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Session : SMART METERING PART B – DISCOMs, AMISPs, OEMs and Sis

PRESENTATION TOPIC

Presented By

Subhadip Raychaudhuri, Head-Engineering, Energy Audit, GIS & AMI Applications, TPDDL

CONTEXT

- Ideal Architecture of Large AMI Systems
- Reliable Communication Infrastructure to Meet the SLAs
- Measures to Ensure Cyber Security
- Architecture and Functionalities of Smart Meter Operations Center (SMOC) and Network Management System (NMS)

INTRODUCTION

- Joint Venture of Tata Power and Govt. of Delhi (51:49)
- License Area: North and North West Delhi (510 sq km)
- Annual Turnover: 1.026 Billion US Dollar
- Consumer Base: 1.9 Million
- Population Served : 6.0 Million
- Peak Load Served: 2115 MW
- ISO 9001, 14001, 27001 ; SA 8000; OHSAS 18001 Certified

INTRODUCTION

Feathers in TPDDL Cap

1st Time for TPDDL

- Successful peak load management – All Time High load of 2481 MW
- All Time High Billing Efficiency @ 94.5%
- >5.3 Lakh Smart Meters installed
- Prestigious Deming Prize 2024
- Patent on Self Generating Breather
- Smart Grid Index 2024
- Customer Service Rating of Discom (CSRD) FY23-24
- Integrated Rating of Discoms FY23-24
- Distribution Utilities Ranking FY23-24

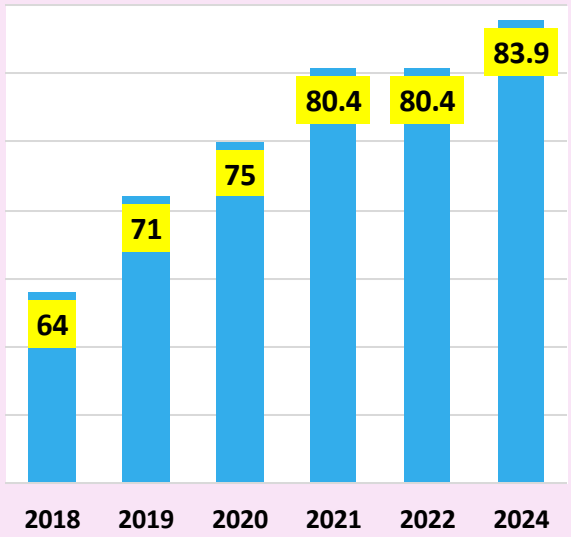
INTRODUCTION

Benchmarks a total of 92 utilities across 36 countries / markets

Smart Grid Index 2024 (by Singapore Power)

