# Implementation of Common Meter Data Management System

Introduction of CMDMS

The CMDMS provides a single repository of data pertaining to all the Electricity Meters across the Discom

It covers the overall meter data received through various meter reading systems mentioned below:-

1. Meter data of conventional scalar meters collected once in a month through meter reading app or manually collected.
2. Meter data collected through Automatic Meter Reading (AMR) for LT & HT consumers.
3. Meter data collected through existing & proposed Smart meter systems with their respective Head End Systems (HES).
4. Meter data of Feeder meters through SHMS and WebSCADA

Smart Metering :Process flow
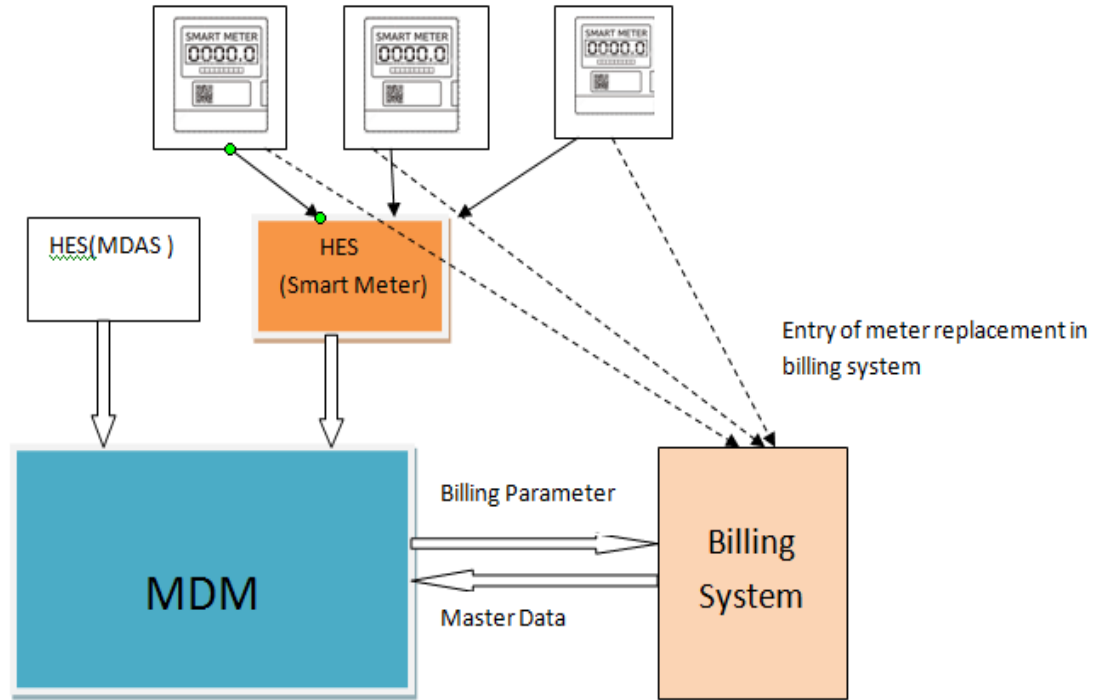
Why Common MDM

- Traditionally, Meter interoperability has been a big challenge in successful AMI implementations across the world.

