FÓRUM LATINO-AMERICANO DE SMART GRID

SMART GRID

16ª EDIÇÃO

TATA POWER-DDL

Towards a Greener Tomorrow

SMART ENERGY SYSTEMS: BEST PRACTICES AND OPPORTUNITIES

Excellence through TQM...

Government of
National Capital Territory of Delhi

TATA
TATA POWER

51:49

JV of Tata Power Company Limited and the Government of Delhi

25 years

License Period starting in 2002

510 sq. kM

License Area of North and North West Delhi

2.1 Million

Customer base

TATA POWER-DDL
Towards a Greener Tomorrow

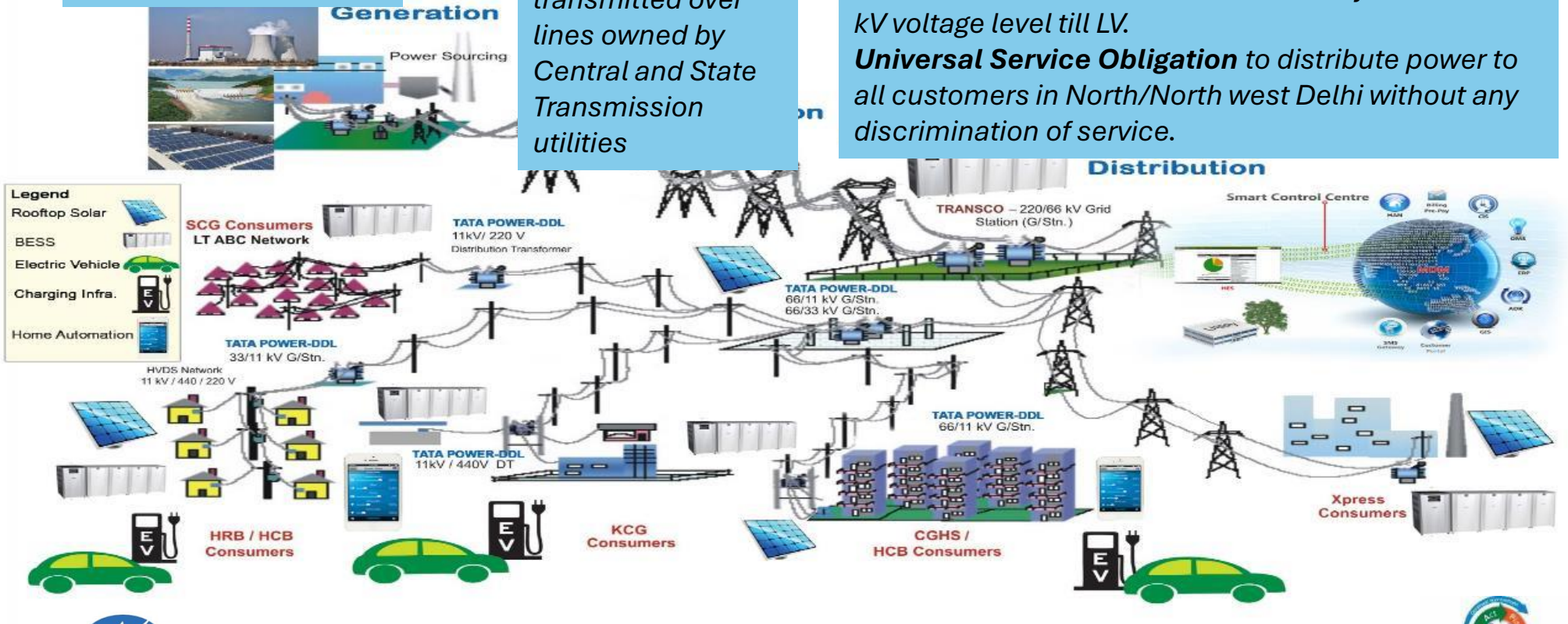
Excellence through TQM...

Overview of Distribution Utility Business of TATA Power-DDL

We source power from Generators across India

Power is transmitted over lines owned by Central and State Transmission utilities

Tata Power-DDL owns the distribution system from 66 kV voltage level till LV.
Universal Service Obligation *to distribute power to all customers in North/North west Delhi without any discrimination of service.*



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Excellence through TQM...

Performance in past 22 years

Parameter	Unit	July 2002	September 2024
OPERATIONAL PERFORMANCE			
AT&C Losses	%	53.1	**5.07**
System Reliability – ASAI -Availability Index	%	70	**99.9**
Transformer Failure Rate	%	11	**0.68**
Peak Load served	MW	930	**2481** ***(as on 18 June 2024)***
Length of Network	Ckt. km	6750	**13790**
Street Light Functionality	%	40	**99.37**
Smart Meters Installed	Million	0	0.488
CONSUMER RELATED PERFORMANCE			
New Connection Energisation Time	Days	51.8	**3***
Meter Replacement Time	Days	25	**3**
Mean Time to Repair Faults	Hours	11	**0.67**
Consumer Satisfaction Index	%	-	**97**

'**Roshni**' – our Brand Mascot

* Completion of commercial formalities & DN generation for payment

TATA POWER – DDL IS CERTIFIED WITH					
ISO 9001:2015	**ISO 14001:2015**	**OHSAS 18001:2015**	**ISO 27001:2005**	**SA 8000 : 2008**	**EMS 50001:2018**

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Excellence through TQM...

