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**ROUNDTABLE:**  
**TRACKING FAILURE CURVES OF EARLY AMI**  
**DEPLOYMENTS**  
**CONSIDERATIONS FOR AMI 2.0**  
**SYSTEM OBSOLESCENCE CONSIDERATIONS**

*TESCO's Meter School*  
**TESCOOL**  
*July 20-23, 2025*

July 21, 2025  
10:30 AM – 12:00 PM  
Glenn Pritchard

## Introductions

- What company are you representing and what is your role?
- Describe your AMI deployment and when was it installed?





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# PECO's AMI DEPLOYMENT

- PECO is located in Southeastern Pennsylvania, serving Philadelphia and the surrounding counties
- PECO installed a [Sensus FlexNet AMI platform](#) from 2011-2016
- The system serves:
  - [1.725M electric meters](#)
  - 550k gas meters
  - 4,200+ Distribution Automation devices (Reclosers, Capacitors, FCI's, etc)
- Initial goals of the AMI deployment included:
  - Meeting Pa. Act 129 of 2008 required meter functionality, including
    - Hourly interval data (15 minute or faster as needed)
    - Remote disconnect & connect
    - Outage Alarming
  - Meeting and exceeding performance levels of the existing Ladis+Gyr CellNet AMR system
  - Creating opportunities to expand and deliver enhanced functions that leverage the network and meters



## Advanced Grid/Meter Background

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- ✓ PA Act 129 (Oct. 2008) required electric distribution companies to provide all customers with new metering technology within 15 years
- ✓ In October 2009, PECO was awarded a \$200M U.S. DOE Smart Grid Investment Grant – one of 6 companies maximum grant under the program - to project and reduce costs to customers
- ✓ In 2012, PECO initiated the AMI Gas in benefits of moving from an AMR third private meter read system, in conjunction
- ✓ In August 2013, the PA PUC approved deployment and complete this project to customers
- ✓ PECO has completed the AMI electric programs.
  - 1.7 million AMI electric meter installs
  - 529K AMI Gas module installs

## Advanced Meter Functionality

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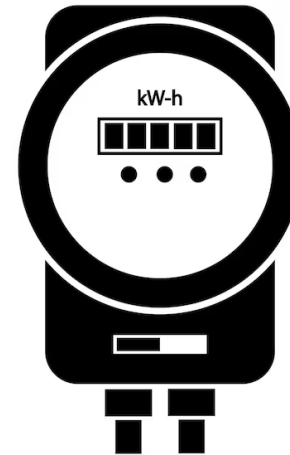
### Act 129 Summary Requirements List

Bi-directional data communications
Remote disconnection and reconnection
15-minute or shorter interval data to customers, EGSSs, 3 <sup>rd</sup> parties and RTOs on daily basis
Record minimum hourly reads and deliver at least once per day
On-board meter storage of meter compliant with national, non-proprietary standards
Open standards and protocols compliant with national, non-proprietary standards
Ability to upgrade minimum capabilities as technology advances and becomes economically feasible
Ability to monitor voltage at each meter and report data
Remote programming
Communicate outages and restorations
Ability to support net metering of customer-generators
Support automatic load control by EDC, customer and 3 <sup>rd</sup> parties with customer consent
Support time-of-use and real-time pricing programs
Provide customer direct access to consumption and pricing information (hourly consumption information)



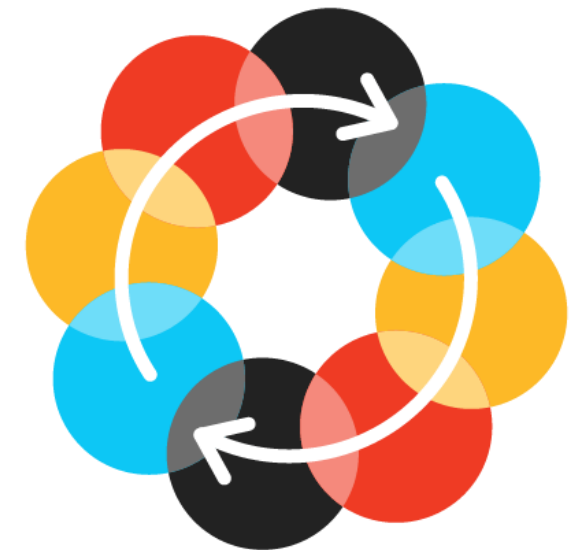
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# METER OBSOLESCENCE