- In order to solve the issue of interoperability in smart meters, the most feasible option is to have a common MDM. This allows the utilities to go for multiple communication technologies for smart metering with a common MDM.
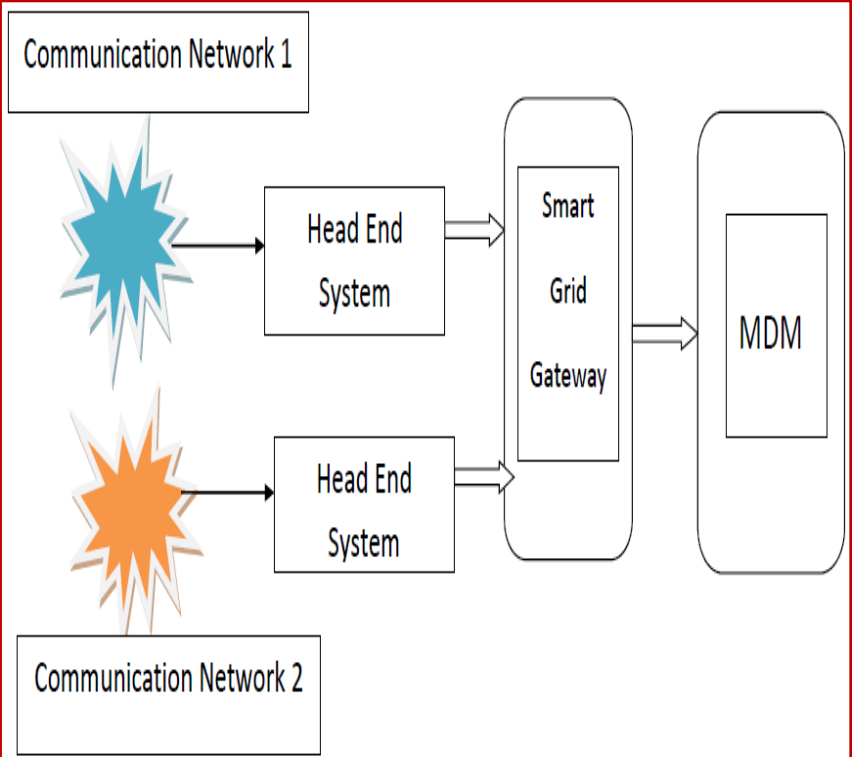
Common MDM in MP

MP is one of the few states where it was decided to have a common MDM in respect of all the Discoms. Most of the MDM solutions implemented so far in India are COT solutions which have their own issues like:
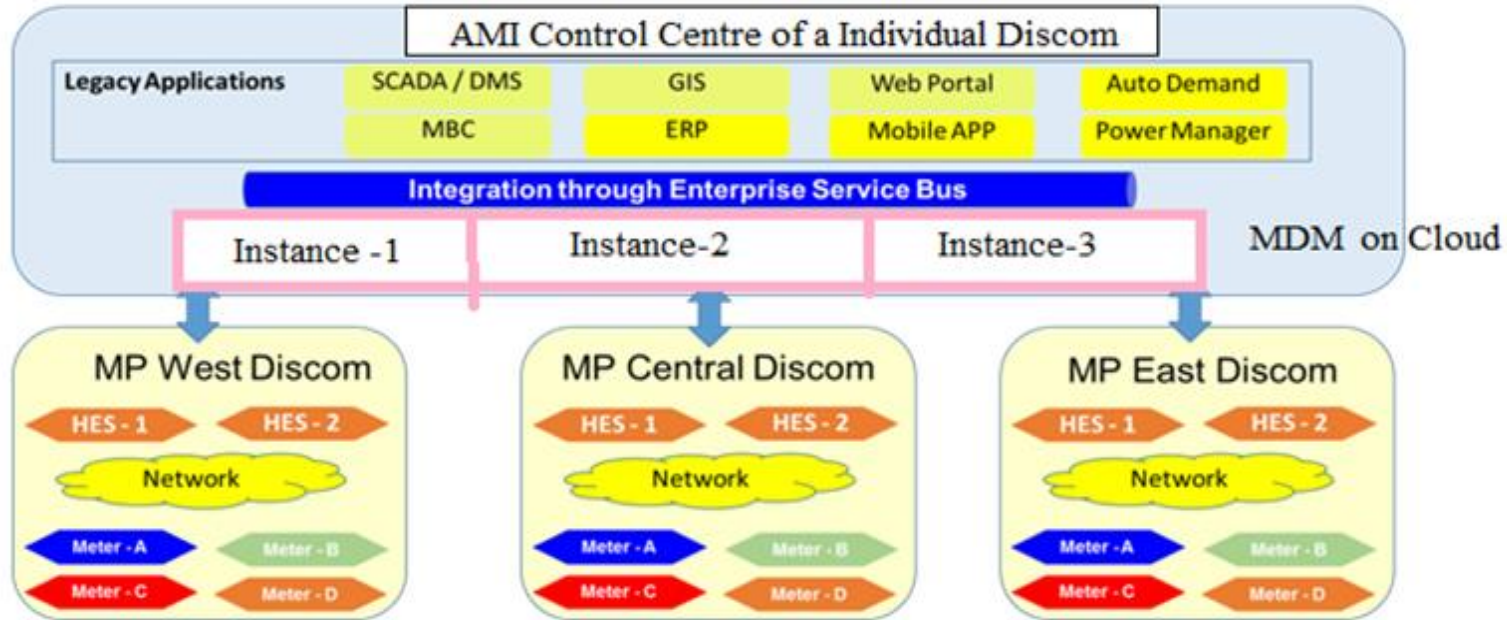
- Licensing issues
- Rigid architecture.
- Application not so user-friendly.

