions and as per PSTCL Spec. No. STQ 6070 as detailed below:-

1.0 DESCRIPTION OF EQUIPMENT AND SCHEDULE OF PRICES & QUANTITIES:-

Sr. No.	Description	Qty.	Unit Variable Ex-works Price (based on negotiated Unit FOR Prices) With base date 01.02.2020	F&I charges	GST @ 18%	Unit all inclusive negotiated F.O.R. Destn. Variable Price	Total F.O.R. Destn. negotiate all inclusive Variable Prices
		In KM	(Rs./KM)	(Rs./KM)	(Rs./KM)	(Rs./KM)	(Rs.)
1.0	Unarmoured FRLS PVC Outer and inner sheathed, Heat Resistant PVC insulated copper control cable with stranded 7 wires per core, annealed, tinned high conductivity electrolytic copper conductor conforming to relevant Indian Standards & Annexure-B & C of this purchase order and of the following sizes:-		Variable				
1.1	2CX2.5 mm^2	36	42674.19	1387.42	7931.09	51992.70	1871737.20
1.2	4CX2.5 mm^2	51	72673.34	2310.47	13497.09	88480.90	4512525.90
1.3	7CX2.5 mm^2	23	116588.51	3755.68	21661.96	142006.15	3266141.45
1.4	9CX2.5 mm^2	15	154152.26	4855.03	28621.31	187628.60	2814429.00
1.5	12CX2.5 mm^2	23	199929.97	6256.13	37113.50	243299.60	5595890.80
1.6	16CX2.5 mm^2	38	261265.00	8165.25	48497.45	317927.70	12081252.60
			Total				30141976.95

(Rupees Three Crore One Lacs, Forty One thousand, Nine hundred Seventy Six and paisa Ninety Five only)

2.0 PRICES & PRICE VARIATION

2.1 PRICES:

Prices are **'VARIABLE with base date 01.02.2020** & F.O.R. Destination basis anywhere in Punjab inclusive of GST@ 18%, Freight & transit insurance charges, packing, forwarding & handling charges. The statutory variation in the taxes within contractual delivery period shall be to PSTCL's account and shall be payable on ex-works prices and F&I. The statutory levies shall be paid against documentary proof only. Statutory taxes shall be paid after allowing all abatements/discounts/exemptions permissible under the relevant act so as to ensure least payout of PSTCL.

2.2 PRICE VARIATION:

The Ex-works price are variable as per under mentioned IEEMA's price variation formula for copper conductor PVC insulated 1.1 KV control cables (without armour). The basic prices will be those as per IEEMA's circular for the month Feb-2020.

(1)

pstcl

PUNJAB STATE TRANSMISSION CORPORATION LIMITED,

(A Punjab Govt. Undertaking)
Regd Office: PSEB Head Office, The Mall, Patiala.147001.
Office of: Dy. Chief Engineer/TS(Design),
First Floor, Shakti Sadan, Opp. Kali Mata Mandir, Patiala-147001.
Telefax-0175-2207774 email: se-trd@pstcl.org
Corporate Identity No. U40109PB2010SGC033814
Website : www.pstcl.org

PURCHASE ORDER CUM CONTRACT AGREEMENT NO. STP- 5166 / SPEC. NO. STQ-5135 DATED- 07.01.2022

To

M/S Engineers Enterprises.,
Road No. 14,V.K.I Area,
Jaipur - 302013.

Email- engineersenterprises1975@gmail.com

Memo No. 85 Dt. 07/01/2022

Subject: **Design, Manufacture, testing, supply and delivery of 132kV 1250A Isolators, 132 kV 800A Isolators & 132 kV 800A Isolators with Earth Switch against PSTCL Spec. STQ-5135.**

Dear Sir(s),

With reference to your offer in response to PSTCL Spec. No. STQ-5135, your office letter no. PSTCL/EE/2021-22/STQ-5135/Price Discount/01 dt. 06.01.2022, this office LOA issued vide memo no. 44/STQ-5135 dt. 07.01.2022 and other correspondence on the subject matter, I am directed to place on you a detailed purchase order for design, manufacture, testing, supply and delivery of following equipment at VARIABLE rates and on PSTCL's standard terms & conditions/specifications as detailed below:

Sr. no.	DESCRIPTION	Qty.			Unit FOR Destn. VARIABLE price incl. GST and F&I Charges (Rs.)	Total FOR Destn. price. (Rs.)
		For P&M	For Planned Works	Total		
1.	<u>132 KV, 1250 Amp Isolators with Solid Core Insulators:-</u> 132 KV, 1250 Amp. Pressure Relieving type double break with center post rotating, triple pole, Gang operated, Outdoor type , silver plated	Nil	08	08	2,50,648.20	20,05,185.60

2

	contacts, isolating switch for horizontal mounting complete in all respects including Phase mounting channel, operating rods/pipes, operating mechanism provided with the arrangements for pad locking isolators both in 'ON' & 'OFF' position. (without supporting structure & with **SOLID CORE Insulators**) and in addition fitted with mechanically interlocked triple pole line earthing switch with separate manually operated mechanism provided with additional padlock arrangement as well as four pairs of auxiliary NO/NC contacts to indicate ON/OFF position of line earthing switch and provided with the following fittings and accessories: i) Aux. Switch with 6 pairs of contacts in open and 6 pairs of contacts in closed position assembled in weather proof housing. ii) Arcing contacts of make before and break after type. iii) Adjustable rod gaps for insulation co-ordination. iv) Bimetallic connectors suitable for 0.4 sq. inch Twin ACSR 'ZEBRA' conductor and also shall be suitable for Horizontal/Vertical mounting. v) Electrical Interlock between isolators and C.B. suitable for 220V D.C. operation vi) Cable glands for terminating multi core control cables in auxiliary switch box. vii) Provision for padlocking the isolator both in ON/OFF position.						
2.	<u>132 KV, 800 Amp Isolators with Solid Core Insulators:-</u> 132 KV, 800 Amp. Pressure Relieving type double break with	06	22	28	2,15,770.48	60,41,573.44

	center post rotating, triple pole, Gang operated, Outdoor type , silver plated contacts, isolating switch for horizontal mounting complete in all respects including Phase mounting channel, operating rods/pipes, operating mechanism provided with the arrangements for pad locking isolators both in 'ON' & 'OFF' position. (without supporting structure & with **SOLID CORE Insulators**) and in addition fitted with mechanically interlocked triple pole line earthing switch with separate manually operated mechanism provided with additional padlock arrangement as well as four pairs of auxiliary NO/NC contacts to indicate ON/OFF position of line earthing switch and provided with the following fittings and accessories: i) Aux. Switch with 6 pairs of contacts in open and 6 pairs of contacts in closed position assembled in weather proof housing. ii) Arcing contacts of make before and break after type. iii) Adjustable rod gaps for insulation co-ordination. iv) Bimetallic connectors suitable for 0.4 sq. inch Twin ACSR 'ZEBRA' conductor and also shall be suitable for Horizontal/Vertical mounting. v) Electrical Interlock between isolators and C.B. suitable for 220V D.C. operation vi)Cable glands for terminating multi core control cables in auxiliary switch box. vii) Provision for padlocking the isolator both in ON/OFF position.					
3.	**<u>132 KV, 800 Amp. Isolator with Earth switch with Solid Core Insulators:-</u>**	09	13	22	2,60,241.30	57,25,308.60