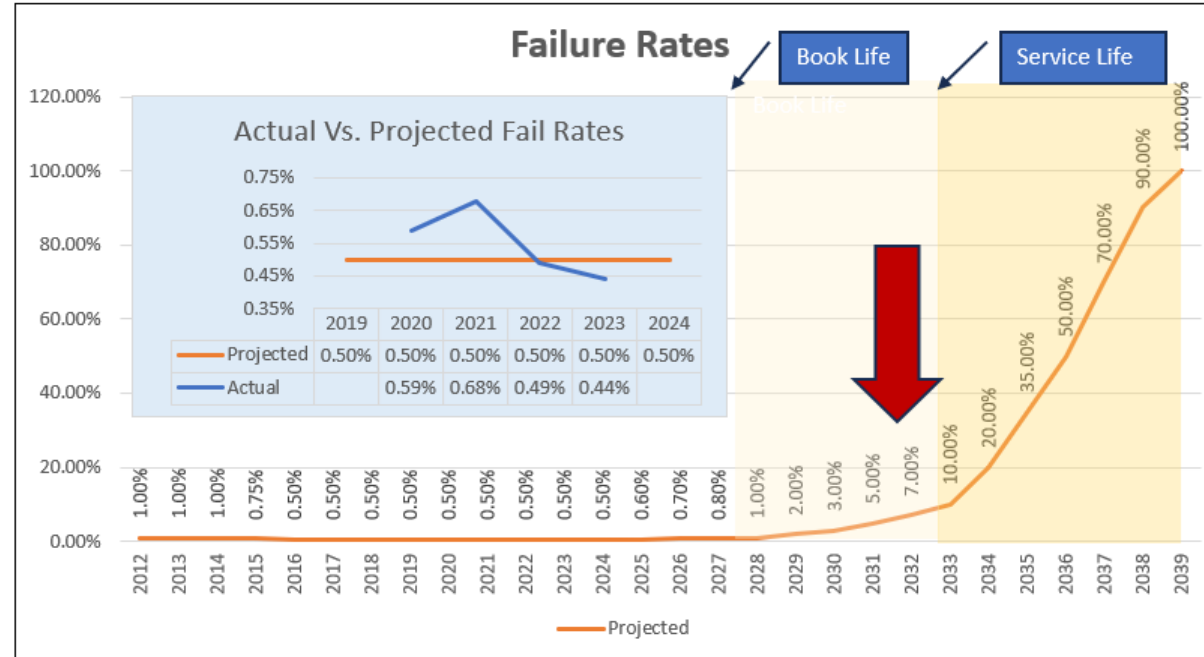


- NEW SMART METERS HAVE A FINITE USEFUL LIFE (15-20YRS)
- IT IS IMPORTANT TO RECOGNIZE THAT THERE WILL BE A FUTURE NEED TO REPLACE BOTH THE METERS AND THE NETWORKS
- IS A FUTURE FULL REDEPLOYMENT AN OPTION?
- WHAT ABOUT A FUTURE ANNUAL REPLACEMENT PLAN?



*It pays to plan for this now, account for it in your Long-Range Financial Plans  
It is also advisable to include your regulators and stakeholders*

# Projected Meter Failures



- Analysis of failure rates over the past 3 years confirms current failure rate curve projections
- Recommend beginning replacement in earnest by 2027 to stay ahead of the expected failure rates
- Meter failure rates will quickly increase by 2029, exceeding meter shop capacity to adequately respond without significant additional support
  - ~50% deployment needed by 2031 to stay ahead of failure curve



How did COVID change AMI?

