TESCO METERING

Tracking Failure Curves and Considerations for AMI 2.0

TESCO's Meter School

TESCOOL

July 19-22, 2026

Date July 22, 2026

1:00 PM – 2:30 PM

John Williams, TESCO

TESCO METERING

AGENDA

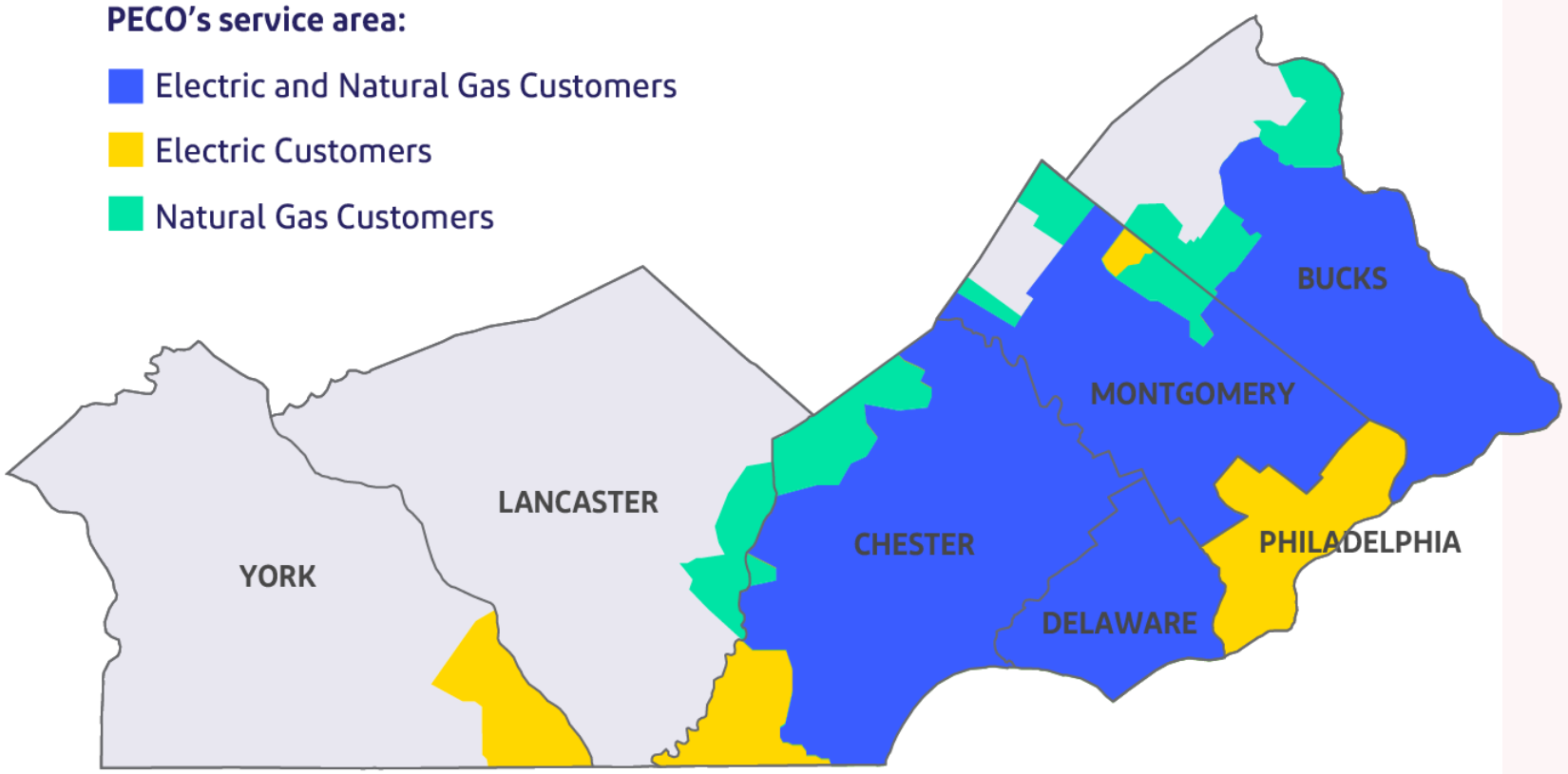
- PECO – Overview
- PECO's Automated Metering Journey
- Current Situation/Challenge
  - Device Obsolescence / Meter Failure Bathtub Curve
  - Industry Trends
- PECO's Plan – the strategy and actions
- AMI 2.0?
- Open Discussion

