METERS ARE STILL THE CASH REGISTER

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Looking back

Thomas Alva Edison (1847-1931) introduced the first electrical distribution systems for lighting using direct current. He believed that electricity should be sold just like gas. His 'electric meter', patented in 1881, used the electrochemical effect of current to measure consumption. Over the next couple of decades, with contributions from scientists and entrepreneurs around the globe, he made several key enhancements and innovations that birthed the utility industry. The mechanical meters as we know them today are induction meters that were introduced into the marketplace in 1914. These meters are also known as Ferraris meters (based on the principles of the Bláthy meter - Titusz Bláthy (1860-1939). Fast forward 60 years or so and the next big advancement in the industry came with the advancement in analogue and digital integrated circuits. Through the years utility companies enhanced their billing capabilities by offering various rate structures. Examples include simple/fixed, tiered/step, time of use, demand and so forth. However, nothing has changed fundamentally in regard to accurately measuring a consumer's energy consumption so they can be billed. In the 1980's the introduction of advanced meter reading (AMR) continued to push technology in the industry. AMR is an automated way of gathering basic meter data through an electronic handheld device, equipment in a vehicle, or phone dial-up systems. As the name implies, these systems are capable of collecting and transmitting data; usually monthly.

Presently, the evolution of automated metering infrastructure (AMI) is a continuation of society's growth and acceptance of an integrated world. We commonly refer to the internet of things or IoT. In reference to the utility industry, meters are no longer mechanical but rather software driven. An electrical smart meter still records the consumption of electricity but possesses complex digital signals (based in firmware), with a wireless two-way communications module (much like a cell phone) between the meter and the utility company. The biggest change from AMR to AMI is the ability to record and transmit customer consumption hourly or even more frequently over a communication network to a central collection point. AMI typically provides a substantial payload of information that includes: cumulative kWh usage, daily kWh usage, peak kW demand, last interval demand, load profile, voltage and voltage profile to name a few. AMI systems and smart meters, enable real-time information allowing for improved operations and customer management.

The business case and drivers for AMI

Most companies and analysts agree that the following goals can be achieved through AMI:

- Increase profitability through the elimination of the labour and transportation costs of 'in-person' meter reading.
- Improve billing accuracy, eliminating misreads or inaccurate readings.
- Pinpoint the exact location of outages more quickly, meaning a faster response time.
- Increase consumer engagement across the operating units.
- Improve electric service reliability and power quality by monitoring loads on transformers and service drops.

For any company to realise the investment, goals and objectives, there are several fundamental game changers in today's AMI world that need to be considered. We need to realise that the asset is more than the physical piece of hardware. It also includes the software contained within the meter/device. For example, firmware version, communication module IP/MAC addresses, remote service switch, disconnect.

Integrated data across the service delivery model need to be seamless and constantly validated to maximize efficiency and effectiveness for an organization. The days of using stand-alone excel based or access based tracking is no longer supported or scalable in today's world of integrated systems. Existing meter shops need to let go of their standalone data. Knowledge is not power until it is shared.

Standard information about a meter configuration includes (form, class, phase, volts, amps Kh) and due to AMI/ smart meters, we need to add software versions like the communication firmware and IP/MAC addresses of communication modules. This also applies to current and voltage transformers, (current transformer (CT)/voltage transformer (VT)) and the meters they are associated with. Today's AMI world also includes all the network devices that are required for the transmission and processing of data. Examples include access points, relays, range extenders. All these devices have batteries that must be tracked and ultimately replaced. Therefore a robust asset management and inventory tracking solution to track all metering (configuration and attributes) assets, testing, inspection and calibration of test equipment is required. Your metering system must be able to accurately and consistently comply with regulatory (public utility commission, PUC, public service commission, PSC) reporting requirements. Advanced meter asset and inventory management systems must be able not only to record a meter's history from cradle to grave (installed, replaced, tested, or reconfigured) but all the ancillary software that is integrated into the hardware. Not to mention, the data must be retrievable, auditable and able to be reported upon.