	132 KV, 800 Amp. Pressure Relieving type double break with center post rotating, triple pole, Gang operated, Outdoor type, silver plated contacts, isolating switch for horizontal mounting complete in all respects including Phase mounting channel, operating rods/pipes, operating mechanism provided with the arrangements for pad locking isolators both in 'ON' & 'OFF' position (without supporting structure) in addition fitted with mechanically interlocked triple pole line earthing switch with separate manually operating mechanism provided with additional padlock arrangement as well as four pairs of auxiliary NO/NC contacts to indicate ON/OFF position of line earthing switch and provided with the following fittings and accessories: i) Aux. Switch with 6 pairs of contacts in open and 6 pairs of contacts in closed position assembled in weather proof housing. ii) Arcing contacts of make before and break after type. iii) Adjustable rod gaps for insulation co-ordination. iv) Bimetallic connectors suitable for 0.4 sq. inch Twin ACSR 'ZEBRA' conductor and also shall be suitable for Horizontal/Vertical mounting. v) Electrical Interlock between isolators and C.B. suitable for 220V D.C. operation vi) Cable glands for terminating multi core control cables in auxiliary switch box. Provision for padlocking the isolator both in ON/OFF position.						
						TOTAL	1,37,72,067.64
	(One Crore Thirty Seven Lac Seventy Two Thousand Sixty Seven rupees and Sixty Four paise only)						

2. PRICES:

The above prices are VARIABLE and are FOR destination any railway station in Punjab or PSTCL store through road transport. Price are inclusive of applicable taxes/duties, packing, forwarding, GST, freight & Insurance charges but exclusive of octroi. The present prevailing rate of GST @ 18%. Statutory taxes shall be paid after allowing all abatements/discounts/ exemptions permissible under the relevant act so as to ensure least payout for PSTCL. The breakup of prices is as follows:

Description	Item No. 1 132 KV, 1250 A Isolators	Item No. 2 132KV, 800A Isolators	Item No. 3 132KV, 800A Isolators with Earth Switch
1. Unit Ex-works	2,12,413.73	1,82,856.34	2,20,543.48
2. F&I (Rs.)	0.00	0.00	0.00
3. GST @ 18%	38,234.47	32,914.14	39,697.82
4. TOTAL	2,50,648.20	2,15,770.48	2,60,241.30

The PV Formula is as under:- Base date (09/2021)

$$P = \frac{Po}{100}\left\{19 + 17\frac{IS}{ISo} + 17\frac{C}{Co} + 13\frac{AL}{ALo} + 19\frac{IN}{INo} + 15\frac{W}{Wo}\right\}$$

The price variation on the base price of component elements as prevailing on the first working day of the calendar month one month prior to the date of tender opening, should form the basis for quoting variable rates. However, price adjustment shall be made on corresponding rates of variable elements prevailing on the first day/first working day of one month prior to (as prescribed in the price variation Formula) the date of readiness of material intimated in the offer by the firm for inspection or the date on which the offer for inspection of material is duly received in the concerned office (which is later), if the date of readiness of material is not specified in the offer.

In case of delayed deliveries, the purchaser reserves the right to make payments for price variation on the basis of price computed according to the contractual delivery date or actual delivery date whichever is advantageous to the purchaser.

Wherever the prices of raw material are controlled by the Government, the basis shall be Government notification from time to time and in the remaining cases, notifications/ circulars issued by recognized associations like IEEMA, CACMAI etc.

3. TERMS OF PAYMENT:

a. 100% payment of contract value pro-rata for each consignment of operationally complete equipment dispatched after approval of Inspecting Authority/Test Certificate etc. along with taxes & duties and other Statutory levies as per contract shall be paid within 45 days against receipted challans alongwith all requisite documents like bills, receipted challans/GRN, insurance cover, GST Invoice, GST certificates, test certificates, other literature, commissioning/ clearance certificate of the equipment etc. subject to furnishing a Bank Guarantee of 5% of the amount valid for a period of three months after the receipt of operationally complete

2

(1)

pstcl

PUNJAB STATE TRANSMISSION CORPORATION LIMITED,

(A Punjab Govt. Undertaking)
Regd Office: PSEB Head Office, The Mall, Patiala.147001.
Office of: Dy. Chief Engineer/TS(Design),
First Floor, Shakti Sadan, Opp. Kali Mata Mandir, Patiala-147001.
Telefax-0175-2207774 email: se-trd@pstcl.org
Corporate Identity No. U40109PB2010SGC033814
Website : www.pstcl.org

PURCHASE ORDER CUM CONTRACT AGREEMENT NO. STP-5168 / SPEC. NO. STQ-5133 DATED- 07.01.2022.

To

M/S Engineers Enterprises., Email- engineersenterprises1975@gmail.com
Road No. 14,V.K.I Area,
Jaipur - 302013.

Memo No. 117 /STQ-5133 Dt. 07/01/2022

Subject: **Design, Manufacture, testing, supply and delivery of 66KV Isolators and 66KV Isolators with earth switch of various rating (Manual & Motorized) against PSTCL Spec. STQ-5133.**

Dear Sir(s),

With reference to your offer in response to PSTCL Spec. No. STQ-5133, your office letter no. PSTCL/EE/2021-11/STQ-5133/LOI/66kV Iso/01 dt. 06.01.2022, this office LOI issued vide memo no. 31/STQ-5133 dt. 06.01.22 and other correspondence on the subject matter, I am directed to place on you a detailed purchase order for design, manufacture, testing, supply and delivery of following equipment at negotiated VARIABLE rates and on PSTCL's standard terms & conditions/specifications as detailed below:

Sr. no.	DESCRIPTION	Qty.	Unit FOR Destn. price incl. GST and F&I Charges . (Rs.)	Total FOR Destn. price. (Rs.)
1.	66kV 2000A Isolators with Solid Core Insulators(Manual)	06	1,61,215.60	9,67,293.60
2.	66kV 2000A Isolators with Solid Core Insulators(Motorized)	02	1,91,392.49	3,82,784.98
3.	66kV 1250A Isolators with Solid Core Insulators(Manual)	02	1,36,630.00	2,73,260.00
4.	66kV 1250A Isolators with Solid Core Insulators(Motorized)	02	1,63,250.00	3,26,500.00
5.	66kV 800A Isolators with Solid Core Insulators(Motorized)	02	1,44,005.20	2,88,010.40
6.	66kV 800A Isolators with Earth switch with Solid Core Insulators (Manual)	06	1,33,580.00	8,01,480.00
7.	66kV 800A Isolators with Earth switch with Solid Core Insulators Motorized)	04	1,62,500.00	6,50,000.00
TOTAL				36,89,328.98
(Thirty Six Lac Eighty Nine Thousand Three Hundred Twenty Eight Rupees and Ninety Eight Paise only)				

2

Ltd. Howrah and M/s G Nandy & Co., Howrah. Accordingly, the Price Bids of the 2 no. firms i.e. M/s Elektrolites (Power) Pvt. Ltd., Jaipur and M/s Faraday Electricals Pvt. Ltd., Jaipur were opened on 31.12.2021 followed by reverse auction.