Development of CMDM

Looking to issues in COT Products it was decided to go for a bespoke development of MDM, which would facilitate:

- Better understanding of application to discom staff.
- Overcome the challenge of licensing and scalability to large extent.
- Having the source code it is expected to accommodate future requirements like *Net metering & Prepayment.*
- *Developm*ent of a Scalable solution.
- Less dependency on external agencies.

Architecture of CMDM

AMI Control Centre of a Individual Discom

Legacy Applications: SCADA / DMS, GIS, Web Portal, Auto Demand, MBC, ERP, Mobile APP, Power Manager

Integration through Enterprise Service Bus

Instance -1 | Instance-2 | Instance-3 | MDM on Cloud

MP West Discom: HES - 1, HES - 2, Network, Meter - A, Meter - B, Meter - C, Meter - D

MP Central Discom: HES - 1, HES - 2, Network, Meter - A, Meter - B, Meter - C, Meter - D

MP East Discom: HES - 1, HES - 2, Network, Meter - A, Meter - B, Meter - C, Meter - D

BENEFITS OF CMDMS

The CMDMS rollout in the MPWZ will positively impact various systems & processes related to the various sections of the DISCOM:-

- Master data exchange
- AMR System: HT AMR & LT AMR
- Meter Reading and Billing Process
- Bill Payment Process
- Meter Data from Feeders Process
- Energy Audit Process
- Outage - Failure Monitoring Process
- Customer Care Center Process
- Asset Management - Repository Process
- Meter Replacement Process
- Pre-Payment Process
- Operations – Disconnect/Reconnect Process
- Revenue Protection Process
- Consumer Apps Process
- Overall MIS & Reporting Process

Master Data Exchange

Master Data is the base data which is required to configure the CMDM system. There will be a regular data exchange between existing billing system & CMDMS through API (Application programming interface). There will be a single database of meter readings including details of meters installed and type of meter installed like Net meter, smart meter , HT meter etc. which will get updated regularly at least once in month.

- **1) Organization data:** All hierarchy levels data Ex: Region, Circle, Division etc.
- **2) Network data:** All n/w hierarchy data Ex: Sub-station, Feeder, DTR etc.
- **3) Consumer Data:** All Consumer details Ex: IVRS ID, Consumer Name, Address, Mobile No., Connection Date etc.
- **4) Meter Information:** All Meter related details Ex: Meter Serial No, Meter Make, Meter Constant, Net Meter, Prepaid Meter etc.

AMR System: HT AMR & LT AMR

 HT & LT AMR data is currently pushed in XML format files on a pre-configured FTP location as per agreed schedule and from ftp the same is picked up for billing purpose. This processes will be changed after complete CMDM rollout and AMR data can be directly pushed to CMDM through which it will flow to billing system. There will following benefits of data flow to CMDM before billing:-

- Data aggregation from AMRs at single system
- Pre analysis of AMR data at CMDM stage
- Outage event data analysis
- Load survey analysis at common platform
- Tamper event analysis in CMDM
- AMR / HES system interface for upcoming smart meters / AMR meters

Meter Reading and Billing Process

- Currently the CMDM implementation has changed the billing process for the Smart meters. For Smart meters, the CMDM automatically collects the billing data & meter reading data gathered from HES & validates the monthly consumption reading & sends these validated billing determinants to Billing system via API for bill generation.