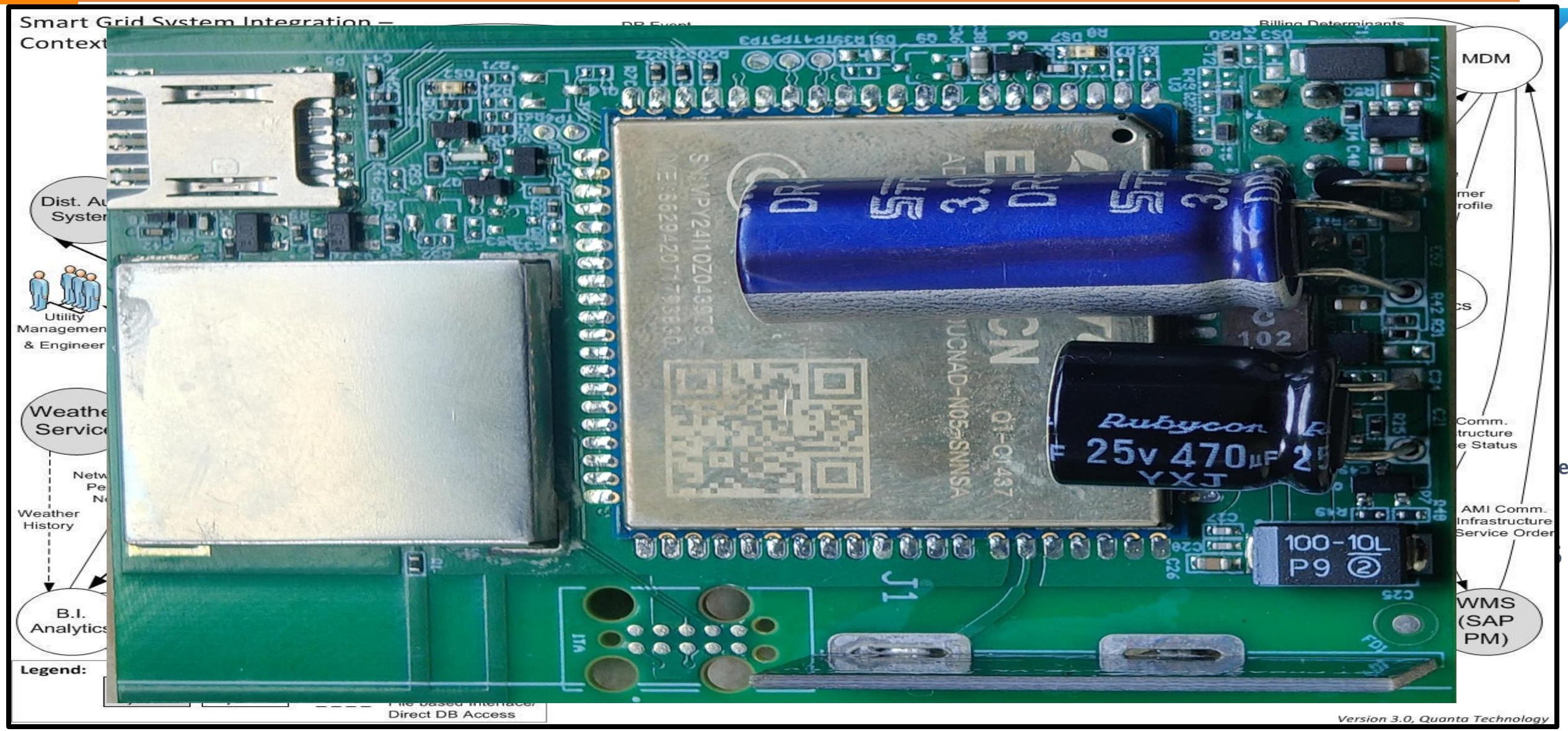
Utilities	Country/Market	Score %	Best Practices
Enedis	FRA	98.2	
TaiPower	TWN	96.4	
UKPN	GBR	96.4	
CitiPower & Powercor	AUS	94.6	
DEWA	ARE	94.6	
State Grid Shanghai	CHN	94.6	
ConEd	USA	92.9	
SP Energy Networks	GBR	92.9	
State Grid Beijing	CHN	92.9	
WPD	GBR	92.9	
Guangzhou Power	CHN	91.1	
Shenzhen Power	CHN	91.1	
ENWL	GBR	89.3	
Northern Powergrid	GBR	89.3	
SDGE	USA	89.3	
TEPCO	JPN	89.3	
ComEd	USA	87.5	
SSEN	GBR	87.5	
Stedin	NLD	87.5	
Duke Energy	USA	85.7	
FPL	USA	85.7	
SCE	USA	85.7	
BGE	USA	83.9	
CLP	HKG	83.9	
Chubu	JPN	83.9	
e-distribuzione	ITA	83.9	
i-DE	ESP	83.9	
Jemena	AUS	83.9	
LADWP	USA	83.9	
PG&E	USA	83.9	
PEPCO	USA	83.9	
Tata power-DDL	IND	83.9	
United Energy	AUS	83.9	

Tata Power-DDL- Smart Grid Index Score trend (↑)

