Meter Data Management System
Where We Are Now and Where We Are Heading

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n NMR Project Overview
n MDMS Scope
n MDMS Functional Overview
n MDMS Vision
n Lessons Learned
JEA owns, operates and manages the electric, water and wastewater systems in Jacksonville, Florida.

- Florida's largest municipally owned electric utility and the eighth largest in the United States.
- 113th largest of all 3,000 plus electric utilities in the country.
- Electric system serves approximately 400,000 customers in Jacksonville and parts of three adjacent counties.
- Water system serves more than 240,000 water customers and 186,000 sewer customers.

JEA started its NMR initiative in 2001 and plans to complete it in 2007, its main focus is to provide:

- customer service improvement and satisfaction;
- better system reliability and accuracy; and
- additional operational cost savings.
It is a multi-departmental and multi-year implementation project that includes

- installation of a Cellnet radio frequency fixed network and fiber backhaul infrastructure;
- replacement or retro-fit of approx. 640,000 electric and water meters to communicate with network; (360,000 elec, 280,000 wtr)
- development of interfaces to JEA information systems including its customer information systems (CAIR), outage management system (CGI), field force dispatch system (FFDS), etc.; and
- development of advanced Meter Data Management System (MDMS) to take advantage of volumes of meter data.

JEA owns all NMR hardware within its service territory. An O&M contract is in place with Cellnet to maintain the RF network, and provide system performance in compliance with contract metrics/service level agreements. This contract will run thru the year 2016.
MicroCell Controller Network (LAN)

The MCC handles all local processing for the CellNet network. It tracks all endpoint devices and stores the received data until the information is uploaded into the Relational Database.

Wireless Wide Area Network (WAN)

The WAN routes information between the System Controller and MicroCell Controllers using CellNet or other 3rd party technologies.

Endpoints

Network Infrastructure - 3 Components
- MCC
- CM
- COM Hub

Utility Company

Utility Application Gateway

System Controller (WAN Server)

Network Operating System (NOS)

Management

Relational Database

System Controller Network

Provides data and network management; serves as the customer data access point.

Object Management System (OMS)

NOC

WAN Router

Click to buy NOW!
640,000 mtrs -> 3200 MCCs -> 34 CMs

Data Flow Diagram
1) NMR project and CIS implemented at same time, 2) JEA develops own meter data management system (MSRP) => JEA contracts for formal/standardized MDMS => MDMS application improvements done incrementally, 3) New CIS implemented
Why JEA Chose MDMS?

Became clear that vendor was just a data provider
- JEA’s new Customer Information System (CIS) had not fully stabilized and adding complex interfaces to it was not feasible
- JEA builds MDM system to store data and serve as interface for vendor data base and JEA CIS in order to eliminate/reduce new CIS interfaces
- Easier to develop new exception processing in MDMS

Standardized Meter Data Management System (MDMS) a key recommendation from SLB study
- Strategic vision to use NMR data beyond billing
- Single repository for all meter sources (NMR, MV90, Handheld etc.)
- Easier access to meter data for analysis and business intelligence
- Interfaces to other essential systems (Outage management, System Planning, Data Warehouse, etc.)
- A separate MDMS will be easier to change for BPL, mesh RF and other NMR technologies

Vendor provided MDMS deemed less risky due to lack of internal SMEs on NMR
MDMS Initial Scope

- Interface between vendor data file and CIS
- Meter Asset Management
- Network (MCC/Cell Master) Asset Management
- Single repository for analysis and business intelligence
- Data Collection Service Upgrade
- Virtual Move In/Out, Service Risk
- Customer Service Enhancement (leak detection, excessive consumption, etc.)
- Recovering lost revenue by identifying meter resets
- Revenue Enhancement (improved estimation, identification of zero consumption meters, demand rate customers, etc.)
- Outage Management
- Distribution planning and engineering
- Bellwether Meters for Outage Management
- Transformer load management
Meter Data Management System (MDMS)

- Web Access to External Customers
- Customer Information System (CAIR)
- JEA Internal Customers
- Field Force Dispatch System (FFDS)
- External Customers

Primary Meter Data
- NMR (Cellnet)
- MV90
- ITRON

Other Meter Data
- Other Read Sources (FFDS, FMS, CAIR, etc.)

