Smart Metering

... Solution to Loss Reduction

Secretary Energy

Govt. of Chhattisgarh

Chhattisgarh State Distribution Infra -

Sr No	Description	Unit	@Mar 2000	@ Mar 2026	% Growth
1	33 kV Line	Km	6,988	26,512	279%
2	33/11 kV Substation	No	248	1,501	505%
3	33/11 kV Substation Capacity	MVA	1,033	10,912	956%
4	11/0.4 kV Substation	No	29,692	2,62,842	785%
5	11/0.4 kV Substation Capacity	MVA	1,951	15,451	692%
6	11 kV Line Length	Km	40,556	1,52,475	276%
7	Low Voltage Line Length	Km	51,314	2,53,984	395%
8	Consumers (Total)	No	18,91,528	66,66,192	252%
9	Existing Pumps (as per R-15)	No	73,369	8,73,417	1090%
10	Maximum Demand	MW	1,334	7,006	425%

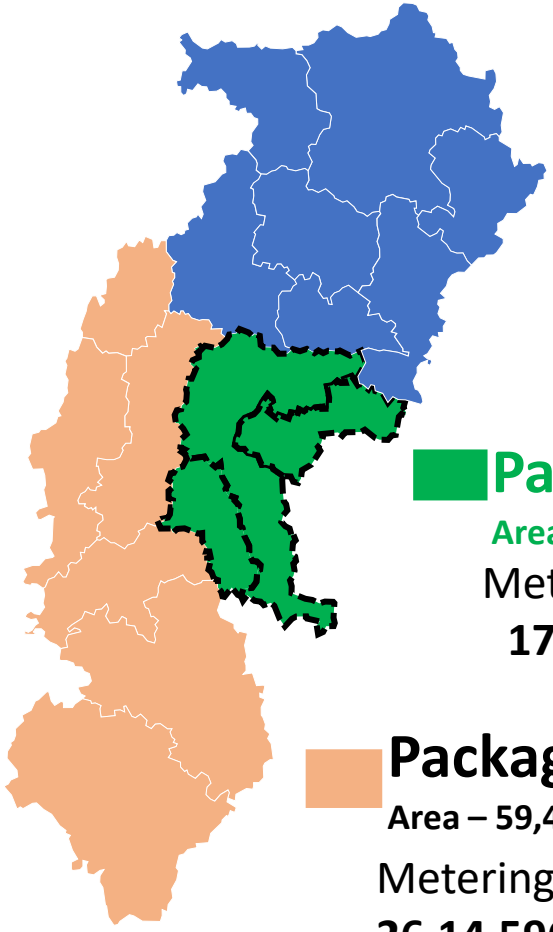
LT & HT Consumers		
S No	Category	Count (Nos.)
1	BPL	1447978
2	Domestic	3762034
3	Non-Domestic	474690
4	Agriculture	873417
5	Industrial	39902
6	Street Light	11240
7	Water Works	52586
8	Information Technology	8
9	High Voltage Consumers	4337
Total		66,66,192

Exponential growth recorded from the inception of Chhattisgarh State @ Nov 2000

- **Distribution infra(33/11 kV S/s , HT & LT Line , DTs)-** 3 to 10 times
- **Consumer base –** 2.5 times
- **Demand –** 4 times

Chhattisgarh State Distribution Infra covered under Smart Metering Project -

Particulars	@Mar- 2024	@Mar-2026	@2034 (Projected)
Total Consumer base	63.0 Lac	66.6 Lac	70.0 Lac
11 kV Feeders	5,609	5,985	8,108
Distribution Transformers	2,25,374	2,62,842	2,67,001
Annual Input Energy (MU)	37,117	40,264	64,175
AT&C Losses	14.58%	12.57 %	8%
10th annual integrated rating (MoP)	B	A	-



Package -1
Area – 49,276 Sq.KM
Metering Nodes-
26,84,037 Nos.

Package -2
Area – 21,548 Sq.KM
Metering Nodes-
17,91,269 Nos.

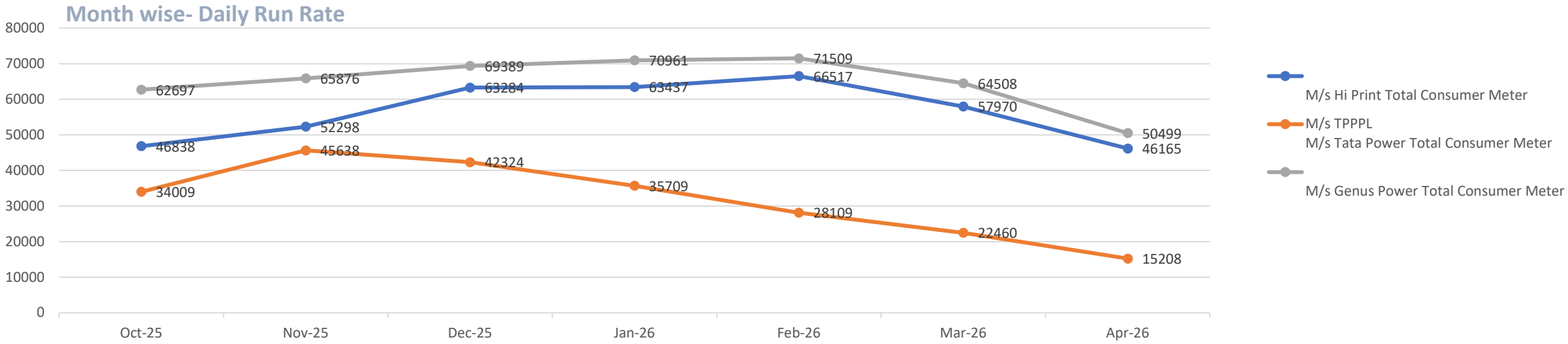
Package -3
Area – 59,425 Sq.KM
Metering Nodes-
26,14,596 Nos.