OVERVIEW

Headquartered in Philadelphia, PECO is Pennsylvania's largest electric and natural gas energy delivery company, serving 1.7 million electric customers and more than 553,000 natural gas customers in southeastern Pennsylvania.

PECO employs approximately 3,000 people and is a subsidiary of Exelon Corporation (NASDAQ: EXC), the largest fully regulated utility company in the nation with more than 10 million customers.

PECO Territory



22,659
distribution miles

1.7 million
electric customers

553,000
natural gas customers

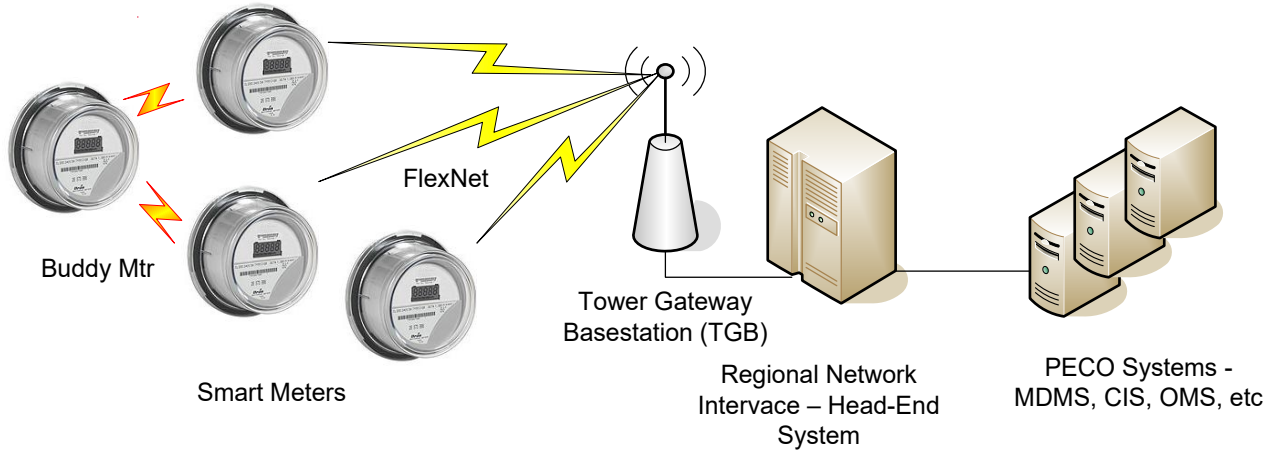
10%
commercial/industrial

90%
residential

PECO's Automated Metering Journey

Timeline

- Pre-2000 – Emetcon PLC
- 2000-2016 – Landis+Gyr/CellNet Fixed Network AMR (*Full Deployment*)
- 2008 – Pa. Act 129
- 2010 – Federal ARRA Stimulus Grant Award
- 2011–Present - Sensus FlexNet AMI, Generation 1 (*Full Deployment*)
- 2022 – Next Generation Meters and V2 Communications Protocols
- 2027 – Obsolescence Plan Starts