Outage Management System FMS (CGI)

Data Marts
- NMR Business Intelligence
- System Planning
- Market Research
- Energy Management

Field Force Dispatch System (FFDS)
MDMS Functional Overview

- **Cellnet (OCDB)**
- **Cellnet JMS Server**
- **TLM**
- **MDMS**
- **MSPR (NMR Phase I)**
- **CAIR**
- **MDMS Web Viewer**
- **DPS, DW etc.**
- **Computer Associates Workload**
- **FFDS**
- **CGI**
- **MV90**
- **ITRON**

**LEGEND**
- NMR Phase II System
- Existing JEA System
- Future JEA System
- Existing Integration
- New eMeter Integration
- New ESI Integration
- Phase 1
- Phase 2
- Phase 3
- Phase 4

**Key Points**
- An aggregation of a) Transformer and Meter Connectivity with b) Meter Reads to assist with the TLM configuration parameters such as coincidence curves, seasonal load profiles and alike (Parking Lot)
- Power Up Notification (to be determined how OMS will use from this data)
- Verify single premise "Lights Out" trouble call (Parking Lot)
- Initial Load of Historical Data
- Residential Monthly Meter Reads
- 15 minute interval data
- DBMaint/DBSync (plus extras including rate class/type, last billing read etc)
- Daily Billing File
- Move-in, move-out, Off-Cycle Customer Meter Read Request
- On-demand Request
- System Load Snapshot
- Field Order Status (Query/Response)
- Violation Service Order (Meter Tampering, Suspect Usage, Logical Disconnect Thresholds Exceeded)
- Service Request for Customer that should be on-demand rate
- Diagnostic Service Order (Malfunctioning "Dead" Meters, Battery Replacement)
- Billing cycle schedule Sync
- DPSCycleMCC/MIU connectivity
- Post Install Synchronization
- Service Pt, Transformer, MCC connectivity Synchronization
- Initial Load - Historical Monthly Reads
- Initial Load - Historical daily reads
- Daily and Billing Meter Reads
- Direct Register Reads
- Computer Associates Workload
- Usage Data, Data Collect Time, Usage and Flags Analysis
- Service Request Status
- Field Order ID (CAIR query)
- Last Gasp and Power-Up Notifications
- Meter Reads (Parking Lot)
- More-in, move-out, Off-Cycle Customer Meter Read Request
- Verify single premise "Lights Out" trouble call (Parking Lot)

**Additional Notes**
- MDMS
- WebViewer
- Request for Manual Read
- Demand Meter Reads (DRR)
- Field Order ID (CAIR query)
- Usage Data, Data Collect Time, Usage and Flags Analysis
- Service Request Status
- Field Order ID (CAIR query)
- Last Gasp and Power-Up Notifications
- Meter Reads (Parking Lot)
- More-in, move-out, Off-Cycle Customer Meter Read Request
- Verify single premise "Lights Out" trouble call (Parking Lot)
Current status
- in production since 11/2005