Total Geographical Area - 135,192 Sq. Km.

- *Project Kick off – Jan 2024 , Project completion period 24 months and O&M period for 93 months including New Meter Installation.*
- *Advance Metering infrastructure Service Provider (AMISP) – Pkg – 1 M/s High Print, Pkg-2 M/s Tata Power, Pkg -3 M/s Genus Power*

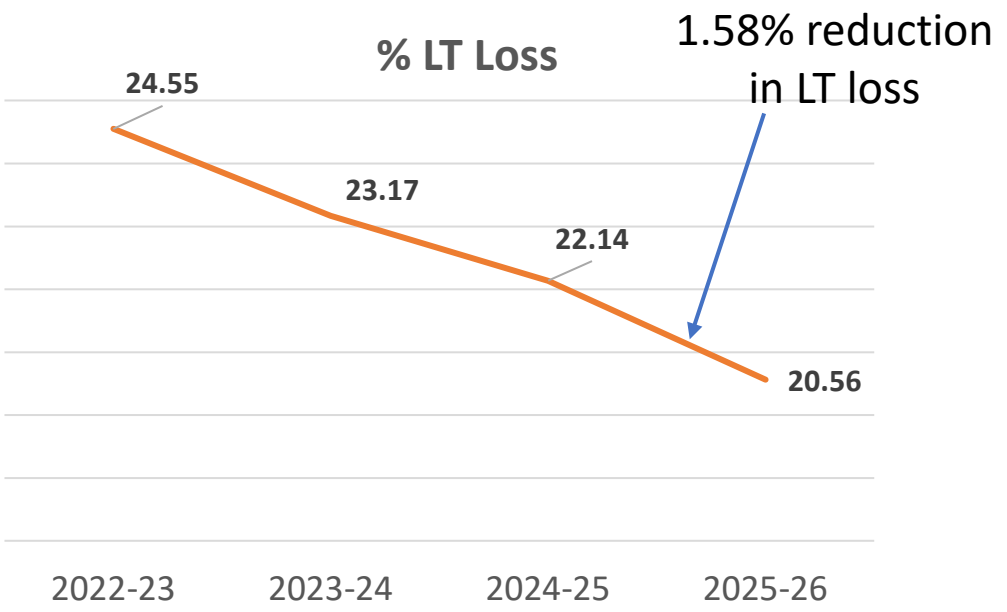
Chhattisgarh: Smart Metering Work Progress

Sr.No.	Particular	Scope Qty	Progress	% Progress
1	Feeder	5985	5985	100%
2	Distribution X-mer	245424	90067	37%
3	Consumer	5592523	3902827	70%