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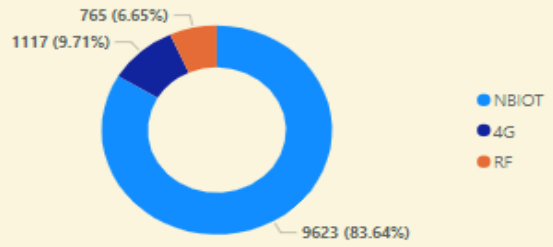
Smart Meter Installation Dashboard Overall

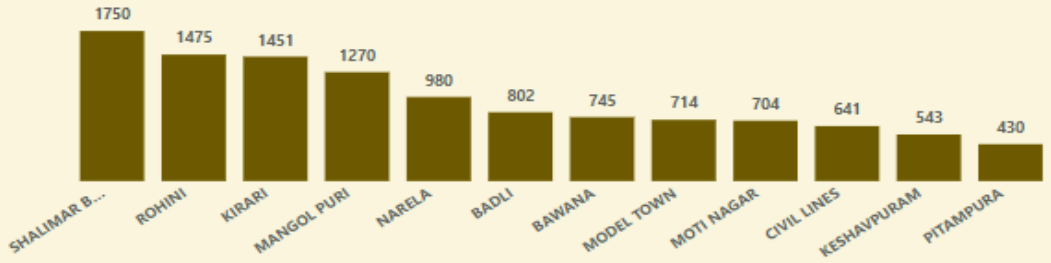
Data Selection: MTD

Total Issued meters	Total Removed meters	Total Active meters	Installed meters (YTD)	Installed meters (MTD)	Installed Meters (WTD)
488027	23941	464086	72282	11505	1126

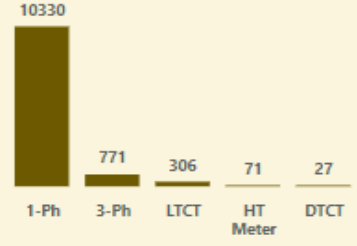
Technology wise meters installed



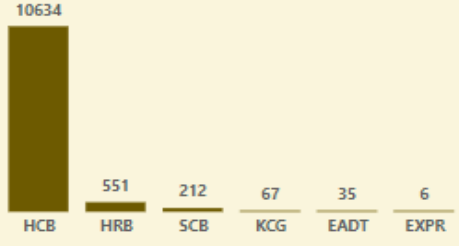
District wise meters installed



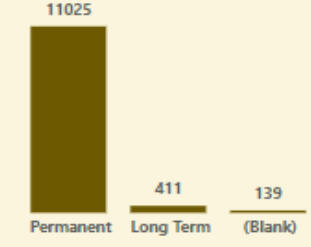
Meter Type wise installed meters



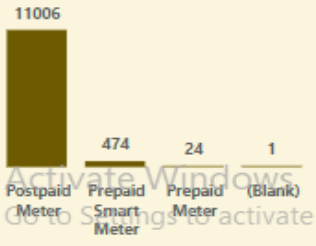
Segment wise installed meters



Installed meters by Cont Class



Prepaid Postpaid meters

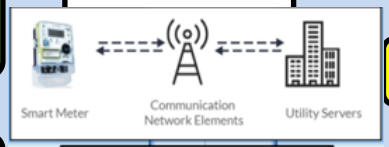


Tata Power-DDL Interfaces

First Time Use Case In Power Sector

Conventional Use

- Remote Billing
- Remote Connection and Disconnection
- Remote Firmware Update
- User Update to Consumer



Smart Metering Infrastructure

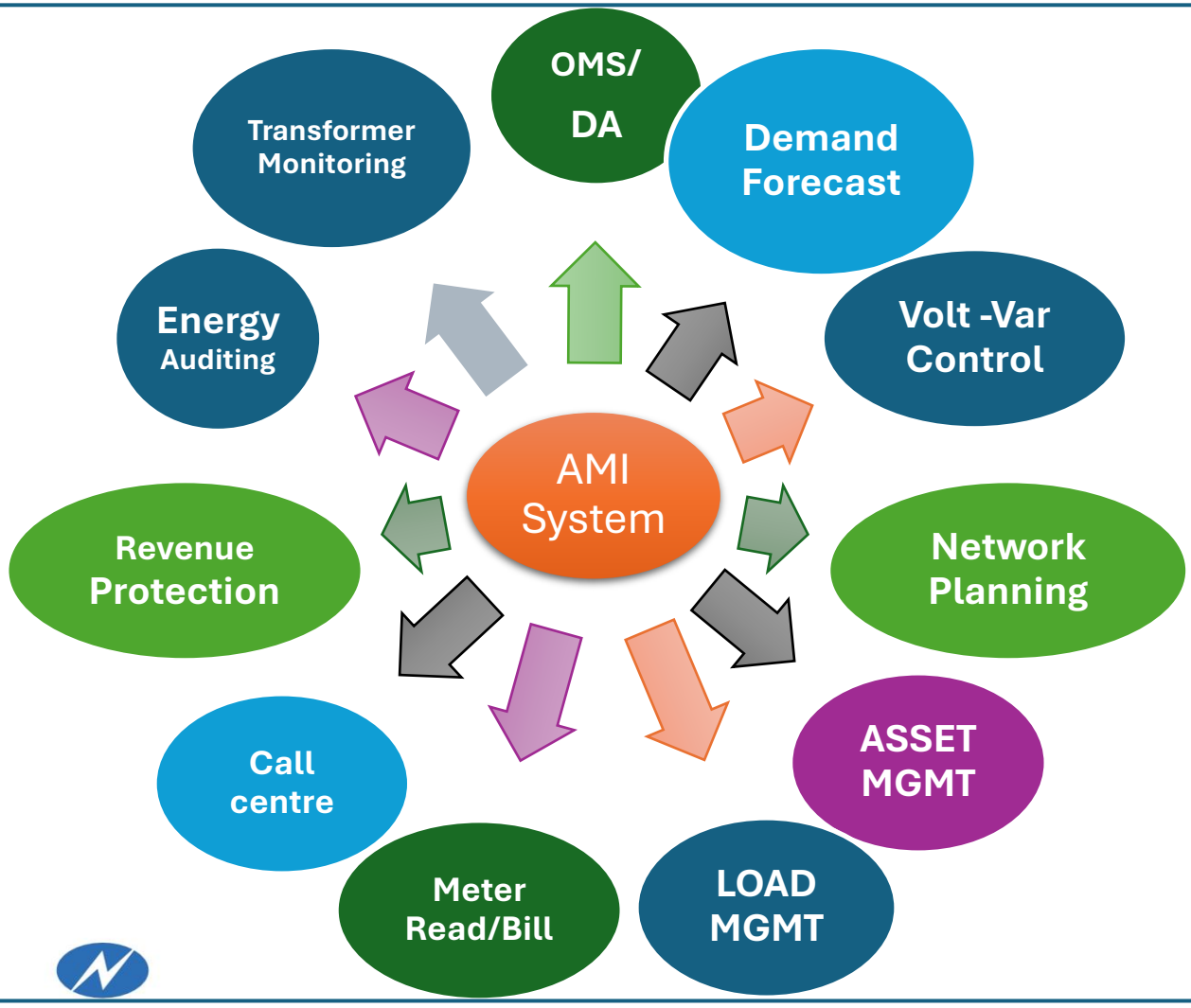
Innovative Use

- Outage Management
  - Last Gasp Integration with ADMS
  - Meter Ping in Consumer Complaint
- Asset Utilization
  - Virtual Metering
  - Load Monitoring & Forecasting
- Asset Health
- Power Quality Improvement
- Behavioral Demand Response
- Revenue Protection
- Thin Prepaid Mechanism