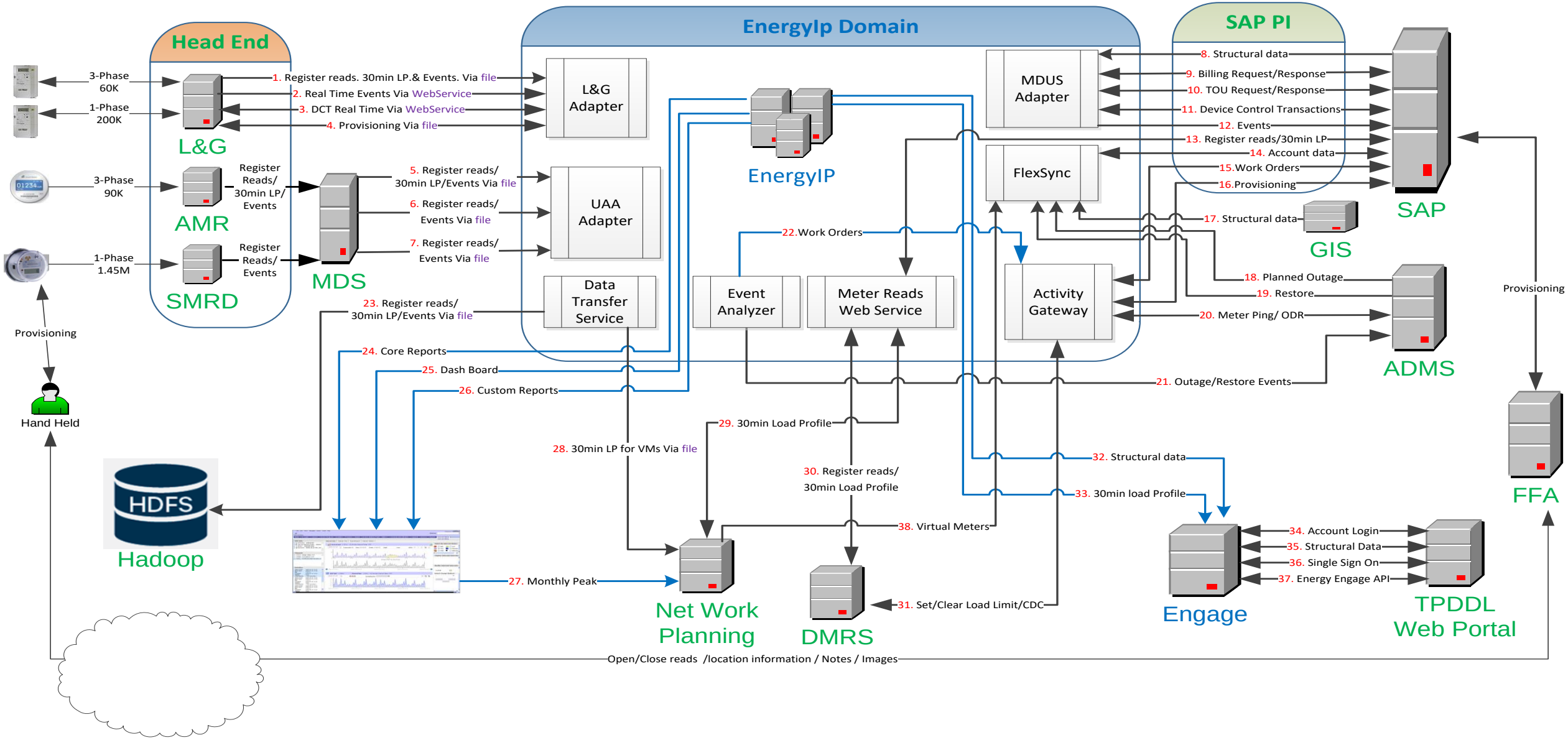


- **Best Practice in 'Monitoring & Control' in 2018 rating**
- **Best Practices in 4 areas in 2024 - Monitoring & Control, Green Energy, Security, and Customer Empowerment & Satisfaction**