AMI initiatives and deployments

As companies go through their AMI deployment, they will re-visit all their customer's meter installations/devices. This is going to be a very costly exercise but could have a high-return if your current asset management system can capture and record all the configurations and attributes for the hardware installed. When will you go out to the field again (besides customer issues/ compliance) once AMI is deployed? Without a robust asset management system you will have missed the window of opportunity and wasted dollars.

With an AMI savvy asset management system in place, once you have validated and verified the production base, you have the capabilities to validate devices' configuration and associated attributes against other systems in the AMI programme/portfolio. Value-add asset management systems should be able to calculate the ratio of your CT/VT along with the meters billing constant and compare it against what is the current billing constant. Some companies may only track the billing constant not what the billing constant should be based upon the configuration installed. Tracking devices by serial numbers (configuration/attributes) will avoid future errors from happening.

Robust asset management systems should be able to compare and alert when an authorized firmware version was not correct in a shipment we are processing. Similarly, knowing what installations need to have their meters replaced if an over the air upgrade is not possible. Think of the wasted effort to go through a receipt and installation process for a firmware version you no longer want to use. It has happened to companies already.

Top issues and pitfalls

1. **Data quality of existing asset system**

It is perhaps the most important task to complete in order to increase your chances for a success in your AMI deployment. If you have a legacy system (decades old), the probability of clean data goes down as the age of existing system increases; many skeletons in the closet. Do not under estimate this effort or the negative impact on the programme if not done correctly. It is highly recommended to get the data clean (at the source) before you think about integration with other systems. Converting poor quality data leads to wasted effort as you will spend time analysing functional issues when they are actually data related.

2. **Build vs. buy - asset management system feature set**

Each company will go through their own set of criteria, investment tolerance and risk, to decide which route is best for them. It is highly unlikely that your legacy system will be able to scale with AMI programmes. The effort to enhance and then maintain this antiquated system will most likely extend the time to deploy as well as your pay-back period. Do not under estimate the cost of ongoing maintenance of legacy applications.

3. **Integrating with existing ERP/CRM systems**

For some companies they have already made the investment in systems like (SAP/Oracle) and therefore one needs to consider using these systems for asset management as well as financial and logistics business operations for example. It is important for companies to decide what system will be the "system of record" for the asset. Decide which system will track inventory movements/status or is tracking limited to only the meter shop. Once that is known, you have a better understanding of what data needs to be interfaced with other existing systems. You will also know how much customisation is going to be needed in support of those business operations. Do not underestimate the effort involved in customising a base application that has a generic view of asset and inventory management. Expand the view to include meter shop and field operations as well as back-office processing.

4. **Meter asset (configuration and attributes)**

The depth of data needed in an AMI world necessitates a robust tracking system that can maintain the referential integrity of assets (hardware and software) configuration. With high quality data and the ability to interface (in real-time) will enable and trigger warnings and errors before they have a financial impact.

5. **Physical Inventory/field operations**

Do not miss this opportunity to record and validate the installed configurations of assets (meters and devices). Do it right the first time (record and document everything) could not be more apparent and critical. Remember to verify the signal strength is adequate to enable communications. Basement/sub-terrain locations may need additional assistance in order to transmit/ communicate with other systems.

The return on your investment from delivering an AMI programme can be realised and the goals to the consumer can be attained. Choosing the right asset and inventory management system to ensure the integrity of the cash register will have a high rate of return and finding those errors (and the ability to stop them from happening) will have an immediate ROI and a reduced payback period. MI

ABOUT THE AUTHOR:

Paul Fratellone's career in quality assurance began in the mid-1980s and has spanned multiple industries and domains. Through the years, Paul has recognized certain patterns and pain points which all organizations need to deal with. Paul's perspective and passion are clearly rooted in ensuring teams provide value to the business and ultimately to end users. Knowing what is important to the customer is how Paul has quantitatively articulated the cost-risk-benefit equation of quality to business owners and IT management.