Past, Present and Future of Power Transmission in UP

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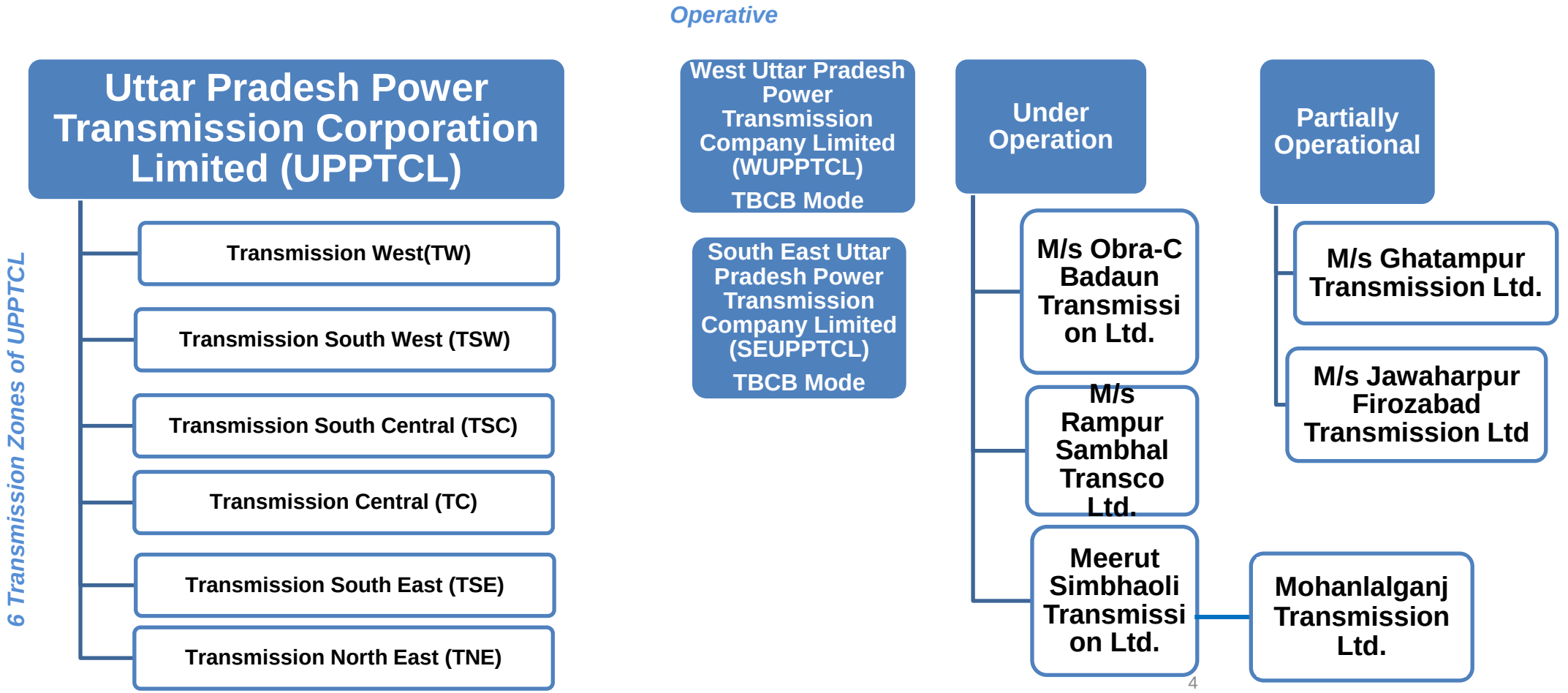
Ex Chief Engineer Transmission
(UPPTCL)

Brief Summary of UPPTCL

- UP Power Transmission Corporation Limited (UPPTCL) is a company incorporated under the Companies Act 1956.
- Established in 2006, UPPTCL's primary objective is managing, operating, and developing electrical transmission lines and networks in Uttar Pradesh, India, and beyond.
- UPPTCL's responsibilities include managing extra high voltage and high voltage transmission lines, sub-stations, cables, wires, and associated equipment.
- UPPTCL also coordinates power transmission agreements, conducts studies and research, and undertakes planning and coordination activities for the power system in the state.

ABOUT UPPTCL'S EXISTING NETWORK

Existing Transmission Licensees in the State



UPPTCL is also designated as State transmission Utility (STU)

Existing Network of UPPTCL

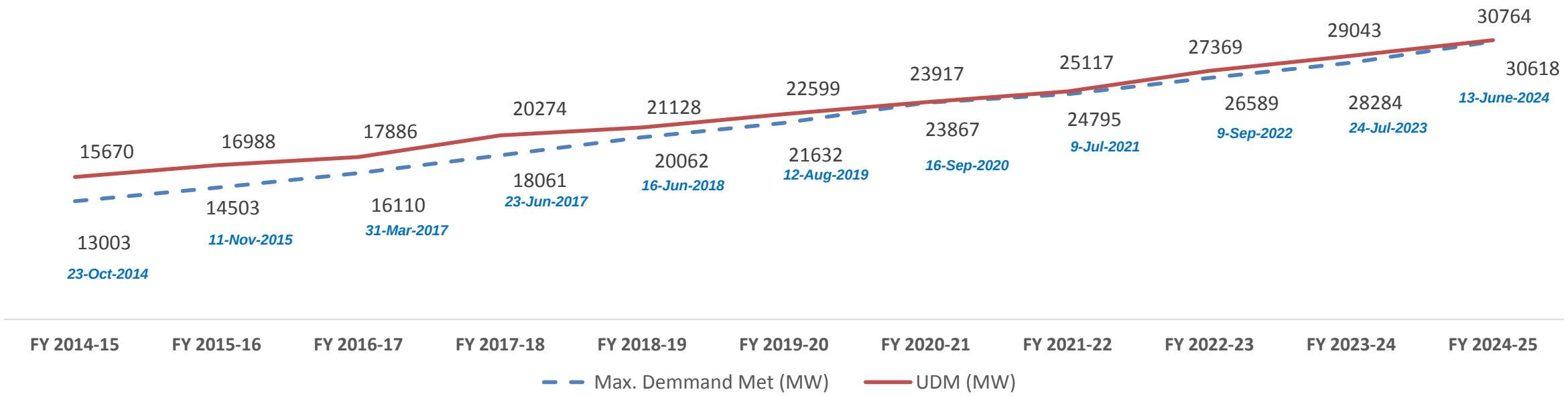
Summary of Transmission Network of STU till NOV-2024

Voltage Level (kV)		132 KV	220 KV	400 KV	765 KV	Total
No. of Substations (Nos.)	UPPTCL	476	169	29	2	676
	PPP	0	1	11	5	17
	Total	**476**	**170**	**40**	**7**	**693**
Transformation Capacity (MVA)	UPPTCL	67400	63720	27925	6,000	1,65,045
	PPP	0	2520	13120	14000	29640
	Total	**67,400**	**66,240**	**41,045**	**20,000**	**1,94,685**
Transmission Lines (Ckt. Km)	UPPTCL	29181	16597	7509	1511	54,798
	PPP	176	78	1926	1075	3255
	Total	**29,357**	**16,675**	**9,432**	**2586**	**58,053**

State's Transmission Network Growth in last 6 Years

Voltage Level (kV)	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	Growth in Last 5 Years (%)
No. of Sub-stations							
132	414	426	442	451	463	474	**2.74%**
220	118	126	131	137	153	167	**7.19%**
400	27	28	30	33	37	39	**7.63%**
765	5	5	5	5	6	6	**3.71%**
Total	**564**	**585**	**608**	**626**	**659**	**685**	**3.96%**
Transformation Capacity (MVA)							
132	48,001	50,410	53,747	57,906	61,197	65,216	**6.32%**
220	40,050	45,660	48,180	52,060	58,860	64,040	**9.84%**
400	24,190	27,110	29,090	32,065	37,155	39,715	**10.42%**
765	13,000	13,000	13,000	13,000	16,000	20,000	**9.00%**
Total	**1,25,241**	**1,36,180**	**1,44,017**	**1,55,031**	**1,73,212**	**1,88,971**	**8.57%**
Line Length (ckm)							
132	21,658	23,732	25,006	26,562	27,752	29,143	**6.12%**
220	11,900	12,985	13,455	13,909	15,200	16,655	**6.95%**
400	6,842	7,012	7,189	7,728	8,561	9,031	**5.71%**
765	1,720	1,720	1,720	2,532	3,065	3,671	**16.37%**
Total	**42,120**	**45,449**	**47,370**	**50,731**	**54,578**	**58,500**	**6.79%**

Peak Demand Handled in Past Years



- ✓ *The Un-restricted Demand (UDM) was 27,369 MW in the FY 2022-23, the same has grown with an annual growth rate of around 6% in the last 5 years.*
- ✓ *The Demand met by UPPTCL in the FY 2022-23 was 26589 MW, which has grown by 7.30% annually in the last 5 years*
- ✓ *UPPTCL though its robust & efficient transmission system was able meet 30618 MW of peak demand in the current year (FY 2024-25), which is the highest among all the states.*

Data Source: UPSLDC

Peak Demand Met

The State ranks first in the country in meeting the maximum demand.