Ideal Architecture of Large AMI Systems



Ideal Architecture of Large AMI Systems

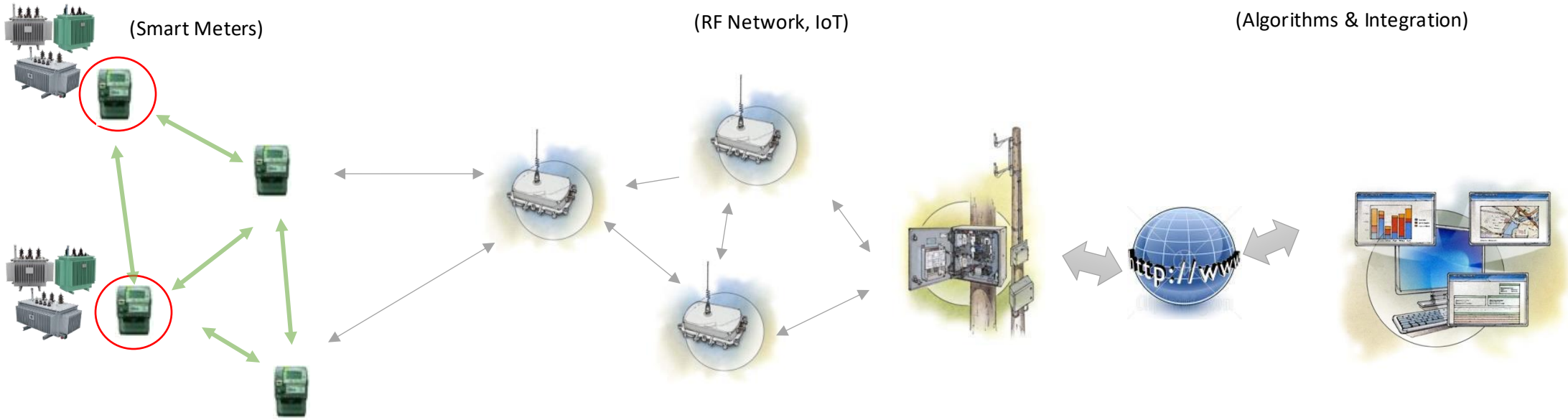


Ideal Architecture of Large AMI Systems

Scalability	• The architecture must be able to accommodate a large number of smart meters and data streams.
Security	• Robust security measures are essential to protect the data and prevent unauthorized access or manipulation.
Interoperability	• The system should be able to integrate with other smart grid components and systems.
Reliability	• The communication network and data management systems must be highly reliable to ensure continuous operation.
Flexibility	• The architecture should be flexible enough to adapt to future technologies and changing grid conditions.
Cost-Effectiveness	• The architecture should be designed to minimize costs while maximizing performance.

Characteristics of Ideal Architecture for Large AMI System

AMI Deployment (RF)



Meter & DA Points

1. 4.5 L+ Lacs Deployed
2. Developed Field Tools and teams for troubleshoot
3. Meter of different OEMs being explored.
4. Deployed Net Meter, Pre-Paid deployment with FOTA