Comparative statement duly pre-audited by AO/TS is reproduced as follows:-

220 KV 1600Amp Isolators (NIT Qty - 100 nos.)

Sr. No.	Name of Firm	Qty Offered (Nos.)	Ex-works Variable price after Reverse Auction (Rs)	F&I Charges (Rs)	GST @ 18% (Rs.)	Unit FOR Destn Variable price after RA (Rs)	MP	Unit FOR Destn Variable price before RA (Rs)
1	2	3	4	5	6=(4+5)*0.18	7=4+5+6	8	9
1	M/s Faraday Electricals, Jaipur	60	409254.24	6000.00	74745.76	490000.00	L-1	501500.00
2	M/s Elektrolites (Power) Pvt. Ltd. Jaipur	60	419081.00	12600.00	77702.58	509383.58	L-2	509383.58

220KV 1600Amp Isolators with Earth Switch (NIT Qty - 30nos.)

Sr. No.	Name of Firm	Qty Offered (Nos.)	Ex-works Variable price after Reverse Auction (Rs)	F&I Charges (Rs)	GST @ 18% (Rs.)	Unit FOR Destn Variable price after RA (Rs)	MP	Unit FOR Destn Variable price before RA (Rs)
1	2	3	4	5	6=(4+5)*0.18	7=4+5+6	8	9
1	M/s Elektrolites (Power) Pvt. Ltd. Jaipur	30	456008.47	13500.00	84511.53	554020.00	L-1	625732.76
2	M/s Faraday Electricals, Jaipur	18	509000.00	6000.00	92700.00	607700.00	L-2	607700.00

4.0 DISCUSSION OF BIDS:-

4.1 M/S Elektrolites (Power) Pvt. Ltd., Jaipur:

4.1.1 Merit position of the firm is as under :-

Sr. No.	Item	Merit Position After reverse auction	Unit FOR Destination Price (Rs.) Before Reverse Auction	Unit FOR unit Destination Price (Rs.) After Reverse Auction
1.	220kV 2000A Isolators	L-2	5,09,383.58	5,09,383.58
2.	220kV 1600A Isolators with earth switch	L-1	6,25,732.76	5,54,020.00

Calculations of control cables

	For 220 kV Isolator		For 220 kV LE switches		For 132 Isolator		For 132 kV LE switches		For 66kV switches		For 66 kV LE switches	
Cables Requirement	9 CORE	4 core	9 CORE	4 core	9 CORE	4 core	9 CORE	4 core	9 CORE C	4 core	9 CORE	4 core
Approx. Distance from CR (in m)	250	25	250 * 2	25	200	25	200*2	25	200	25	200	25
Rate of respective cables (Rs/m)	187.628	88.48	187.628	88.48	187.628	88.48	187.628	88.48	187.628	88.48	187.628	88.48
Total Rate of Respective CC	31474597	1484252	23922570	564060	6079147.2	358344	5929044.8	174748	41578364.8	2450896	41053006	1209964

Total Rate of Control Cables	₹ 156,278,994.20

Format –A6

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

I, _____, son of Sh. _____resident of Patiala presently working as CAO/Finance and Audit in the Punjab State Transmission Corporation Limited hereby undertake to comply with the following terms and conditions with regard to funding of implementation of Substation Automation System for 220 kV Sub-stations of PSTCL 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.**

Date:

Signature : _____

Name : _____

(Authorized Representative)

Format –A5

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.

(To be filled after appraisal is received)

Date:

Signature : _____

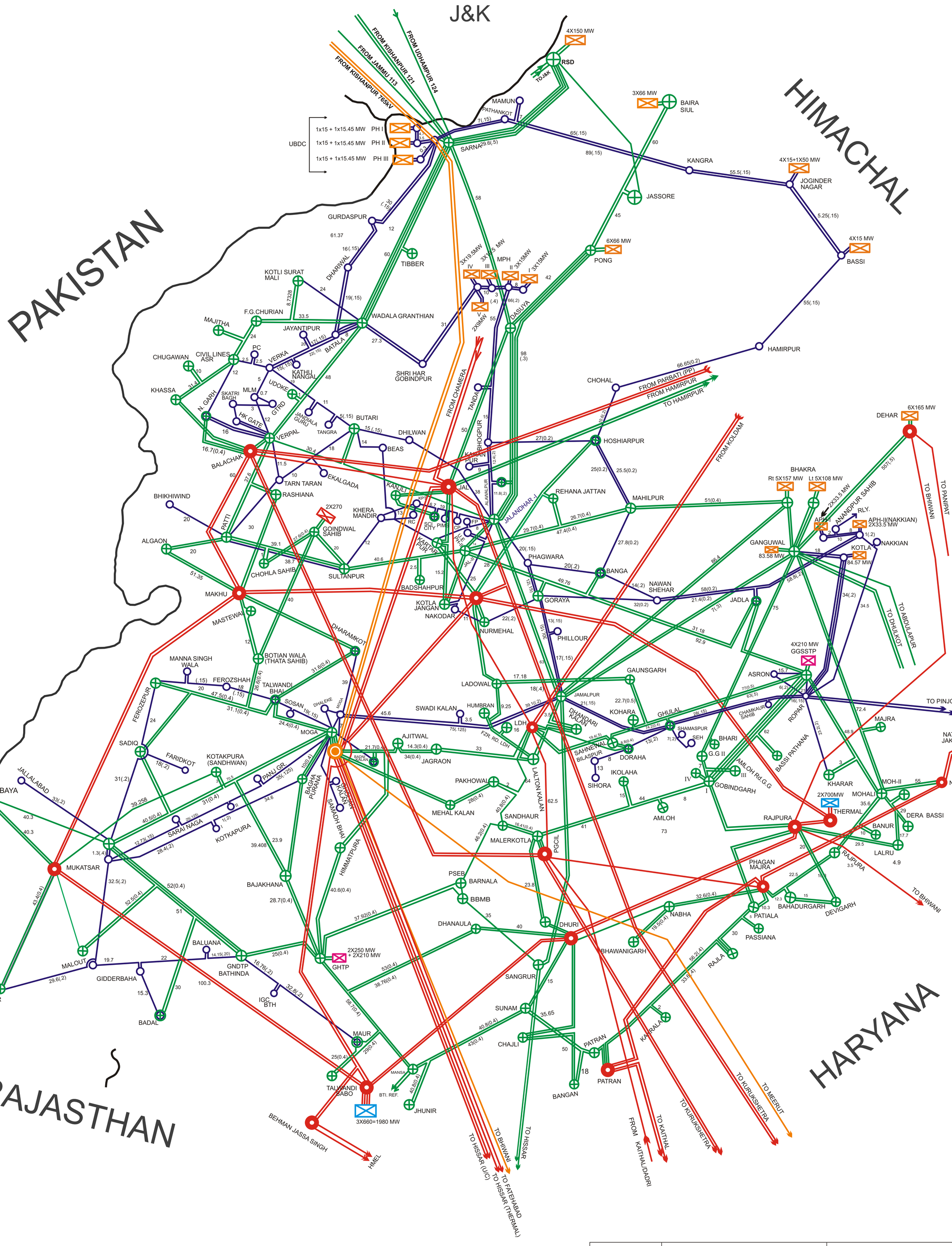
Name : _____

(Authorized Representative)

PUNJAB STATE TRANSMISSION CORPORATION LIMITED

TRANSMISSION MAP OF PUNJAB

132 KV & ABOVE UP TO MAY 2022



LEGEND		Existing			Proposed		
Sr.No	Description	Trans Lines	Grid Sub Stn	Power Houses	Trans Lines	Grid Sub Stn	Power Houses
1	132 KV SC / DC			Thermal			Thermal
2	220 KV SC / DC			Hydro			Hydro
3	400 KV SC / DC			Thermal			Thermal
4	765 KV SC / DC						

ISSUED BY PLANNING PSTCL

NOTE: LINE LENGTH ARE INDICATED IN KMS ALONG WITH LINES
CONDUCTOR SIZE OF ALL 220 KV LINES IS 0.4 SQ INCH
ACSR ZEBRA AND OF 132 KV LINES IS 0.2 SQ INCH
ACSR PANTHER UNLESS INDICATED OTHERWISE.