Sr. No.	State	2024-25	
		MW	Month
1	Uttar Pradesh	30618	June
2	Maharashtra	28969	February
3	Gujarat	25588	June
4	Tamil Nadu	20784	May
5	Rajasthan	18128	January
6	Madhya Pradesh	17817	January

Projections Vs Actual Peak Demand Handled & TTC in Past years

FY	FY 2022-23		FY 2023-24		FY 2024-25	Growth w.r.t Previous Year
	Projected	Actual	Projected	Actual	Projected	
Peak Demand (MW)	28,000 (as per UPPCL) 24,197 (as per CEA)	26,589	28,982 (as per UPERC) 27,531 (as per CEA)	28,284	*31,590* (as per UPERC) *29,235 (as per CEA)*	11.69%
UDM (MW)		27,369		29,043		6.11%
TTC (MW)	14,000	14,000	15,900	15,900	16,000	0.63%
Grid Capacity (MW) considering internal generation and TTC	28,000	28,000	29,500	28,900	32,000	9.69%

05 year State Transmission Plan for Period of FY 2024-25 - FY 2028-29

Planned Generation Capacity till FY 2028-29

- Thermal Generating Plants of capacities 12,200 MW are expected to be commissioned within the State from FY 2023-24 to FY 2028-29.

- 4000MW of Solar Generating Plants are planned to be established in Bundelkhand region by UPNEDA.

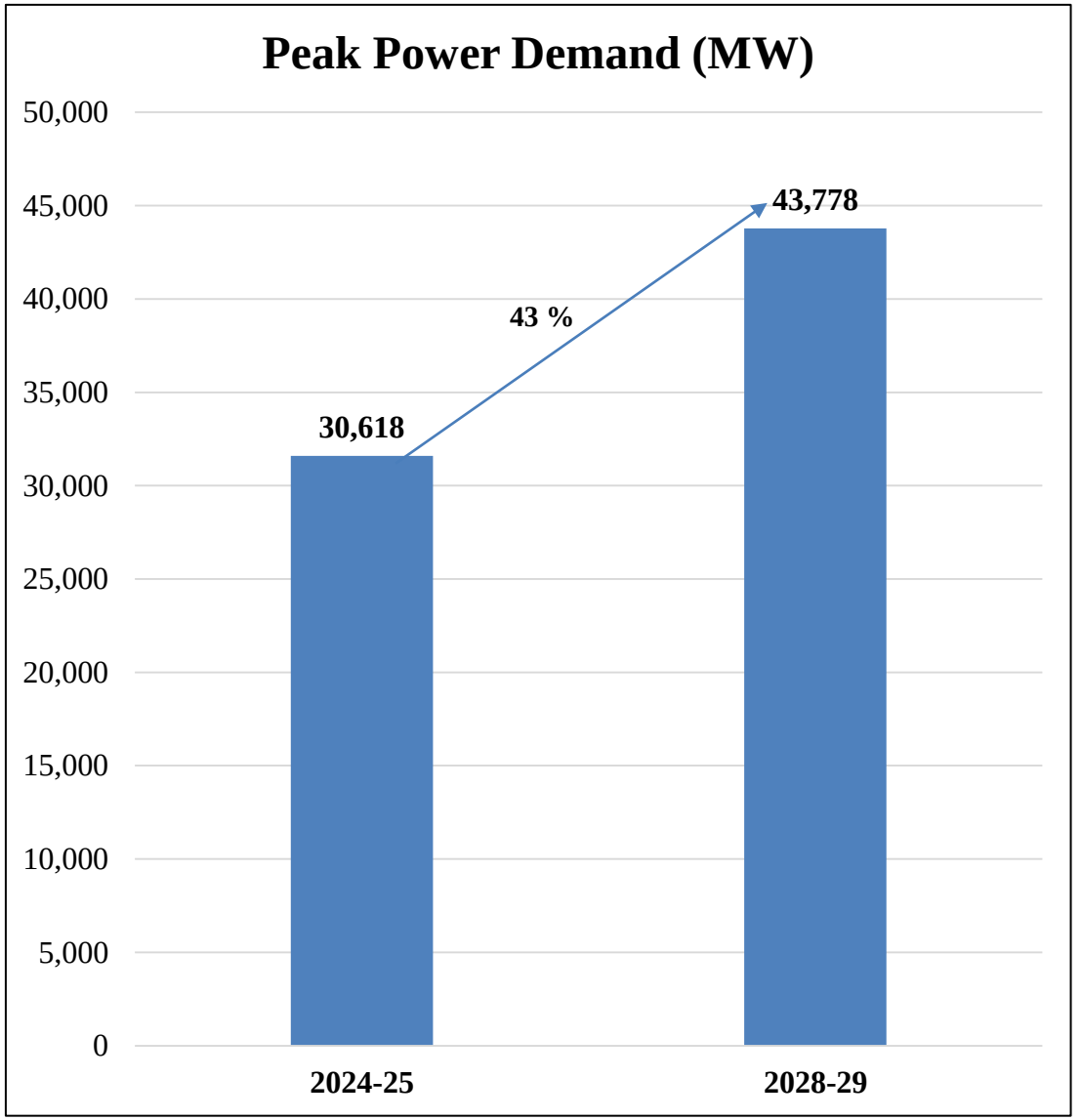
Projects	Thermal Plant Capacity (MW)	Expected CoD
Ghatampur TPS	3x660	FY 2024-25
Obra-C TPS	2x660	Unit-1 energized on 09.02.2024
Jawaharpur TPS	2x660	Unit-1 energized on 21.02.2024
Panki TPS	1x660	FY 2024-25
Khurja STPP	2x660	FY 2024-25
Obra D TPS	2x800	FY 2028-29
Anpara E TPS	2x800	
Meja Ext. TPS	3x800	

Projected Peak Demand (MW) for FY 2024-25 to 2028-29

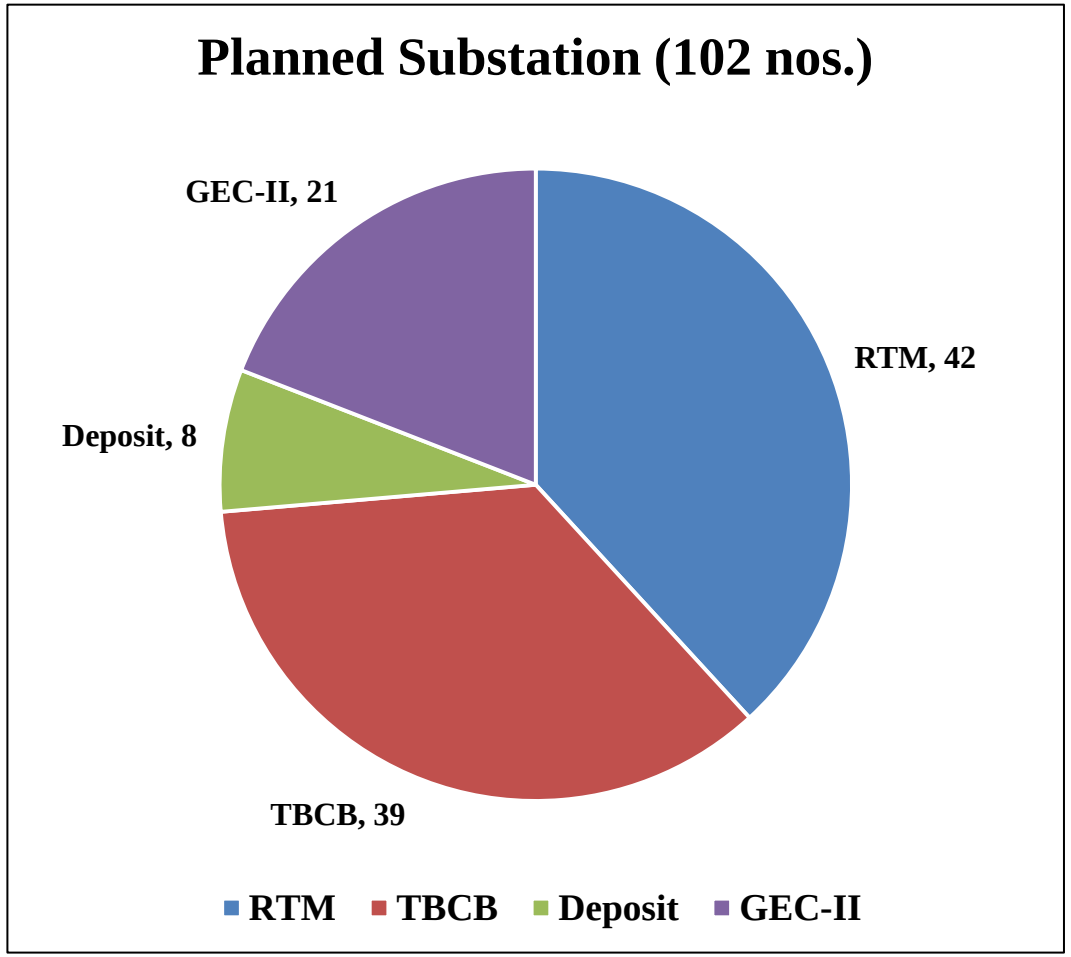
- Projected peak demand (MW) from FY 2023-24 to FY 2028-29 is tabulated as below:

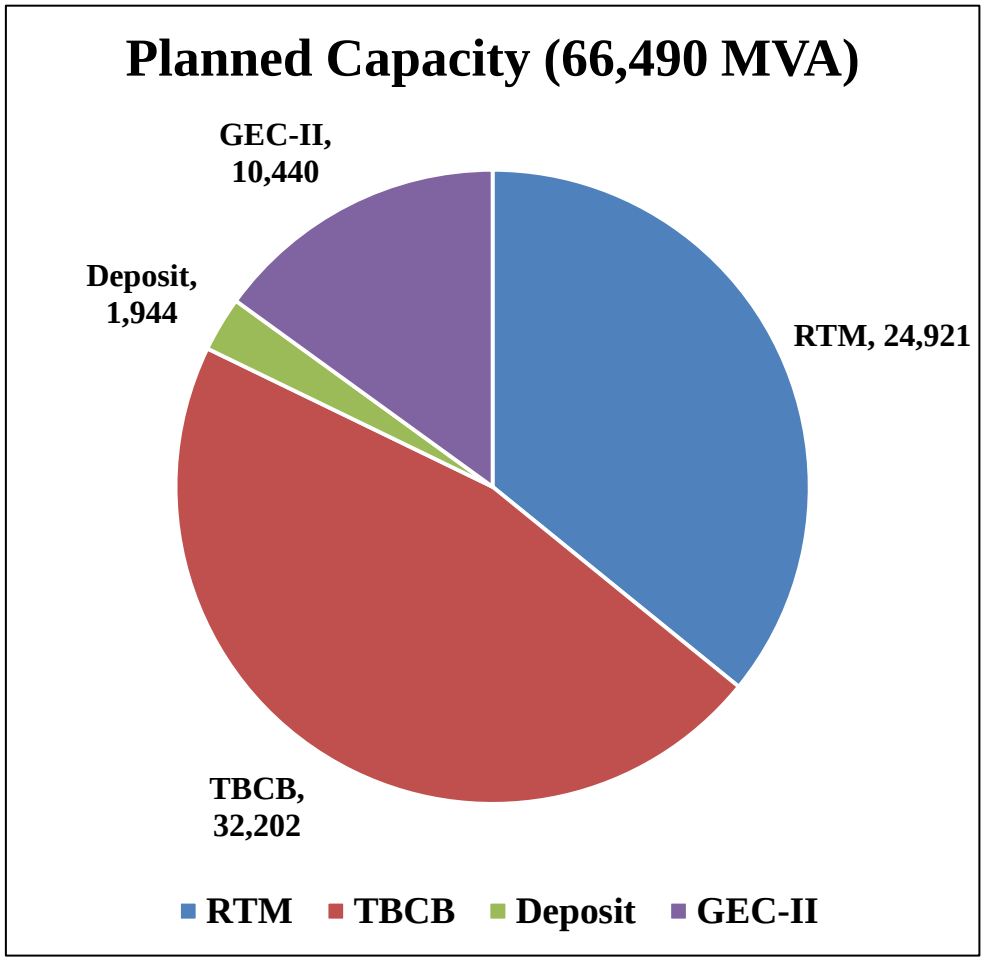
FY	Peak Power Demand (MW)
2023-24	28,284*
2024-25	30,618*
2025-26	34,434
2026-27	37,533
2027-28	40,535
2028-29	43,778

**as per SLDC data actual peak load on 24.07.2023 & 13.06.2024*

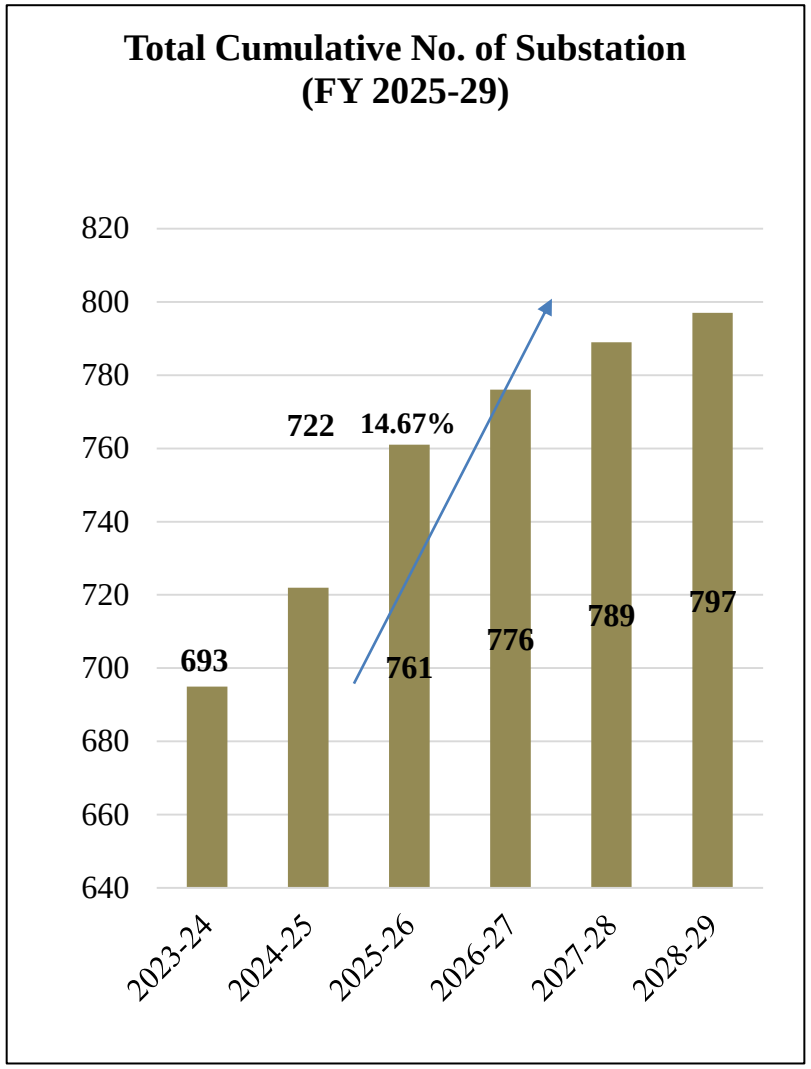


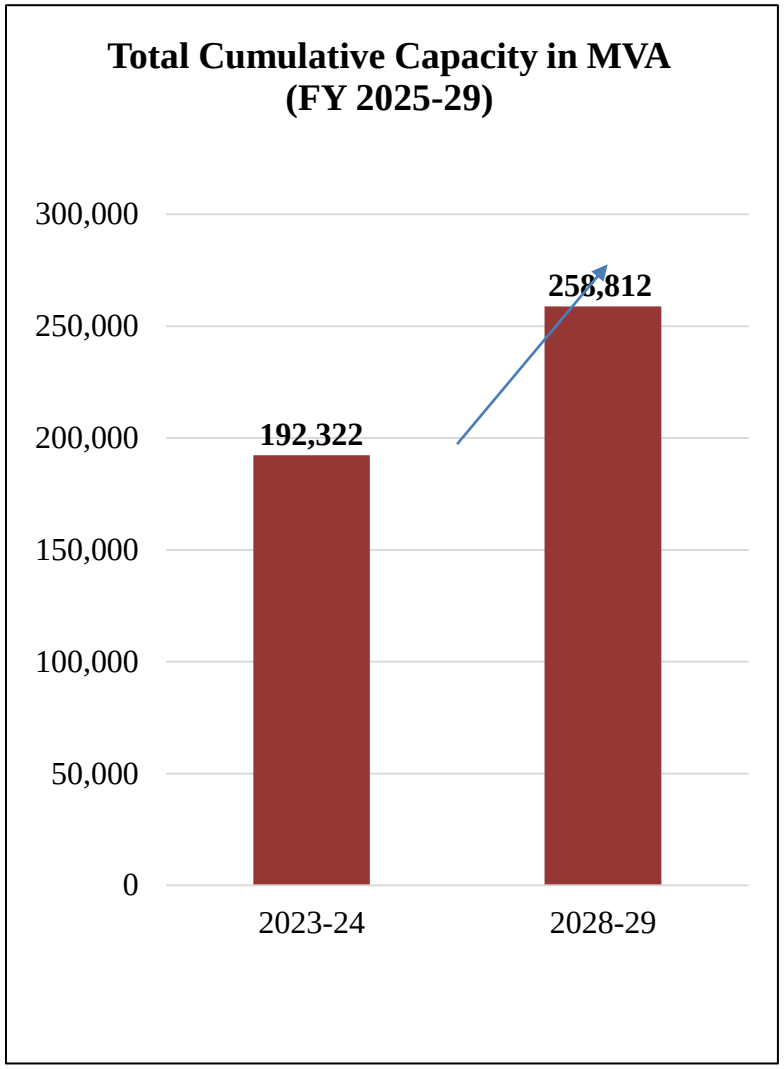
Planned Transmission Network FY 2024-25 to 2028-29