Opex reduction leading to consumer tariff coming down. Quantifiable

Opex reduction leading to consumer tariff coming down. Intangible

Operation Impact for Utility-Implemented Business Cases



- ❑ Flexible AMI networks:
  - Smart Metering based on RF, 4G and NBIoT
  - Communication technology agnostic MDM
- ❑ Edge of the grid implemented on multiple technologies.
- ❑ Robust Communication backhaul with integrated Network Management Systems.
- ❑ Grid Level Battery Storage, Community Storage
- ❑ Integration of all renewables done.

Glimpse of Technology

Smart Meter Communication Technologies

PLC BASED SMART METERS

RF-MESH BASED SMART METERS

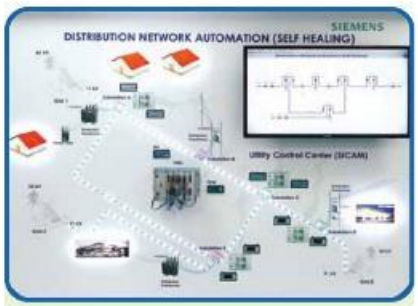
10 MW Battery Energy Storage

GIS

Edison Award 2008 for GIS Implementation

Distribution Network Management

ADVANCED DISTRIBUTION MANAGEMENT SYSTEM (ADMS)



DISTRIBUTION NETWORK AUTOMATION (SELF-HEALING)

Automated Demand Response

Certification

TATA Power-DDL recognized as **In-house R&D unit** by Dept. of Science & Industrial Research **(DSIR)**

Implemented Technology Landscape

Major Technology adoption

- SCADA
- DMS
- OMS
- AMR
- Smart Metering
- GIS
- ADMS
- FFA
- Demand Response
- SAP ERP
- CRM
- Battery Storage

Data Analytics | **CMMI & PCMM** | **Cyber Security**

Technology Enablers

All the major technology adoption over the years along with our current drivers playing a significant role towards our aspiration of TPDDL 2.1

IoT & ICT | **Smart Metering & DER Technology** | **Grid Modernization**

Outcomes

- Improved Reliability
- Consumer Value Creation
- Societal Value Creation
- Zero Harm Culture
- Sustainable Operations

Key Focus Areas for Future

Safety

Zero Harm Culture, Behavior Based Safety

Utility of the Future

Innovation & R&D, DER Technology, Behind the Meter technology, Global Benchmarking

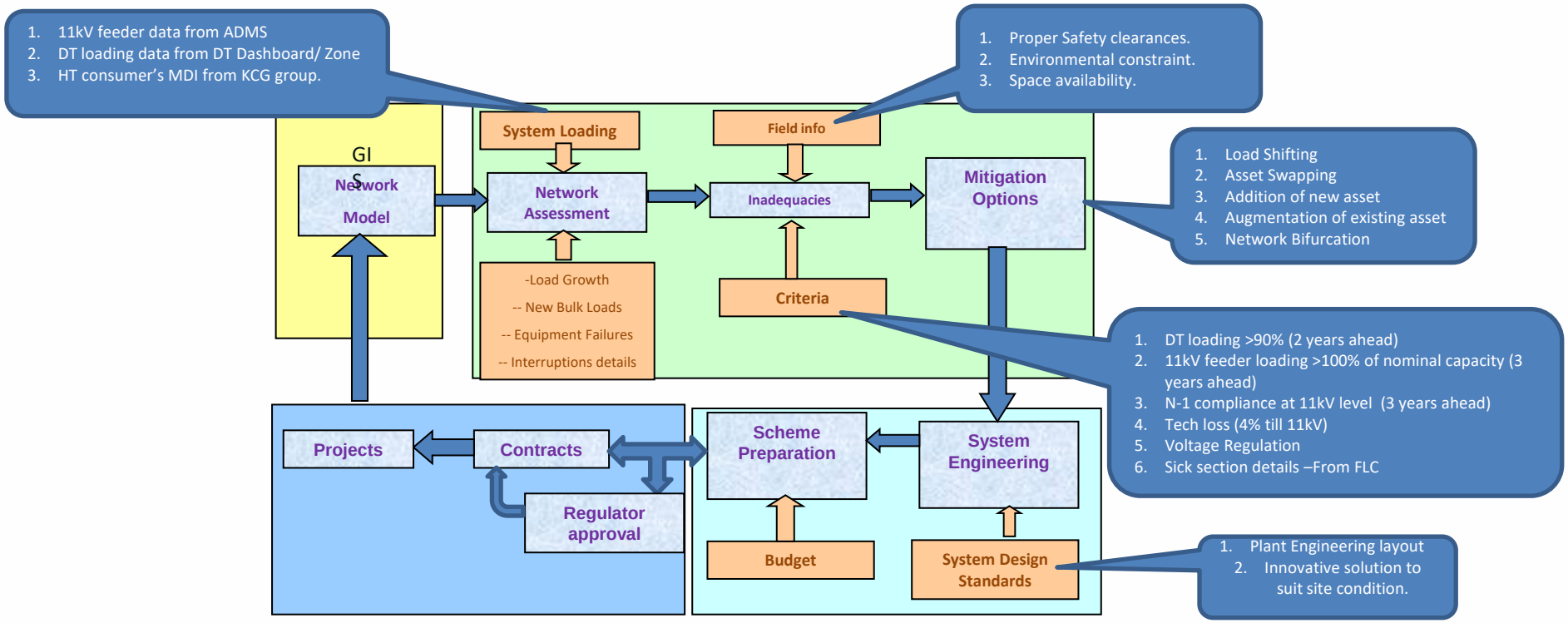
Cyber Security

IT/OT, Data Security, Benchmarking

Financial Health & Sustainability

Positive Cash Flow, Cost Reflective Tariffs, Liquidation of Regulatory Assets, Green Power Share

