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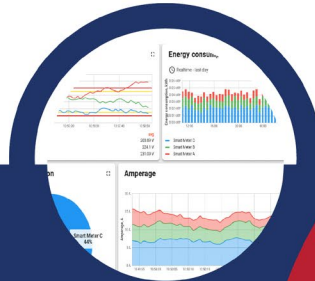
South Asia Clean Energy Forum 2023


Catalyzing Partnership for Clean Energy Transition

SESSION 2: Smart Metering and Data Analytics

Ganesh Srinivasan
CEO, Tata Power Delhi Distribution Limited

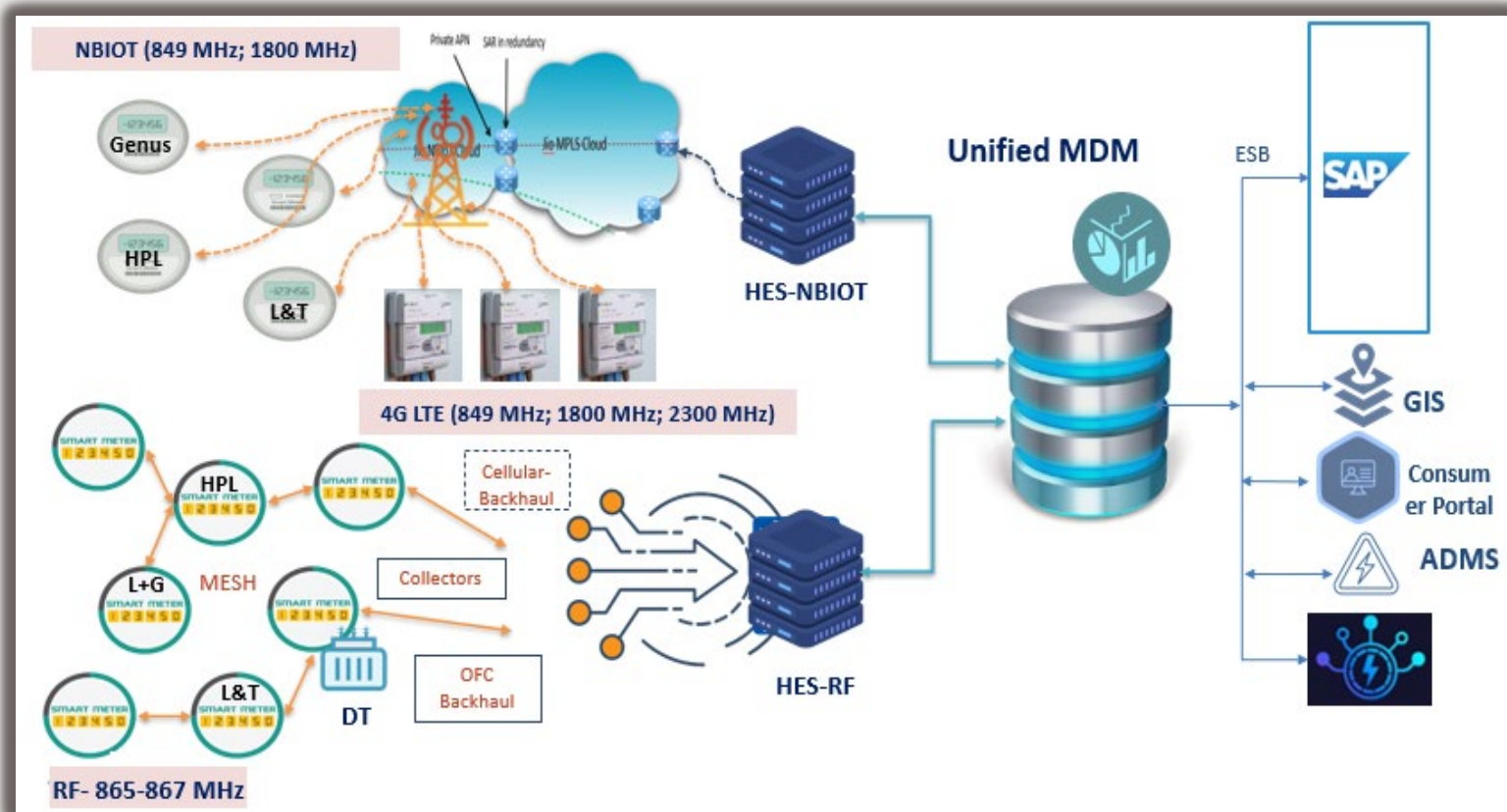
3rd May 2023





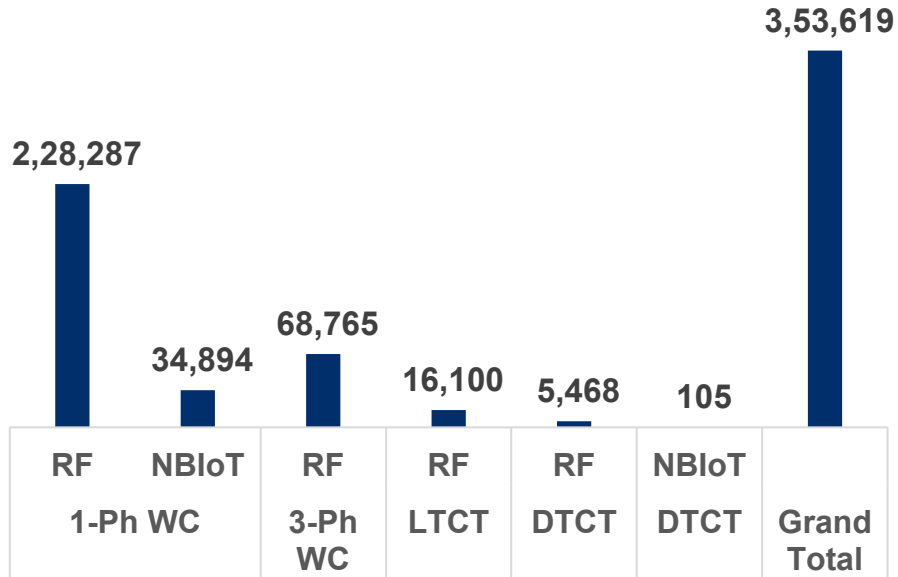
Smart Metering and its usage

AMI Deployment Architecture

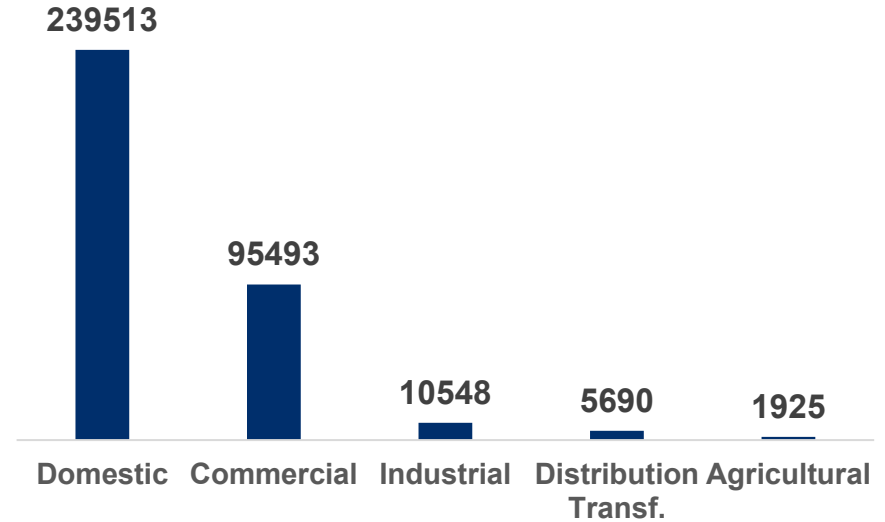


Smart Meters Deployment at Tata Power-DDL

Smart Meter Deployment till FY 23



Customer segment wise count



~50 no. Personnel engaged in Smart Metering Activities:

AMI Applications and Analytics: 05 Nos.
 IT Communication and Analytics: 04 Nos.
 MMG: 10 teams (4 members per team)

No. of AMR Meters: 26,498 Nos

Smart Metering Journey of Tata Power-DDL

International Exposure

International exposure to employees for understanding of system

Smart Meter

Phase-1: Single Phase, PP-WC, DT Meters

Year-02

Supply of Meters
Order of CT-Meters

POC



Tender-1

National
Tariff Policy



Tender-2



Tender-3



RF Canopy

Year-01

Deployment(back End),
Material Delivery, Planning of
deployment and backhaul &
Strategy