- Material Supply Constraints
- Premature Material Obsolescence
- Technology Evolution
- New Customer Expectations





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# AMI 2.0?

- What is AMI 2.0?
- What is changing?



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

## Advanced Metering Infrastructure

### What is the Advanced Metering Infrastructure (AMI)?

The Advanced Metering Infrastructure is an integrated system of smart meters, communications networks, and data management systems that enables two-way communication between utilities and customers.

### Smart Meter -

A smart meter is an electronic device that records consumption of electric energy and communicates the information to the electricity supplier for monitoring and billing. Smart meters typically record energy hourly or more frequently, and report at least daily. Smart meters enable two-way communication between the meter and the central system.

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

- Increased Sample Rates
  - 60-, 15-, 5- & 1-minute samples are possible
- Multiple Recording Channels
  - Some vendors are claiming up to 32 independent channels are available
- Distributed Intelligence and Decision Making local to the meter

*Question – Has the network and head-end kept pace with the new meter capabilities?*

- On-Board Decision Making
  - EV Management
  - Voltage Regulation
- Analytics
  - Non-intrusive load monitoring & Load Disaggregation
- New Communications Methods for FAN and HAN
  - WiFi Enabled Meters



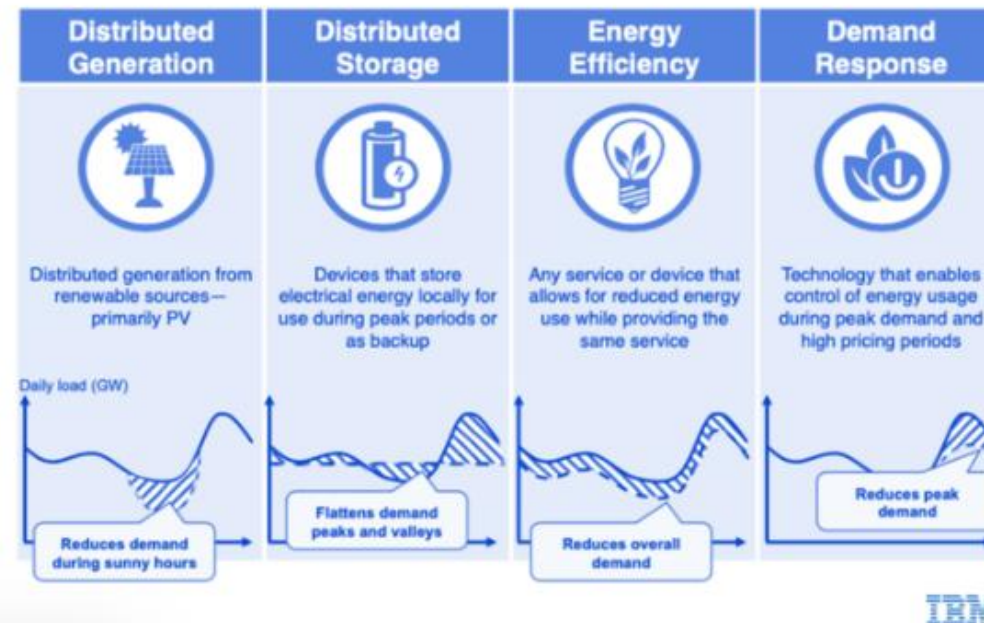
# AMI 2.0 USE CASES

## Grid optimization use cases

- Supply/Demand security on all voltage levels
- Manage Congestion management (dispatching)
- Keep Grid stable (frequency, voltage) despite renewable
- Optimize utilization of grid capacity

