A Look Forward at the Direction of the Grid

Prepared by Tom Lawton, TESCO
The Eastern Specialty Company

For Energy Council of the Northeast (ECNE)
Friday, November 2, 2108
10:30 a.m. – 12:00 p.m..

Where are we heading and what does this mean for Meter Services and related Electric Operations?

Our Perspective –

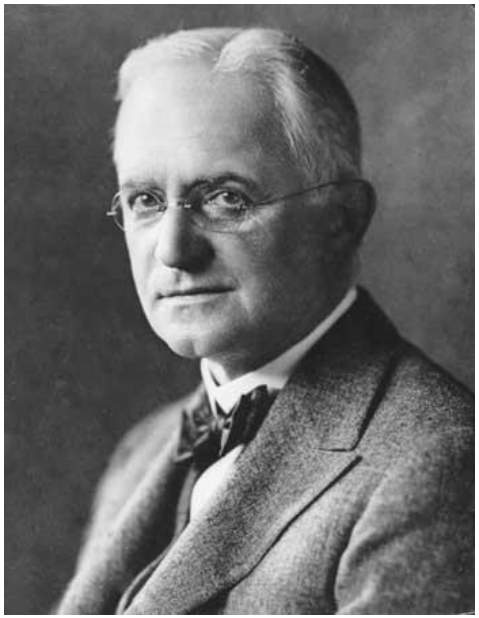
- What are our customers asking us for?
- What is the marketplace starting to look for?
- How can we apply new technologies?

- Are we looking ahead?

Why do we need to look ahead and embrace the future?

The Eastman Kodak Company

- George Eastman, the founder, began a successful Dry Plate company, The Eastman Dry Plate Company in Rochester, NY in April 1880.
- This company was embracing the relatively new technology of the skyrocketing photography industry.
- He had a partner and a stable manufacturing business allowing him to quit his day job at the local bank and work at his own business full time.



First Tectonic technology shift

The Eastman Kodak Company

- Within a few years George Eastman saw that dry plate technology was a thing of the past and film was the way of the future.
- By 1885 he had dissolved the partnership (not everyone saw the same future) changed the name of the company to the Eastman Dry Plate and Film Company and purchased a patent for roll film that he then developed much further.
- In 1888 he introduced the first model of Kodak camera, and trademarked the name KODAK. Amateur photography was born and the company took off.

A KODAK Moment……

- A Kodak Moment.....entered the common American lexicon by the mid 20th century.
- The company had navigated another fundamental shift from black and white to color film.
- By 1976 Kodak commanded 90% of the film market in the US and 85% of camera sales and one of their research scientists had discoved how to take digital pictures the previous year.
- Kodak pursued patents on digital pictures and was poised to make yet another transition securing their success for many years to come....

A KODAK Missed Moment……

- Upper management did not embrace digital technology and decided to stay the course with their film technology.
- Kodak realized their mistake by the late 1980's and tried to reverse course by jumping in with both feet and aggressively pursuing patent infringement law suits.
- Their last patents on digital technology lapsed in 2007 and by 2012 they declared bankruptcy eventually shedding nearly all of their Intellectual Property and virtually every business line. Kodak was finished.

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
  - Private networks
- Street Lights
- Smart Poles
- Renewables
- Battery Storage
- Electric Vehicles

Next Generation AMI

- We are approaching 60% deployed in North America and the North East is just starting to go AMI. By 2022 we should be nearly 85% deployed and the early adopters who first started deploying in 2007 will be starting on their second generation deployments.
- We are seeing more and more features incorporated inside the meter.