Year-03

Integration with other vendors

MDMS

Year-02

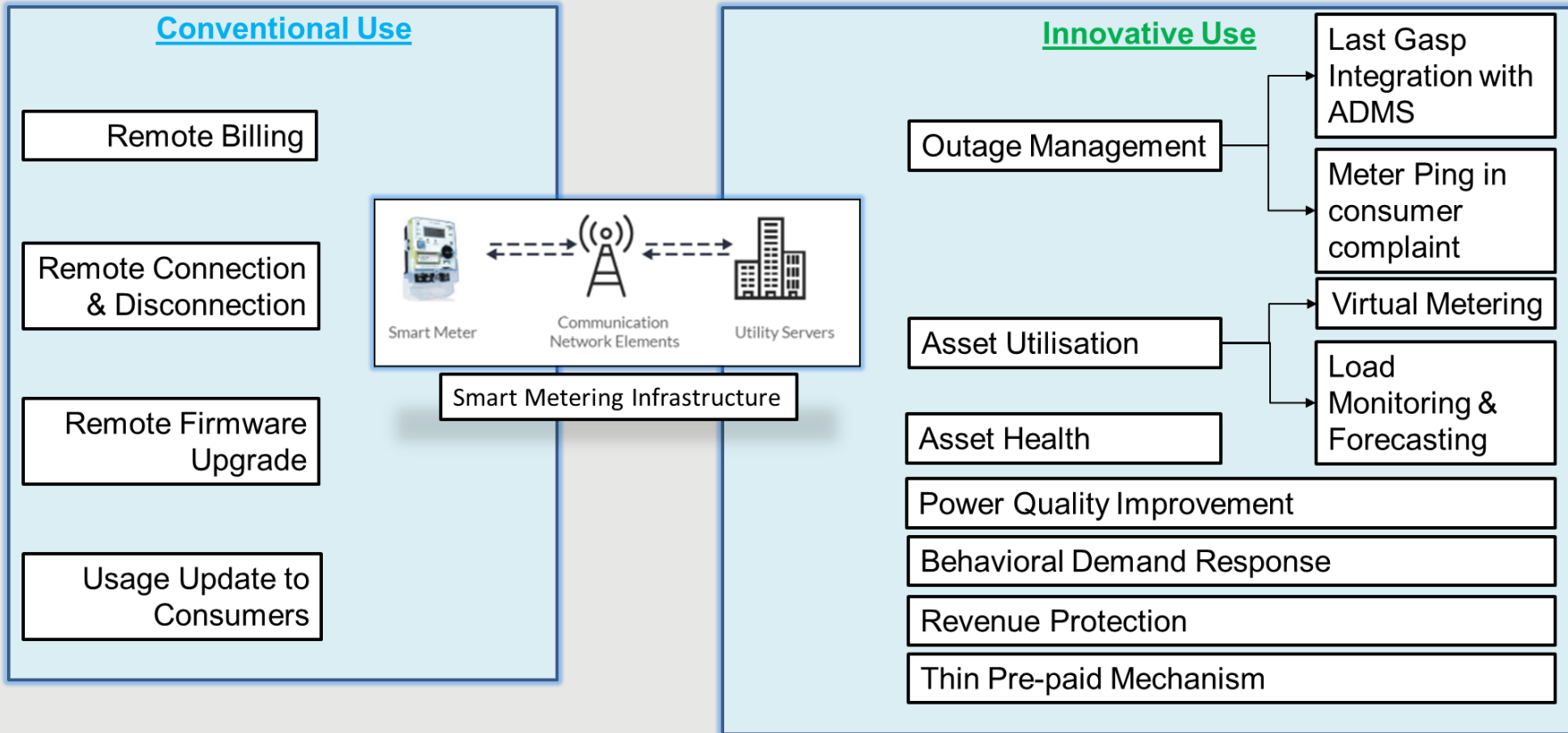
Supply of hardware,
Delayed by Design

Year-03

Rollout, In house for
billing developed
(Sequence Change)



Tata Power-DDL use cases





Innovative Use of Smart Meter Data – Outage Management

Last Gasp integration with ADMS:

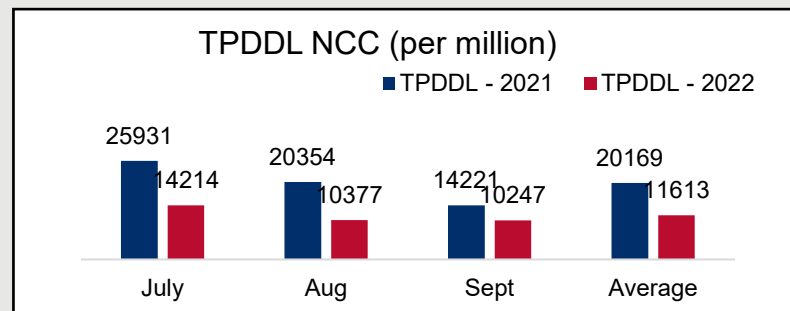
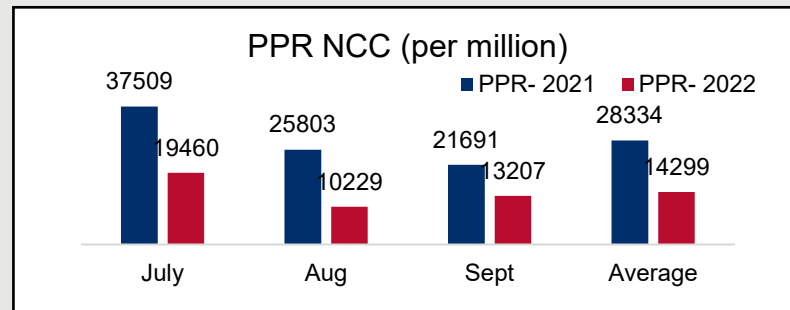
Objective: Using the Last Gasp signal to prioritize the outage response.