## Distributed Energy Resources use cases

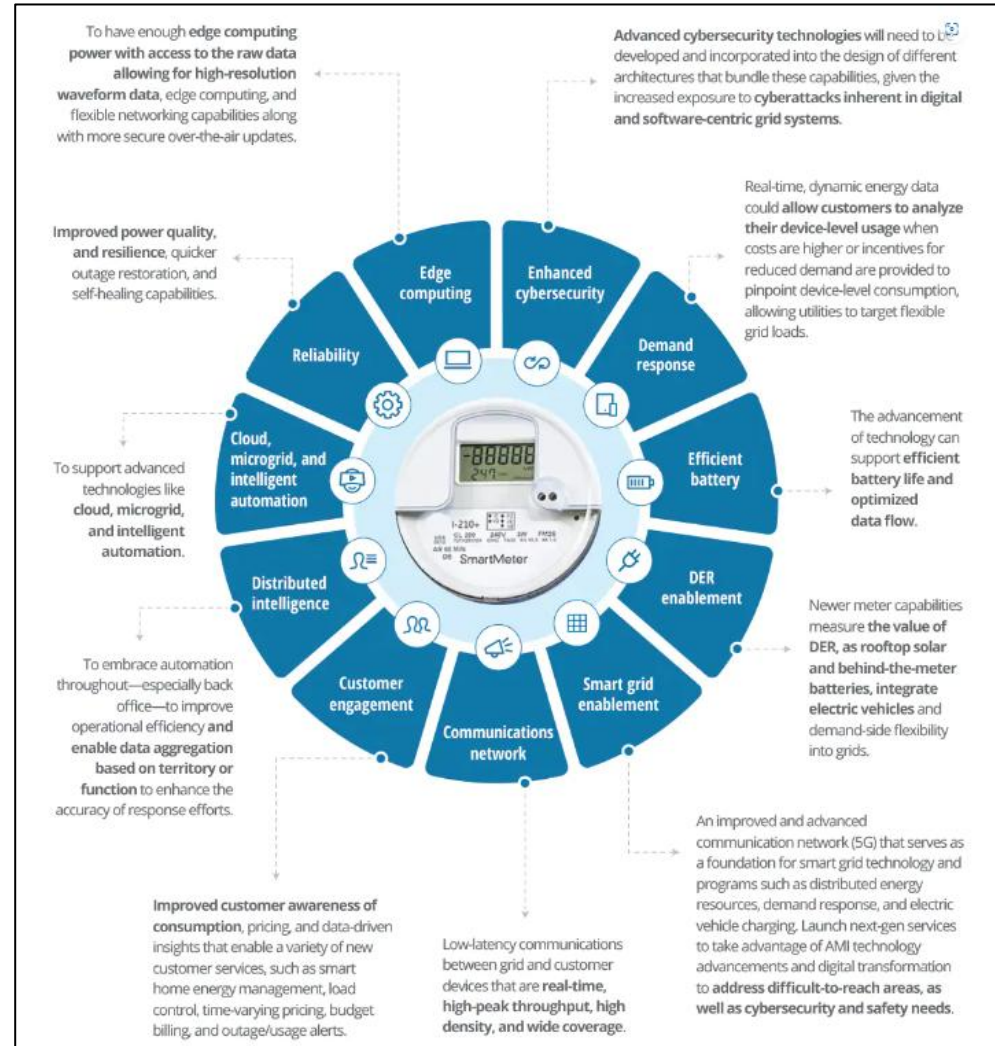
- Distributed generation
- Distributed storage
- Energy Efficiency
- Demand Response
- Load and Feed-in Management
- Microgrids & VPP (Virtual Power Plant) Mgmt.
- Ripple Control (heating, heat pumps)



AMI – Advanced Analytics Opportunities - Utility Analytics Institute



## From Deloitte's AMI 2.0 Study



<https://www2.deloitte.com/us/en/pages/energy-and-resources/articles/next-gen-advanced-metering-infrastructure.html>