Functionality
- Daily historical consumption and demand read data
  - Table and graph form
  - Configurable date range
  - Meter flags and indicators (outage, reverse rotation, etc.)
  - Read identifier (system, used in billing, extrapolated, interpolated, etc.)
- High Usage reports to notify customers (new process needs to be implemented)
- Billing reads to CAIR based on Cellnet Daily file and Billing file
  - Interfaces to MV90 and ITRON Handhelds are not yet implemented
- Better integration of Meter Reading Exception work (manual reads for inaccessible meters, re-reads, New process developed to handle NMR lag reading)
- Virtual Move In/Out (permanent solution)
  - New process developed to handle exceptions for virtual move in/out process
  - Modified (expedited) consumption no contract process
- Analysis of daily meter data to reduce revenue loss related to potential meter failure
  - Low Battery flags for 5 consecutive days – field trip needed before battery fails
  - Water Meter Error – indications of cut wire or bogus reading for a number of consecutive days
  - Meter Reset – investigation needed to prevent revenue loss
  - Zero Consumption (interim)– dead meter suspected – field trip needed to possibly replace meter
  - Usage exceeds +/-20% of last 3 months average (interim) – potential meter failure
  - Missing Reads for a number of consecutive days – potential meter failure
Functionality (continued)

- Analysis of daily meter data to reduce revenue loss related to potential investigation (New or modified process must be in place to handle reports and associated field activities)
  - Theft Flags – reverse rotation or magnetic flags – may require field trip to assess
  - Potential theft report based on consumption in a premise with no active SA - consumption no contract or CNC-1 process
  - Theft Identified based on completion of CNC-1 above (this is the CNC-2 process)
  - Potential Meter Problem/Water Leak
  - Excessive Demand Missing
  - Excessive Load Profile Missing
  - C&I Meter with 1 channel of good data and the other bad

- Analysis of daily meter data to reduce revenue loss related to data issues (New or modified process must be in place to handle reports and associated field activities)
  - Meters failing billing validation checks
  - Exceptions related to data synchronization between CAIR, MDMS (NMR Phase II) and Cellnet
n Current status

ü Outage/Restoration Events & Restoration Verification interfaces to FMS – in production since 07/2005
ü Group Outage (DCSB) and outage reports – in production since 11/2005

n Functionality

ü Outage Events Processing – MDMS will receive outage data within 6 to 11 minutes of outage and pass the data to FMS for processing similar to customer calls
ü Restoration Events Processing – MDMS will receive restoration data within 6 to 11 minutes of restoration and pass the data to FMS; FMS will flag the outage as NMR verified restored
ü Restoration Verification – FMS will send a list of meters to Cellnet (thru MDMS) to verify restoration status of each meter. Cellnet (thru MDMS) will send FMS status of each meter whether the service is restored, or is still out or other applicable status. SOCC will use this process to perform
  - Transformer restoration verification, Single lights out verification
  - Call-back verification - EOIS currently calls customers back or pages them or sends a text message/email per the customer’s request for a callback when power is restored. FMS will now validate restoration status thru the NMR to eliminate/reduce incorrect calls
  - Bellwether/Commercial Meters- better quality and more reliable outage and restoration data for bellwether meters (JEA specified) or commercial meters. FMS processing for bellwether meters or process changes for SOCC TBD
ü Interface with EOIS – thru FMS for outage and restoration data
n Functionality (continued)

ü **High Profile Outage Status Report** – ability to request the current outage status of the Duval county schools, lift stations, etc..

ü **Excessive Outage Report** - a daily report which identifies any meter/service point which has experienced more than X outages/momentaries over Y consecutive days, where X and Y are configurable.

ü Outage Exception Report – an exception report for any meter/service point which has experienced more than X total outages.

ü **Outage Summary** Report - a summary report totalizing the number of service points for which outages have been reported. In outage scenarios, this report could be produced on an hourly (or more frequent) basis.

ü **Outage History Report** - a historical report (typically, run day after day) identifying the number of meters reporting outage events, number of meters reporting restoration events, number of meters reporting an outage (from the daily reads file), number of meters which an outage and a restoration, number of meters with an outage and no restoration, etc.

