Advanced Distribution Management System (ADMS)

Thomas Bialek PhD, PE
Chief Engineer

July 7, 2015
Outage and Distribution Management System (OMS/DMS)

Replace existing OMS and install new DMS system with integrations to GIS, CIS, AMI, SCADA, Crew Dispatching …

WENT LIVE SEPTEMBER 29, 2012!

Present

- Paperwork
- Manual processes
- Software systems are not fully integrated
- Most Unplanned outages are reported by customers

Past

Future  NOW

- Near real time data
- Automated process
- Integration with many systems
- Faster outage restoration times
- Improved outage communications
Integrated OMS/DMS – Key Benefits Today

► Reduce outage time through integration with Smart Meter technology, SCADA, and customer calls with GIS based model
► Reduce outage time by improving utilization of response personnel
► Improve efficiency of planned switching process by taking advantage of mobile terminals in the field and automated generation and testing of switching plans
► Improve real time reporting of current outages for customers and management personnel
► Improve the management of resources during major events to more quickly restore service to customers and better predict and communicate restoration times
OMS/DMS: Project Scope

► Unplanned Outages
  • Implement Oracle Network Mgmt System (NMS)
  • Integrate AMI & SCADA & Customer Calls for outage detection and prediction of interrupting device
  • Utilize GIS ESRI model into NMS model
  • Use NMS for restoration steps including SCADA operations
  • Use PING function to confirm outage status

► Distribution Management
  • Use Real Time As-Switched Model of Distribution System

► Major Events-Storm Module
  • Aggregate Assessment and Repair Status for All Outages
  • Estimate Overall Restoration Time and What-If Scenarios
Planned Switching

• Simplify Field Requests for scheduled work switching
• Facilitate communication with customers for planned outages

Outage Communications

• Implement Obvient’s focalPoint
• Provide real time stats on current outages – customers impacted and ETR status
• Provide primary & secondary outage whiteboards
• Provide status of repair jobs during storms
• Provide outage maps
• ... and many more
OMS/DMS Smart Grid Inputs

• **Smart Meter/AMI**
  - Historical Transformer Load Profiles to support power flow calculations
  - Power Off Alarms – to detect outages
  - Power On Alarms – to verify restoration
  - Status Pings – to verify outage predictions and restoration

• **CBM**
  - Dynamic ratings for substation transformers
  - Substation Alarms and Analog (e.g. oil temperature) Information

• **SCADA**
  - Device Status (Open/Close)
  - Alarms and Analog (e.g. load and voltage) Information
  - Fault Indication and Fault current

• **Wireless Fault Indicators**
Outage Prediction Integrations

OMS / DMS

Customer Calls

Outage Status

Power Off Alarms

Power on/Ping Response

Device Status

CISCO

+ 10 minutes Ave

Smart Meter

Immediate – offs
3 minutes – ons/pings

SCADA

Immediate
Positive Effects of AMI

• Fuse Outages are predicted earlier
  – (10 minutes 1st call, 25 minutes same prediction)

• Service Connection problems have been identified and resolved
Real Time as-switched view of distribution system.
Integrated with AMI to more quickly detect outages. Average of 10 minutes before first customer call and 25 minutes before customer calls would predict same outage location for non SCADA outages.

Integrated with mobile dispatch system to dispatch work and track crew status.

Overall Summary of outages in progress and historical trend of outage and restoration activity.
### Current Outage List and Documentation of restoration steps

#### Filter: SAL - Active DSO

<table>
<thead>
<tr>
<th>Status</th>
<th>Event #</th>
<th>Rel. E.</th>
<th>Evt Type</th>
<th>Plan #</th>
<th>Dis.</th>
<th>Substation</th>
<th>Circuit</th>
<th>Device</th>
<th>Device Type</th>
<th>Start Date</th>
<th>Est. Restore Time</th>
<th># Calls</th>
<th>Clues</th>
<th>Crew</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENR</td>
<td>8502</td>
<td>0</td>
<td>PDO</td>
<td>Ener 4139,...</td>
<td>CM</td>
<td>STREAM/VIEW</td>
<td>430</td>
<td>F87607</td>
<td>UG Fuse</td>
<td>10/24/12 10:13</td>
<td>10/24/12 12:43</td>
<td>173</td>
<td>29</td>
<td>AMR,Out</td>
</tr>
<tr>
<td>UAS</td>
<td>8370</td>
<td>8353</td>
<td>RDO</td>
<td>Ener 4079</td>
<td>EA</td>
<td>SANTEE</td>
<td>396</td>
<td>396-1</td>
<td>Hook Stick</td>
<td>10/23/12 17:39</td>
<td>10/24/12 12:31</td>
<td>37</td>
<td>14</td>
<td>AMR,Out-Othe...</td>
</tr>
<tr>
<td>ENR</td>
<td>8494</td>
<td>0</td>
<td>PDO</td>
<td>Ener 4136</td>
<td>CM</td>
<td>GRANT HILL</td>
<td>1434</td>
<td>F8596B</td>
<td>OH Fuse</td>
<td>10/24/12 10:04</td>
<td>10/24/12 12:34</td>
<td>9</td>
<td>10</td>
<td>AMR,Out-Other</td>
</tr>
<tr>
<td>RCVD</td>
<td>8495</td>
<td>0</td>
<td>PDO</td>
<td>Ener 4136</td>
<td>CM</td>
<td>GRANT HILL</td>
<td>392</td>
<td>392-16SM</td>
<td>Primary M...</td>
<td>10/24/12 10:08</td>
<td>10/24/12 12:38</td>
<td>1</td>
<td>1</td>
<td>Part</td>
</tr>
</tbody>
</table>