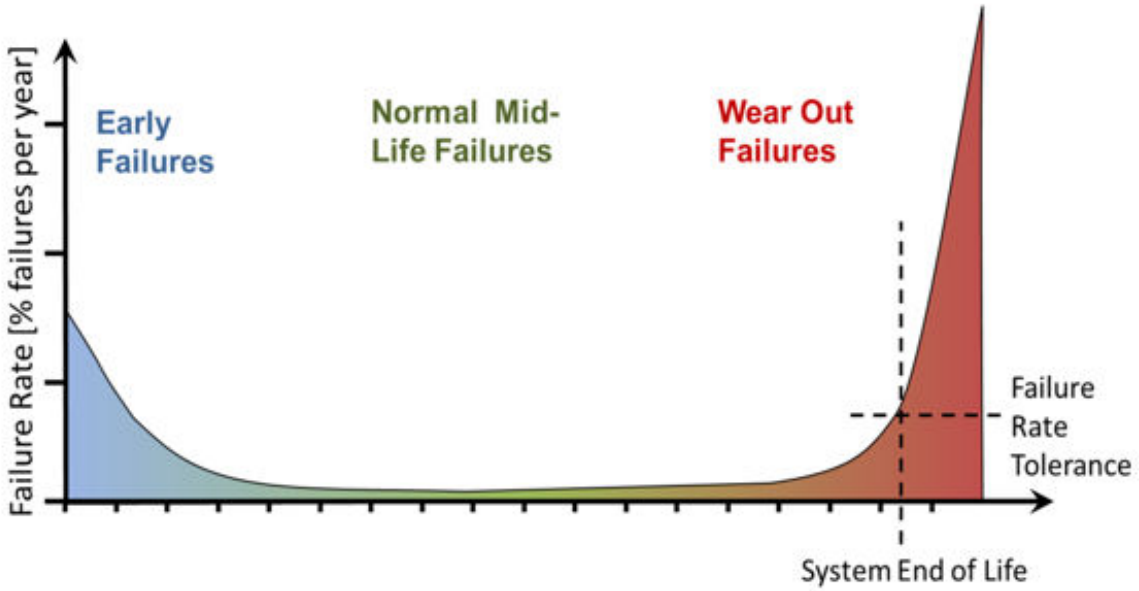
PECO's current AMI Platform

- PECO's network consists of a private Radio Frequency (RF) network, which operates using Tower Gateway Base Stations (TGBs), FlexNet SmartPoint modules, and the FlexNet AMI Regional Network Interface (RNI).
  - PECO licenses their radio frequencies from the FCC
- The network consists of nearly 250 TGBs
  - Individual meters interact with 3-7 TGBs on average
- Meters from Aclara, Honeywell, L+G, and Sensus are used today
- The head-end application is hosted by Sensus

Device Obsolescence and Failure Rates

Device Failure Rates and AMI System EOL

- Synchronized meter age from mass deployments
- Practical EOL at the system-level occurs when relatively few have failed
- Proprietary nature of early AMI systems – challenging to replace continuously



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Device Obsolescence and The Bathtub Curve

- In the utility industry, the **Bathtub Curve** is a graph that shows the failure rate of AMI meters over time. Understanding this curve helps utilities manage the obsolescence of smart grid technology.

The Three Phases of the Meter Curve

- **Infant Mortality (The First Stage)**: Meters have a high failure rate right out of the box. This is caused by factory defects, faulty electronic components, or installation mistakes.
- **Useful Life (The Middle Stage)**: The curve flattens out, giving the meter a long period of low, steady, and predictable failure rates.
- **Wear-Out (The Final Stage)**: As the meters age, physical wear and material degradation cause the failure rate to shoot up rapidly.

Why Utilities Use the Curve

- **Replacement Planning**: Utilities study the curve to determine the average useful life of their smart meters, which typically ranges between 10 to 15 years.
- **Cost Management**: Rather than waiting for meters to fail in the field—which can cause billing errors or require emergency repair trucks—utilities proactively replace fleets of meters before they climb the wear-out slope.
- **Firmware Updates**: Utilities analyze early-life failures (Infant Mortality) to find software bugs and fix them via over-the-air firmware updates before they affect the wider population of meters.

Device Obsolescence and Failure Modes

Electric Meters have no Utility serviceable components

Meter **"Failure" is seen to be a binary event**, it either works as designed or it is removed from service and retired as *failed*.

Typical Meter Failure Modes

- Higher part-count/complexity – fundamental Mean Time Between Failure (MTBF) from random failures is lower
- Electrolytic (wet) capacitors dry out
- Crystal oscillators age - frequency changes. Radios don't work well.
- MOV Surge Suppressors wear out, stop protecting against overvoltage transients
- LCD displays fade, become unreadable
- Memory semiconductors are write/erase cycle limited
- Internal batteries (especially in gas/water AMI modules) could get to EOL.