- However, after CMDM-NGB Integration the updated Billing data & Meter data for all the HT AMR meters as well as Scalar meters is being pushed to CMDM via API for analysis & reporting. Due to the above updated data of meter readings , and billing determinants will be available in CMDM for analysis purpose.

Meter Data from Feeders Process

- Feeder meters data is an important part of the overall Discom's energy input which is required for efficient analysis of the energy flow & loss calculation. Feeder meter data is being fed to CMDM from 33/11kv WebScada & SHMS systems through API. Therefore CMDM will have repository of energy input to the DISCOM through integration with WebSCADA enabling loss calculation as unit sold information is also available in the same software through billing data integration.

- If payment information is also integrated to CMDM , this software will be able to calculate AT&C loss at DISCOM level , Regional level and circle level.

Energy Audit Process

- MDAS (Meter Data Acquisition System) shall be integrated to CMDM .

- Feeder meter data shall be available in CMDM.

- EHV consumers feeding directly from 132/220/400KV & HT consumers feeding directly from 33KV & 11KV will also be considered for energy input.

- On billing integration ,Circle/Division wise or Feeder wise sold units data will be available in CMDM s/w .

- Energy audit reports would be made available at Circle/Division levels & centralized Energy audit cell for further analysis.

- Data analysis can be added to enhance the quality of Energy audit.

Outage - Failure Monitoring Process

- Currently there is no system through which the power availability at the customer premise can be known. The consumers call "Customer care centre" to inform about outages. With CMDM in place, outage information can be integrated with CMDM and this information can be made available to Customers through CCC which is also integrated with CMDM.

- Call centre executives will be having access to information about any planned outages recorded at CMDM.

- The Alerts & Events data from all the consumer Smart meters data as received at the CMDM will be made available to the Control Centre on a portal or as API that can be interfaced with existing Customer care portal.

- CMDM would push notifications to the consumer app related to any of the planned outages & inform consumers on power restoration based on events similarly .

- SMS can be sent to consumers post complaint resolution through CMDM.

Asset Management - Repository Process

- CMDM will have a central repository to keep track of the meter assets.

- CMDM to pull the meter data from URJAS for all type of meters.

- CMDM creates a meter asset data containing information such as Meter make, Date of PO, Warranty, Type, Display digit, DLMS/Non-DLMS, Firmware version & Rating etc.

- It defines multiple asset grouping such as WC, LTCT & LT etc.

- It defines the administrative hierarchy.

- It records Purchase order & historical information on the asset and provides analytical features.

Meter Replacement Process

- After CMDM rollout, the existing meter replacement process of Scalar meters to Scalar meters will be followed as it is only with a small change that CMDM shall receive updated information of scalar to scalar meter replacement either from the Billing system or URJAS & will update the same accordingly in it's database.

- Old & new meter information to be exchanged with CMDM.

- Esyasoft meter replacement app would be used for conducting any scalar to smart meter replacement activity.

- This data will be made available for updation in the Billing system by MDM either through API

- Billing system would approve the replacement after due verification.

Pre-Payment Process

The provision pre-payment mechanism for consumers is also available with the MP Discoms.

There are two methods in which pre-payment is implemented:

1. Proposed solution1 – Flat tariff basis
2. Proposed solution2 - Fixed & Slab based Energy charges basis

- 1-ph Smart meters & 3-ph (Whole current) Smart meters can be used for enabling pre-payment.

Operations – Disconnect/Reconnect

- After AMI-CMDM rollout, the process of Disconnection/Reconnection can be achieved by involving an authorization process at Control center or directly integrating with Billing system via Web services.

- The list of Smart meter consumers for disconnection generated from billing system is being uploaded to CMDM through API.

- Authorized person from the field office verifies the DO list & approves for disconnection. An OTP message is given to the concerned authority in the Control centre.

- Upon approval, disconnection takes place in CMDM through HES-CMDM integration.

- CMDM generates the summary report for disconnection for all users (circle/division/zone).

- Post clearance of dues & reconnection charges, list of consumers for reconnection generated from billing system is being uploaded to CMDM through API.

Revenue Protection Process

- CMDM has proposed a system called ATR (Action taken report)for structurally analyzing the huge amount of consumer data to extract revenue related information which can help the Discoms to identify potential theft cases & issues.