Communication

1. RF-Mesh deployed

HES

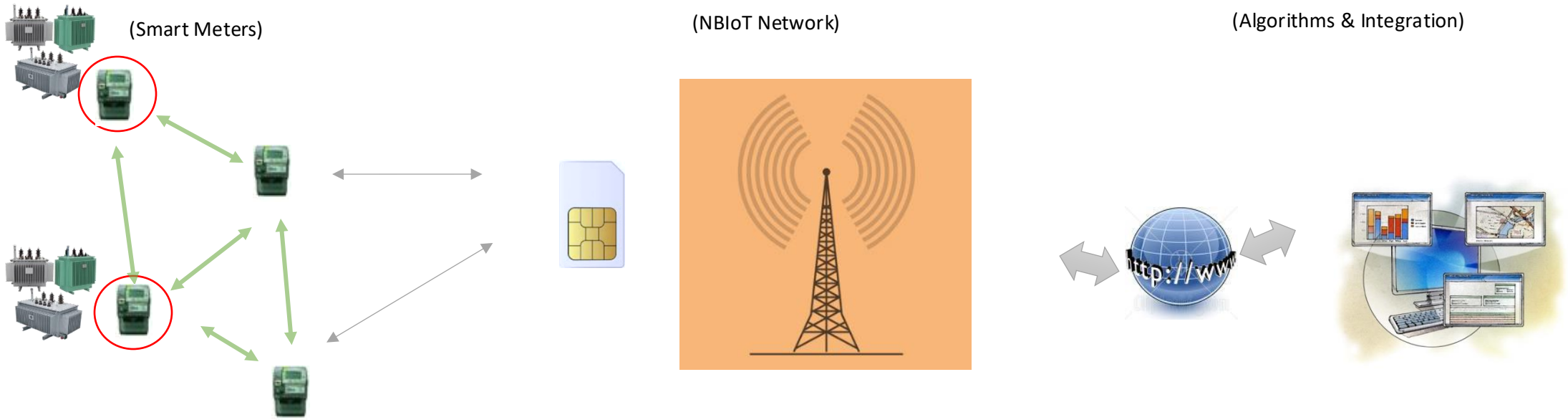
1. OTA Commands & Upgrades done
   -Pre/Post conversion
   -Reconnection
   -Net Metering
2. Interval/Daily/ Monthly/ Instantaneous data and reads availability

ERP, GIS, ADMS & MDM

1. Integration done & Modules Deployed
2. In-house resources developed for modules application development

Ideal Architecture of Large AMI Systems

AMI Deployment (All Cellular Technologies)



Meter & DA Points

1. 90K+ Deployed
2. Developed Field Tools and teams for troubleshoot
3. Meter of different OEMs being explored.
4. Deployed Net Meter, Pre-Paid deployment with FOTA

Communication

1. NBIoT based Cellular network

HES

1. OTA Commands & Upgrades done
   -Pre/Post conversion
   -Reconnection
   -Net Metering
2. Interval/Daily/ Monthly/ Instantaneous data and reads availability