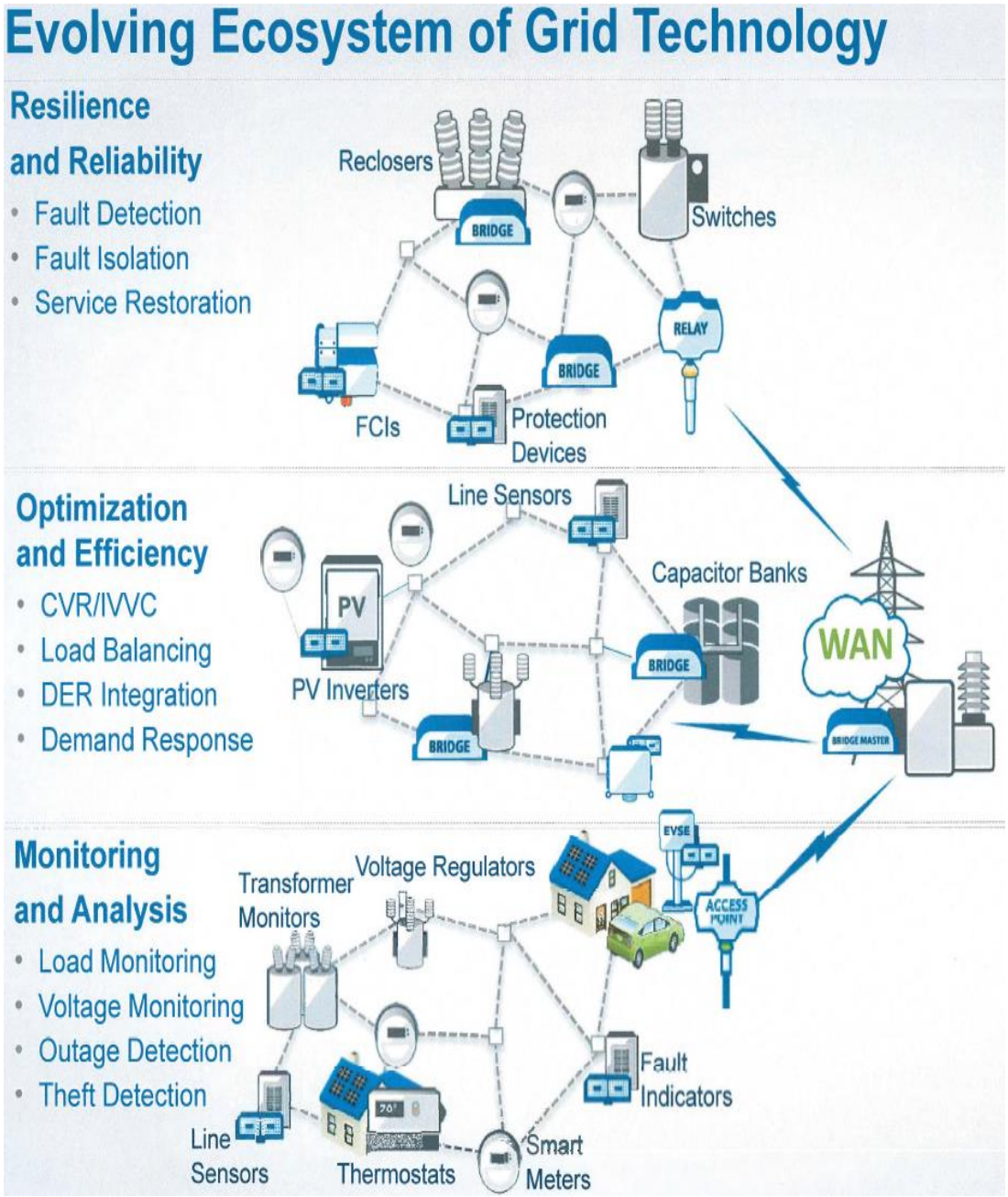
- Disconnect Devices are essentially standard.
- Power Quality and circuit sensing devices are working inside the meter and sending operational data back to the utility.

Next Generation AMI (con't)

- Initial promises of advances in outage management have been realized and the technology continues to improve and add more benefits. As Bill showed in the previous presentation current benefits include, but are not limited to:
  - Usage Data
  - Fault Locating
  - TX Loading
  - Phase Balance
  - Smart Pole
  - Outage Detection/Loss of Neutral
  - Tampering
  - Street Light Control

- Electric Operations is starting to come to Metering for data and actionable operational information.