Focus:Power Distribution Network Analysis & Planning



Load Growth, Reliability, Safety, Quality

Network Planning & Interconnection Analysis

New Connection request

NETWORK ANALYSIS / ANALYTICS

Network Planning involves simulation of the network though load flow studies to identify constraints in the network (overload, voltage violations & contingency studies)

GIS

Smart Meters

SCADA

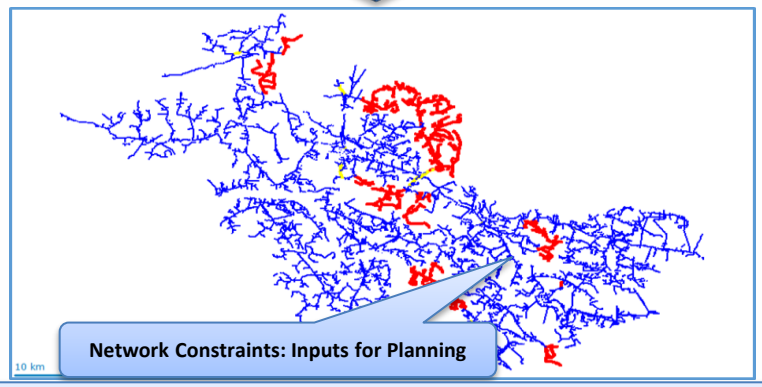
Consumer data

Connection processed instantly based on seasonal peak

Digital Diligence

System is designed in a way that it checks historical seasonal peak data of that DT.

Based on this, even if that DT would be loaded to max in summer, but in winter adequate margin is available, the connection can be released



Network Constraints: Inputs for Planning

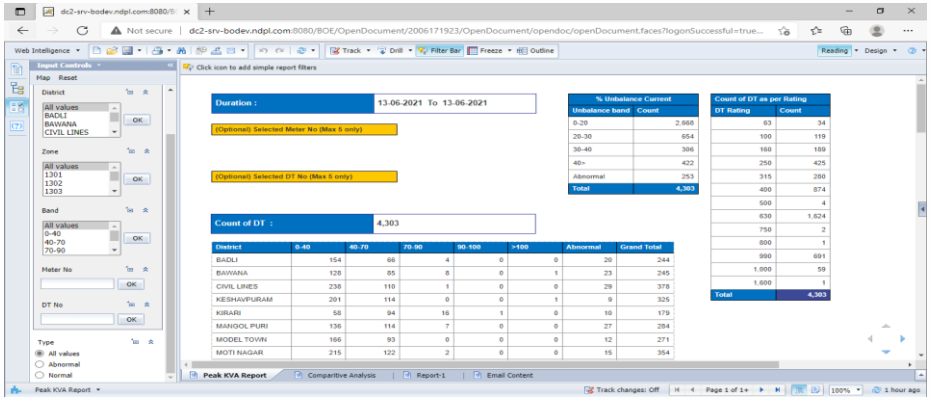
With availability of smart meters, transformer and consumer level time interval data has now become available creating new opportunities.

- Incorporation of SM data in load flow leads to more **accurate line loading and voltage** specially in downstream sections. SM data can help towards time series data for more accurate planning.

- Traditionally load type on a feeder was mostly homogenous with similar patterns. But with DER generation & EV, feeder loading patterns will undergo drastic changes. Smart meters and IOT devices which collect load level data and analysis platforms are critical for planning the network of the future

Innovative Business cases for Smart Meters

1. DT Dashboard : Smart Distribution Transformer (DT) Planning



- Convert Data of MDM into usable report
- DT Dashboard generates 2 hrs Sustained peak loading
- Load Curve Analysis of Multiple DTs
- Auto-abnormality Detection

2. Virtual Metering Portal : HVDS DTs Planning

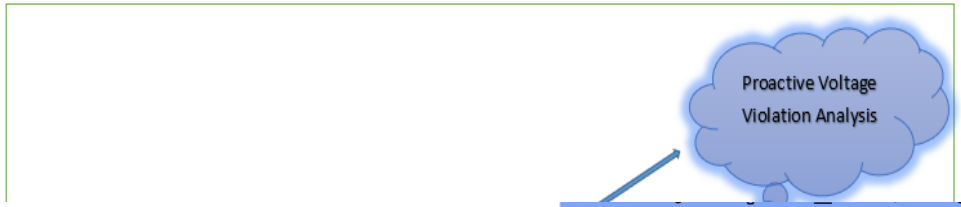
District	0%	0-40%	40-70%	70-90%	90-100%	>100%	Grand Total
BDL	2	79	30	6	1	4	122
BWN	16	1647	901	186	47	128	2925
CVL	1	5					6
KPM	1	146	37	9		8	201
KRR	2	21	2	1			26
MDT	1	28	1			1	31
MGP		59	13	3	1	4	80
MTN		23	5	2			30
NRL	10	319	165	24	11	23	552
PPR		120	57	12	3	8	200
RHN		2	1				3
SMB	1	51	9	3		1	65
Grand Total	34	2500	1221	246	63	177	4241

- For DTs with no physical meter but having 100% smart downstream consumers.
- Offers insights into loading patterns of DTs without a dedicated Smart meter on DT
- Load Curve Analysis of Multiple DTs
- Effective Asset Management and Planning

Innovative Business cases for Smart Meters

3. Consumer Voltage Profile Analysis Application : Data integration of Consumer & DT Smart Meter with ADMS.

- Auto collation of data from MDM (Consumer and DT Smart Meter Data), ADMS and SAP.
- Dashboard for data visualization.