Adoption in Business Process:

- To benefit consumers by improving SAIDI
- Optimize utilization of field crew

Benefits:

- Early identification of power failure in the network.
- Saving in Operational Expenses by using manpower efficiently
- Reduction in registration of No Current Complaints. Ref. graph of 01 district of Tata Power-DDL.



- **49.5% reduction in average NCC (per million) observed in PPR as compared to last year**
- **42.4% reduction in average NCC (per million) observed in total TPDDL.**



Innovative Use of Smart Meter Data

– Outage Management

Meter Ping in consumer complaint

Objective: To register no-current complaints pertaining to utility only

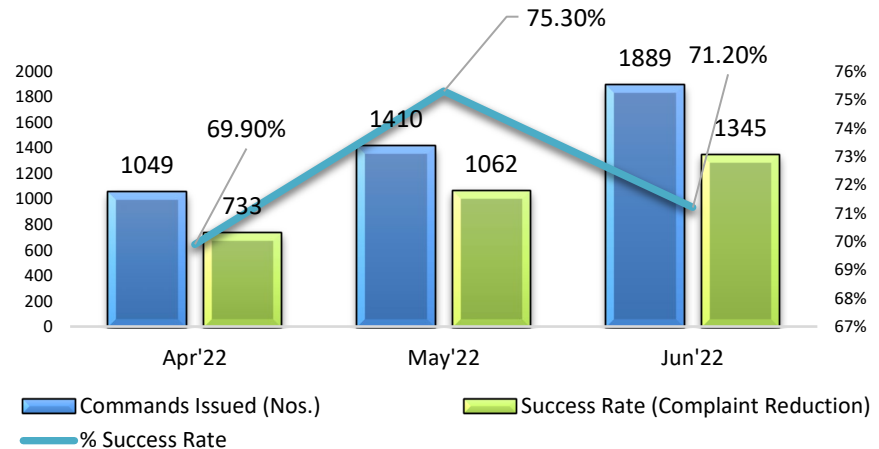
Adoption in Business Process:

- Eliminates false no-current complaint registration
- Timely information to consumers if cause of power supply failure at his end.

Benefits:

- Optimize utilization of field crew
- Saving Operational Expenses by using manpower efficiently.

Meter Ping in Consumer Complaints (No Power Supply)





Innovative Use of Smart Meter Data – Revenue Protection

Objective: To protect revenue by setting up a rule-based algorithm system

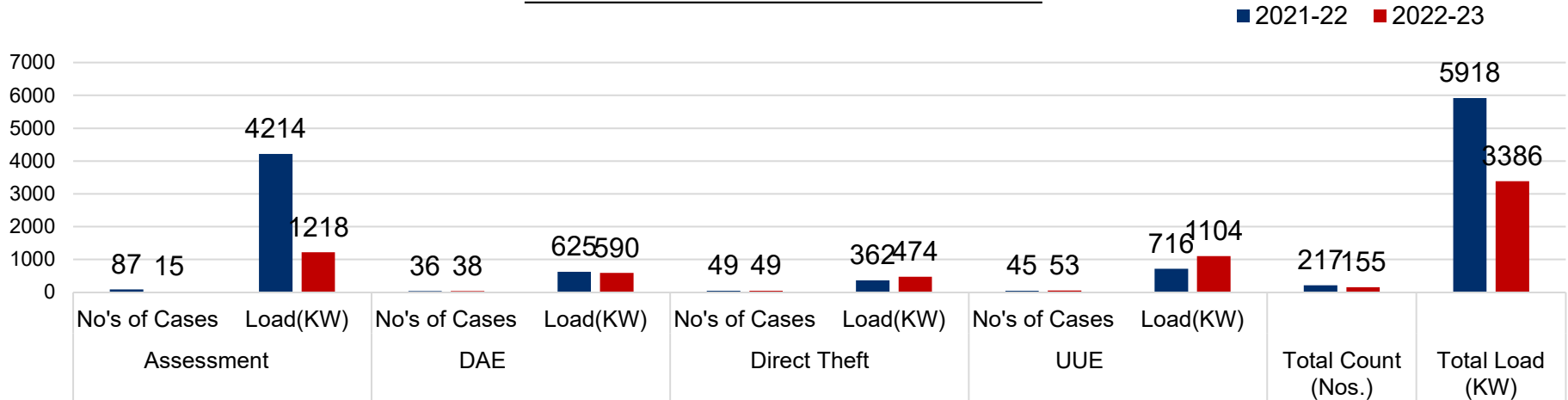
Adoption in Business Process:

- Filtration of potential cases
- Lesser effort is required as compared to previous system for AMR meters.