Industry Trends – EEI Meter Ops Committee Survey

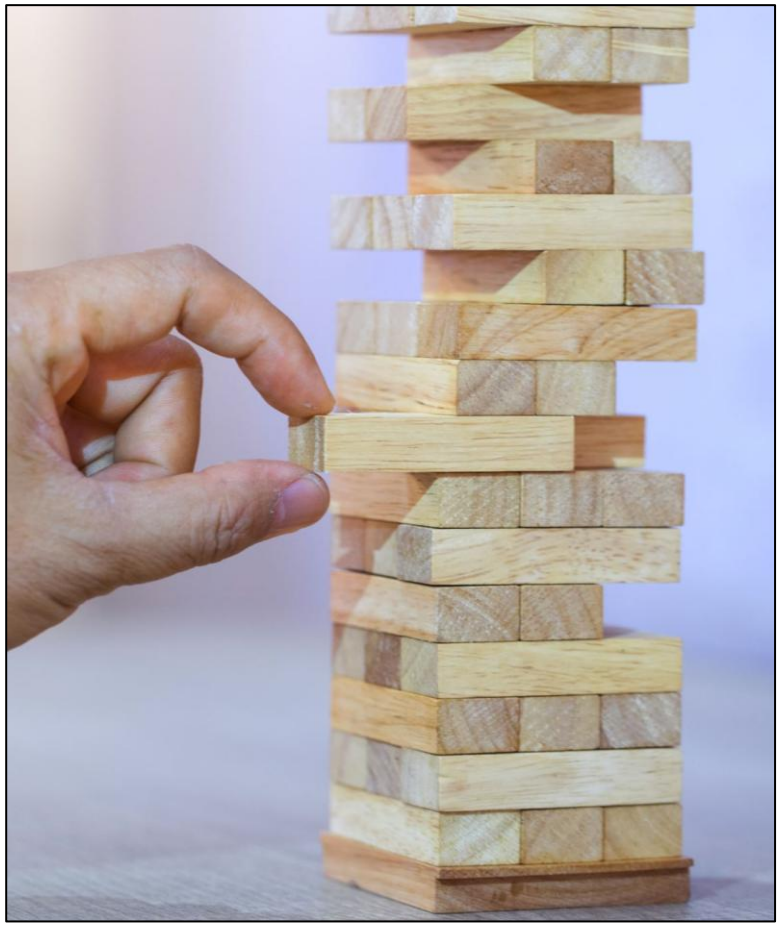
What utility do you represent?	What is a typical lifespan of your AMI meters?	AMI Tech (Comms)	How many customers/meters does your Metering Engineering Department support?
Alliant Energy	We started a lifecycle program to replace meters 10+ years old	Sensus	1 million
Minnesota Power	We are starting AMI 2.0 at 15 years of age	Sensus	150,000
Georgia Power	Unknown	Sensus	2.8 million
AEP	10-15 years	L+G/Itron	5.6 million
Ameren Missouri	20 years	L+G	1.25 million meters
NV Energy	Less than 20 years	Sensus	1.5 million
Xcel	We are hoping 20 years	Itron	3.2 million
CenterPoint Energy	15 years	Itron	2.8 million
PacifiCorp	na. Installed in 2017	Itron	+2 million
Oncor		Itron	> 4 million meters
Florida Power & Light	15 years	Itron	6,000,000
Ameren IL	Commercial meter displays start going bad around 5 years	L+G	1.2 million
OG&E	10-15 years	Itron	900,000
Dominion Energy Virginia		Itron	2.5 million

Key Take-Aways

- The surveyed Utilities generally see **AMI meter service life as 15 years**, with a range of 10-20 years.
- The **service life is independent** of the meter manufacturer or AMI Communication Technology