TATA POWER-DDL

Pages

HV Complaints analysis

LV Complaints Analysis

File | Export | Share | Chat in Teams | Get insights | Set alert | ... | Copilot

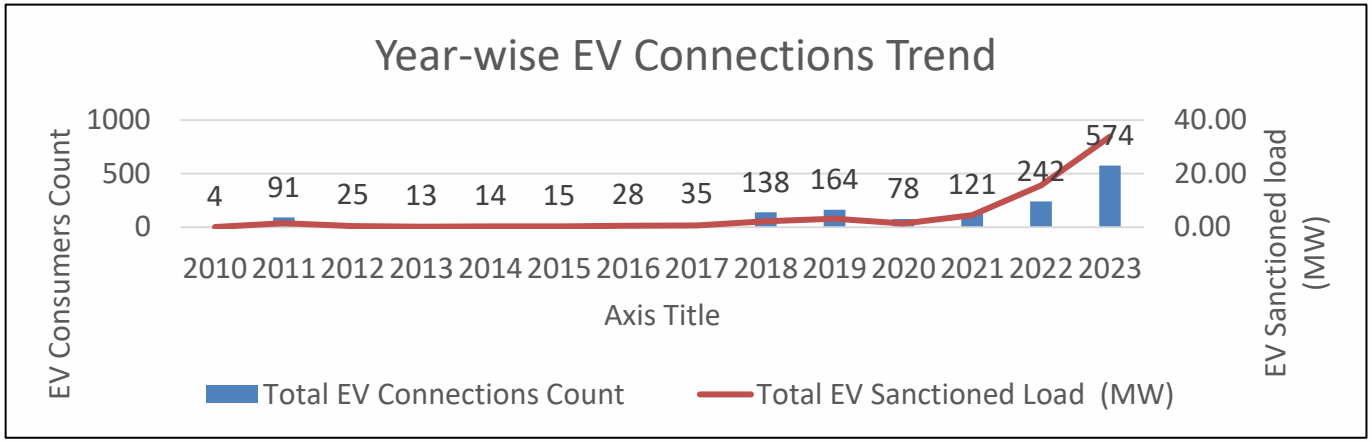
TATA POWER-DDL

High Voltage - Complaint Analysis

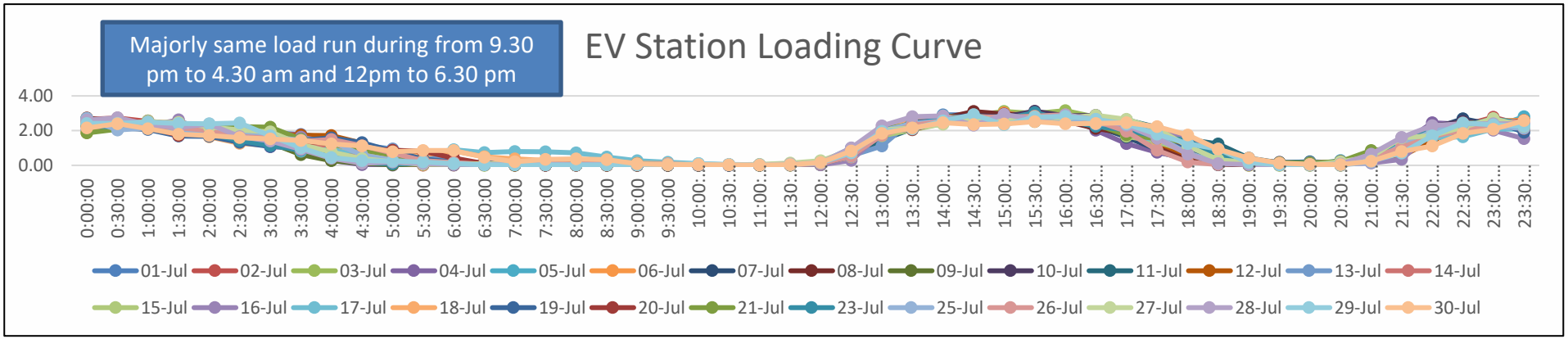
Select Interval: 4/1/2024 – 7/31/2024

District	Zone	CA No	DT No	DT Meter No	Meter Type	Consumer Meter No	Installation	Rate Category	Customer Name	Sanction Load (KW)	HV Compla (Nos)
BADLI	507	60000013064	6203H0		Smart	11206287	5000001056	E-SIP	Ms. REKHA JAIN	161.00	
BADLI	507	60000020366	6213H0		Smart	11205739	5000001425	E-NDLT	Mr. KARAN SINGH	110.00	
BADLI	507	60000020556	9706H0		Smart	11203157	5000001518	E-NDLT	Mr. MOHAN LAL	98.00	
BADLI	507	60000020622	6203H0		Smart	21200322	5000001549	E-SIP	Ms. SUDHA RANI	89.00	
BADLI	507	60000020762	HTKCG		Smart	21300126	5000001619	E-NDHT	INDRAPRASTHA GAS LIMITED	198.00	
BADLI	507	60000036222	9706H0		Smart	21201089	5000018775	E-NDLT	Mr. RAJ SINGH .	37.00	
BADLI	507	60000067904	970101		Smart	11028450	5000027137	E-NDLT	Mr. RANDHIR SINGH .	21.00	
BADLI	507	60000117303	9708H0		Smart	11040803	5000039915	E-NDLT	Ms. KAMLESH YADAV	20.00	
BADLI	507	60000122113	6115H0		Smart	21201035	5000044290	E-NDLT	Mr. JAI RANA PRAKASH .	60.00	
BADLI	507	60000122337	621002		Smart	11106156	5000040020	E-NDLT	Mr. KRISHAN RANA	37.00	
BADLI	507	60000173207	6202H0		Smart	11107233	5000044728	E-NDLT	Mr. JAI PRAKASH	40.00	
BADLI	507	60000173991	620410		Smart	11026455	5000044811	E-NDLT	Mr. BALWANT SINGH ARORA	21.00	
BADLI	507	60000193528	6115H0		Smart	11100040	5000049460	E-NDLT	Mr. JAI PRAKASH RANA .	35.00	
BADLI	507	60000199996	6212H0		Smart	11042206	5000049180	E-NDLT	Ms. TEJWATI .	17.00	
BADLI	507	60000238109	6115H3		Smart	11037662	5000054149	E-NDLT	Mr. KULDEEP SINGH	21.00	
BADLI	507	60000250153	6202H0		Smart	11205811	5000039434	E-SIP	Mr. MOHAN LAL .	84.00	
BADLI	507	60000302335	6202H0		Smart	11205098	5000044121	E-SIP	Mr. GAJ RAJ SINGH .	121.00	
BADLI	507	60000302814	6213H0		Smart	11100272	5000044206	E-NDLT	Mr. MAHAVIR SINGH .	49.00	
BADLI	507	60000342422	6210H1		Smart	11032265	5000059243	E-NDLT	Mr. KRISHAN KUMAR YADAV	20.00	
BADLI	507	60000342455	6202H1		Smart	11207076	5000059585	E-SIP	Ms. DARSHANA DEVI	89.00	
BADLI	507	60000342828	6202H1		Smart	21201845	5000059619	E-SIP	Mr. SHEESH PAL GARG	112.00	
BADLI	507	60000348155	6203H0		Smart	11106952	5000059291	E-NDLT	Ms. BIMLA YADAV	14.00	
BADLI	507	60000361372	6203H0		Smart	11040515	5000059576	E-NDLT	Mr. SEWA RAM	25.00	
BADLI	507	60000367718	6220H1		Smart	11001785	5000059936	E-NDLT	Mr. RAJAT KUMAR	25.00	
BADLI	507	60000379903	6213H0		Smart	11106151	5000049241	E-SIP	Mr. SURINDER SINGH .	39.00	
Total											

