Middle Tennessee EMC – Murfreesboro, TN – 1/17/19

Bad meter lugs have been interesting problems that surprised MTEMC.

AMI Operations (network operations), AMI Engineer (program management), Meter shop gets involved for advanced troubleshooting (1 person), area offices take care of routine meter issues. Meter and service site inspections including IR inspection (hotspots) are now performed by the employees that used to do more meter reading/programming related activities. No fee for opt-out at MTEMC due to member push back. Less than 1% opt out.

Three area offices with 3-4 meter tech's in each area office. Did RF radiation study that MTEMC performed.

No problems with ISM band interference or performance issues. Use backhaul combo microwave and VZW modem. 24 VZW collectors, 8 gap collectors, 15 full collectors. 1350 routers. (SLEMCO proposal does not include gap collectors). Batteries do wear down over time. Other technologies had concerns with performance over time.

Goal was to keep below eight hops. Average number of hops is 3. Longest is above ten hops.

Failure with devices stopped working. Can no longer communicate was biggest problem during deployment. Took a long time to deploy. RFP was in 2011 time frame and took until 2017 to get network to operate smoothly. Gap collector upgrades from 3G also ongoing on VZW collectors.

Antenna is just below the neutral. But new antenna will go in live space.

MTEMC always contacts LG to find locations for new collectors, routers, etc. Not really necessary though.

Network deployed already while other things were being done in parallel (software app's).

Pilot was to used to help train employees and create a buy-in from front line employees.

How long was process to get collectors moved feedback from LG? - usually less than 24 hours.

Network communications reports help identify any problems areas. Use GIS to help see where collectors may become overloaded or struggling with path diversity issues.

Some concerns about failing or slow commands going out to edge devices due to sporadic misalignment between Command Center and Collector. Only rolled one truck for disconnect thus far.

Used contractors to install both single phase and three phase. Large revenue accounts and special accounts are in house.

Heat alarms in meters can monitor for potential surge failure problems.

LG support and Irby support has been good. Developed regional LG user group meeting to help learn from each other. Anything on software and network design went directly back to LG (not Irby).

MTEMC does not have accurate meter GPS locations – didn't work out. The contractor app used was not accurate. Must include in the contract how much accuracy you want with geo coordinates.

Dropping NISC OMS – going to OSI for SCADA, DMS, and OMS. NISC not responsive enough from feature set standpoint.

Three people on AMI team – two full time – called AMI operations department and reports to engineering group. LG had bad batch of supercapacitors that needed to fix. Have five year warranty from the project contract.

Interval data - use 15 min on residential and five minute on C&I. Delivered, received, etc. Command Center stores 90 days of data. Limited data access to data when using hosting. Within 90 days MTEMC puts data in Milsoft db so that they can maintain access to it.

Problems with the installation contractor. Mostly quality issues. Need to require them to bring in talented people rather than hire anybody off the street.

Consolidated and standardized meter asset base. Got rid of old obsolete form numbers, standardized np's, programs, etc.

Meter based problems that are obvious (visual) it is member's problem. If it becomes apparent after MTEMC touched it, then it is MTEMC's problem. Prepay is very small percentage. Some people pay every day.

NISC multispeak integration was fairly simple at MTEMC. However the readnow function was a problem due to how a roundup function can create a rollover problem.

Member services limits the number of disconnects done per day to limit the number of calls coming into the call center each day.

Concern about iVue properly managing service orders related to reconnects. MTEMC had to write a work around.

First article meters leadtimes – put in contract a guaranteed date. Use blanket order with scheduled releases.

3-4 meter tech's in each area office (3 offices). Bought three IR cameras for each regional office.

Important to have someone monitoring the network performance – check on events and alarms. Check on things. SLA's are very important to get these structured right.

AMI system control person – variety of issues from system alarms to communication troubleshooting.

Keep 90 spare routers. Like to keep 10% spares or 130 routers. Keep 8-10 gap collectors and 4 full collectors on hand.

Elster wanted to do the firmware upgrades. MTEMC likes to do their own upgrades. Data schema access was also a problem. Liked LG software interface (Command Center).

Conduct scheduled maintenance on router batteries – replace every five years. Schedule 1/3 in years 5 through 7. Need bucket truck to reach the router. MTEMC tests all firmware upgrades and new meters in the meter test lab.