Benefits:

- 82% more cases booked in H1 (FY23) as compared to H1 (FY 22)
- Lesser Manpower requirement in executing the same no. of cases

Revenue Protection Module: Load Booked





Innovative Use of Smart Meter Data

-Risk Prediction of Distribution Transfer

Objective : To create a prediction of risk for DTs

Adoption in Business Process

- From period based maintenance /overhaul to data based maintenance /overhaul
- Embed in workflow by linking to notification process

Benefits

- Avoid both scheduled and unscheduled interruption
- Reduce opex/ Capex and asset failure rate

Features

- All asset data in different systems like ERP, MDM, etc integrated to create a model.
- Threshold values validated by verifying previously failed DTs

Distribution Transformer Risk Based Matrix

DT Zone	Equipment ID	DT ID	DT Capacity (in KVA)	Smart Meter Status	Substation Description	AGE			LOADING			Interruption Total
						Year	CR	Weightage	% Loading	CR	Weightage	
1001	AH103010	302403	215	NO	IT101-45/02	-	0	0	-	0	0	-
1001	AH103014	302402	550	YES	W15-2 FURNITURE BLOCK	20	0	30	50.50	0	20	-
1001	AH103020	302514	550	YES	L.BLOCK/SH/1/AGAR	20	0	30	57.37	0	20	19
1001	AH103075	341101	600	YES	INDIRA	-	0	0	44.77	0	20	0
1001	AH103025	302604	400	YES	59 SARAI ROAD	34	0	30	21.05	4	20	0
1001	AH1030817	342602	100	YES	BHILAIKOTI NER	12	0	30	28.84	1	10	0
1001	AH103091	303002	400	YES	5.00 BRU/ROBE NADAR	30	0	30	65.57	0	20	0
1001	AH103042	302403	500	YES	W15-2 FURNITURE BLOCK	-	0	0	50.00	0	20	-
1001	AH103024	341002	515	NO	STC	20	0	30	-	0	0	-
1001	AH103020	302101	400	NO	TO BIKRIE	37	0	30	-	0	0	-
1001	AH103020	372410	400	NO	SIGNALPADA (ROAD BUS AREA AH103040101)	34	0	30	-	0	0	-
1001	AH103014	302504	215	NO	IND	-	0	0	-	0	10	-

Summary



Innovative Use of Smart Meter Data – Asset Health

Objective: To protect the health of transformers and other assets by getting digital input and digital output signals through smart meters.

Adoption in Business Process:

- Daily alert report on low oil level
- Prevents assets from fire hazards and theft
- Prevents theft of internal components of transformers (oil etc)

Benefits:

- Prevented DT oil theft in 02 cases
- Prevented breakdown in 12 cases owing to low oil level



Innovative Use of Smart Meter Data

– Auto Consumer Mapping Correction

Objective:

Use consumer and DT smart meter outage stampings and GIS information to detect anomaly and predict correct mapping

Adoption in Business Process

- Sustainable process to correct indexing
- Integrated to ADMS for equipment outage prediction

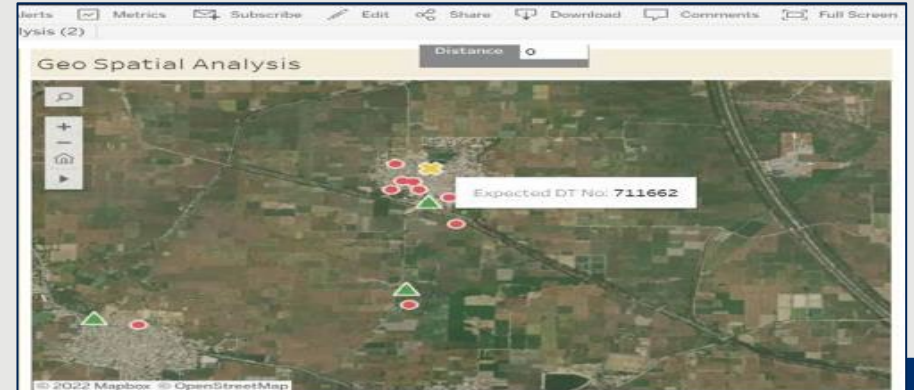
Benefits

- Correct Indexing leading to correct loss calculation, device prediction
- Reduced effort and time over conventional ways of checking indexing