ü **Pending Outage Report** - a list of current outages (not yet restored) sorted from the oldest to the newest (outage that began first is first on list)

ü **Transformer Outage Identification Report** - After the daily reads file has been processed, MDMS can identify any transformers for which reads were not received for any meters associated with that transformer.
Current status

- Transformer Load Management
  - Load consumption by service points
- System Load Snap shot data
  - System peak data
- Load Profile Data
  - Basic functionality

Basic flat file interface for Demand Side Management data in the process of being collected
Cellnet Synchronization
- Identify requirements for synchronization of MDMS with Cellnet systems and processes. Configure MDMS and complete integration testing of the Cellnet synchronization.

Load Profile Support and Load Research Support
- Identify requirements for Cellnet Load Profile Adapter and load profile data delivery. Configure the Load Profile Adapters and complete integration testing.

Field Service Module Configuration
- Identify requirements for scheduled battery maintenance and scheduled meter inspection and audit. Configure the Field Service Module and complete integration testing for the Field Service Module.

Outage Filtering and Enhancements
- Conduct data analysis and identify requirements for the enhancement of the MDMS outage adapter and capabilities. Configure and complete integration of these enhancements.

RF Connectivity Synchronization
- Identify requirements for the capture and management of RF information from Cellnet. Configure and complete integration of these enhancements and modules.
n MDMS Web Viewer (CSR/Billing Support/other areas)

n MDMS Interface to Outage Application
  ü Special Outage Interface – Duval County School Board
Welcome: Meter Data Management System (MDMS) Web Viewer

Welcome. This service allows JEA to more fully utilize our Cellnet NMR network. The three functions in this service are Reports, Customer Care and On-Demand Read.

**Reports**: A way to view and save a report in a .txt file format created by the MDMS application.

**Customer Care**: A way to view meter read data in tabular and graphical format. The opening table is a simple table showing the primary meter flags and 30 days of readings. There are links from this table to a graph of those readings and other more complex views.

**On Demand Read**: A way to query the NMR network for the most recent meter read. The system is communicating with NMR enabled meters throughout the day and the On Demand Read function returns the data from the last time the network communicated with the meter. This ability can help us reduce field visits, improve customer care and verify possible outages.

**Confidentiality**: Like all customer data, the data presented throughout this Web Viewer are confidential and our customers trust JEA with their privacy.
MDMS Journey at JEA

- Business Intelligence
- Energy Supply
- Load Research
- System Planning
- Outage
- Customer Care
- Billing
- Legacy – everyone does it!
- Cutting Edge
- Time/Vision
- AMR Data Usage

Strategic/Visionary

Click to buy NOW!
### MDMS Roadmap

**Core, Advance & Business Intelligence Applications**

#### MDMS Core Applications

<table>
<thead>
<tr>
<th>Feature</th>
<th>Annual Bus. Savings</th>
<th>FY05</th>
<th>FY06</th>
<th>FY07+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single repository for all meters (NMR, MV90, ITRON)</td>
<td>Strategic</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MDMS Web Viewer (less rereads/investigations)</td>
<td>~$600K</td>
<td></td>
<td></td>
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<tr>
<td>Billing Interface for NMR Reads</td>
<td>Essential</td>
<td></td>
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<tr>
<td>More Accurate Billing due to new meters etc. (Phase I)</td>
<td>~$10M</td>
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<tr>
<td>Exceptions Handling</td>
<td>Essential</td>
<td></td>
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<tr>
<td>Cellnet synchronization</td>
<td>Essential</td>
<td></td>
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<tr>
<td>Virtual Move in/Out</td>
<td>~$2M</td>
<td></td>
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<tr>
<td>Enhance theft detection</td>
<td>~$500K - $1M</td>
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</tr>
<tr>
<td>MDMS Enhancements (CNC, Zero Cons, Demand etc)</td>
<td>TBD</td>
<td></td>
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<tr>
<td>PM Activities (Battery replacement, meter inspection)</td>
<td>Essential</td>
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<tr>
<td>MDMS Web Viewer integration with CC&amp;B</td>
<td>Essential</td>
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<tr>
<td>Replace MV90 for some customers</td>
<td>TBD</td>
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</tbody>
</table>