MTEMC charges a penalty fee to electrician (member) for meters that are pulled without approval from MTEMC.

MTEMC will prosecute a member who is stealing electricity. The AMI along with prosecution has stopped much of this activity.

Internal SLA's developed within MTEMC to set the expectations. Barcode and smart numbers on meter np's.

MTEMC uses a super user approach – the 90 day dumps into the Milsoft db can be queried with SQL's and exported to excel. 2.5M site visits per year avoided.

Ozarks EC

Cautionary note: Ozark is operating a sparse mesh network. This is the likely root cause for many of their concerns/complaints.

Started deploying in October – so everything is still new. Still in steep part of learning curve. Some concern about how long it takes to re-path for outage/dispatch. Two hours for meter to find another path back (this is likely due to very sparse mesh caused by too few meters installed).

Router went down – a long time to come back up. Maybe firmware upgrade?

Six thousand meters connected to AMI by end of last year.

FTTH is around 9000 homes today.

Signed open PO to **develop a fiber-based meter solution with Honeywell** – includes up to 3000 fiberbased meters. Fiber based meters for SCADA for CVR/VVR.

Poor communications options – even using public carriers. So Ozarks needs fiber to get more reliable communications. FTTH is only to help pay for the fiber build-out that was needed for other reasons.

Busy rebuilding network due to limited mesh density to get connectivity working. This should resolve itself once the full mesh rollout is in place.

Ozarks changing out their own C&I meters. Five-year rollout – this is slow relative to most utilities. Would rather do it faster but limited by budget – they are simultaneously rolling out \$150M fiber project. Using contractor for residential changeouts – UPA is being used.

Honeywell is partnering with Ozarks for custom development for home energy management – including home thermostat and hot water heaters. Goal is to provide peak shaving.

Honeywell phase identification is a software solution – high low avg voltage every five minutes – 3^{rd} will build voltage profiles over time – this allows reliable predictivity of which phase the meter is on based on voltage profile. Using Leidos Insight for this today. Hope for less expensive solution - NISC is reportedly developing this – others too most likely.

Too **many alarms coming back causing "noise" (**need to invest time to configure this up front to limit to critical alarms). A little overwhelmed by the data available and how to work with the data.

Took a long time to work through contract negotiations with Honeywell – 4-5 months to get contract. (This is likely due in part to the custom development of fiber-based meters as this is not an easy development).

Self-hosting the head-end.

Sent out postcards and UPA used door hangars to inform members of new meters. Told them about benefits online – used some **data from Honeywell to help dispel myths** about health dangers and privacy concerns. Some complaints and some opt-outs requests – but not enough to cause problems yet.

Did not see a lot of benefit to licensed bandwidth.

Some concern about too many hops in the early deployment. This may be due to sparse network (not enough meters installed yet) or this can happen if no specification is provided up front - SLEMCO's spec's call for no more than 3 hops on average. Also this is example reason for a system pilot verification – the pilot must perform according to specifications before proceeding to full deployment.

Billing department is in IT. There are some process concerns about re-reads and how best to do. Again this need should dissipate as the network density improves.

Did not have a big push for prepay – but members love it.

Workload effected by AMI - not yet. Expect some reductions over time.

Would SLEMCO want to ask Ozark for copy of a redacted Honeywell contract?

Five days AMI headend data storage is unusual. This is normally 90 days. Need to check this.

Small number of failures so far – some power-on, some readings errors. First article meters took about a month to ship. No mechanical failures with the disconnect.

Extra training ordered but it was technology focused and was somewhat disappointing to Ozark due to lack of understanding of the business processes.

Negotiated pricing on emergency support. Severity 1 definition expanded to allow Ozark to avoid paying extra support fees.

Consider separate performance specification for connect/disconnect and phase identification success.

A4 is Honeywell's new platform that is designed more for 3rd party comm's. Most likely this is the platform being used for the fiber meter. Doubtful they would use the older meter (RexU).

Developed meter number logic to be smart numbers (form/voltage).

Colored np's to indicate form numbers. Can also do this to indicate voltage.

Honeywell support has been very good according to Teresa.

Wesco has been excellent logistics partner. Keeps inventory off coop's books.

Transaction history (NISC) works at SLEMCO but not at Ozark. Search by SSN works at Ozark but not at SLEMCO.

Ask another coop about contract negotiation process.

No problems on the 480V meter surge problems.