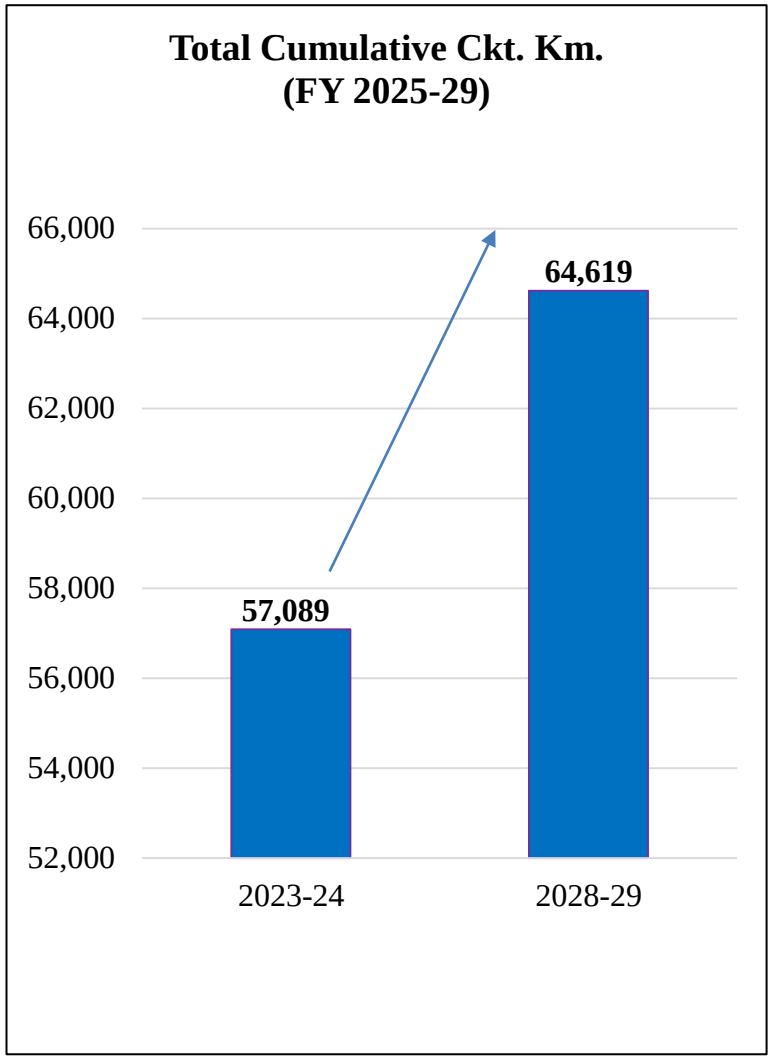




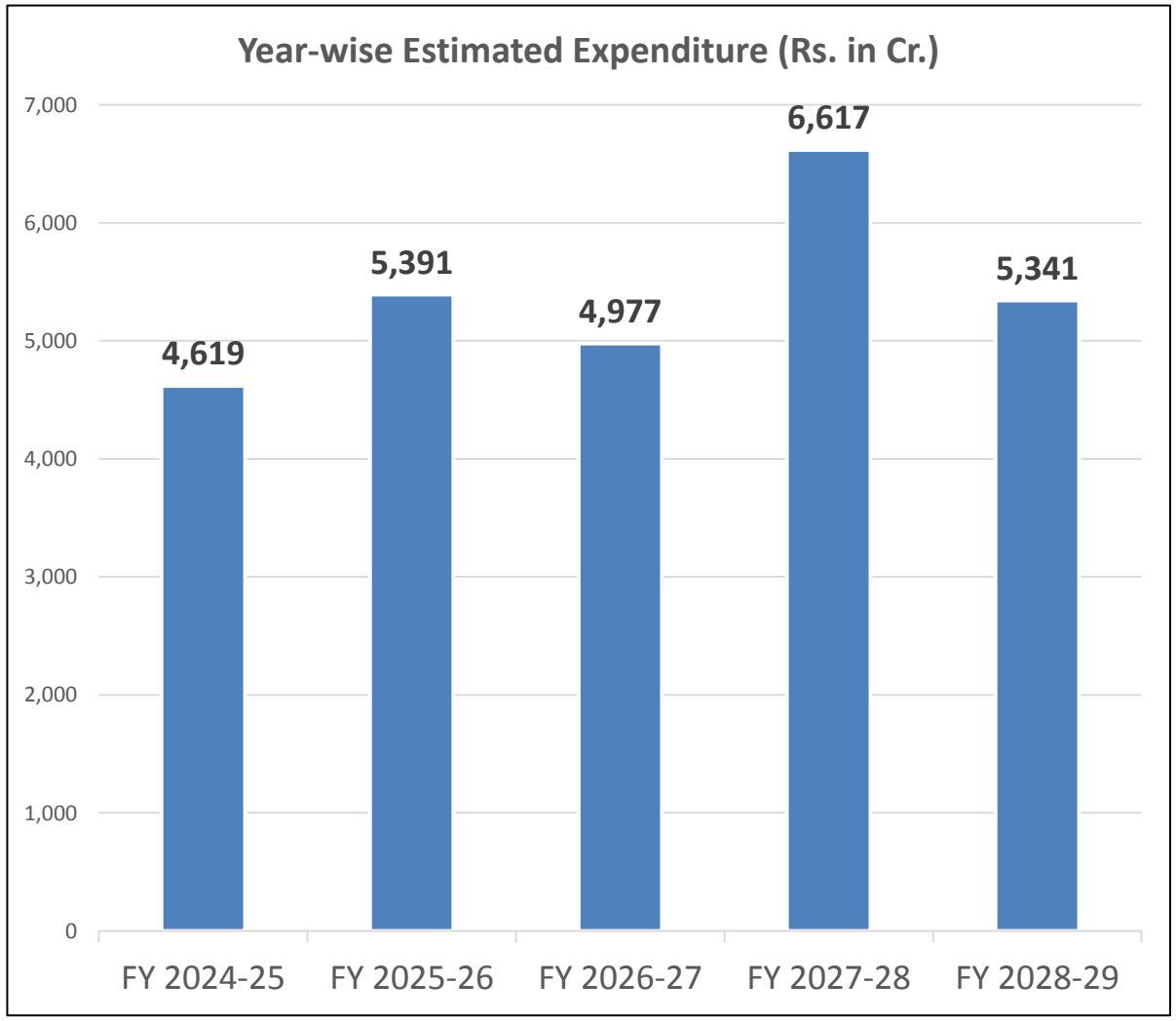
Growth plan for FY 2024-25 to 2028-29

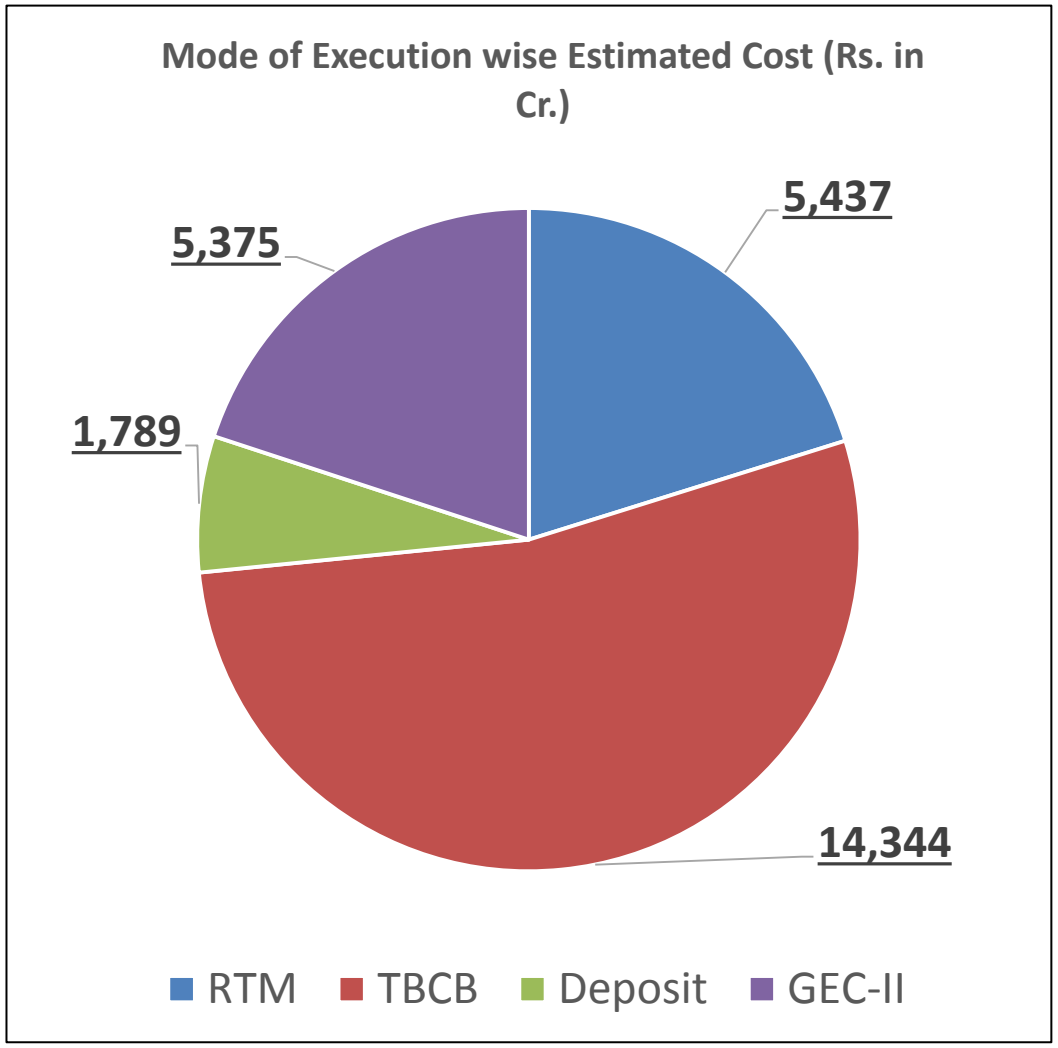






Expected Investment for Planned Network FY 2024-25 to 2028-29





The total investment plan for FY 2024-25 to FY 2028-29 amounts to **Rs. 26,945 Crore**