Annexure-7

Capital Expenditure	
Financial Year	**Capex (in Cr.)**
2017-18	351
2018-19	262
2019-20	226
2020-21	219
2021-22	321

Annexure-8

	Sr No. as per CIP Order	Particulars	Network Addition	Scope of Work	Project Start Date	Actual/ Anticipated Year of completion	Reasons for delay of work	Total CAPEX 17-26	TOTAL Approved as per CIP 1st & 2nd	Reasons for cost escalation
Spill Over Works of 1st Control Period (From FY 2017-18 to FY 2019-20)										
2	**120**	220 kV S/Stn Sherpur (Focal Point) (U/G from 66 kV grid with 220 kV side GIS and 66 kV side Conventional)			27/11/2020	2023-24	Start of work got delayed due to shifting of 11 kV feeders and dismantlement of old building/ water tank by PSPCL. The site was cleared by PSPCL in March, 2021 and was handed over to the contractor for execution of work. Now the work of control room and yard.is in progress.	48.08	16.55	Partial Capital investment was got approved in 1st/2nd CIP. Project cost is higher being GIS.
Table No. 13 Spill Over Works approved by the Board in FY 2019-20 outside the first MYT										
20	**1a**	132 kV Faridkot – Kotkapur-2 SC link (Amendment no. 16 / 2018-19)	30 Kms		31/10/2019	3/2024	Work has been delayed due to court case.A legal opinion is being sought for further course of action as . Price bid has already been opened.	20.05	12.9	Partial Capital investment was got approved in 2nd CIP.
	1b			2 no. 132 kV line bays (one at each end)	Apr 23	Dec 23	Work in progress. to be completed by 12/23.			
21	**2a**	132 kV Sihora-132 kV Seh SC line	31 Kms		01/2021	06/2023	ROW issues.	15.47	12.18	Partial Capital investment was got approved in 2nd CIP.
22	**4**	220 kV S/S Beas (new)	2x100 MVA 220/132 kV Auto T/F		2023-24	2025-26	Project cost is more than 50 cr but land is to be given free of cost by Radha Swami Dera Beas as such TBCB guidelines (as per Tariff Policy 2016 read with PSERC notification no. 132 dated 05.11.2018(Annexure-A) and MOP GOI letter no. 15/2/2017-Trans-Pt(1) dated 15.03.2021)(Annexure-B) are not applicable.	52.36	1	Capex approved in 2nd MYT was just for survey work, which was only partial cost of the project.
			6x132kV line bays (Existing 3 and additional 3)							
		132KV S/S system at Butari will be dismantled.	LILO of Butari – BBMB Jalandhar at PGCIL Jalandhar 2.5Km 0.4Sq" and subsequently LILO of PGCIL Jalandhar-Butari at Beas 22.5Km 0.4Sq"							
		Bypassing 132 Kv Beas line to Tangra & Dhilwan-Beas/Butari to Ekalgadda after LILO of Dhilwan-Butari at Beas (new)	Shifting of 132kV system from 220kV Butari (1 Km length) by LILO of 132 KV Dhilwan - Butari at Beas 1.5 KMs with some portion on Modern Techniques Total Length 2.5 Km							

Annexure-8

	Sr No. as per CIP Order	Particulars	Network Addition	Scope of Work	Project Start Date	Actual/ Anticipated Year of completion	Reasons for delay of work	Total CAPEX 17-26	TOTAL Approved as per CIP 1st & 2nd	Reasons for cost escalation
			2x132kV towers dismantlement & 3nos. Towers to be erected							
			Conversion of 132kV Tarn taran -Butari-Ekalgadda T-off to LILO 15Km 0.2 Sq"							
			132KV D/C Beas - Ekalgadda Line 30 Kms 0.2 Sq"							
23	**7**	OPGW			21-22	23-24	Work under progress. 50% funding Under Power System Development Fund (PSDF) i.e. Rs 33.05 Cr, and balance amount of Rs. 66.24 Cr – Rs 33.05 cr = Rs 33.19 Cr as PSTCL share. (DPR cost = Rs 66.10 Cr)	57.76	37.05	Projections given and actual expenditure incurred during the project period also includes the funding amount also, which is not included in the aprroved Project cost by the commission .
24	**10**	220 kV Dhandari Kalan - 2		2x160 MVA, 220/66 kV T/F at new location to be added (with complete newICT bays	2022-23	March 24	This sub-station caters industrial load and this work requires multiple shutdowns due to which work got delayed.	33.05	22.94	Partial Capital investment was got approved in 2nd CIP.
25	**11**			dismantlement of 2x100 MVA T/F for creating space for double bus bar	2022-23	March 24				
26	**12**			interconnecting 66 kV double bus bar of dhandarikalan 1- dhandarikalan 2	02-2020	March 24				

Annexure-8

	Sr No. as per CIP Order	Particulars	Network Addition	Scope of Work	Project Start Date	Actual/ Anticipated Year of completion	Reasons for delay of work	Total CAPEX 17-26	TOTAL Approved as per CIP 1st & 2nd	Reasons for cost escalation
Table 17 : Spill over of New Works planned for the 2nd Control Period from FY 2020-21 to 2022-23										
36	**10**	400 kV Dhanansu(already planned) its additional 400 kV link required	400 kV bays 2 no.		2023-24	2024-25	Tendering work under process.	3.57	1.19	Partial Capital investment was got approved in 2nd CIP.
50	**29**	Augmentation/additions of transformers at 220/132 kV level.	(L.S. provision)	For augmentation and addition of 220 kV as well as 132 kV transformers, as per the unforeseen/emergent loading requirements, an approximate provision of 5 Cr..s per year (i.e. 3 transformers per year) has been made.	21-22	24-25	Work in progress.	46.27	37.53	This is lumpsum provision and requirement is generated in normal course of time which is to be executed in shortspan of time . Expenditure may increase or decrease depending upon the requirement of works of transmission system. These works are added as and when identified by field offices with the approval of BOD's of PSTCL and are being completted priority wise.
52	**31**	New 220 kV Jhoke HariHar (New)		U/g of 66 kV Jhoke Harihar to 220 kV with installation of 1X 100 MVA, 220/66 kV T/F (including 2 Nos. line bays, 1 No. T/F bay and 1 No. B/C bay)	2023-24	2025-26	Earlier this project was under study with approved CIP of 23.28 crores but now scope has been finalised and Amendment No. 11/21-22 dated 08.07.21 issued and ratified by BOD. Right to use not finalised.	29.75	19.865	Work of Addl. 1 No. 100 MVA T/f at Jhoke harihar is included in new works of 3rd CIP. The projections of that work is included in this work, the expenditure of new work will not included in this work.
53	**32**	220 kV Gurdaspur including SAS of RS 1 cr	LILO of one ckt of 220 kV wadalagranthian- sarna line DC on DC 2xDC, conductor size 0.4sq", LILO length 5 km(approx)	0	12/2020	03/2024	Grid work was to be taken in hand only after the completion of line . Now ROW is clear, so civil work has started at site.	7.51	4.41	Partial Capital investment was got approved in 2nd CIP.