Features

- Takes geographical co ordinates to validate predicted DT
- Rechecked with LT network availability of predicted DT's network in the vicinity

District	Zone	Expected DT Meter	Expected DT No.	Current DT	CA
BAWANA	512	95405130	800661	480429	060022688323
		95402856	710701	800722	060015329586
		95405157	711662	X00717	060012583278
				711613	060022156081
				K00510	060062098022
				N00612	060000488902
					060001388440
					060012559500
					060018144018
					060021532035
		95403257	K00636	060022375269	
			K00509	060027205568	
				060000476345	
				060002114415	
				060006975829	
				060009862396	
				060010320343	
				06001388440	

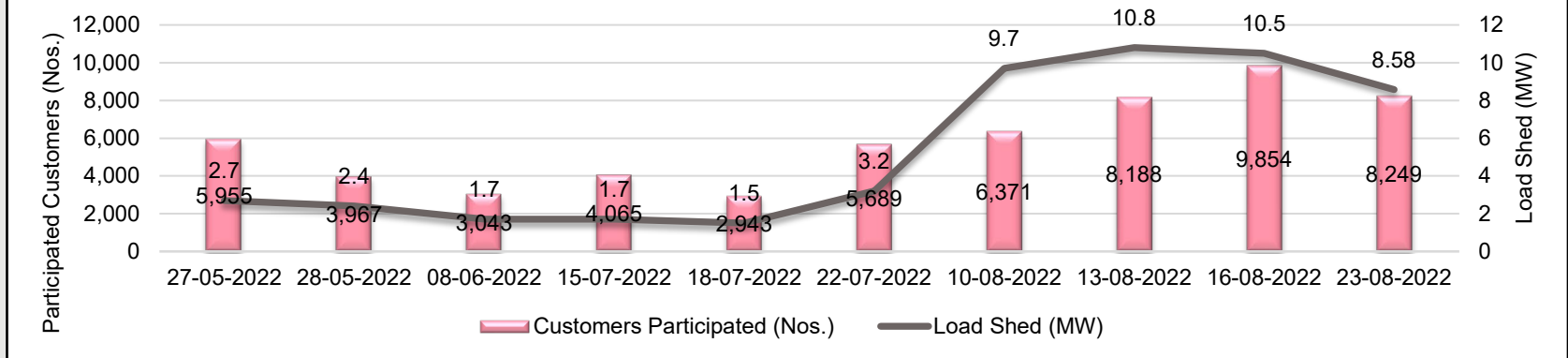




Innovative Use of Smart Meter Data – Behavioral Demand Response

- **Objective:** Educating consumers on reduction in consumption from normal levels during critical events as called by utility.
- **Duration:** May'22 to September'22 (Launched on Earth Day: 22nd Apr 22)
- **Enrolled customers:** 14K+ Residential and 6.7K+ C&I customers enrolment done
- **Number of DR events planned:** 16 Events; 8 day events, 8 night events.
- **Event duration:** 2 hours
- **DR event scheduling:** Depending on the peak demand projections, Day ahead planned event to be dispatched through FLEX and intimation to customers 24 hours advance
- Customer engagement through SMS / WhatsApp / Phone Calls / E-mailers, Dedicated Webpage.
- **DR Event Updates:** Successfully executed 10 events

Demand Response Event Details



Smart Meters, by their feature of recording and transmitting interval data, facilitate the execution of DR Programs

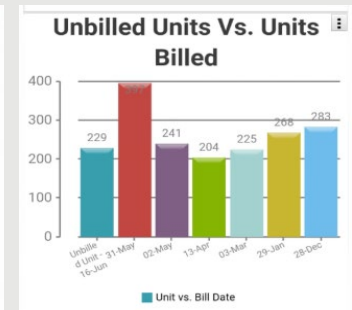
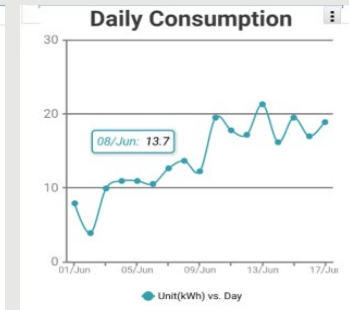
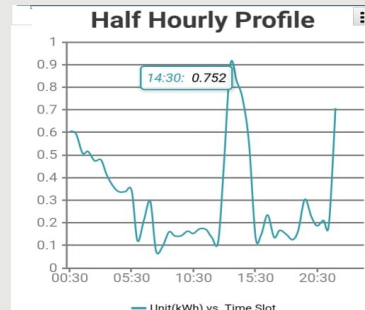
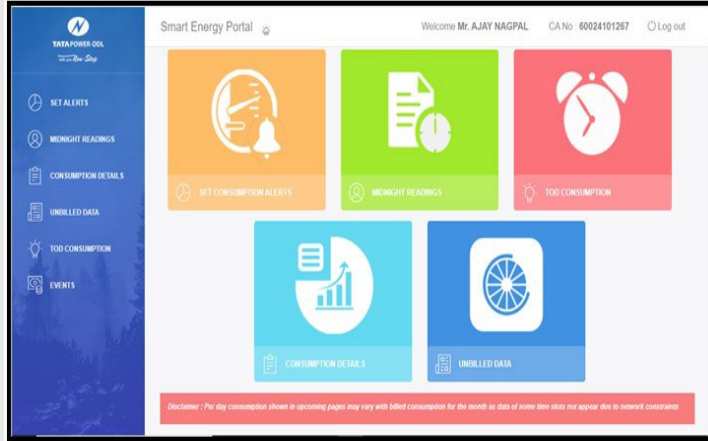
End Customer Empowerment with Smart Meter Data