EV Stations - Study



- Total eV connections = 1952 nos. (till Aug'24)
- Total sanctioned load = 76.43MW (till Aug'24)
- 8 nos. connections released for Delhi Transport (47.85MW).
- 1 no. connection released for DMRC (2.5MW)



Storage Initiatives

10 MWh energy storage system at Tata Power Delhi Distribution's Rohini Substation (in partnership with AES, Mitsubishi)

Community storage: 15-20% of the Distribution Transformer Capacity. 630kVA DT – 150 kW/528KWh Storage (in partnership with Exide & Leclanche)

First of a kind pilot project on Pole Mounted Battery Energy Storage (Under Development 20KW/20KWh)

Grid Storage

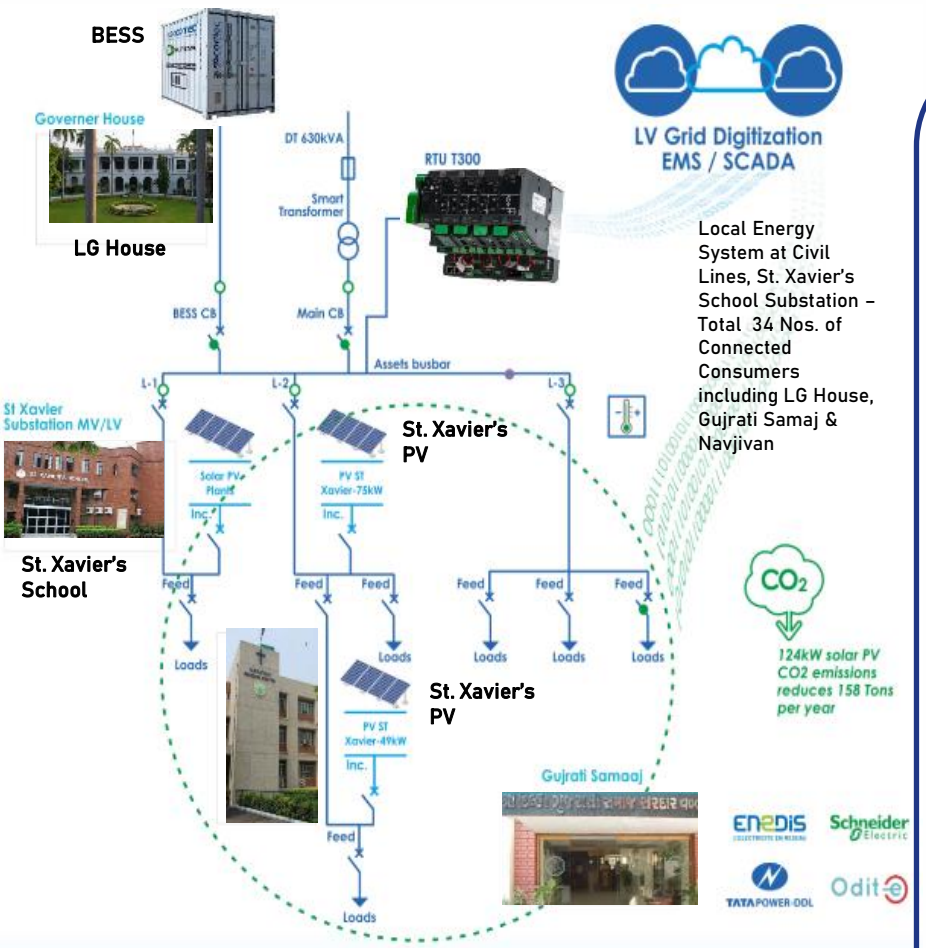
Better load management and system flexibility

Community

Prevent overloading and backup during exigency condition

Pole Mounted

LOCAL ENERGY SYSTEM : Connectivity



Objectives

ENERGY STORAGE

To increase renewable energy sources integration and enhance local use of local renewable energy

GRID AUTOMATION

To make power supply more efficient and reliable by digitizing the network and introducing automation

DEMAND RESPONSE

To enable flexibility of the customer's demand and enhance customers' involvement

ISLANDING

To increase the reliability and resilience of the electricity supply

1. Maximize the local consumption of Distributed Energy Resource Generation
2. Improve reliability through the islanding of the Microgrid in case of an outage
3. Behavioural Demand Response program to optimize energy consumption
4. Application of P2P energy trading to support various distributed energy generation

Towards a Greener Tomorrow

The Changing Paradigm: Energy-A Service

Decentralization, Decarbonization & Digitalization are reshaping power sector, requiring the shift in business models from traditional utility centric to consumer centric.

DISTRIBUTED GENERATION

- Increased Renewable generation (Solar/ wind/Rooftop/Micro-Grids)
- Energy Storage
- Local Energy Markets
- Distributed Energy Resource Management

GRID INTEGRATION

- Demand Management
- Peaking Power; Ancillary Market
- Cybersecurity

COMPETITION DRIVEN

- Lower Margins
- From Regulated to Competition Driven

E-MOBILITY

- Increased Power Demand
- Reshaping Load-Curve
- System Balancing; Energy Storage Solutions
- Time of the day Tariffs

CONNECTED SYSTEMS

- Access to data
- Sensors & Control
- Two-way Communication
- Advanced Analytics

SUSTAINABILITY

- Circular Economy
- Energy Efficiency
- Coal Tax
- Stringent Emission Standards

EMPOWERED CONSUMER

- *Prosumers;* Peer to Peer Transaction
- On- Demand Services
- Personalised data-driven customer experience
- Other utility services

New Offerings to the consumers

Objective-

- To create non –tariff revenue & profit chain for the organization through sustainable business & initiatives within & outside the licensed area in Delhi Region.