Annexure-8

	Sr No. as per CIP Order	Particulars	Network Addition	Scope of Work	Project Start Date	Actual/ Anticipated Year of completion	Reasons for delay of work	Total CAPEX 17-26	TOTAL Approved as per CIP 1st & 2nd	Reasons for cost escalation
66	**71**	Second source of battery at various 220/132 kV S/s of PSTCL	0	Balance work for 49 Nos grids (out of these 31 Nos are 220 kV & remaining 18 Nos are 132 kV S/s) Total cost = 15 Cr..s (with 70% PSDF funding & remaining to be arranged through capital investment)	2023-24	2024-25	PSDF funding sanctioned in the month of March 22 for 67 No. Grids. PSDF funding is 5.91crore (project dost 11.67). PSDF sanctioned late.	8.93	5.21	Projections given and actual expenditure incurred during the project period also includes the funding amount also, which is not included in the aprroved Project cost by the commission

Note: The escalation of around 20% generally occurs for projects because projections are given at time of submission of MYT and there is increase in cost of material due to time gap between submission of MYT & actual execution of projects. So reasons have been provided only for works where escalation has been more than 20%. So the same may kindly be accepted please.

	Sr No. as per CIP Order	Particulars	Scope of Work	CIP approved for 2nd Control Period (in Cr)	Total Cost of Project	Project Start Date/ Zero Date	Actual/ Anticipated Year of completion	CWIP UPTO 2020-21				
								Works Exp	EC	IDC	Total	
												Works Exp
(A) : Spill Over Works of 1st MYT Control Period (From FY 2017-20)												
1	1	Scheme for providing 45 Nos Remote Terminal Units for SCADA/EMS system at 220 & 132 KV Substations of PSTCL in Punjab (Spill over from 1st MYT)	Supply and installation of 45 nos RTUs	0 480	6 720	22 03 18	2023-24	1 37	0	0	1 37	0 5509
2	2	Centralised AC system, Furniture & Fixtures (including office ACs)(Spill over from 1st MYT)	Centralised AC system, Furniture & Fixtures (including office ACs)	1.760	1.450	01.04 20	2024-25	0	0	0	0	0 0479
3	3	IT equipments including Server, computer, Displays, software etc. for SLDC, Web site and its offices. (Spill over from 1st MYT)	IT equipments including Server, computer, Displays, software etc. for SLDC, Web site and its offices.	0 380	0 300	01.04 20	2022-23	0	0	0	0	0
Total (A)				2.620	8.470	0.00	0.00	1.37	0.00	0.00	1.37	0.60
(B) : Spill Over Works of 2nd MYT Control Period (From FY 2020-23)												
4	4	Implementation of SAMAST scheme in Punjab (Procurement of meters, communication equipments and Hardware and software for Scheduling, Accounting, Metering and settlement of transaction of Electricity)(Spill over from 2nd MYT)	Implementation of SAMAST scheme in Punjab.	22 520	22.520	04.03.22	2023-24	0	0	0	0	0
5	5	Procurement/ Replacement of RTUs for various substations of PSTCL (66 nos. RTUs) (Spill over from 2nd MYT)	Out of 66 No, 45 No. RTU have been procured out of which 44 nos. have been installed. Fresh tender enquiry shall be floated for remaining 21 nos. RTUs + 9 nos. more RTUs against future/damaged/outlived RTUs	13 640	9 660	28 02 22	2024-25	0	0	0	0	5.2672
6	6	Extension of SLDC Building (Spill over from 2nd MYT)	Extension of building Shall be required for equipment under ULDC Phase 3/New Parking Shed/UNMS(Unified Network Management System) project	1 930	1.930	01.04 23	2025-26	0	0	0	0	0
Total (B)				38.090	34.110	0	0	0	0	0	0	5.2672
Total C (A+B)				40.710	42.600	0.00	0.00	1.37	0.00	0.00	1.37	5.87
New works for MYT 2023-26												
1		Purchase of equipment/software as per instructions of central agencies like NLDC, NCIIPC, CERT-IN, for cyber security etc. or any other unforeseen SLDC related works.	Purchase of IT equipment/software as per instructions of central agencies like NLDC, NCIIPC, CERT-IN, for cyber security etc. or any other unforeseen SLDC related works (i e. for RTU, IT, SAMAST, etc)	NIL	1 500	01.04 23	2025-26	0	0	0	0	0
2		ULDC Phase III (Under Study)	Replacement of SCADA System. The proposal for this work is under review at center level. This work will be covered under capital works only in case proposal of execution through tariff mode is rejected	NIL	As per MoP, this project is to be implemented by CTU (PGCIL), the modalities of which are under discussion							
Total					1.500	0	0	0	0	0	0	0
66 Nos ABT Meters												0.1194
47 Nos. RTU												0.08495
Total												0.07

Note : The approved work mentioned at Sr. No. 7 of 2nd MYT "OPGW laid by PGCIL under package V on turnkey basis" is being dealt by P&M Organisation.

CAPEX during 2021-22			Capitalization during 2021-22				CWIP Upto 2021-22				CAPEX during 2022-23				C
		Total				Total								Total	
EC	IDC		Works Exp	EC	IDC		Works Exp	EC	IDC	Total	Works Exp	EC	IDC		Works Exp
0	0.0246	0.5757	0	0	0	0	1.9209	0	0.0246	1.9457	0.75	0	0.025	0.775	1.5
0	0	0.0479	0.0479	0	0	0.0479	0	0	0	0	0.3	0	0	0.3	0
0	0	0	0	0	0	0	0	0	0	0	0.3	0	0	0.3	0.3
0.00	0.02	0.62	0.05	0.00	0.00	0.05	1.92	0.00	0.02	1.95	1.35	0.00	0.03	1.38	1.80
0	0	0	0	0	0	0	0	0	0	0	18.52	0	0	18.52	0
0	0	5.2672	0.1149	0	0	0.1149	5.1523	0	0	5.1523	1.5	0	0.025	1.525	6.2926
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	5.2672	0.1149	0	0	0.1149	5.1523	0	0	5.1523	20.02	0	0.026	20.046	6.2926
0.00	0.02	5.89	0.16	0.00	0.00	0.16	7.07	0.00	0.02	7.10	21.87	0.00	0.05	21.42	8.09
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

stage.