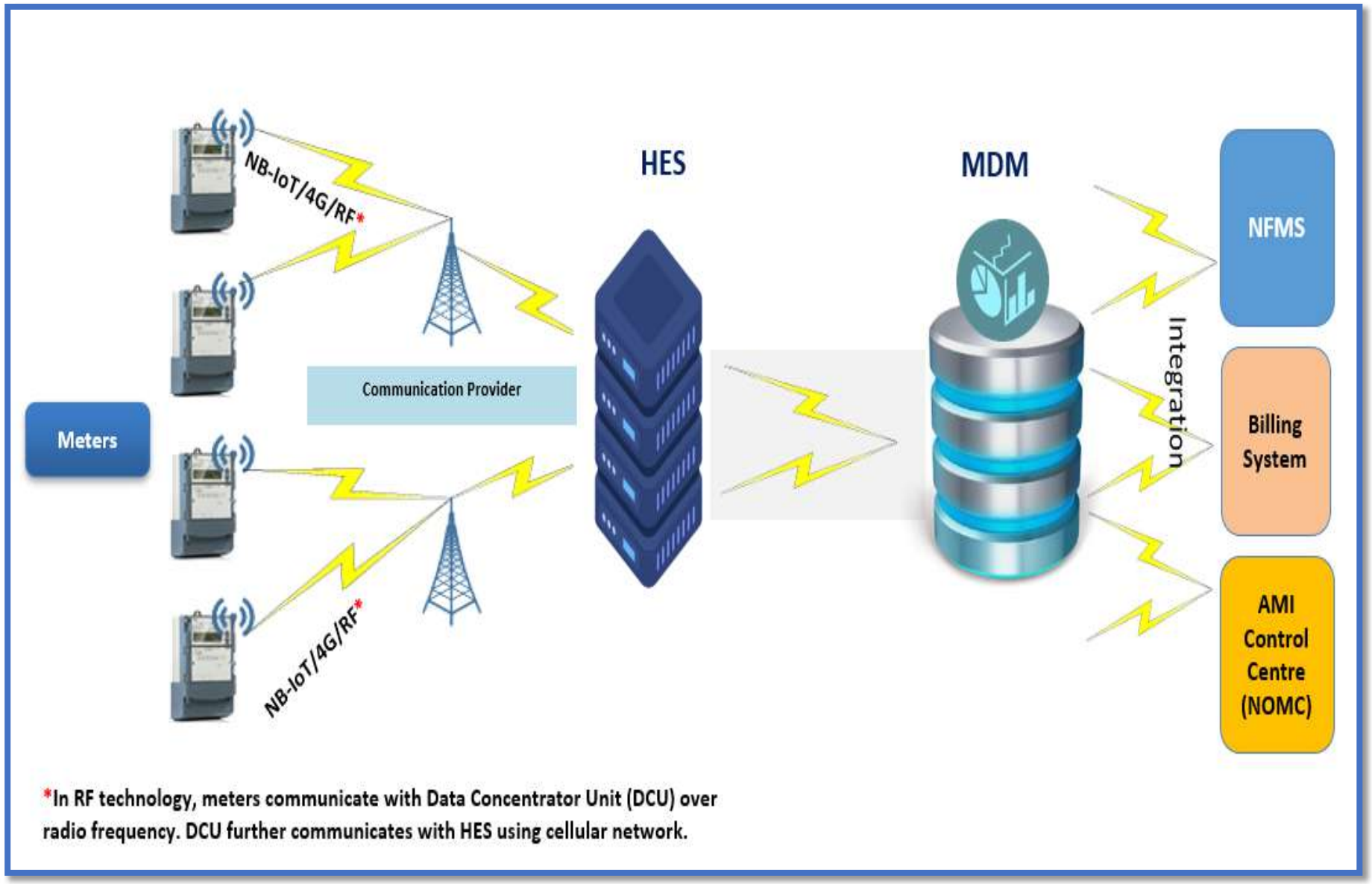
Loss Segregation Matrix- Sub Transmission & Distribution infra

T&D LOSS ANALYSIS SMART METER EFFECT									
YEAR	INPUT UNIT (MU)	ENERGY SALE (MU)			UNIT LOSS (MU)	% T&D LOSS (Inclusive HT sale)	LT INPUT (MU)	LT Sold (MU)	% LT LOSS
		LT	HT	TOTAL					
2022-23	29436	15831	8328	24159	5277	17.93	20983	15831	24.55
2023-24	27871	15296	7845	23141	4731	16.97	19908	15296	23.17
2024-25	33778	19377	8761	28132	5646	16.72	24886	19377	22.14
2025-26	33761	19276	9355	28631	5130	15.2	24266	19276	20.56

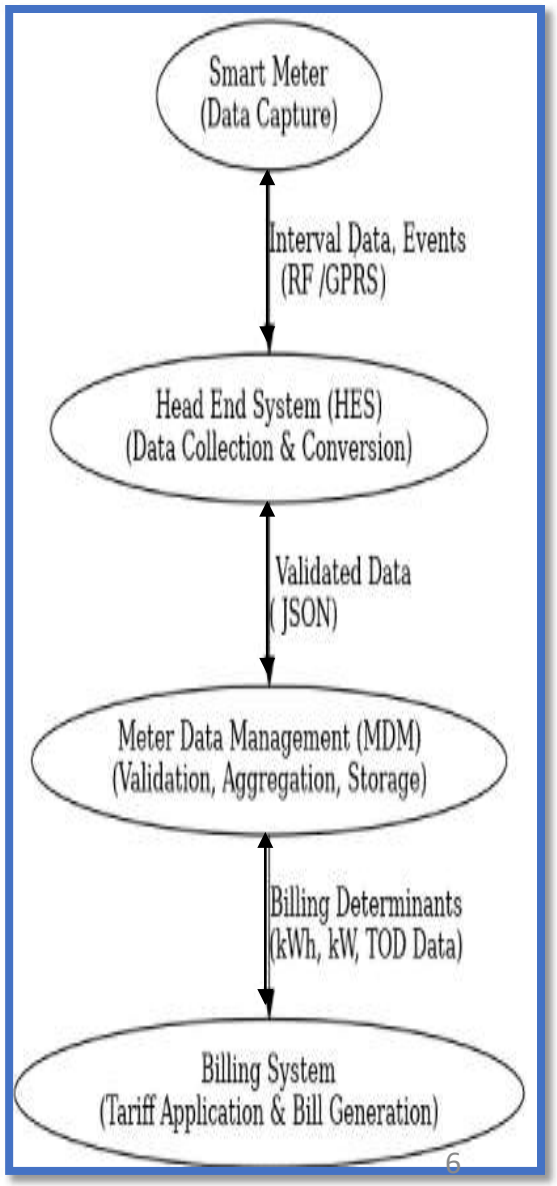


- T&D losses for the FY 2025-26 : **12.57 %** (Inclusive EHV Sales)
- Average Cost of Supply @Rs 7.02/kWh
- Annual Saving (FY 2025-26) after Smart Metering & LT infra upgradation (24886* 1.58% x 7.02) - Rs 276 Cr

System Overview & Integration details: Meter, HES, MDM and Billing.