- To support & promote the Central and State Govt driven New/Green initiatives.

TATA POWER-DDL

Towards a Greener Tomorrow

Facilitation to Govt in Green Initiatives

Dedicated Team

To drive the sustainability initiatives by Govt through support & liasioning as Nodal Agency

24X7 Sampark Kendra (Call Center) for Consumer Queries handling

Handling & resolving consumer queries /complaints with minimal TAT

Framing of policies along with decision makers

Contributing in providing relevant inputs in making the policy consumer friendly .

Buffer between consumers & Govt Agencies

- *Regular/Continuous percolation of information/Policies to the end consumers*
- *Taking up consumer inputs with Govt Agencies.*

Awareness & Implementation of policy

Awareness & Implementation of policy with regular updates , corrective measures ,Progress, results , reports etc.

Continuous improvement

Making the policy more robust and practical through past learnings & making the ecosystem more conversant with consumers.

Solar Policy Highlights

Current Policy Highlights

Central Government (MNRE)

Old MNRE Solar Policy Vs. New PM -Surya Ghar :Muft Bijli Yojana

Solar Rooftop Policy Comparison		
Residential Load Slab	**Old Policy subsidy before 16th Feb 2024**	**New Policy subsidy post 16th Feb 2024**
1 kW	18,000	30,000
2 kW	36,000	60,000
3 kW	***54,000***	***78,000***
4 kW	*63,000*	*not applicable above 3 kW*
5 kW	*72,000*	
6 kW	*81,000*	
7 kW	*90,000*	
8 kW	*99,000*	
9 kW	*1,08,000*	
10 kW	*1,17,000*	
Max Subsidy	***1,17,000***	***78,000***

State Government

Delhi Solar Policy 2023 notified dated 14th March 2024

Generation Based Incentive (GBI)		
Type of Consumer	**Previous Applicable GBI (INR per KWh)**	**Revised Monthly GBI (INR per kWh)**
Residential :Maximum upto 3kW	2	***3***
Residential :Above 3kW & upto 10kW		2
Group Housing Societies /Residential Welfare Associations : upto 500 kW (at 10 kW per house)		2
C&I (For the first 200 MW deployed)	NA	***1***

Capital Subsidy for residential consumers : GNCTD will provide capital subsidy @ Rs 2000/- per kW upto a maximum of Rs 10,000/- per consumer.

Incentive Parameters for Discom as laid down by MNRE		
S.No.	**Parameter Incentive to be Provided**	**Incentive to be Provided**
1	For installed capacity achieved above 10 %and up to 15 % over and above of the installed base capacity* within a financial year	5% of the applicable cost** for capacity achieved above 10 % of the installed base capacity
2	For installed capacity achieved beyond 15% over and above of the installed base capacity* within one financial year	5% of the applicable cost** for capacity achieved above 10 % and up to 15 %of the installed base capacity PLUS 10% of the applicable cost** for capacity achieved beyond 15 % of the installed base capacity

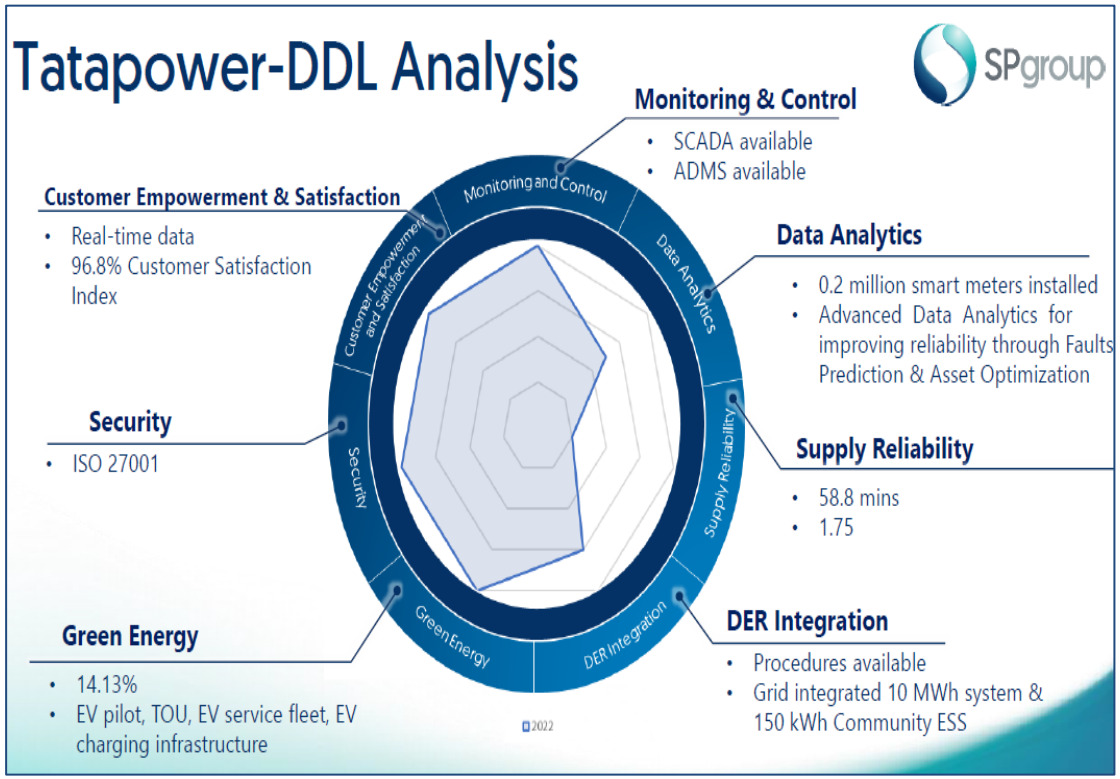
Role of DISCOM (TPDDL)

1. Integrating the Discom net metering portal with MNRE national portal as a single window facilitation to consumer applying for solar plant.
2. Empanelment of interested Vendors/channel partners on National Portal
3. Post successful installation of solar plant, a joint site visit along with vendor to ensure quality, quantity and safety.
4. Verification of completion reports /Documents for Central Financial Assistance disbursement to eligible consumers
5. Regular monitoring of National Portal and Solar Requests status along with necessary follow up actions.
6. Complaint /Grievance Handling with CA-PA.
7. Meetings with Govt bodies on weekly, fortnightly & Monthly basis(As & when) for updating progress & designing future road map.