0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			0.527												
0.00	0.02														

pitalization during 2022-23			CWIP Upto 2022-23				CAPEX during 2023-24				Capitalization during 2023-24				
		Total								Total				Total	
EC	IDC		Works Exp	EC	IDC	Total	Works Exp	EC	IDC		Works Exp	EC	IDC		Works Exp
0	0.025	1.525	1.1709	0	0.0248	1.1957	0.050	0.000	0.025	0.075	1.221	0.000	0.050	1.271	0.000
0	0	0	0.3	0	0	0.3	0.700	0.000	0.000	0.700	1.000	0.000	0.000	1.000	0.000
0	0	0.3	0	0	0	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.00	0.03	1.83	1.47	0.00	0.02	1.50	0.750	0.000	0.025	0.775	2.221	0.000	0.050	2.271	0.000
0	0	0	18.52	0	0	18.52	4.000	0.000	0.000	4.000	22.520	0.000	0.000	22.520	0.000
0	0.025	0.3176	0.3597	0	0	0.3597	2.500	0.000	0.000	2.500	0.000	0.000	0.000	0.000	2.860
0	0	0	0	0	0	0	0.500	0.000	0.000	0.500	0.000	0.000	0.000	0.000	0.500
0	0.025	0.3176	18.8797	0	0	18.8797	7.000	0.000	0.000	7.000	22.520	0.000	0.000	22.520	3.360
0.00	0.05	8.14	20.35	0.00	0.02	20.38	7.750	0.000	0.025	7.775	24.741	0.000	0.050	24.791	3.360
0	0	0	0	0	0	0	0.500	0.000	0.000	0.500	0.000	0.000	0.000	0.000	0.500
0	0	0	0	0	0	0	0.5	0	0	0.5	0	0	0	0	0.5

CWIP Upto 2023-24			CAPEX during 2024-25				Capitalization during 2024-25				CWIP Upto 2024-25				CAPEX du	
						Total				Total						
EC	IDC	Total	Works Exp	EC	IDC		Works Exp	EC	IDC		Works Exp	EC	IDC	Total	Works Exp	EC
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000
0.000	0.000	0.000	0.400	0.000	0.000	0.400	0.400	0.000	0.000	0.400	0.000	0.000	0.000	0.00	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000
0.000	0.000	0.000	0.400	0.000	0.000	0.400	0.400	0.000	0.000	0.400	0.000	0.000	0.000	0.00	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	2.860	0.200	0.000	0.025	0.225	3.060	0.000	0.025	3.085	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.500	1.000	0.000	0.000	1.000	1.500	0.000	0.000	1.500	0.000	0.000	0.000	0.000	0.430	0.000
0.000	0.000	3.360	1.200	0.000	0.025	1.225	4.560	0.000	0.025	4.585	0.000	0.000	0.000	0.000	0.430	0.000
0.000	0.000	3.36	1.600	0.000	0.025	1.625	4.960	0.000	0.025	4.985	0.000	0.000	0.000	0.000	0.430	0.000
0.000	0.000	0.500	0.500	0.000	0.000	0.500	1.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.500	0.000
0	0	0.5	0.5	0	0	0.5	1	0	0	1	0	0	0	0	0.5	0

ng 2025-26		Capitalization during 2025-26				CWIP Upto 2025-26				Remarks
	Total				Total					
IDC		Works Exp	EC	IDC		Works Exp	EC	IDC	Total	
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Scheme for providing 45 No. RTUs mentioned at Sr. No. 1 of 2nd MYT CIP.Total 43 Nos RTUs have been installed.The major work is expected to be completed in 2022-23. However few minor works/bookings are expected in 2023-24
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	This work is mentioned at Sr. No. 2 of 2nd MYT CIP. 10 Nos split ACs have already been procured. New ACs against outlived office ACs and centralized AC system for control room shall be procured under this work.
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Providing additional display for confrence room. Procuring of IT items for SLDC Building. Next generation firewall and other IT equipment shall be procured in near future as per requirement.
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	The project has been started on 04.03.2022 and contractual date of completion is 04.03.2023. approved CIP is as per PSERC order dated 02.03.2022 against petition no 63 of 2021 (The scheme is partially funded from PSDF. The Total PSDF Fund sanctioned for this work is Rs. 12.22 Cr out of which Rs 1.222 Cr has been received in Oct-2020). Remaining funds have been sought from POSOCO
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Out of 56 No. 45 No. RTU have been procured out of which 44 nos. have been installed. Fresh tender enquiry shall be floated for remaining 21 nos. RTUs and another 9 no RTUs against future/damaged/outlived RTUs.
0.000	0.430	0.430	0.000	0.000	0.430	0.000	0.000	0.000	0.000	Extension of building Shall be required for equipment under ULDC Phase 3/New Parking Shed/UNMS(Unified Network Management System) project
0.000	0.430	0.430	0.000	0.000	0.430	0.000	0.000	0.000	0.000	
0.000	0.430	0.430	0.000	0.000	0.430	0.000	0.000	0.000	0.000	
0.000	0.500	0.500	0.000	0.000	0.500	0.000	0.000	0.000	0.000	
0	0.5	0.5	0	0	0.5	0	0	0	0	

Table 7: All India Historical Demand Supply Gap

FY	Energy				Peak			
	Req.	Avl.	Surplus (+)/ Deficit (-)		Req.	Avl.	Surplus (+)/ Deficit (-)	
	MU	MU	MU	%	MW	MW	MW	%
2022-23 (Projected)	1505198	1549597	44399	2.9	214871	222112	7241	3.4
2021-22	1375143	1368809	-6334	-0.5	203014	200539	-2475	-1.2
2020-21	1275534	1270663	-4871	-0.4	190198	189395	-803	-0.4
2019-20	1291010	1284444	-6566	-0.5	183804	182533	-1271	-0.7
2018-19	1274595	1267526	-7069	-0.6	177022	175528	-1494	-0.8
2017-18	1213325	1204697	-8628	-0.7	164066	160752	-3314	-2.1
2016-17	1142929	1135334	-7595	-0.7	159542	156934	-2608	-1.6
2015-16	1114408	1090851	-23557	-2.1	153366	148463	-4903	-3.2
2014-15	1068923	1030785	-38138	-3.6	148166	141160	-7006	-4.7
2013-14	1002257	959829	-42428	-4.2	135918	129815	-6103	-4.5
2012-13	998114	911209	-86905	-8.7	135453	123294	-12159	-9.5
2011-12	937199	857886	-79313	-8.5	130006	116191	-13815	-10.6
2010-11	861591	788355	-73236	-8.5	122287	110256	-12031	-9.8

Table 8: Region-wise Demand Supply Gap in June 2022 (Anticipated/Projected)

Region	Energy (MU)			Peak (MW)		
	Req.	Avl.	Surplus (+)/ Deficit (-)	Req.	Avl.	Surplus (+)/ Deficit (-)
Northern	45320	43050	-5.01%	75900	77230	1.75%
Western	36273	39728	9.52%	60387	63276	4.78%
Southern	30591	34041	11.28%	53216	56450	6.08%
Eastern	15228	15495	1.75%	26578	27179	2.26%
NER	1613	1851	14.76%	2984	3292	10.32%

Table 9: Demand Supply Gap in Punjab for Last Five Years

Year	Energy			Peak		
	Req.	Avl.	Surplus (+)/ Deficit (-)	Req.	Avl.	Surplus (+)/ Deficit (-)
	MU	MU	%	MW	MW	%
2021-22	62759.1087	62323.5437	-0.69%	15335.5	13431.16	-12.42%
2020-21	58430.6632	58365.5632	-0.11%	13148	13148	0.00%
2019-20	56542.1168	56542.1168	0.00%	13606	13606	0.00%
2018-19	55274.5934	55261.6334	-0.02%	12638	12638	0.00%
2017-18	55011.7008	55011.7008	0.00%	11705	11705	0.00%

Table 10: Available Transfer Capability for Punjab (in MW)

Duration	Total Transfer Capability (MW)	Reliability Margin (MW)	Available Transfer Capability (MW)	Long-Term Access and Medium-Term Open Access (MW)	ATC for Short-Term Open Access (MW)	Remarks
July 1, 2022	9000	500	8500	5716	2784	
May 1, 2022	7700	600	7100	4860	2240	
May 1, 2021	7400	600	6800	4860	1940	
May 1, 2020	7200	600	6600	4515	2085	
May 1, 2019	7000	600	6400	4580	1820	
Oct 1, 2015	6200	500	5700	4033	1667	

Table 11: Additional Schemes undertaken based on Board Approval			
Sr. No.	**Amendment**	**Name of The Work**	**Scope of Work**
1	Petition No. 63 of 2021 dt. 02.03.2022	80 nos. Interface Energy Meters (ABT Type) of 0.2s accuracy class	80 No. Energy meters were procured in 2022-23 as emergent work approved by BOD and PSERC vide order dated 02.03.2022 against petition no 63/2021. Material has been received and is being installed on need basis.