ERP, GIS, ADMS & MDM

1. Integration done & Modules Deployed
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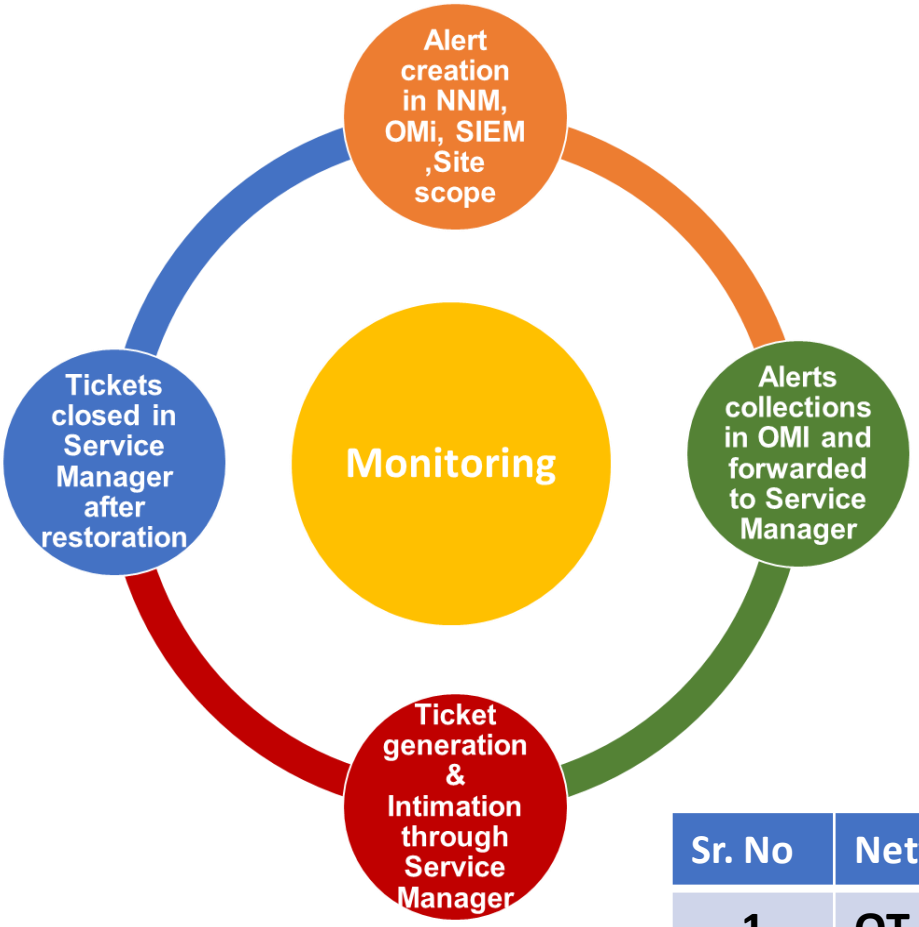
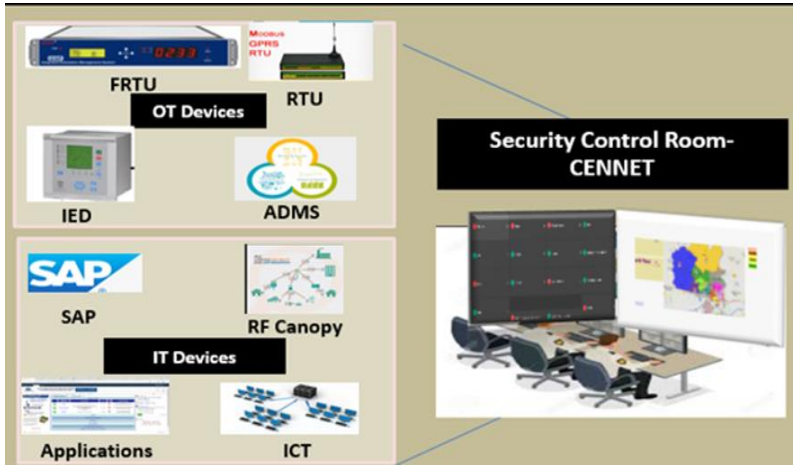
Measures to Ensure Cyber Security

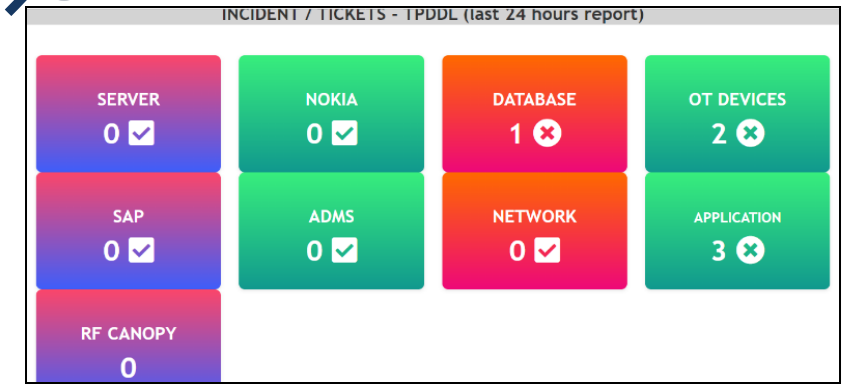


iNMS (Micro Focus) and SIEM(HP Arc sight)



- 24X7 monitoring of IT and OT network in 3 shifts along with shift handover MIS
- Proactive monitoring, alert generation & incident creation
- Security related alerts
- SLA based incident management
- Integration of various applications like BCM, CRM, FFA, ADMS, IP/MPLS
- Automated and Manual Reports