Smart Meter Consumers can

- Monitor Load profile
- View Daily Consumption
- View Unbilled readings (like Unbilled amount of post paid mobile)
- View Daily Mid Night readings
- Get Consumption Alert
- Comparison with Peers

Smart Prepaid Consumers

- Daily Account balance update
- Account statement
- Alerts on Auto Disconnection
- Flexible schemes / options to set off arrears





Innovative Use of Smart Meter Data

– Asset Utilization

Asset Swapping

Objective: Adding efficiency to the system by swapping under-loaded assets with overloaded assets

Adoption in Business Process:

- Deferral of Capital Investment
- Optimum utilization of Network

Benefits:

- From Apr'21 to Jul'22, 202 nos. of Distribution Transformer swapped to create the margin in the network for sanctioning load
- Fire incidents due to overloading could be ruled out.

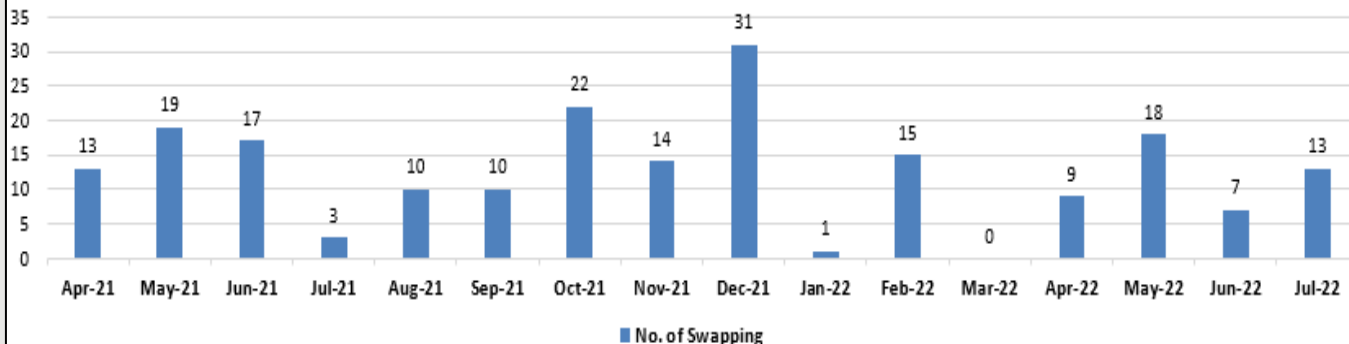
Virtual Metering

Objective: Planning Network capacity in advance by using data from Smart Meters installed under unmetered distribution transformers, feeders and Solar generation

Adoption in Business Process:

- Proper Planning of network helps in sanctioning load timely.
- Optimum utilization of Network

Savings from Month-wise DT Swapping





Innovative Use of Smart Meter Data

– Thin Prepaid

Objective: To make pre-payment meters friendly for consumers as well as Utility by doing the billing and other accounting at the back-end.