National Electricity Plan - Uttar Pradesh (220 kV and above Voltage level)

	Peak Electricity Demand (GW)	Transmission lines (ckt in km)	Transformation Capacity Augmentation in S/s(MVA)	Likely Investment (Rs. Cr.)
2022-27	35	9858	50205	22386
2027-32	47.17	4230	23250	16114

		Commissioned	Under Construction	Planned	Total
2022-27	Transmission lines (ckm)	4516	3663	1679	9858
	Transformation Capacity (MVA)	24675	22150	3380	50205
2027-32	Transmission lines (ckm)	0	0	4230	4230
	Transformation Capacity (MVA)	0	0	23250	23250

RE Capacity to be integrated to intra-state network till 2027 (under GEC scheme)		
RE capacity to be added under GEC I (balance) (GW) (as on 31.03.2024)	RE capacity to be added under GEC II (GW)	Total (GW)
0	4.00	4.00

Status of PPP Projects Under TBCB Mode

- Govt. of U.P. and U.P. State Electricity Regulatory Commission has directed construction of transmission systems of 220 KV and above via Tariff Based Competitive Bidding (TBCB) under Public Private Partnership (PPP).
- UPPTCL has executed **transmission projects worth Rs. 13,399.17 Crore through TBCB**.
  - 400 KV Substation Mohanlalganj project worth **Rs. 975.23 Crore is energized on dt. 13.03.2024**
- Construction of **07 transmission projects at a cost of Rs. 1,852.59 Crore awarded and work in progress.**
- Planned transmission **projects worth Rs. 12,491 cr. under TBCB mode for FY 2024-25 to 2028-29**.

Green Energy Corridor (GEC-II)

- The Central Government of India and the State Government of U.P. have approved a **4000 MW Solar Power Generation Project's Power Evacuation System**.
- Funding includes **33% grant** from the Government of India, **47% soft loan** from financial institution KFW, and **20% equity**.
- The project involves **constructing 21 transmission substations and associated lines**.
- It will **add over 10,440 MVA transformation capacity** and **2432 Ckt. km transmission lines** to the grid.
- Project cost is approximately **Rs. 5,375 Crore**
- Implementation occurs in **two stages**, with the **first phase scheduled for completion by March 2025** and the **second by March 2026**.

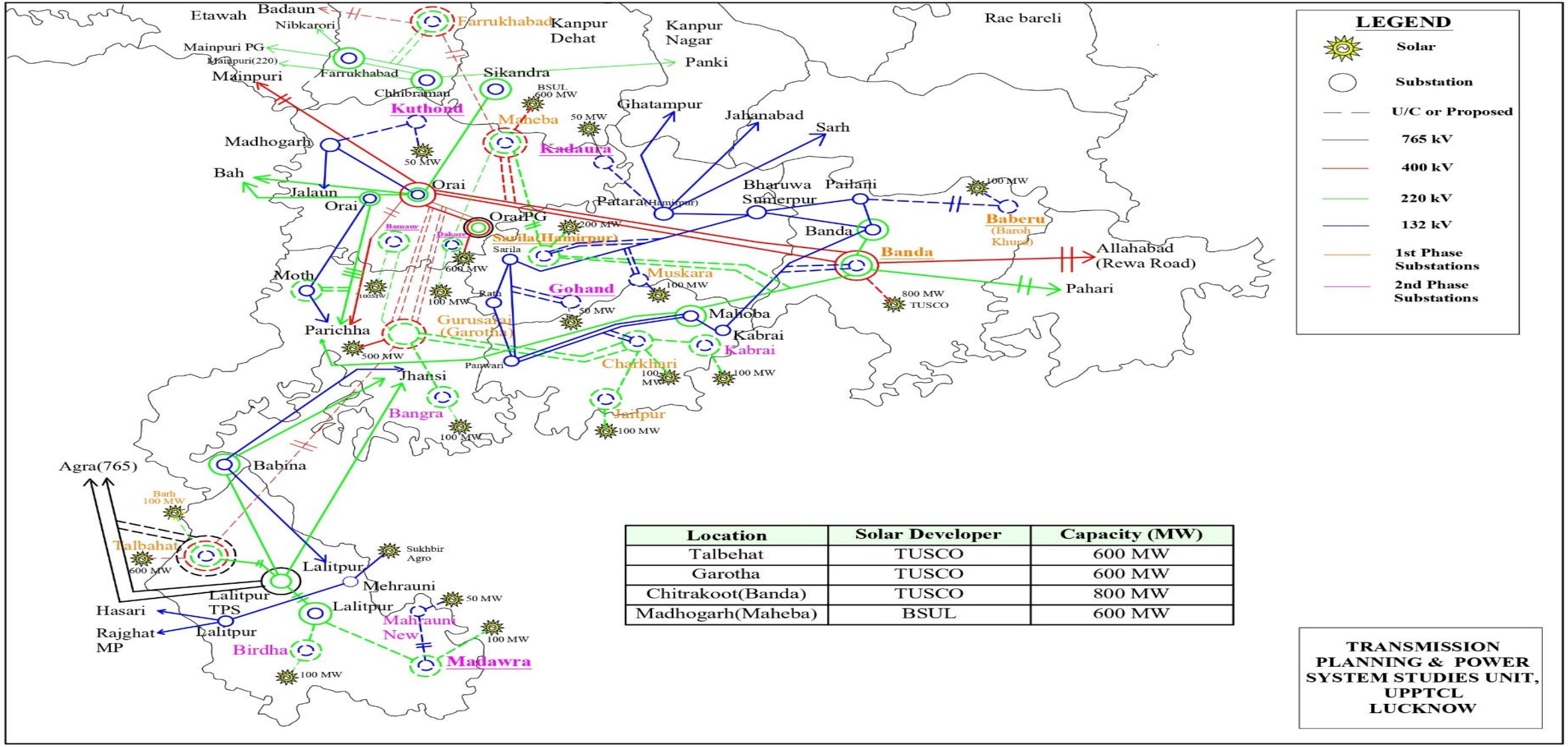
Green Energy Corridor (GEC-II)

- Out of Total 23 Nos Packages, LOI/LOA have been issued for 23 Nos Packages.
- KfW, Germany sanction loan – Euro 250million (Approx. Rs. 2250 Cr.)
- **Minimum Disbursement Aggregate of Euro 5million (Approx. Rs. 45Cr.) from KfW, Germany before 08/06/2024 achieved by UPPTCL and thus Management Fee of 0.25% flat on loan amount was waived off. The amount of Rs. 53.81Cr. has been disbursed to UPPTCL.**
- 1st installment (70%) of CFA claim has been raised for Pkg-01,02,03,04,10,11A,11B,14 & 16 for Rs. 416.93 Cr. by UPPTCL.
- 2nd installment (30%) will be released after commissioning of work.
- CFA amount of Rs. 171.29 Cr. has been sanctioned & released by MNRE.
- State equity for amount of Rs. 157.33 Cr. has been disbursed to UPPTCL.
- Financial Progress of GEC-II project is Rs. 437 Cr.

Geographical Map of GEC-II Projects

Geographical map of Solar Power 4000 MW Evacuation Plan
(BSUL Solar 2x600 MW connected at 400kV S/S Maheba,2x600 & 800 MW M/s TUSCO Ltd.)

(Phase II)
Solar Max
Condition)



Location	Solar Developer	Capacity (MW)
Talbehat	TUSCO	600 MW
Garotha	TUSCO	600 MW
Chitrakoot(Banda)	TUSCO	800 MW
Madhogarh(Maheba)	BSUL	600 MW

TRANSMISSION PLANNING & POWER SYSTEM STUDIES UNIT, UPPTCL LUCKNOW

New Technologies and Solutions adopted by UPPTCL

Remotely Operated Sub-stations

- Total 332 nos. substations (02 nos. 765 kV, 27 nos. of 400 kV, 152 nos. of 220 kV, 151 nos. of 132 kV) are identified for conversion from conventional to Remote Operated Substations.
- Work for survey and preparation of detailed DPR including actual cost estimate and finalization of BoQ has been awarded to PGCIL for Rs. 3.75 Cr. Agreement signed between UPPTCL and PGCIL.
- As per contract PGCIL has to submit detailed DPR latest by 14.08.2024.