*In RF technology, meters communicate with Data Concentrator Unit (DCU) over radio frequency. DCU further communicates with HES using cellular network.



Case Study 1 : Outcome of Data Analytics Report- Feeder to DT to consumer loss report

Feeder data analyzed for losses after installation of Smart Meter.

Region name	Division name	Feeder name	BEFORE ANALYSIS			AFTER ANALYSIS		
			Feeder to DT Loss(%)	DT to Consumer Loss(%)	Feeder to Consumer Loss(%)	Feeder to DT Loss(%)	DT to Consumer Loss(%)	Feeder to Consumer Loss(%)
AMBIKAPUR	AMBIKAPUR CITY	11KV COLONY FEEDER	13.76%	45.19%	58.95%	0.42%	9.14%	9.52%
BILASPUR	BILASPUR CITY II WES	11KV MAA HARSHIDDHI FEEDER	12.32%	27.58%	39.91%	1.90%	15.54%	17.15%
RAIGARH	AKALTARA O&M	11KV TOWN-2	4.31%	14.40%	18.71%	1.85%	8.30%	10.15%
RANJNANDGAON	KAWARDHA O&M	11KV SAMNAPUR FEEDER	10.98%	28.04%	39.02%	1.91%	9.60%	11.51%
DURG	EE_ONM AHIWARA	11KV KHARUN GREEN FEEDER	8.93%	19.00%	27.93%	3.45%	9.22%	12.67%
JAGDALPUR	KANKER	11KV NARHARPUR FEEDER	17.44%	26.00%	43.44%	1.89%	9.69%	11.39%
RAIPUR CITY	E.E. (City South) Dn Raipur	11KV PHQ1 FEEDER	2%	34%	35%	3.13%	2.92%	5.96%
RAIPUR RURAL	E.E. (O&M) DN BHATAPARA	11KV DEORI (RURAL) FEEDER	13.60%	4%	17.50%	7.47%	2.16%	6.83%

- *524 feeders are saturated*
- *However, Consumer indexing not corrected due to which the losses figures are appearing incorrect in the system.*

Case Study 2 : Non Smart Stop Defective meter replacement with Smart Meters

Analysis conducted on old non smart faulty meter replaced in the month of Jul-25				
Particular	Package-01	Package-02	Package-03	Grand Total
No. of Faulty Meters Replaced	10,163	6,382	10,306	26,851
Billing Faulty Meter (crs.)	14.22	16.62	60.05	90.89
Billing Post Smart Metering (Crs.)	16.63	20.51	70.70	107.84
Differential Revenue Generated (Crs.)	2.41	3.88	10.65	16.94

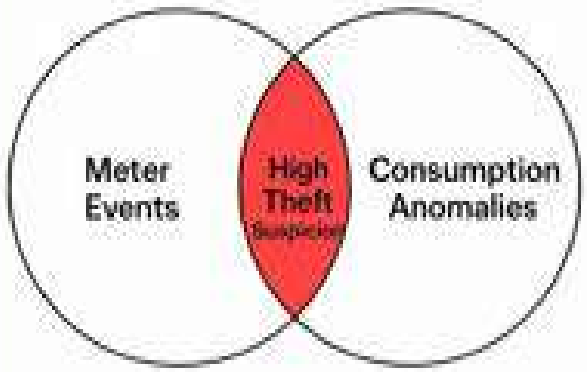
Case Study 3 **Revenue Protection (RVP) - Analytical Framework**

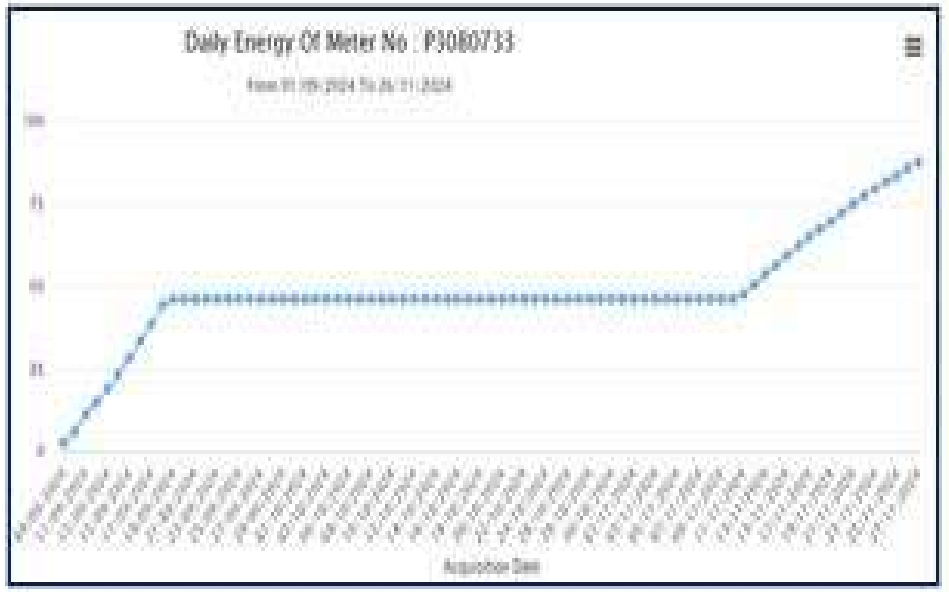
To identify and analyze electricity theft using smart meter data by combining:

- **Meter Event Analytics** (real-time alerts)
- **Consumption Pattern Analytics** (usage-based anomalies)

Analytics Type	Data Inputs	Detection Logic	Action Outcome
Meter Events	Tamper alerts, last communication, outages	Flag unusual meter behavior	Prioritize for field inspection
Consumption Patterns	Daily/Monthly consumption trends, load profile, peer comparison	Detect sudden drops or abnormal usage trends	Revenue protection & legal case preparation
Combined Approach	Both event + consumption anomalies	Holistic theft risk score	High theft suspicion → field inspection & recovery

Combined Approach = Meter Event + Consumer Consumption Anomalies



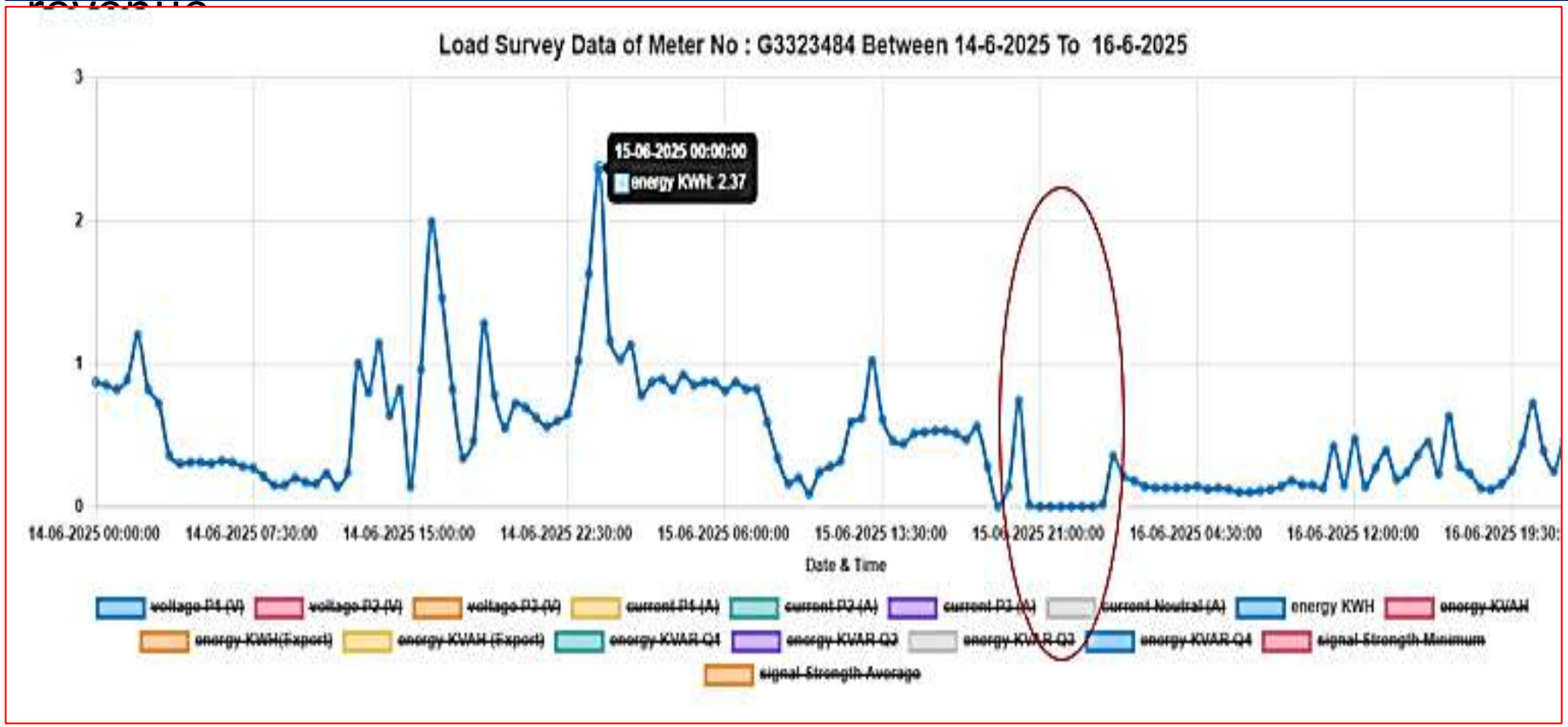


Case Study 3 : Theft Detection

- Consumer monthly usage: {June –609.84 Units, July 269.37 Units, August 32 Units}
- Cover Open : 15 June 2025 Meter Installation: 07 June 2025, CSPDCL Booked Case-August 2025
- Meter events: cover open + neutral disturbance