Developing Strategies

- The Industry and each Exelon OpCo has installed AMI systems across their territories
  - Initial deployments started as **early as 2008**
- All Exelon Utilities have acknowledged AMI meter life is finite and not **expected to exceed 20 years**
  - Meter Vendors have confirmed this expectation
- PECO Finance has affirmed the 15-year book life of the AMI meters
- All Exelon Opcos are developing plans that include **5% ongoing annual meter replacement**
  - Initial program deployment rates may be higher to account for the original “big bang” meter deployments, up to 10%



PECO's Obsolescence Plan

- 15-Year Replacement Plan with Continuous Meter Refresh
  - Assumes replacement of current generation PECO Electric meter population over 15-year period 2027-2041
  - Plan will continue on to address future meter generations
- Deployment Rates
  - 10% Yearly Deployment in 2027-2031 to address oldest meters
  - 5% Continuous Deployment starting in 2032
- The 10% and 5% deployment rate was selected to ensure that the current field operations and meter shop will not be overwhelmed with failing meters
  - The PECO meter is currently sized to manage 25,000 meters per year.

PECO's Obsolescence Plan

- The Plan is designed to leverage the **newest, most capable meters** throughout the deployment
  - The meters purchased in year 1, will likely not be the same as the meters purchased in year 5 or year 10
  - Initially, meters from **Sensus and Aclara** will be deployed
- If Customer or Utility needs dictate a change in AMI Communications or AMI Vendor platform, flexibility has been designed into the plan to account for shifting needs and/or strategies

Program Staffing (*final plan is under development*)

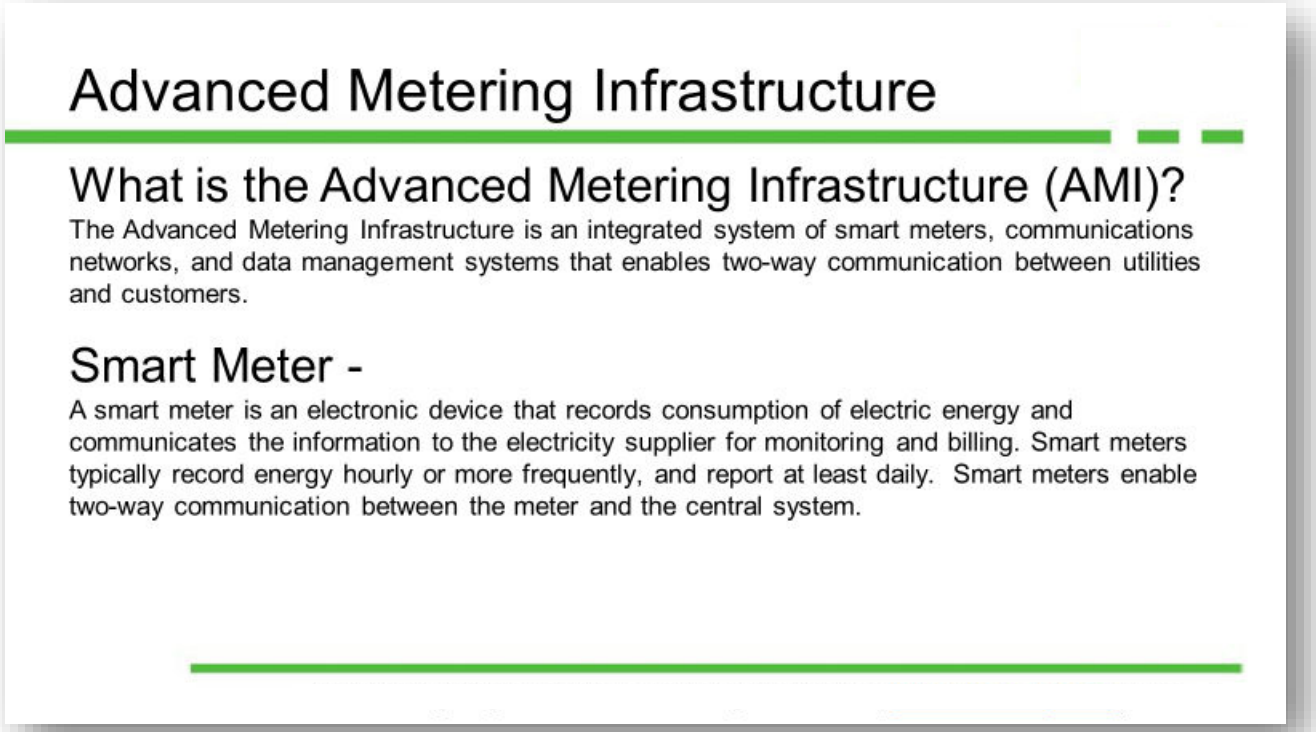
- Back Office team of 10 FTEs: 1 Manager, 2 E03s, 7 E02s
  - Supervisors, Analysts, Customer Care, Billers, Schedulers, Supply Chain Specialists, Etc.
- Field team of 15 meter technicians
- Contract Installers to fill in the remaining installer needs