Drone Surveillance

- Patrolling and condition monitoring of over head EHV Transmission Line (approx 2500 Km.) was carried out by Drone. It has provided very use full information regarding general O&M of Lines.
- It helps in detecting unseen electrical malfunctions such as :-

➢ Hot spots of Line through High Resolution Camera.

➢ Visual condition of all the components.

➢ Clear understanding of the nearby environment and encroachments.

Mobile Substation

- UPPTCL, to meet the exigencies, intends to procure mobile GIS-Station.
- It will deliver required power temporarily during :

➢ Kumbh/Maha Kumbh Mela.

➢ Global Investor Summits.

➢ Trade Shows/Expos.

➢ Restoration of power supplies in case of critical equipment failure.

- EOI has been called for procurement of mobile substation.

Leasing of OPGW

- Presently approximately 9,761 kms. of OPGW has been laid on various transmission lines of UPPTCL.
- OPGW network is on 12 pair fiber (24 fiber cables) out of which 02 pairs are used for communication and 01 pair is kept as spare & 09 pairs of dark fibres are available for leasing out through open competitive bidding process
- UPPTCL has also obtained an infrastructure provider category 1 (IP-1) license.
- UPPTCL offered the leasing of 09 pairs of dark fiber along the route length of 9,737 kms. of 236 lines at minimum lease rate of Rs. 12,500/- per fiber pair per kms. Per annum.
- LoI has been issued to Bharti Airtel, Jio Digital, Sify Technologies, Lightstrom, PGCIL

Transmission Line Patrolling System

TLPS has revolutionized the way of patrolling of transmission lines and towers, managing networks, etc. in UPPTCL. It has helped the organisation in monitoring the status of entire network on regular basis.

TLPS application also helped the organisation for planning the procurement, for maintenance work. The application has became a integral part of the organization for all patrolling related activities. Every step, from regular patrolling to maintenance work, are managed and monitored by TLPS.

Challenges faced Previously

Difficulty in Monitoring Patrolling Agencies

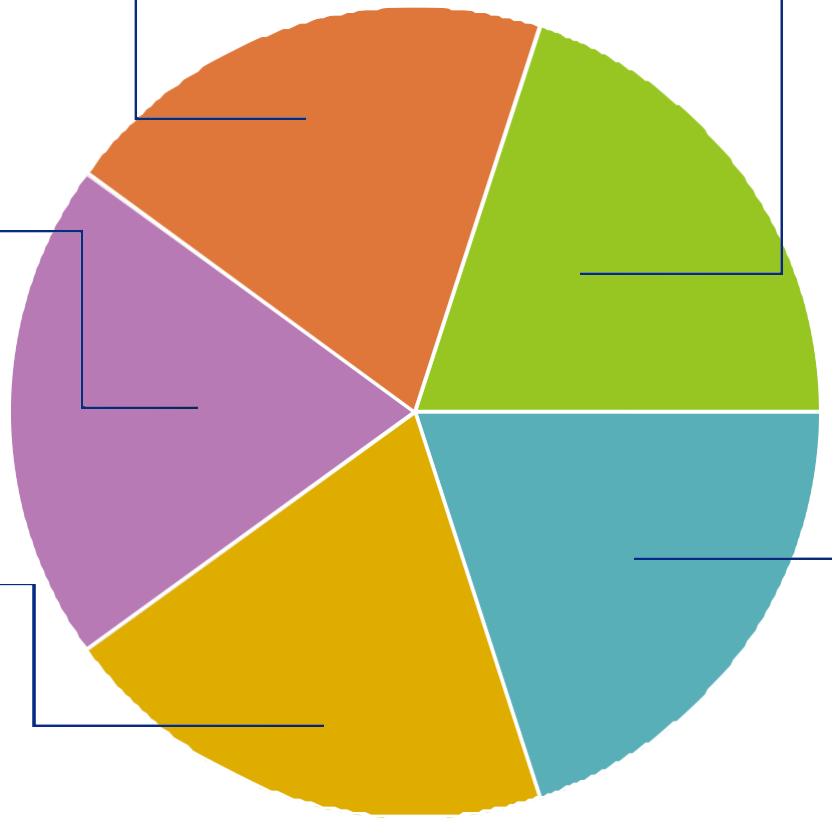
Tracking the patrolling related performance was very difficult.

Procurement Estimation

Higher management did not had any data to initiate the procurement of different assets.

No Live View of Events

Higher management has no access of day to day events happening in the transmission lines.

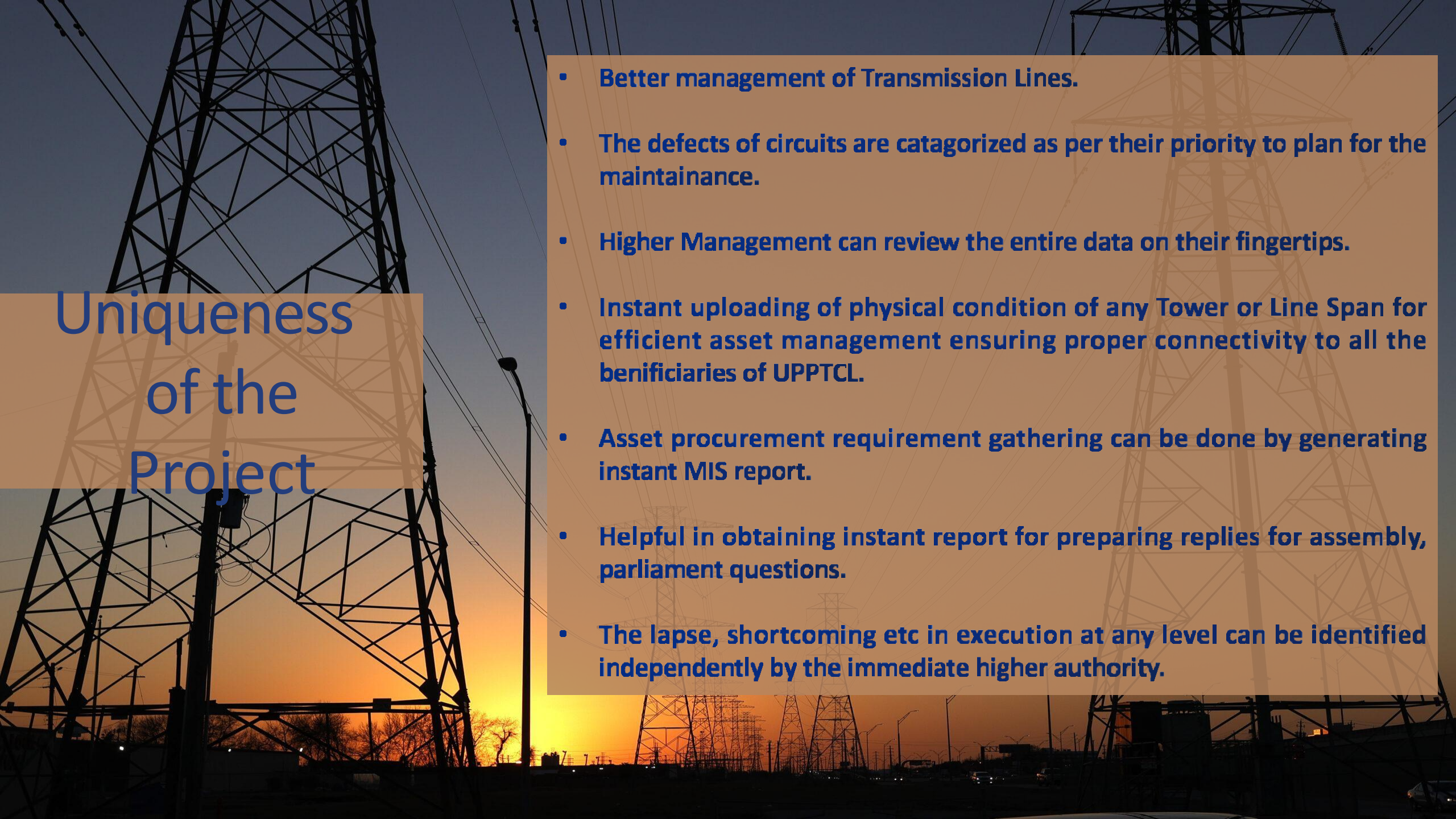


Accuracy of Patrolling

There was no assurance about wheather the patrolman is going to the tower or not.