Evolving Ecosystem of Grid Technology



SCE&G®
A SCANA COMPANY

Communication Networks

Frustration over technology obsolescence

- AMI Mesh Networks operate on an unused public bandwidth or a private bandwidth.
- Powerline carrier is losing popularity due to a perceived information bandwidth limitation.
- Cellular Deployments are frustrating as celluar technology changes far faster than utility infrastructure.
- As data costs continue to plummet the larger carriers are now starting to offer 20 year leases for bandwidth that will allow utilities to launch private networks.

Which Way Will our Industry Turn for our Future Communication Needs?

- Mesh?
- Powerline carrier?
- LTL Cellular?
- Private networks?
- Something new?

Street Lights…..

A Better Solution

- Light the street or parking area better
- Significantly less light pollution
- Significantly less energy usage
- Additional lighting features not possible before;
  - Turning the lights up and down to better suit usage and need
  - Directing emergency vehicles
  - Alerting motorists to hazards

BUT……..

- Every light or bank of lights now needs a meter and not just a “street light rate”
- A potentially significant investment in new infrastructure for a utility to obtain far less revenue. Embracing the future…..is this truly a good investment?

….and Smart Poles

As the first new Street Light poles go in so does a new revenue opportunity

- Cellular carriers want to put their transmission devices in every new street light/smart pole installation in the country as quickly as they are being deployed.
- Once again we need to meter this new application, and the this time the revenue generated will be more than the old street light usage.
- Municipalities and other users want to put additional devices on the pole;
  - Security devices
  - Pollution monitoring devices
  - A variety of new sensors for new applications – from sound to light to gas monitoring

New Markets
Electric Vehicles

Energy Usage per capita has been essentially flat for 20 years

- Peak year per person was 2005
- Has fluctuated within a few percent since 1997
- There are new emerging markets
- Electric Vehicles – a technology of the future?

Electric Vehicles Disruptive Technology Managing the Risks

- Safer
- Autonomous drivers – faster and safer
- New market for electric use
  - Average Monthly Energy usage in US is 867 kWh according to the US Energy Information Administration
  - Average amount of energy to recharge an electric vehicle from 10% to 80% is @70kWh per charge or 350kwh if you drive roughly 25,000 miles per year.
- New potential for energy storage

The real question becomes who will control this emerging market for car chargers and how will they be metered?

Renewables and Distributed Generation

Our Brave new world

- As an industry we have moved away from coal (53% to 30.4% in 20 years) as the economics and social concerns move us toward a signficant increase in natural gas (14% to 33.8%) and renewables (9% to 14.9%)
- These renewables are often brought on line by customers within a utilities service territory
- Many utilities are actively pursuing ways to partner with their customers on renewables

Utility Grade and Residential Storage

The key to renewables is energy storage

- Hydro has pumped water for years in non-peak hours when energy is extremely inexpensive or even free.
- Wind farms and solar are great when the wind is blowing and the sun is shining
  - If you do not have a back up for when the wind stops and sun does not shine, there is not much practical benefit from renewables
- Utility Grade Storage
  - SDG&E 120MW of storage in one of two new energy storage projects
  - An increasing number of island communities are using this to allow them to go 100% renewable and no longer rely on any diesel or imported fuel for their generation
- Residential Grade Storage
  - As you heard in an earlier presentation Tesla is leading the charge with their Power Wall to go with their proposed solar shingles

And at the Center of Everything……

Our Advanced Metering Infrastructure

- More data, faster. More analytics. More capabilities under the cover. Interoperable meters. A more robust and energy efficient Grid. And a greater need than ever before to understand Metering.
- And if we continue to stay on top of our game we can create a Kodak moment for metering.....of the right kind
  - Take control of these new markets
  - Understand the market adoption of these and other paradigm shifting technologies through this data and then positioning our utilities to take advantage of them

Questions and Discussion

Tom Lawton

tom.lawton@tescometering.com

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