Table 12: New Works to be undertaken in FY 2023-26

Sr. No.	Name of Work	Scope of Work	Remarks
1	Purchase of equipment/ softwares as per instructions of central agencies like NLDC, NCIIPC, CERT-IN, for cyber security etc. or any other unforeseen SLDC related works.	Purchase of equipment/ softwares as per instructions of central agencies like NLDC, NCIIPC, CERT-IN, for cyber security etc. or any other unforeseen SLDC related works.	Provision for this work is needed in view of various advisories of Ministry of Power (GoI) for cyber security of Power systems in the country

Table 13: Proposed Works at 220 kV to be undertaken in FY 2023-26

Sr. No.	Name of Work	Scope of Work	Remarks

does not relate to this office

Table 14: Proposed Works at 132 kV to be undertaken in FY 2023-26

Sr. No.	Name of Work	Scope of Work

Does not relate to this office

Table-15: Summary of Capital Investment proposed for Control Period (Rs. Crore)

Sr. No.	Particulars	FY 2023-24	FY 2024-25	FY 2025-26
1	**Spill Over schemes**			
1.1	Spill Over from CIP 1st (FY2017-18 to FY2019-20)	0.775	0.400	0.000
1.1	Spill Over from CIP 2nd (FY 2020-21 to FY 2022-23)	7.000	1.225	0.430
2	**New Development Schemes**	0.500	0.500	0.500
	Total Schemes	8.275	2.125	0.930

Table 16: Capitalisation Schedule including IDC and IEDC for the Control Period (Rs. Crore)

Sr. No.	Particulars	FY 2023-24	FY 2024-25	FY 2025-26
1	**Capital Investment**			
1.1	Spill Over from CIP 1st (FY 2017-18 to FY 2019-20)	0.775	0.400	0.000
1.2	Spill Over from CIP 2nd (FY 2020-21 to FY 2022-23)	7.000	1.225	0.430
1.3	New Schemes	0.500	0.500	0.500
	Total	8.275	2.125	0.930
2	**Capitalisation**			
2.1	Spill Over from CIP 1st (FY 2017-18 to FY 2019-20)	2.271	0.400	0.000
2.2	Spill Over from CIP 2nd (FY 2020-21 to FY 2022-23)	22.520	4.585	0.430
2.3	New Schemes	0.000	1.000	0.500
	Total	24.791	5.985	0.930

* IDC MEANS (INTEREST DURING CONSTRUCTION) (CAPTIALIZE EXPENSES)

* IEDC MEANS (INCIDENTAL EXPENDITURE DURING CONSTRUCTION) (CAPITALZE EXPENSES)

Table 17: Proposed Capital Investment and Capitalisation for SLDC (Rs. Crore)

Sr. No.	Particulars	FY 2023-24	FY 2024-25	FY 2025-26
1	**Capital Investment**			
1.1	Spill Over from CIP 1st (FY 2017-18 to FY 2019-20)	0.750	0.40	0.00
1.2	Spill Over from CIP 2nd (FY 2020-21 to FY 2022-23)	7.000	1.20	0.43
1.3	New Schemes	0.500	0.50	0.50
	Total	8.25	2.10	0.93
2	**Capitalisation**			
2.1	Spill Over from CIP 1st (FY 2017-18 to FY 2019-20)	2.22	0.40	0.00
2.2	Spill Over from CIP 2nd (FY 2020-21 to FY 2022-23)	22.52	4.56	0.43
2.3	New Schemes	0.00	1.00	0.50
	Total	24.74	5.96	0.93

Table 18:- Capital Investment Plan proposed for Control Period (Rs. Crore)

Sr. No.	Particulars	FY 2023-24	FY 2024-25	FY 2025-26
1	Transmission			
1.1	Opening CWIP as on 1.04.2023			
(i)	Spill Over from CIP 1st (FY 2017-18 to FY 2019-20)			
(ii)	Spill Over from CIP 2nd (FY 2020-21 to FY 2022-23)			
1.2	Capital Expenditure			
(i)	Spill Over from CIP 1st (FY 2017-18 to FY 2019-20)			
(ii)	Spill Over from CIP 2nd (FY 2020-21 to FY 2022-23)			
(iii)	New Schemes			
1.3	Capitalisation			
(i)	Spill Over from CIP 1st (FY 2017-18 to FY 2019-20)			
(ii)	Spill Over from CIP 2nd (FY 2020-21 to FY 2022-23)			
(iii)	New Schemes			
1.4	Closing CWIP			
(i)	Spill Over from CIP 1st (FY 2017-18 to FY 2019-20)			
(ii)	Spill Over from CIP 2nd (FY 2020-21 to FY 2022-23)			
(iii)	New Schemes			
2	SLDC			
2.1	Opening CWIP as on 1.04.2023	20.38	3.860	0.000
(i)	Spill Over from CIP 1st (FY 2017-18 to FY 2019-20)	1.50	0.00	0.00
(ii)	Spill Over from CIP 2nd (FY 2020-21 to FY 2022-23)	18.88	3.36	0.00
(iii)	New Schemes	0.00	0.5	0.00
2.2	Capital Expenditure	8.275	2.125	0.930
(i)	Spill Over from CIP 1st (FY 2017-18 to FY 2019-20)	0.775	0.400	0.000
(ii)	Spill Over from CIP 2nd (FY 2020-21 to FY 2022-23)	7.000	1.225	0.430
(iii)	New Schemes	0.500	0.50	0.500
2.3	Capitalisation	24.791	5.985	0.930
(i)	Spill Over from CIP 1st (FY 2017-18 to FY 2019-20)	2.271	0.400	0.000
(ii)	Spill Over from CIP 2nd (FY 2020-21 to FY 2022-23)	22.520	4.585	0.430
(iii)	New Schemes	0.000	1.000	0.500
2.4	Closing CWIP	3.86	0.00	0.00
(i)	Spill Over from CIP 1st (FY 2017-18 to FY 2019-20)	0.00	0.00	0.00
(ii)	Spill Over from CIP 2nd (FY 2020-21 to FY 2022-23)	3.36	0.00	0.00
(iii)	New Schemes	0.5	0.00	0.00
3	Transmission + SLDC			
3.1	Opening CWIP			
(i)	Spill Over from CIP 1st (FY 2017-18 to FY 2019-20)			
(ii)	Spill Over from CIP 2nd (FY 2020-21 to FY 2022-23)			
(iii)	New Schemes			
3.2	Capital Expenditure			
(i)	Spill Over from CIP 1st (FY 2017-18 to FY 2019-20)			
(ii)	Spill Over from CIP 2nd (FY 2020-21 to FY 2022-23)			
(iii)	New Schemes			
3.3	Capitalisation			
(i)	Spill Over from CIP 1st (FY 2017-18 to FY 2019-20)			
(ii)	Spill Over from CIP 2nd (FY 2020-21 to FY 2022-23)			
(iii)	New Schemes			
3.4	Closing CWIP			
(i)	Spill Over from CIP 1st (FY 2017-18 to FY 2019-20)			
(ii)	Spill Over from CIP 2nd (FY 2020-21 to FY 2022-23)			
(iii)	New Schemes			