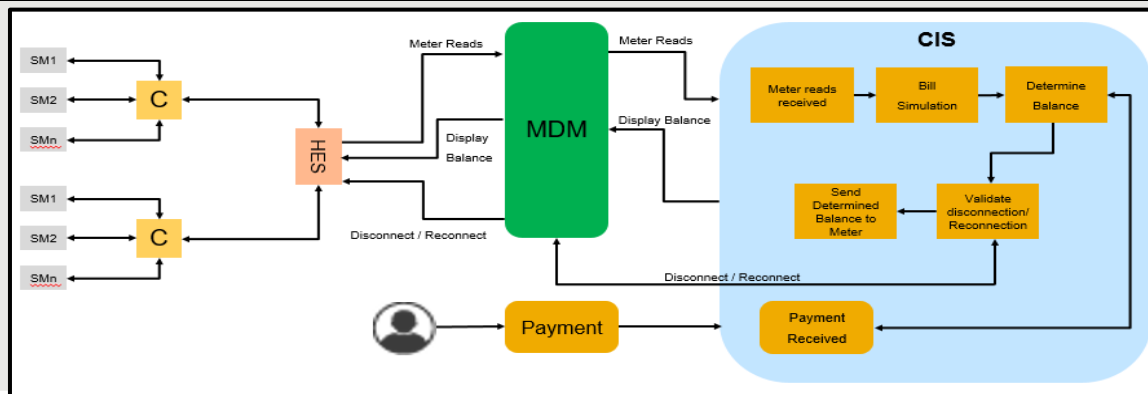
Adoption in Business Process:

- Execute billing at the back-end
- Tariff update through FOTA
- No need to enter lengthy coupon details in the meter.

Benefits:

Tata Power-DDL has deployed 3000 pre-payment meters till Sep'22, benefits shown for last two years:

- More than 4500 site visits could have been saved related to Reading, Tariff Update etc.
- Customer Convenience – More than 5200 transactions could have been saved of manually entering coupon details in meter.



Implementation of AMI-Challenges we experienced

OEM

- **3rd party meters inclusion under development**
- **Communication of Mass Scale – success rate on daily basis**
- **OEM's Product not ready for Indian markets.** (LT-CT & HT-CT Meters)
- **Single party dependency:**
 - **Meter supplier, Inventory management**
 - **RF dependency**
 - **Unwillingness of TSPs on NBIoT in Delhi**
 - **Limited options for fallback on 2-G**

Utility

- **Financial – High upfront costs of smart meters**
- **Uncertainty due to New Technology**
 - Leading to multiple iterations before reaching the desired communication success
- **Absence of skilled manpower and SOP for system commissioning**
 - In depth knowledge of Telecommunications, Metering and IT.
 - Evolving Technology
 - Extensive Training program required.

Governance

- **Multiple models being tested (Opex. Vs Capex.)**
- **Billing modules tariff and IS are having Gaps**
- **Non-Coverage of 100% population of Consumer:**
 - Scattered coverage leads to non utilization of full capabilities of AMI
 - Major resistance by consumer for deployment if Smart meters

Internal

- **Robust implementation structure required-**
 - Separate vertical required for AMI implementation
- **Long procurement and installation period**
- **Cyber Security:-**
 - Applications Layer Security (Inside Data Centre), for external devices & network level security. (Proprietary security in network)
- **Site identification for Router Installation**



What Smart metering will not achieve

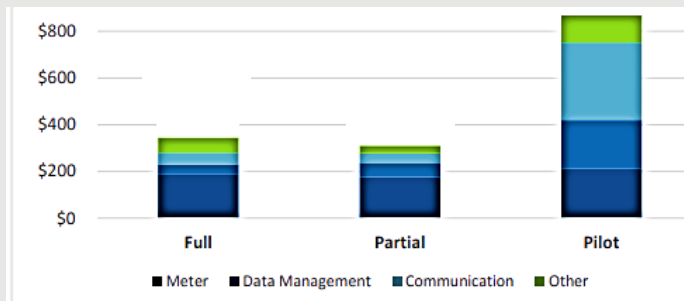
- While smart meter is effective in the revenue billing, collection (smart prepaid) and recovery to certain extent, it can't resolve the revenue leakage on its own. A proper information pipeline and analysis mechanism has to be established for effective results.
- Smart Meter data alone cant achieve asset health monitoring. Read in conjunction with other electrical parameters, the same can be achieved.
- Correct Energy accounting cannot be ensured by standalone Smart meter data.
- Individual customer consumption insights can be achieved through smart meter data but for peer to peer comparison and cohort identification, additional intelligence has to be built.

THANK YOU



Considerations in Smart Metering and Data Analytics

- **Decision on Scale of project implementation** : (Total cost (per meter) of a pilot scale project will be higher than for a Full and partial-scale implementations). Support from regulator for mechanism to consider high smart metering related O&M cost.
- **Maintaining strong cybersecurity and customer privacy protections**
- **Need for comprehensive interoperability standards** to achieve optimal levels of system integration and data flow between smart meters, customer devices, and communications and information systems
- **Creating a cross functional think tank to pre identify use cases/need, integrations required and assimilate it in the plan.**
- **Having a robust Big Data eco system ready for effective use.**
- **Workforce Management, capacity building and Training** : Successful smart metering projects involves workforce training programs to develop new skillsets in database management, data analytics and visualization, interoperability, and cybersecurity and customer care services.



Average AMI System Costs per Meter by Scale of Deployment