- The ATR system provides ability to analyze the following:-

    - Meter tampering flags & alerts

    - Power outage events

    - Usage trends & usage profiles

    - Zero consumption, Peer group comparison

    - Consumer clustering & analysis

    - Identify potential energy diversion situations

- The ATR helps automatically generate daily reports, monthly reports & service order requests for investigation & provides data records.

- Individual dedicated ATR systems have been implemented containing separate set of analytics & validations for Smart meters, HT AMR data, LT AMR data & Scalar meter data (MRDM) for insights & analysis.

Consumer Apps Process

- CMDM provides interfaces for the data exchange between the consumer mobile app & the CMDM. The required changes have been already done in the existing URJAS app.

- CMDM services are integrated with the existing Smart Bijlee app through which consumers can see information related to his energy consumption, account, billing & payment information. The app also has a platform for implementation of Peak load management functionality by providing existing tariff & incentive rates, with customer engagement options etc.

- The Smart meter consumer can monitor the energy consumption for today, current week, current month & year on the Smart Bijli app.

- Integration of Smart Bijlee with Smart meter deployment helps consumers not only to monitor their energy consumption but also can know how much it costs. This helps consumers to develop better habits on energy consumption & reduce electricity bills.

- The consumer will also get various notifications from the utility like planned outage information etc. on the mobile app itself.

Reports available to the Consumers

- Last 7 days consumption
- Last 4 weeks consumption
- Last 6 months consumption
- Last 2 year consumption

(All above 4 reports in a form of Bar graph and tabular)
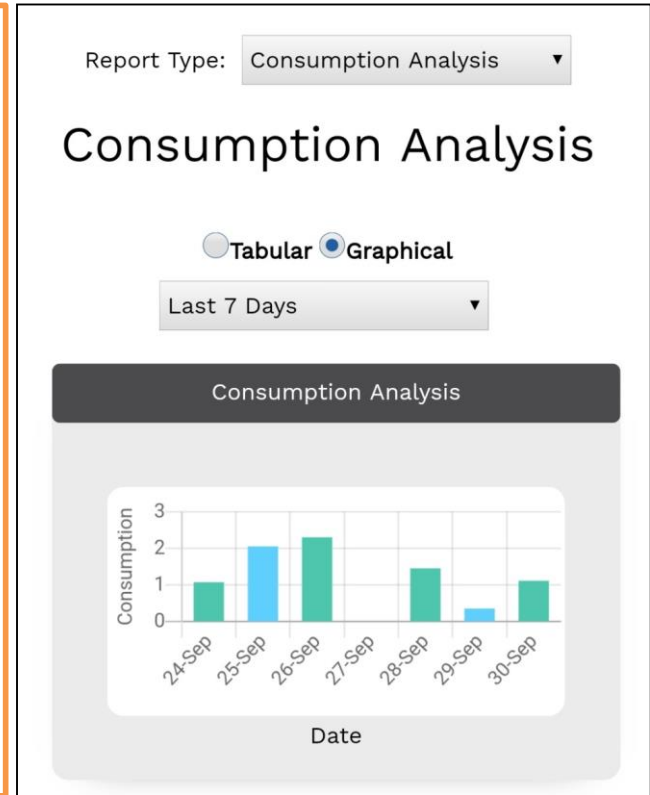
Overall MIS & Reporting Process

- MIS comprises a no. of reports based on historical data & provides insight into various patterns for further studies & comparisons.

- It covers the data gathered from all the meters across the Discom including Scalar meters, Smart meters, LT/HT AMR meters & Feeder meters.

Major Reports in MDM

S#	Particulars	Report Name
1	AMR	Consumption analysis
		Event Analysis report
		ATR Event wise report
		ATR Validation wise report
		ATR summary vigilance
		Circle wise ATR report
		Division wise ATR report
2	MDAS	Hourly Consumption report
		Ag load Analysis
		Live data –hourly
		Load survey report
		Peak load analysis
		Energy audit circle wise
3	Billing System	Zero consumption report
		Scalar consumption analysis
		Scalar validation analysis

THANK YOU