Table 19--: Comparison of Transmission Losses for FY 2020-21 and 2021-22:

S. No	State	Transmission Loss (%)		Remarks
		Approved in the tariff order		
		FY 2020-21	FY 2021-22	
1	Andhra Pradesh	3.17	3.06	
2	Gujrat	3.50	3.60	
3	Haryana	2.15	2.10	
4	Maharashtra	3.18	3.18	
5	Rajasthan	3.33	3.31	
6	Telangana	2.71	2.64	

Table 20: Transmission Losses Trajectory for Control Period

Particulars	FY 2023-24	FY 2024-25	FY 2025-26
Transmission Loss (%)	2.50%	2.50%	2.50%

Table 32: Projection of ULDC charges for the Control period (in crores)			
#	FY 2023-24	FY 2024-25	FY 2025-26
Punjab SLDC			
ULDC-II	1.5	1.5	1.5
ULDC-III (Tentative)	3.5	3.5	3.5
FOCS Charges	3.5	3.5	3.5
NRLDC Charges	3.5	3.5	3.5
Total	12	12	12

Table 33: Projection of Non-Tariff Income for the Control Period (In Crores)				
Sr. No.	Particulars	FY 2023-24	FY 2024-25	FY 2025-26
1	Transmission Business	0	0	0
2	SLDC	0.35	0.35	0.35
	TOTAL	**0.35**	**0.35**	**0.35**

BASED ON TRIAL BALANCE OF FY 2021-22

No. 15/2/2017-Trans-Pt(1)
Government of India
Ministry of Power
Shram Shakti Bhawan, Rafi Marg, New Delhi- 110001

Dated, 15th March, 2021

To

Addl. Chief Secretaries/ Pr. Secretaries/
Secretaries of Power/ Energy Departments
of all the States and UTs.

Subject: Adoption of Tariff Based Competitive Bidding (TBCB) for intra-State transmission projects- reg.

Sir,

You are aware that Electricity Act 2003 has created conducive environment for investments in all segments of the electricity industry, both for public and private sectors, by removing barrier to entry in different segments. Section 63 of the Electricity Act provides for participation of private sector on competitive basis in different segments so as to encourage private sector investment.

2. National Electricity Policy 2005, envisages that role of private participation in generation, transmission and distribution would become increasingly imortant in view of the rapidly growing investment needs of the sector. It also states that the Central Government and the State Governments need to develop workable and successful models for public private partnership for leveraging private investment with the public sector finances.

3. In continuation of the National Electricity Policy 2005, Tariff Policy was notified by the Central Government in 2006 for ensuring optimal development of the transmission network to promote efficient utilization of generation and transmission assets in the country, as well as for attracting the required investments in the transmission sector and providing adequate returns.

4. In line with above policy framework, Ministry of Power notified "Tariff Based Competitive Bidding (TBCB) Guidelines for Transmission Service" and "Guidelines for Encouraging Competition in Development of Transmission Projects" under section 63 of the Electricity Act, 2003 on April 13, 2006. Subsequently, Standard Bidding Documents, viz. Request for Qualification (RfQ), Request for Proposal (RfP) and Transmission Service Agreement (TSA), were notified by Ministry of Power, Govt. of India in the year 2008, followed by subsequent amendments in these documents. With this, tariff based competitive bidding started for development of inter-state transmission sector since 2010.

5. Subsequently, the Central Government notified revised Tariff Policy in January 2016 with following provisions regarding Transmission System:

> *7.1 (6) :Investment by transmission developer including CTU/STUs would be invited through competitive bids in accordance with the guidelines issued by the Central Government from time to time.*

7.1 (7) While all future inter-state transmission projects shall, ordinarily, be developed through competitive bidding process, the Central Government may give exemption from competitive bidding for (a) specific category of projects of strategic importance, technical upgradation etc. or (b) works required to be done to cater to an urgent situation on a case to case basis.

6. In line with provisions of the Tariff Policy 2016, generally inter-state transmission systems are developed through competitive bidding only, except for certain categories of transmission system as specified in the Tariff Policy 2016. With adoption of Tariff Based Competitive Bidding for development of transmission system, following key benefits have been observed:

(i) Lower Tariff compared to Cost Plus: With large number of bidders participating in development of a transmission project, discovered tariff for a transmission project can be lower than cost-plus tariff by about 30-40%
(ii) Less burden on government finances: It will attract private investments for development of projects, and scarce government fund can be spared for other priority sectors
(iii) Risk sharing: It encourage risk sharing with private sector. Innovative Technology: It encourages use of advanced technology for improving cost and efficiency

7. As intra-state transmission system has major share in the transmission sector in the country, adoption of Tariff Based Competitive Bidding (TBCB) in development of intra-state transmission system can effectively reduce burden on State Governments' finances as well as reduce tariff of intra-State transmission system, leading to consumers' benefit. The matter was also discussed in a meeting taken by Hon'ble Union Minister of State (Independent Charge) for Power and New and Renewable Energy on 03.02.2021 and it was decided to request the State/UT Governments to adopt TBCB in development of intra-State transmission system.

8. In light of above and in the larger interest of consumers, it is strongly recommended that tariff based competitive bidding may be adopted for development of Intra-State Transmission system also.

9. This issues with the approval of Competent Authority.

Yours faithfully,

15.03.2021
(Mritunjay Kr. Narayan)
Joint Secretary to the Govt. of India

Copy to

1. Chairpersons of all SERCs and JERCs.
2. Chairperson, CEA, New Delhi.
3. PS to Hon'ble MoSP (IC) / Sr PPS/ PPS/ PS to Secretary (Power) / AS (SKGR) I AS (VKD) / AS&FA / Sr Advisor/ All JSs/ CE(Th), MoP
4. Technical Director, NIC, Ministry of Power- with the request to host this letter on the website of Ministry of Power

PUNJAB STATE TRANSMISSION CORPORATION LIMITED
Regd. Office: PSEB Head Office,The Mall Patiala-147001,Punjab, India.
Corporate Identity Number: U40109PB2010SGC033814 (www.pstcl.org)
(O/o CAO/Finance & Audit(Commercial & Regulatory Cell,3rd Floor,Shakti Sadan, Patiala)
Fax/Ph.No. 0175-2970183 Email: fa@pstcl.org

To

By Hand

Chief Engineer/ARR & TR,
PSPCL,Patiala.

Memo No. 813 /CAO/F&A/Comml./CIP- 3rd
Dated: 09/09/2022

Subject: **Petition for the approval of PSTCL's Business Plan including Capital Investment Plan for MYT Control Period from FY 2023-24 TO FY 2025-26.**

Enclosed please find herewith a copy of PSTCL's Petition for the approval of Business Plan including Capital Investment Plan for MYT Control Period from FY 2023-24 TO FY 2025-26 as filed at PSERC for your information.

Sudhir.
CAO/Finance & Audit,
PSTCL, Patiala.
9/9/22

DA/As above

Receipt
Harpal
9/9/22