Time Delay in Reporting

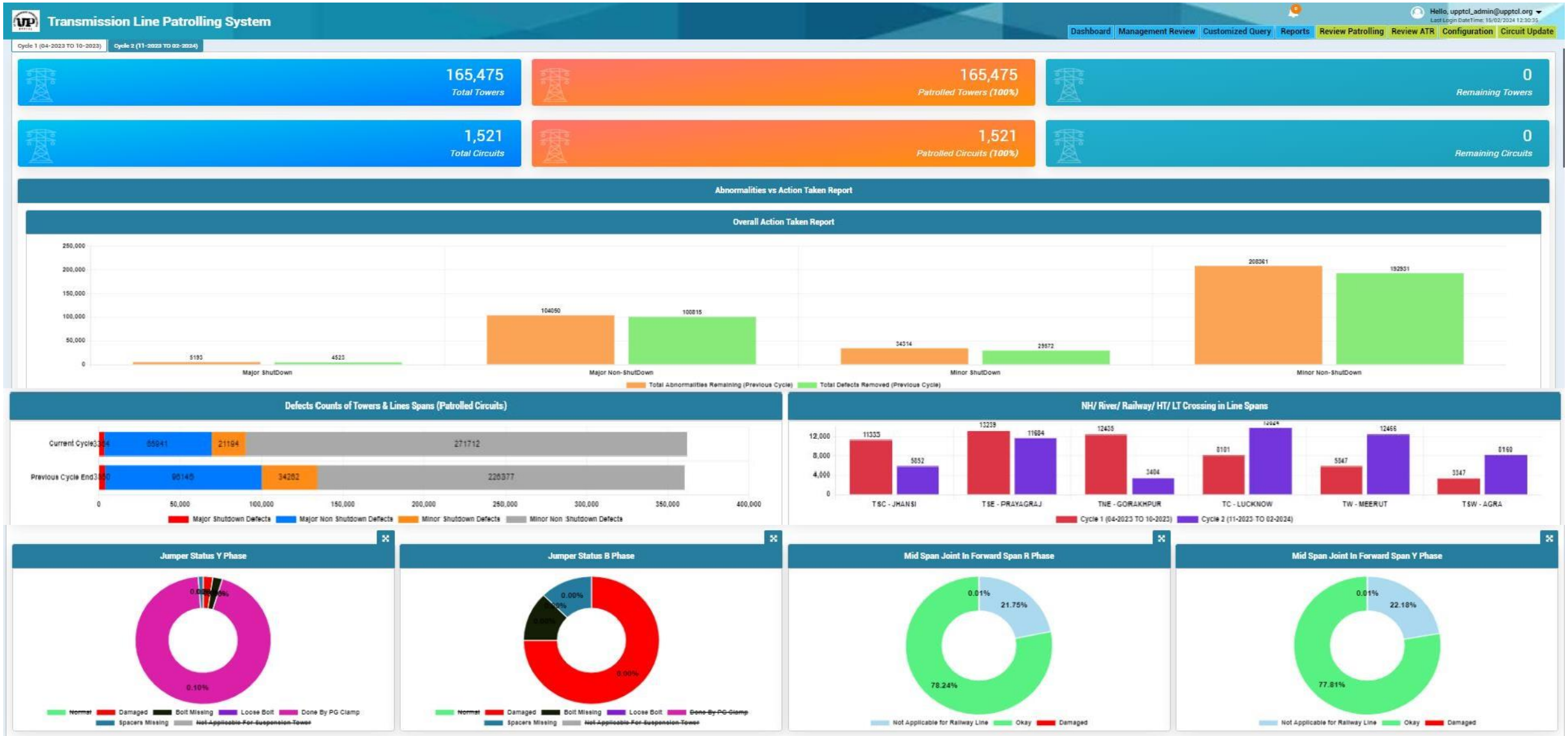
Higher management had to wait for a longer period of time for any kind of report related to lines.



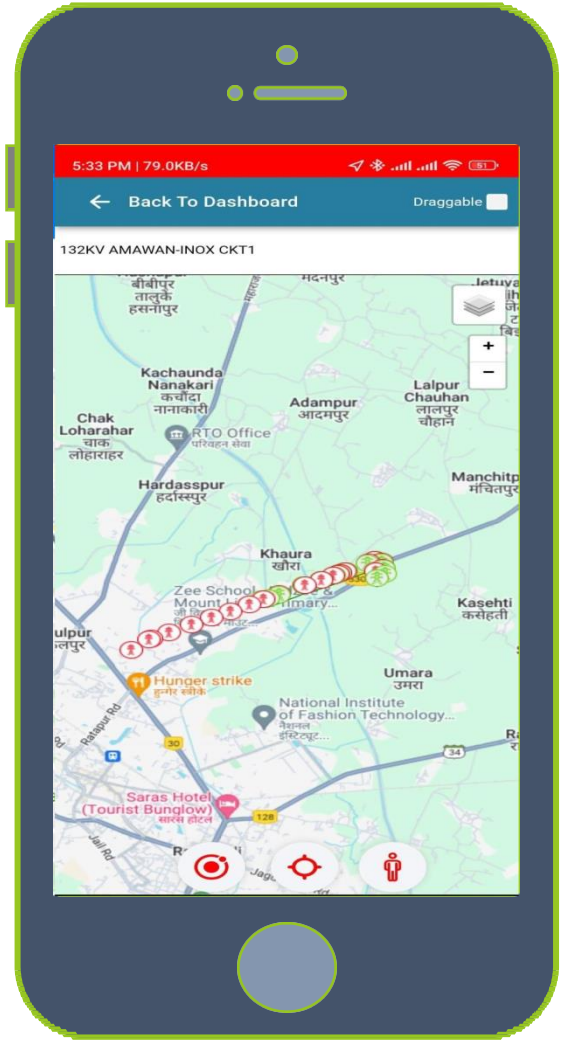
Uniqueness of the Project

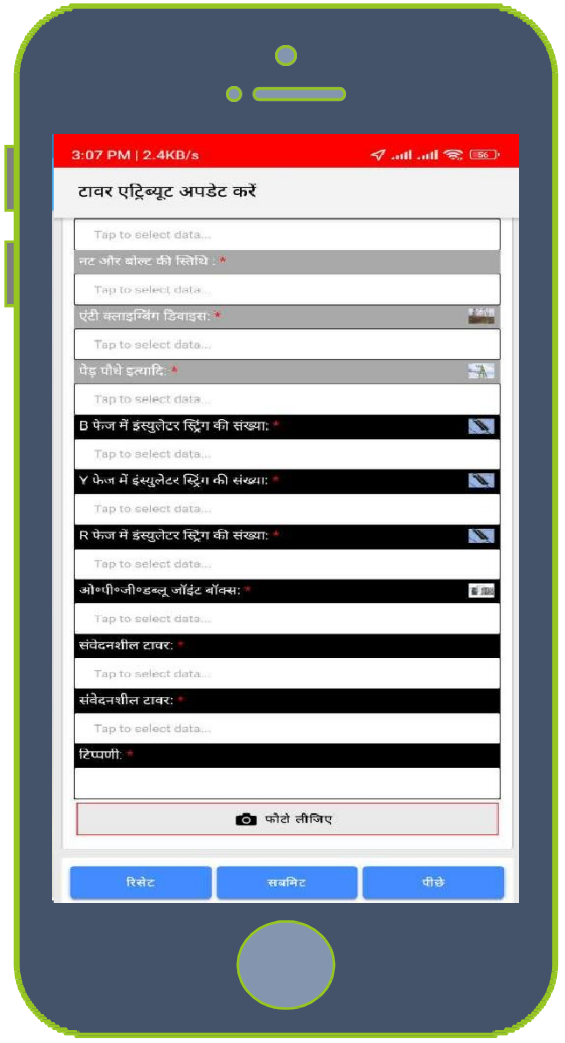
- Better management of Transmission Lines.
- The defects of circuits are catagorized as per their priority to plan for the maintainance.
- Higher Management can review the entire data on their fingertips.
- Instant uploading of physical condition of any Tower or Line Span for efficient asset management ensuring proper connectivity to all the benificiaries of UPPTCL.
- Asset procurement requirement gathering can be done by generating instant MIS report.
- Helpful in obtaining instant report for preparing replies for assembly, parliament questions.
- The lapse, shortcoming etc in execution at any level can be identified independently by the immediate higher authority.

Web Application Dashboard



TLPS Mobile Application





Dashboard

Users can view the circuits assigned to them for patrolling.

Map Module

All assigned lines are towers can be viewed or edited.

Data Collection

During patrolling all data, images can be captured and uploaded.

ERP

- All 05 modules viz. plant and maintenance, material management, project system, HR and FICO have Gone Live from 01.09.2022.
- Users performing all activities related to these modules in real time on SAP environment since 01.09.2022.
- All types of Master data harmonised and uploaded on ERP. Central reporting of all Master data created as single source.
- Balance sheet of FY 22-23 finalised matching with ERP output in first year of Go-Live only.
- Bill Tracking System (BTS) implemented and integrated with ERP.

Implementation of PSDF Schemes in UPPTCL

Currently two PSDF sanctioned schemes are under implementation in UPPTCL

1. Reliable communication (Project ID-115)

- The objective of the project is establish data communication, telemetry & healthy protection for various 400/220/132 KV Substations & Transmission Lines of UPPTCL.
- Sanctioned value accepted by PSDF= Rs. 302.42 Crore (on 50% PSDF grant+ 50% UPPTCL equity Basis)
- Grant received from PSDF= Rs. 45.36 Crore
- **Claim yet to received (to be disburse by PSDF)= Rs. 64.45 Crore**
- Equity Consumed by UPPTCL = Rs. 99.23 Crore
- **Physical Progress = 85%**

Implementation of PSDF Schemes in UPPTCL

1. SAMAST (Project ID-288)

- The objective of the project is to scheduling, accounting, metering and settlement of transactions in electricity of Substations & Transmission Lines of UPPTCL.
- Sanctioned value accepted by PSDF = Rs. 35.23 Crore (on 90% PSDF grant+ 10% UPPTCL equity Basis)
- Grant received from PSDF= Rs. 22.65 Crore
- Equity Consumed by UPPTCL=Rs. 18.79 Crore
- **Physical Progress=100%**

SAMAST

- For implementation of SAMAST guidelines, 4123 ABT energy meters were to be installed at various substations (For metering of G-T points, T-D points).
- Cost of project 76.30 Cr. Funded by PSDF; Grant : 31.70 Cr.
- LoI placed on M/s Secure Meters.
- 4078 energy meters installed.
- Project shall be completed by 28.02.2024.