Meter Id	Event Code	Event Name	Event Status	Date of Event
G3323484	251	Meter Cover Open	Occurred	15-06-2025 22:12:44

→ ₹ 2.46 Lakh

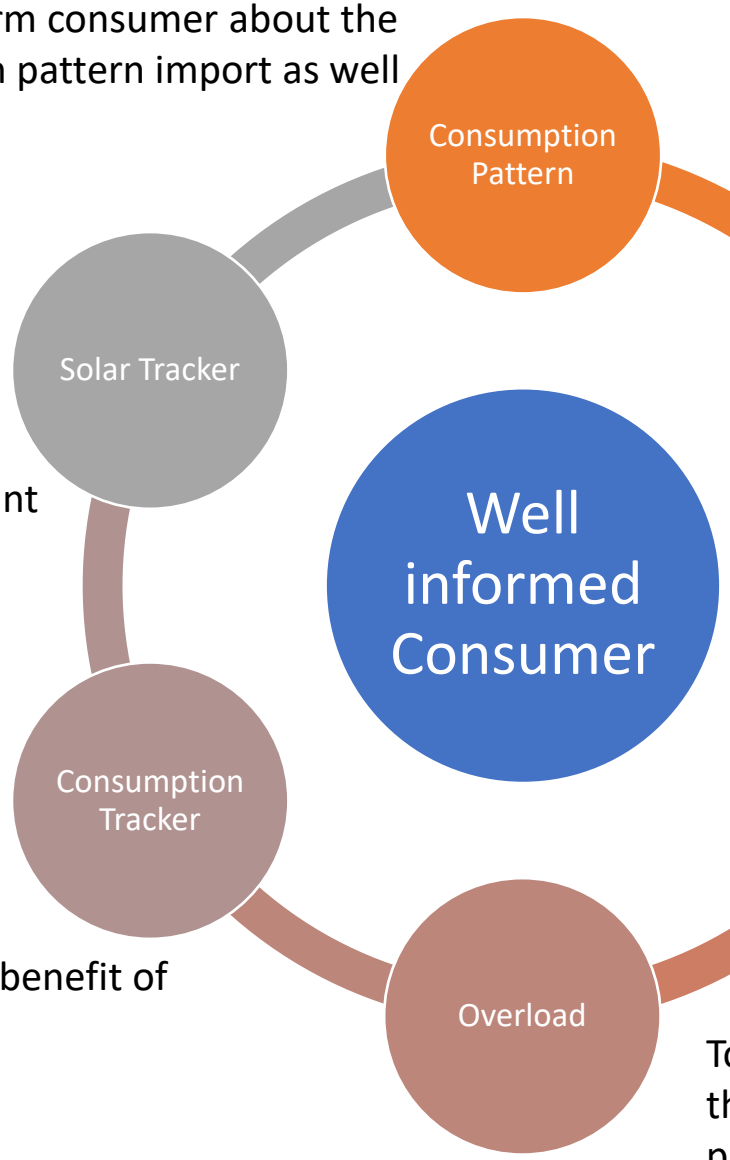


Power failure (Occurred: 154, Restored: 155)

Power Off Time	Power On Time	Duration(Day:Hrs:Min)
16-06-2025 12:03:00	16-06-2025 12:05:00	00:00:02
15-06-2025 23:50:00	15-06-2025 23:51:00	00:00:01
15-06-2025 20:25:00	15-06-2025 23:50:00	00:03:25
15-06-2025 20:02:00	15-06-2025 20:13:00	00:00:11

Meter ID	Reading Date	Cumulative Energy KWH (Import)	
G3323484	18-06-2025 00:00:00	512.100	12.4 Unit
G3323484	17-06-2025 00:00:00	499.960	11.15 Unit
G3323484	16-06-2025 00:00:00	488.810	
G3323484	15-06-2025 00:00:00	464.520	31.75 Unit
G3323484	14-06-2025 00:00:00	432.770	

Operational Advantages-Consumer centric



To keep inform consumer about the consumption pattern import as well as export

Giving real time information on the power supply status at consumer premises

Alert consumer on the performance of the solar plant installed at their premises

Giving real time information on the Relay status of the meter

To provide projection of consumption to achieve benefit of subsidies

To information consumer about the overloading condition at its premises

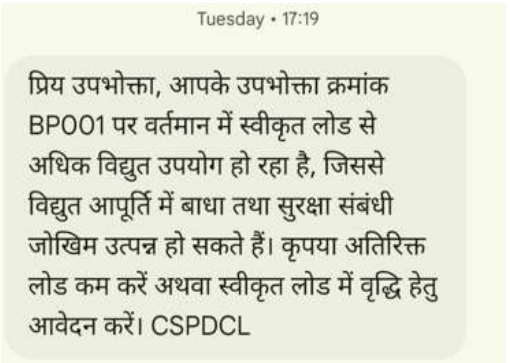
Operational Advantages-Consumer centric …2

Best Practices: Smart meter sync with in house app “Mor Bijli”.