#### MDMS Advanced Applications/Initiatives

<table>
<thead>
<tr>
<th>Feature</th>
<th>Annual Bus. Savings</th>
<th>FY05</th>
<th>FY06</th>
<th>FY07+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outage Core Interface with FMS</td>
<td></td>
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<tr>
<td>Outage Exceptions Reporting</td>
<td></td>
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<tr>
<td>School Board Outage</td>
<td>~ $500K - $1M</td>
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<tr>
<td>Other Group Outages</td>
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<tr>
<td>Outage Enhancements/tighter integration w/ FMS</td>
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<tr>
<td>Real-time Outage Interface</td>
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<tr>
<td>Load Research/Rate Study</td>
<td>Essential</td>
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<tr>
<td>Advanced Load Research (targeted, adhoc)</td>
<td>TBD</td>
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<tr>
<td>Remote Disconnect/Connect (pager tech)</td>
<td>TBD</td>
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<td>Pre-paid (hardware based)</td>
<td>TBD</td>
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<tr>
<td>NMR Asset Management (w/ MAXIMO)</td>
<td>Essential</td>
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</table>

#### Data Integration/Business Intelligence

<table>
<thead>
<tr>
<th>Feature</th>
<th>Annual Bus. Savings</th>
<th>FY05</th>
<th>FY06</th>
<th>FY07+</th>
</tr>
</thead>
<tbody>
<tr>
<td>System Planning (daily cons, SLS)/ Transformer Load management</td>
<td>~$500K - $1M</td>
<td></td>
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<tr>
<td>Conservation Initiative</td>
<td>TBD</td>
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<tr>
<td>Load Forecasting/Generation Deferment (1% reduction in system load results in $30M potential cost deferral (for 30 MW load savings)</td>
<td>~$1.5M</td>
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<tr>
<td>Customer Education/Communication</td>
<td>TBD</td>
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<tr>
<td>Interactive JEA.com for alerts, outages etc.</td>
<td>TBD</td>
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<tr>
<td>Load Management applications (C&amp;I customers primarily)</td>
<td>TBD</td>
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<tr>
<td>Water Load Profile/ Potential TOU/Leak Detection</td>
<td>TBD</td>
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<tr>
<td>Power Quality Analysis for C&amp;I Customers</td>
<td>TBD</td>
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<tr>
<td>System Reliability (using MCC voltage)</td>
<td>TBD</td>
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<tr>
<td>Additional billing options for customers (choice of bill date, on demand billing, more frequent billing, etc.)</td>
<td>TBD</td>
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Total Annual Savings (original NMR Business case) | ~$17M | | | |

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**Legends**

- Item completed
- Item underway
- Item identified for FY07
- Business Case/Owner TBD, Contractual issues, etc.
Lessons Learned

n Must have the highest level of sponsorship and buy-in
  ü Internal resistance will manifest itself in many different forms. Strong executive leadership is required with frequent reminders to the company that this is an important project.

n Have a vision/plan to use data beyond billing

n Develop separate system to house data and interface with other systems
  ü CIS is not the right system

n Deal with the organizational inertia to changes
  ü Don’t underestimate the scope of the process changes
  ü Use MDMS as the catalyst (and not a be all and end all system)
  ü Identify short and long term owners
    - New method of doing business
    - Identify the right ‘change agent’/early adopter
    - Jobs will not necessarily be eliminated but they will change significantly

n Partner with the right vendor
  ü AMR/MDMS is a new field for most utilities and so, finding internal resources with right skills/experience will be difficult
n Manage stakeholder expectation
  Ũ Requirements will be fuzzy at best. New requirements will be surfacing as you deliver basic functionality. You must have a process to enhance the functionally delivered at the same time as you are adding new functionality.

n Spend as much time as necessary crafting the contractual relationship with your vendors (You will be glad you did!)

n Use Six Sigma or other quality tools during the project to run things smoothly
Questions?

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