- Recently, several meter manufacturers have begun to develop Distributed Intelligent models and applications for their AMI meters
- This is seen as a new means to add future functions to the meters
- The concept mimics the “Apple iStore” concept where apps are available to be downloaded into meters as needed
- Apps are often targeted on Real-Time decision making and control solutions



*DI is often associated with Mesh Network based systems where latency in communications may be a factor*

## SAMPLE USE CASES:

- HOT SOCKET MONITORING & ACTION
- SMART INVERTER INTERFACE – AUTONOMOUS CONTROL
- SOLAR AND BATTERY SUPPORT – LOAD COORDINATION
- POWER QUALITY ANALYSIS



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# ALTERNATIVE PERSPECTIVES







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# SENSUS FLEXNET V2 – “CROWDED HIGHWAYS PRESENTATION”

## Summary

- PECO's Smart Grid has enabled many capabilities leading to +1 customer experiences. There is great potential to continue to expand and improve with some investment.
- Our network highways are crowded, and this will continue to increase due to more messages, more frequently, with more devices
- First generation AMI meters are limited in their capability to expand their functionality to meet evolving customer needs:
  - Next generation (NextGen) meters deliver these capabilities & functionality
- Flexnet V2 communications protocol provides the means to fully leverage these NextGen devices & their capabilities
- This evolution will require operational investment and capital
  - Configuration changes to transceivers, RF spectrum and the RNI
  - NextGen meters such as StratusIQ, SonixIQ (Gas), Aclara i210+c w/DT-105
- We cannot afford to be on the sidelines!

## Today— The Highways Are Crowded!

### Crowded Highways

More data, more frequently, from existing devices

### New Cars + Capabilities

Next generation devices and communications needed

### Old Cars on Existing Highways

Current devices won't meet evolving customer expectations

### Hybrid Highways Drive Evolution

Flexnet V1 and V2 will coexist and evolve over time

- CX and +1 imperatives drive data from existing devices (Interval performance, Watt-Hour, etc.)
- Outgoing traffic increases to support these requirements (ESM, Backfill, Outage, Firmware, etc.)
- We'll add more devices and capabilities (Multi-channel/power quality, ESM/Watt-Hour, IoT, etc.) for enhanced capabilities and to use advanced communications (e.g., 4G/LTE, NW reinforcement, tuning, etc.) but more is needed



## Future— NextGen Meters + FlexNet V2

**NEXTGEN METERS**  
Provide new functions, leverage enhanced communications & security features



**FLEXNET V2**  
Enhances Uplink and Downlink communications

**RNI + FLEXNET V2**  
Enhances security for communications and device management

- FlexNet V2 enables more data, more frequently, from more/advanced NextGen devices
- Activate FlexNet V2 in parallel with existing FlexNet V1
- Continue deploying next generation meters on V2 (Tied a future annual meter refresh cadence)



\* - Full slides in Appendix

The FlexNet V2 Protocol enable more efficient use of the RF Channels, delivering higher speed, higher capacity and more secure communications

- **What is V2?**
  - The V2 protocol is a new method to communicate to our meters
  - It easily coexists with the legacy V1 protocol, using the same RF spectrum
  - V2 is built upon higher speed messages and more efficient data packets
- **Why do we need it?**
  - Performance Improvements
  - Improved Security
  - Enables new functionality on NextGeneration Electric and Gas Meters
- **When is V2 available?**
  - NOW, All eligible transceivers are configured to support V2 communications
- **Do we have any devices on the V2 Protocol?**
  - YES, more than 25,000 meters using the V2 Protocol today

## Meters Continue to Evolve

1. PECO's initial AMI meters were installed in 2012-2016
2. Sensus has introduced new functions over the years
  - Enhanced Supervisory Messaging (ESM)
  - Snapshot Data
  - Firmware Upgrades/Enhancements
3. Changes driven by both the comms module and the meter

## Communications

- V2 – More efficient utilization of infrastructure leading to higher capacity and speed
- Security / Encryption – mandatory, enhanced security measures
- New Network hardware – improved software and contemporary hardware

## Functionality

- Multiple Independent Channels – beyond usage, including voltage, power quality, etc.
- Firmware improvements / speed to upgrade
- More flexible remote configuration



Aclara i210+c/DT-105



Sensus Stratus IQ/DT-96

A NextGen Meter is the newest type meter available for use at PECO. A key characteristic is its ability to support the V2 communications and its enhanced security measures.