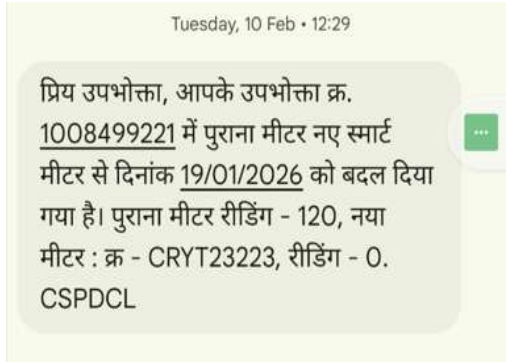
Power Supply Status and Relay Status on Consumer Mobile Application

Daily and 30 min consumption data on Consumer Mobile Application

Overloading SMS

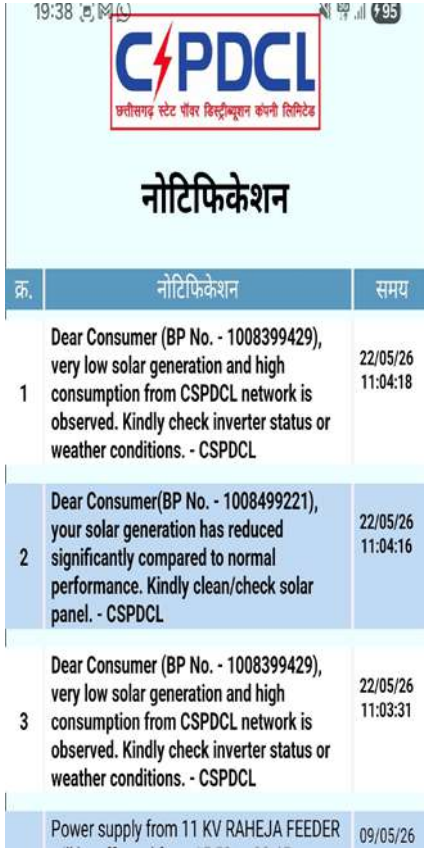


Meter Change SMS



Notifications on consumer app on Overload, Meter change etc.

Consumption Projection to pass direct benefit to consumer



Alerts on performance of solar installation at consumer premises

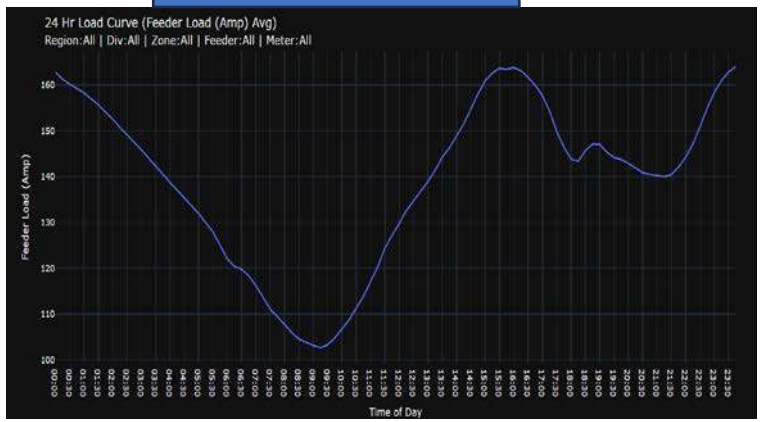
Operational Advantages- DISCOM centric…1

Dashboard Data

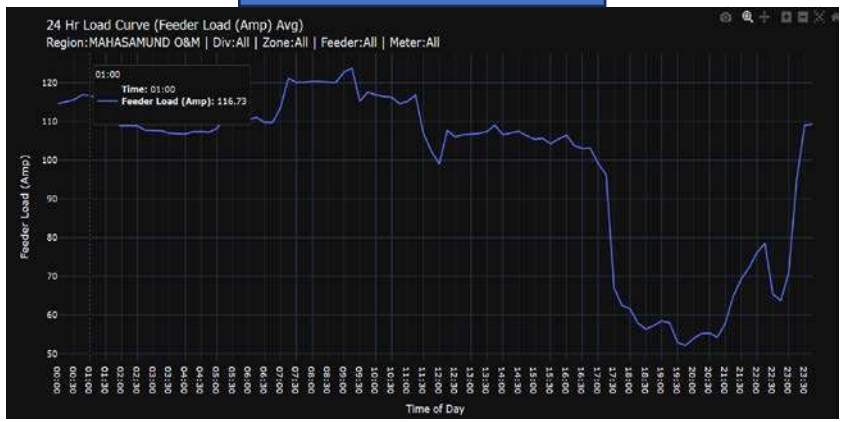
Outcome of Data Analytics Report – DT level