Smart Grid Index 2022 (conducted by Singapore Power)
- Benchmarks a total of 94 utilities across 39 countries / markets

Utility	Country/Market	Score	+ / - (%)	Best Practices
Enedis	FRA	98.2	1.8	
TaiPower	TWN	94.6	-	
UKPN	GBR	94.6	-	
ConEd	USA	92.9	-1.8	
WPD	GBR	92.9	-	
CitiPower	AUS	91.1	-1.8	
DEWA	ARE	89.3	-	
SP Energy Networks	GBR	89.3	1.8	
SDGE	USA	87.5	-	
FPL	USA	85.7	-	
Northern Powergrid	GBR	85.7	1.8	
SCE	USA	85.7	-	
Stedin	NLD	85.7	-	
ComEd	USA	83.9	-	
PG&E	USA	83.9	-3.6	
ENWL	GBR	82.1	-3.6	
Jemena	AUS	82.1	1.8	
PEPCO	USA	82.1	5.4	
Powercor	AUS	82.1	-	
Radius	DNK	82.1	-3.6	
United Energy	AUS	82.1	-	
Chubu	JPN	80.4	8.9	
Hydro Ottawa	CAN	80.4	1.8	
LADWP	USA	80.4	-	
SSEN	GBR	80.4	-	
State Grid Beijing	CHN	80.4	-	
Tata power-DDL	IND	80.4	-	
TEPCO	JPN	80.4	-1.8	

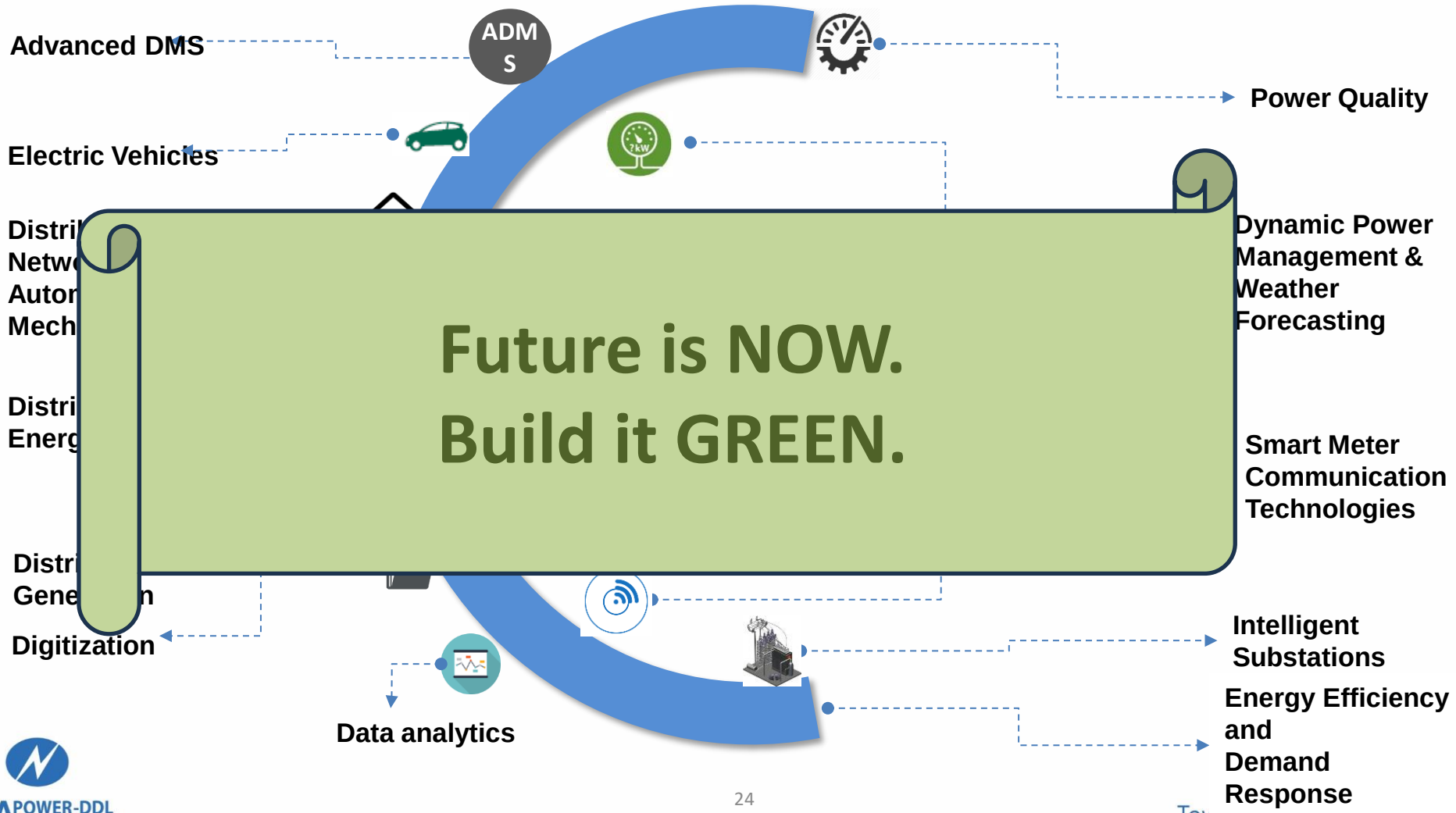
Tata Power-DDL is the 1st Indian Utility to be positioned among Top 25 Utilities across the globe



TATA POWER-DDL

Towards a Greener Tomorrow

Tata Power-DDL: Utility of the Future



TATA POWER-DDL

Towards a *Greener* Tomorrow

Thank You

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