## 1.New Meter Functions

- V2 Protocol
- More Data / Multiple Channels
- New Functions
  - Distributed Intelligence / Grid Edge
  - Loss of Neutral Detection
  - Enhanced Temperature Sensing and Action
- Ultrasonic Gas Metering
  - Remote Disconnect
  - Pressure Sensing

## 2.Distributed Energy Resources – Solar, Batteries, etc

## 3.Electric Vehicles

- Load Disaggregation
- Charging Management

## Next Generation Meters— The Future Needs New Cars



**NextGen ELECTRIC** (Sensus StratusIQ, Aclara i210+c DT-105, etc.)

- Multiple energies, demands, load profiles on multiple channels
- Power Quality / Four quadrant metering
- Tamper detection
- Persistent real-time clock maintains time for 24 hours following outage
- C&I features in residential meter
- **Software defined metrology** for future flexibility

Functionality	Customer Pain	Outcome
Power Quality with Alarms  Measures beyond Usage	Data Access – Additional Insight to Data  Power Quality – Effects	More customer-oriented information from next generation meters  Enable personalized customer experiences tailored to needs  Empower self-service and control over usage, energy costs, environmental  Enable participation in energy efficiency and demand response
Software-defined metrology Local clock Residential Meter + C&I Power	Resilient to grid conditions Functionality can be configured quickly, remotely	Flexible, expandable platform reduces meter changes, interruption
Increased security	Protect customers' usage choices, cost info, privacy	Tamper detection, privacy



## Next Generation Meters— The Future Needs New Cars



### NextGen GAS (Sensus SonixIQ, etc.)

- Solid-state design, compact footprint
- Dual-class metrology: 250 CFH or 425 CFH
- Pressure Monitoring and Remote Disconnect
- 90-day hourly data logs, Built-in theft and tamper detection
- Available pulse output
- Continuous health checks through safety alerts and alarms

Functionality	Customer Pain	Outcome
Increased memory - 90 day, hourly data logs	Provides more granular usage data for Billing, customer control, energy efficiency and other initiatives	More customer-oriented information from next generation meters Enable personalized customer experiences tailored to needs Empower self-service and control over usage, energy costs Enable participation in energy efficiency and demand response
Solid-state design; Compact footprint; Pulse output; Dual-class metrology; 20 yr Battery life	Resilient to grid conditions Functionality can be configured quickly, remotely	Flexible, expandable platform reduces meter changes, interruption
Built-in theft + tamper detection Health checks	Protect customers' usage choices, cost info, privacy	Tamper detection, privacy, safety

*Advanced functionality is dependent on having V2 Network Functionality and RNI 4.8*

## Sensus Stratus IQ+ – Residential

### Features

- 6 energy and 6 demand registers
- kWh, kVAh, kVARh
- Bi-directional metering
- 8 channels load profile
  - 4 LP Data Sets (separate LP interval) = 32 Channels
- 7 TOU tiers, 8 seasons, CPP
- Outage and Restoration notifications
- Conservation Voltage Reduction
- Voltage and Temperature threshold alarms
- Industry leading sensors for high temperature monitoring and protection
- 4 Quadrant metering & separate phase metering
- Voltage, Current, and Demand Distortion measurements
- Loss of Neutral
- Arc Detection
- Phase Detection
- Over the Air Configuration of metrology & radio
- AES 256-bit encryption
- Meter Tilt and Remote Auto-Disconnect
- Magnetic Tamper Attempt Alarm
- Scheduled Disconnect
- Extended Outage (8 Minutes)
  - Persistent Clock
- Harmonic Distortion (19<sup>th</sup> Harmonic)
- EV Charging Awareness