#### Events and Crews

<table>
<thead>
<tr>
<th>Event</th>
<th>Association</th>
<th># Out</th>
<th>Status</th>
<th>Device</th>
</tr>
</thead>
<tbody>
<tr>
<td>8353</td>
<td>Forced</td>
<td>1130</td>
<td>RST</td>
<td>SN-12KV-396</td>
</tr>
<tr>
<td>8355</td>
<td>Manual</td>
<td>1</td>
<td>COMP</td>
<td>396-597</td>
</tr>
<tr>
<td>8369</td>
<td>Forced</td>
<td>371</td>
<td>INC</td>
<td>SN-12KV-396</td>
</tr>
<tr>
<td>8370</td>
<td>Forced</td>
<td>37</td>
<td>UAS</td>
<td>396-1</td>
</tr>
</tbody>
</table>

#### Step #1

1. **Open by SCADA**
   - Device: SN-12KV-396
   - Completed: 10/23/12 17:39
2. **Instruct Remarks**
   - Device: 636 ACSR A...
   - ETS REPORTS CAR POLE CONTACT
   - Completed: 10/23/12 18:07
3. **Open**
   - Device: 396-1
   - Completed: 10/23/12 18:30
4. **Open**
   - Device: 396-7
   - Completed: 10/23/12 18:30

#### Step #2

1. **OK To Place HOLD Tag**
   - Device: 396-1
   - Completed: 10/23/12 18:22
2. **OK To Place HOLD Tag**
   - Device: 396-7
   - Completed: 10/23/12 18:22

#### Step #3

1. **Check Open**
   - Device: 106-TS-396
   - Completed: 10/23/12 18:14
2. **OK Open SWI 396-1 & TAG HN 5190-12A**
   - Completed: 10/23/12 18:14
Road and Aerial Views of outage area.

Location of outage device and distribution transformers

Indication of where calls have been received
Power flow calculated for distribution devices and compared against rated capacity.

Integrated with SCADA for real time analog and status information.

Distribution feeder power flow forecast calculated using real time SCADA reads and transformer profiles built from historical AMI data

Power flow calculated for distribution devices and compared against rated capacity.
Real Time view of Substation with breaker status, reclosing status and SCADA measured currents.
Current Information for Circuit:
- Load Details for all SCADA devices
- Tie Point load and capacity
- Capacitor settings
OMS/DMS Smart Grid Applications
Future Capabilities

► Use power flow calculations and real time modeling for unplanned and planned outages

► Self Healing grid – automatically detect outage, determine fault location and switch to isolate fault and restore customers - FLISR

► Load Balancing – determine overloaded circuits, provide switch plans to balance load and execute switching to balance load

► Volt/VAr Control – determine out of tolerance Volt/VAr conditions, provide recommended settings for LTC/Voltage Regulators and Capacitors

► Fault locating analysis using circuit model and fault currents

► Automation of reliability reporting to accurately calculate the scope and duration of outages
Drivers – Advanced DMS
The limitations of DMS today

Powerflow (PF) – Basis for DMS applications. If PF is incorrect, the following DMS applications are incorrect:

- Fault Location Isolation Service Restoration (FLISR)
- Suggested Switching (SS)
- Fault Location Analysis (FLA)
- Feeder Load Management (FLM)

• NMS Version 1.10: Power flow model does not utilize Distributed Energy Resources (DER’s) characteristics

• NMS Version 1.12: Power flow model will utilize DER’s characteristics
OMS/DMS Keys to Our Success

- Across Organization – Vision Agreement on Desired Capabilities
- Knowledgeable and Committed Business Team, Electric Operations Members, and Information Technology Members
- Strong Teamwork – Key Members Located Together
- Extensive training across organization
- Rigorous Testing on Functionality and Integrations
- Extensive Pilot with Key Systems Integrations
- Good Vendor Products and Cooperation
- It’s Ready When It’s Ready!
Questions?

Thank you.

Thomas Bialek

Chief Engineer

tbialek@semprautilities.com
www.sdge.com-smartgrid/