Sr. No	Network Components	Nos.
1	OT Devices Configured	2597
2	IT Devices Configured	1521
3	Applications Integrated	81
4	Reports and Dashboards	137

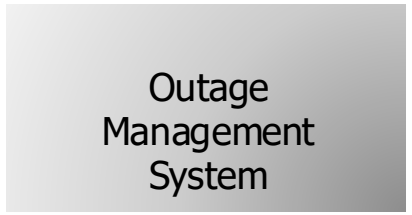


Center (SMOC) and Network Management System (NMS)

- The Smart Meter Operations Centre (SMOC) is a control center that helps monitor and manage smart meter networks using advanced software and analytics. Earlier AMI (Advanced Metering Infrastructure) projects did not have SMOC, but as data from smart meters grew, utilities set up SMOC to handle and analyze this information efficiently.
- Smart meters provide time-stamped readings that offer valuable insights into electricity usage in low-voltage networks. This helps improve power distribution, predict demand accurately, reduce power purchase costs, and optimize assets. SMOC also plays a key role in overseeing and managing the rollout of smart meters.
- In the AMI program under RDSS, the standard bidding document (SBD) includes SMOC functions under Network Management Systems (NMS) and Network Operation & Monitoring Centre (NOMC). While the SBD outlines various technical requirements for NMS and NOMC, it does not specify a fixed architecture for SMOC, allowing bidders to propose their own designs. For large-scale AMI implementation, a well-structured SMOC is crucial for managing meter installations, data collection, integration, processing, and analysis effectively.

Architecture and Functionalities of Smart Meter Operations Center (SMOC) and Network Management System (NMS)

Smart Data for Outage Management



Event → Notify → Analyze → Verify

Increase the Efficiency

- Greatly reduced unnecessary field visits
- Filters “false” outages
- Outages resolved, BEFORE customer effected
- Enhanced Field crew dispatch process
- Significant increase in call resolution w/o dispatching a field crew

Reduce the Deluge

- Limits notifications sent to OMS using intelligent filtering
- Filters sustained outage events with correlated restoration events
- Filters outage events confirmed at feeder level
- Validates restorations & pinpoints nested outages

KEY TAKEAWAYS / RECOMMENDATIONS

1 Data Analytics

Smart Meter Coverage and Data Analytics Application

- Cumulative count : 5.4 lakh, phase-wise addition YoY
- 1.8 lakh in FY26, 8 lakh more by FY30
- Customer empowerment using smart meter data analytics – daily, hourly & monthly reads, energy disaggregation
- New logics in RvPE to enhance revenue recovery
- NIC with BLE, & interoperability from RF to 4G for enhanced communication
- ADMS upgrade with DERMS module planned for Q1 FY26, Implementation in FY27
- Development of Robust Peak Load Growth Calculation Model
- Dynamic Reconfiguration and Feeder Power Management
- Asset Monitoring (DT) through Image Analytics

2 Supply Reliability

SAIDI & SAIFI

- Focused action on 30 no. Ph-VI PM feeders, 68 nos. Ph-V feeders WIP
- Predictive Maintenance using Risk Based and Condition Monitoring Philosophy in distribution and maintenance quality check.
- 2 New Model Zones (target of < 60 mins SAIDI), existing 2 model zones activity completion by Mar'25

KPI	FY24 (A)	FY25 (E)	FY26 (T)
SAIDI (mins)	610	520	420
SAIFI (nos.)	8.45	7.10	6.5

3 DER Integration

Management of DER Integration

- P2P trading – IT backbone under preparation through CFT, targeting operation wef Q3 FY 26
- Solar roadmap– projected capacity addition of 262 MW by FY30
- Smart meter data to promote DSM (house to house comparisons, pushing DSM products etc)
- BDR scaleup – engaging 3.5 lakh customers by FY 27

Grid Scale Energy Storage

- Additional 50 MW of storage planned in FY26

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THANK YOU

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Links/References (If any)