UP SLDC Limited

UP-SLDC

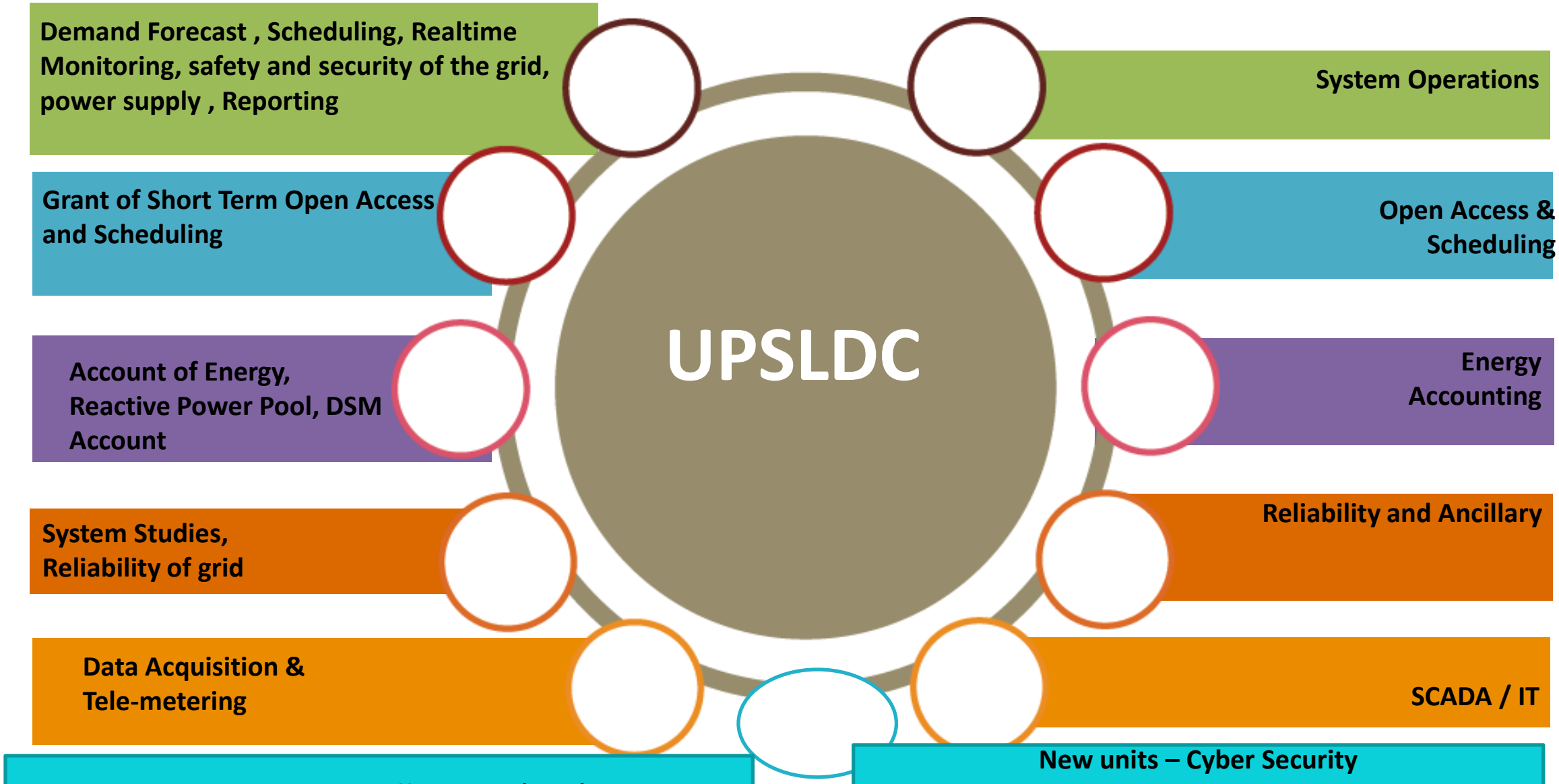
UP SLDC Limited, company formed on 22-08-2022.

- 1st Board Meeting held on 19-09-2022.
- Gazette notification of transfer scheme 24.05.2023.
- ARR submitted in UPERC - 30 November 2023.
- Business plan submitted - 30 November 2023
- Identified as Critical Information infrastructure(CII)
  - UP Govt. notification dated 22 July 2022.
  - **ISMS/ISO-27001:2013 Certified on 24-4-2024**

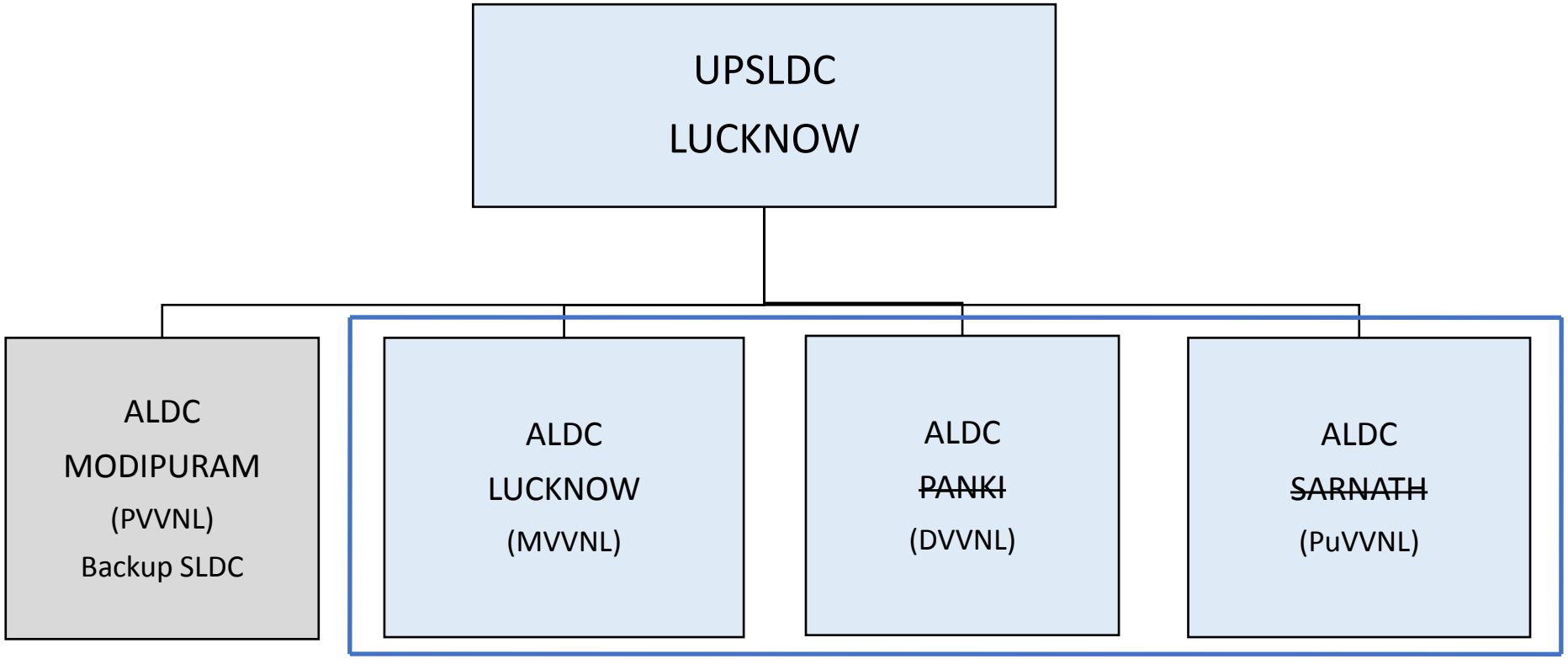
Responsibilities as per Grid Code

- System Operation and control
  - Rescheduling of dispatch and drawl schedules.
- Contingency analysis.
- System Restoration following grid disturbances.
- Operational planning
  - Specifying metering points and data collection.
  - Compiling and furnishing data for grid operation/ system studies.
  - Operation of state UI/DSM pool account and reactive energy account.
- Nodal agency for short term open access.
- State Power Committee (SPC).
- Power State Development Fund (UP PSDF).

Main Functions and Units



Structure of UPSLDC



SLDC operates electrical grid in coordination with NRLDC New Delhi, Transmission Utilities and Generating Companies.

ALDC Lucknow, Panki and Sarnath have been Co located in **SLDC Building Lucknow.**

KESCO is supervised from ALDC Panki

THANK YOU