



# Metering, Operations and Utilities: 2020 and Beyond



Prepared by Tom Lawton, TESCO  
The Eastern Specialty Company

*For North Carolina Meter School  
GENERAL SESSION  
Monday, June 25, 2018 from 1:00 p.m. to 2:30 p.m.*

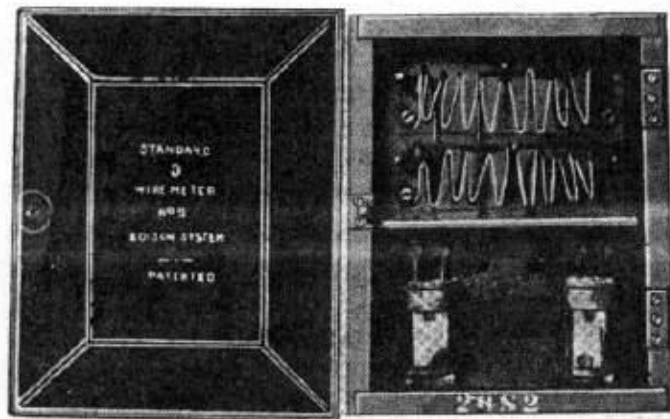
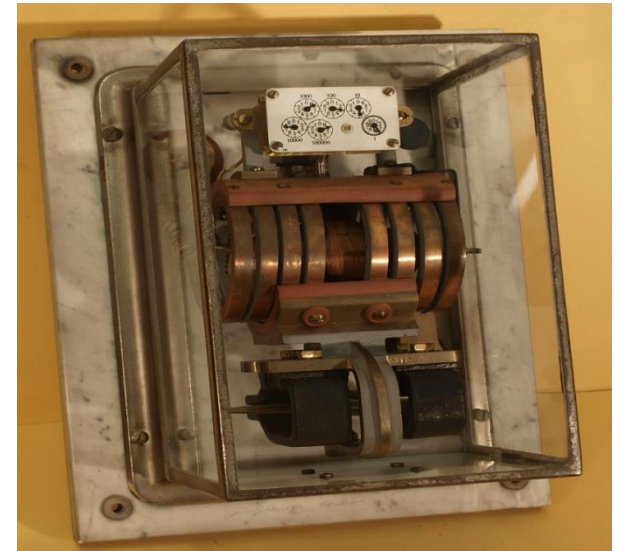
# Topics to Cover as We Look to the Future

- How Metering Has Changed from the 1870's to the 2010's
- Metering Today and the status of our Advanced Metering Infrastructure, Smart Meters and a Smartgrid
- Meter Services role in the utility of the future
  - Big Data and Rolling Trucks
- Meters – the shape of the future?



# 1870's to 1900

- Electric Metering is Invented
- After a few interesting “false starts” several inventors and firms developed and began producing induction meters that are still recognizable to us today
- Four of the five present meter manufacturer's were producing meters:
  - Sangamo (Itron)
  - GE (Aclara)
  - Westinghouse (Honeywell)
  - Duncan (L+G)



# 1900 to 2000

- Not much changed – we use an induction meter for most of the century and only toward the very end of the century start using electronic meters.
  - Meters are standardized in the first half of the century
  - NC Meter School begins 1923 – they had a bell
  - Socket base meters take over for A-base meters
  - Electronic meters are introduced
  - Communications begins to be integrated into higher end metering
  - Same big four meter manufacturers



# 2000 to Present

- The last electromechanical meters are produced. All new meters produced in North America are electronic
- The concept of a Smart Grid is introduced as like our metering infrastructure the grid had not changed much in design since the inception of the grid more than a century ago
- The “brains” of a Smart Grid is an Advanced Metering Infrastructure (AMI)
- The heart of this Infrastructure is a “Smart” meter as the meter becomes a two way communication device with more features built in than just metrology
- A host of new communication vendors enter the market and work with meter manufacturer’s to put their technology under the cover of the meter
- Meter Manufacturer’s also develop their own communication technology to put under the cover
- Additional features such as Disconnect switches and power quality monitoring become standard accessories to be included under the cover of a new meter
- Meters are no longer looked at as simply energy measurement devices



# 2020 and Beyond

Now What?





# 2020 and Beyond

The best way to know the future is to pay attention to the present



# Near Term Projections





# Near Term Projections



# 2020 and Beyond

The best way to know the future is to pay attention to the present.

Best way to do this is to follow the money;  
Not the news.



# New Technologies and shifts in Meter Services and Electric Operations

- Second Generation AMI
  - New capabilities under glass
  - Additional data and additional actionable work orders coming from Meter Services
  - LTL and Private networks
- Street Lights
- Smart Poles
- Renewables
- Battery Storage
- Electric Vehicles



# New Technologies and shifts in Meter Services and Electric Operations

- Folks like Slade Griffen and Contextual Security will be even busier in coming years
- Users and Utilities will want more data more easily
- Folks like Slade Griffen and Contextual Security will be even busier in coming years
- Metering will become enmeshed in distribution and generation and power storage and cyber security and data analysis projects - and then they will become part of the every day fabric for Meter Service Departments





## 2020 and beyond (cont.)

There is only one thing we know for certain about metering in 2020 and beyond;

Metering will not be the same as today and Meter Departments will

- New
- Different
- and ADDITIONAL work



# AMI and Next Generation AMI

- We are slightly more than 50% deployed in North America and the North East is still just at the front end of rolling out AMI
- By 2022 we should be nearly 80% deployed and the early adopters who first started deploying in 2007 are already starting to investigate what they will be doing for AMI 2.0
- We are seeing more and more features incorporated inside the meter
  - Disconnect Devices are essentially standard
  - Power Quality and circuit sensing devices are working inside the meter and sending operational data back to the utility



# 2020 and beyond (cont.)

## AMI and Next Generation AMI

Metering will move the center of Distribution Operations at most utilities as analytics are developed, embraced and begin to mature at individual utilities.