AMI 2.0

AMI 2.0 is a system upgrade that results in increased network reliability and more reliable exchanges of data

The functions build upon AMI 1.0, which set the foundation for the future

"Many of the end user/customer advantages promised by AMI 1.0 did not materialize."



ADVANTAGES OF AMI 2.0

Grid-Edge Computing

- The most significant shift is that meters evolve from data collection devices into edge computing platforms capable of running applications, performing local analytics, and supporting distributed intelligence at the grid edge. AMI 2.0 is often described as a network of edge computers rather than simply a metering system.

Real-Time or Near Real-Time Operational Awareness

- AMI 1.0 was largely optimized for hourly, 15-minute, or daily data collection. AMI 2.0 provides significantly faster data acquisition and event reporting, enabling operational use cases such as voltage management, dynamic load monitoring, DER visibility, and feeder-level situational awareness.

Distributed Energy Resource (DER) Orchestration

- AMI 2.0 is designed to give better visibility into power quality which will assist in the management of grid-connected DERs. AMI 2.0 also provides for local control of DER sources

ADVANTAGES OF AMI 2.0

Grid Sensor Network Functionality

- AMI 2.0 meters increasingly act as distribution grid sensors, measuring:
  - Voltage
  - Power quality
  - Phase conditions
  - Sag/swell events
  - Local grid health

Analytics

- Non-intrusive load monitoring & load disaggregation

New Communications Methods for FAN (Field Area Network) and HAN (Home Area Network)

- Private LTE (PLTE) Based Communications
- WiFi Enabled Meters
- Matter Protocol for in home device integration

Next Generation Meters at PECO

What is a ***Next Generation Meter***?

- Functionality – More recording channels, Grid Edge Intelligence
- V2 Protocol – Increased bandwidth, better RF management

Why Now? What Changed?

- Covid parts shortages
- New meter designs

Meter Exchanges

- Focus on Capitalizing work, reducing Expense spending
- Early NextGen Meter Deployments
  - >75,000 NextGen meters deployed today

PECO's New Meter Functionality

- While the Plan is not designed to introduce new meter functionality, the meters will be able to foundationally support new features* and programs such as:
  - Distributed Intelligence and Grid Edge Functionality
  - Enhanced Power Quality and Voltage Monitoring
  - Loss of Neutral Detection
  - Enhanced Hot Socket Detection and Safety Measures including Auto-Shut Off Functionality

** New functionality requires additional IT integration and business process changes*

- PECO is separately in the process of introducing Over The Air (OTA) meter programming which is expected to reduce meter configuration issues and speed customer addition of DER products (meter exchanges and site visits will not longer be required)
  - This functionality is expected to be available to coincide with the Obsolescence Program initiation in 2027

Summary and Open Discussion

- PECO is changing its meter deployment strategy from an orchestrated “big bang” deployment to a continuous replacement program.
  - As meters near their 10 to 20-year service life, they will be replaced.

- PECO is committed to delivering the most capable meters to our business and our customers to support their evolving needs.

QUESTIONS

1. Are you getting close to the time where you should be thinking of replacing meters? If so, have you begun to see an increase in failed meters?
2. What problems could you solve with AMI 2.0?
3. If AMI 2.0 delivered exactly the same billing functionality, would you still consider the change?
4. What do you think the single most valuable advantage of AMI 2.0 is?
5. Is the growth in DER a factor to consider in your decision?

THANK YOU!

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