AMISP	Total DTs with Smart Metering	Under loaded (0-50%)	Normally Loaded (50%-80%)	Over loaded (80%-100%)	Critically loaded (100%-150%)	Abnormally loaded (>150%)
Genus (incl Hi-Print)	60,405	43,352	16,036	647	285	85
Tata Power	29,590	12,299	11,015	2,647	3,024	605
Total	**89,995**	**55,651**	**27,051**	**3,294**	**3,309**	**690**

(Mixed consumers)



Agriculture feeders



Industrial

Operational Advantages- DISCOM centric…2

Outcome of Data Analytics Report – Consumer level

Parameter	Genus	Hi-Print	Tata	Total
Cases referred (Tariff misuse, Theft, etc)	1935	3141	6254	11330
Tariff misuse cases booked	69	58	154	281
Theft Cases booked	322	29	18	369
Demands raised (Nos)	347	46	137	530
Demand amount (lakh)	**45.93**	**10.80**	**57.54**	**114.27**

Operational Advantages- DISCOM centric…3

Arrear Recovery Drive

AMISP	Period	Total Disconnection	Time taken for DC	Total Reconnection	Time taken from RC
Tata Power	February'26	34,794	<3 minutes	30554	<1 minute for each meter
	March'26	11,292		8921	
	April'26	11,659		10965	
Genus/ Hi-print	February'26	15,637		11595	
	March'26	15,316		9150	
	April'26	0		289	

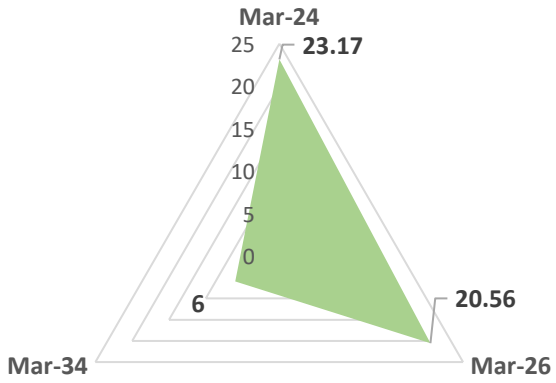
Package	Remotely Disconnected	Amount Recovered
Package1	25549	₹ 14,17,11,175
Package2	108504	₹ 66,79,74,521
Package3	47254	₹ 9,82,45,849
Total	**181307**	**₹ 90,79,31,545**

RC- Re-connection , DC- Disconnection

- All consumers are currently in Post-Paid
- Data for disconnection being provided by DISCOM and being disconnected through MDM
- On payment by consumer, middleware soft ware is pushing the data to MDM & billing solution simultaneously and thereby re-connection being done automatically.

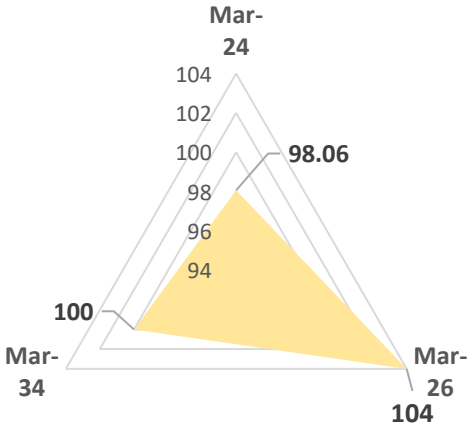
Key Takeaway -

% LT T&D Loss Reduction



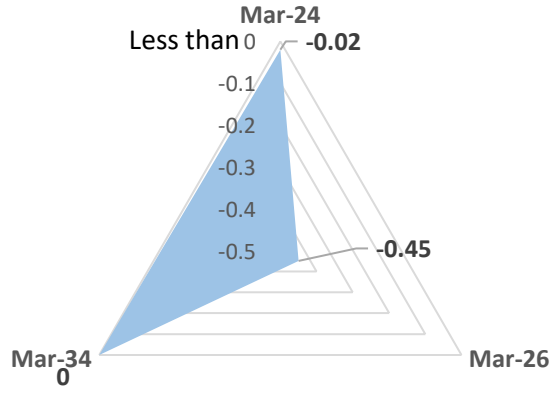
- **Accurate Energy Accounting** – Smart meter installed on 70% consumer premises and on 100 % Feeder .
- **Real Time monitoring & theft detection –** Load Profile analysis and target hitting**.**
- **Feeder & DT Energy Audit** – 548 Feeder Saturated.

Collection Efficiency (%)



- **Billing Efficiency –** Automatic, timely & accurate Meter Reading & Billing.
- **Remote Disconnection & Re-connection –** Prevent revenue linkages from defaulters reduced unauthorised re-connection**.**

ACS-ARR Gap



- **Load Management** – Reduces overloading & Technical losses.
- Enables Time of Day (ToD) tariff
- **Optimising Power Procurement**– Demand forecast and optimising short term power purchase.

THANK YOU