- Knowledge and Information will rule utility operations
- AMI will provide this information and big data/analytics teams will help to provide the tools
- Metering professionals will provide the knowledge on how best to utilize these tools



## 2020 and beyond (cont.)

The tolerance for non-technical losses of any type will become dramatically less.

As the rest of the Utility and the customers begin to understand that we now have the tools to identify, track down and correct these losses they will demand more data and more tools to track down and eliminate these losses





## 2020 and beyond (cont.)

The tolerance for outages will go down as customers get used to us hardening our infrastructure as well as to identify and correct problems without them even reporting them and before or immediately after they even know there is a problem.



## 2020 and beyond (cont.)

The tolerance for poor power quality will go down as we improve our power quality and begin to educate customers on the effects of poor power quality, harmonics and distortion on our networks. New tariffs may come into effect or new requirements placed on customers (or utilities) to provide power factor correction at the customer site.



# Business Use Cases for this big data

In the earlier presentation we talked about;

- Voltage Monitoring  
(*Min, max, average*)
- Transformer Loading Analysis
- Number of customers out of power
- Current demand savings from load control (kW)
- Outage Index Reporting (*SAIDI, SAIFI, MAIFI*) at multiple levels
- Cumulative outage hours (*MTD/YTD*)
- General line loss analysis
- Demand Response (CVR, Peak Reduction, Etc.)
- Power quality investigation
- Number of blinks, sags, etc. (over time specified)
- Peak condition tracking
- Power factor by circuit or time of day
- Pattern detection (Algorithm to detect patterns in voltage, demand, blinks, etc.)
- System efficiency by circuit
- Remote Disconnect/Reconnect



# Business Use Cases for this big data

Now what can we do with this information? Well....To start;

- Isolate and determine where we have voltage issues, correct them and bring an entire line to the same level. This not only works better for our customers but also allows the utility to pursue voltage reduction in a meaningful and controlled way.
- Determine what transformers should be used in any location
- Determine which transformers to store in which inventory yards
- Determine when new loads are present and which transformers are in jeopardy
- Locate Bad connections
- Locate Undersized lines
- For Transformer Rated Services determine which ones are operating for a substantial amount of time below 10% of the rated current
- Find and remediate theft
- Find and remediate remote outages before the user knows they exist
- Find and address Power factor issues





# And now we want MORE.....

More data

Greater frequency

Whatever bandwidth you thought you needed,  
now you need more.



# AMI 2.0

Can we use our existing infrastructure?

Do we have to rip out and replace with a new infrastructure?

What about LTL back haul or a Private Network?

What about Power Line Carrier? Is there life there for my most remote service areas?



# Generation vs Storage

Utility grade energy storage will replace new generation at an increasing pace as some of the largest capital investment projects for utilities.

- The great tunnel under Niagara Falls, Ontario \$1.6 Billion; 150 megawatts – part of an Ontario plan to shut all of their Coal generation Plants



New generation projects are increasingly becoming renewables

- Island communities are already showing us this on larger and larger scales – Ta'u American Samoa; 1.5 megawatts with battery storage for three days



## 2020 and beyond (cont.)

On the distribution side customers will be encouraged to put in more and more renewable energy and they will also add more and more energy storage

Residential loads will move further and further away from power factors of one and put increasing pressure to move to either a Blondel solution for them, a VA/VAR solution for them, or a correction factor for them as AMI systems begin to report back customer power factor for all metering solutions

- 12S or 2S?





# 2020 and beyond (cont.)

On the distribution side customers will be encouraged to put in more and more renewable energy and they will also add more and more energy storage

- Larger customer based energy production and solutions will lead to expanded micro grids.
- Second Generation AMI and potentially new communication paradigms as LTL data becomes less and less expensive and reaches larger and larger areas.



# AMI 2.0 Infrastructure

- Second Generation AMI and potentially new communication paradigms as LTL data becomes less and less expensive and reaches larger and larger areas – without new infrastructure
- Research in Power Line Carrier Technology may provide expanded bandwidth to allow for greater data transfer more frequently without as much new infrastructure
- Mesh networks continue to improve and AMI 2.0 is anticipating leveraging the infrastructure installed in AMI 1.0



# The shape of metering to come 2020 and beyond

Meters that do not look like meters as we know them, will become a part of our world.

- Street lights
- Smart Poles
- Electric vehicle chargers
- Sub meters – which may now become our meters



# Summary – The Past and the Future

- The more things change, the more they will remain the same.
- Understanding how to accurately measure a customer's consumption correctly will become an increasingly valuable commodity. This includes a better understanding of the effects on metering of poor power quality and energy distortion.
- How to pair an understanding of metering and distribution with big data to provide an increasingly automated set of AMI analytics to monitor and maintain our distribution network and to continue to develop new ones to constantly improve our networks.
- Meters may not look like meters in the future but metering will become the center of the Electric Distribution Universe.
- There will continue to be NC Meter Schools to help keep you abreast



# Questions?



**Tom Lawton**

TESCO – The Eastern Specialty Company

*Bristol, PA*

215-785-2338

This presentation can also be found under Meter Conferences and Schools on the TESCO web site: [www.tescometering.com](http://www.tescometering.com)