### Specifications

- UL 2735 and UL 61010-1
- C12.19 ANSI tables
- Exceeds industry standard accuracy - 0.2%



**SENSUS**  
a xylem brand

- Meter systems continue to evolve and increase functionality
- NextGen Meters and AMI 2.0 are two similar manifestations of this evolution
- Many of the initial deployments are nearing their useful end of life, leading to significant decisions by the AMI Operators

Please Take a Few  
Minutes To Provide  
Feedback About The  
Course & Instructor

Track 4 - Tracking Failure Curves of  
Early AMI 72125 10:30AM Glenn  
Pritchard





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# APPENDIX



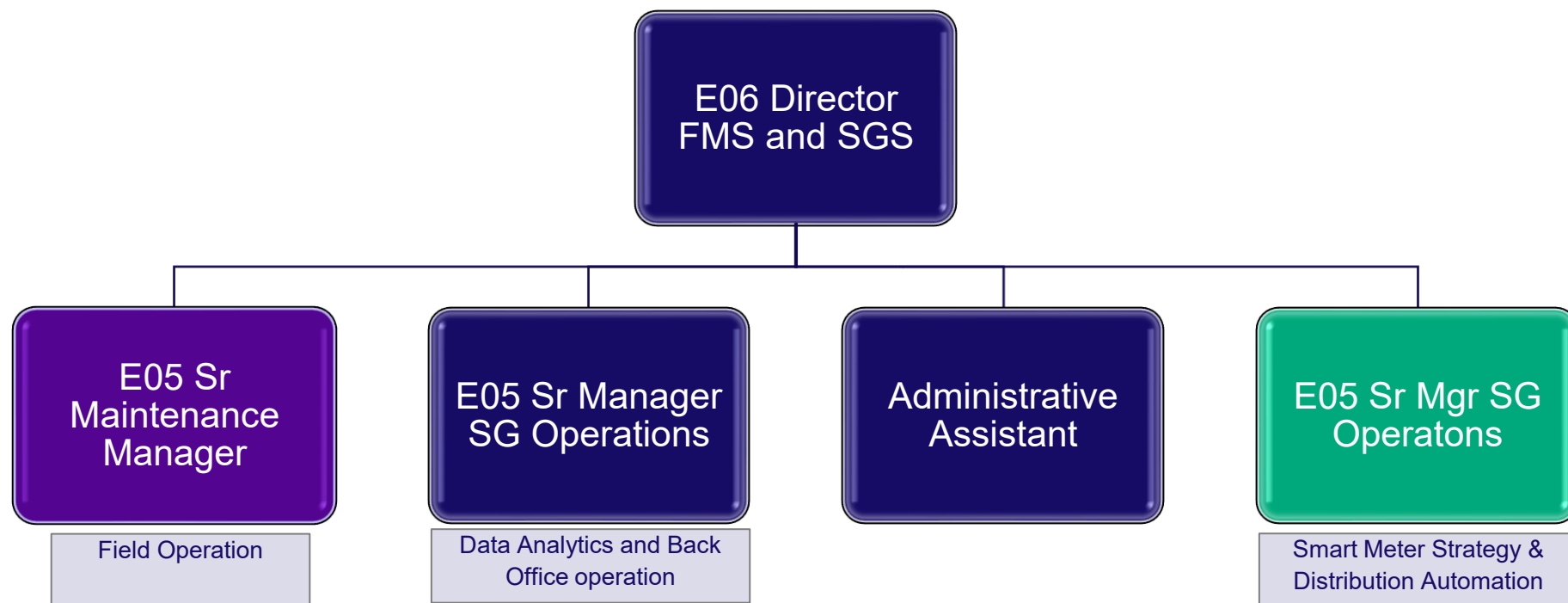


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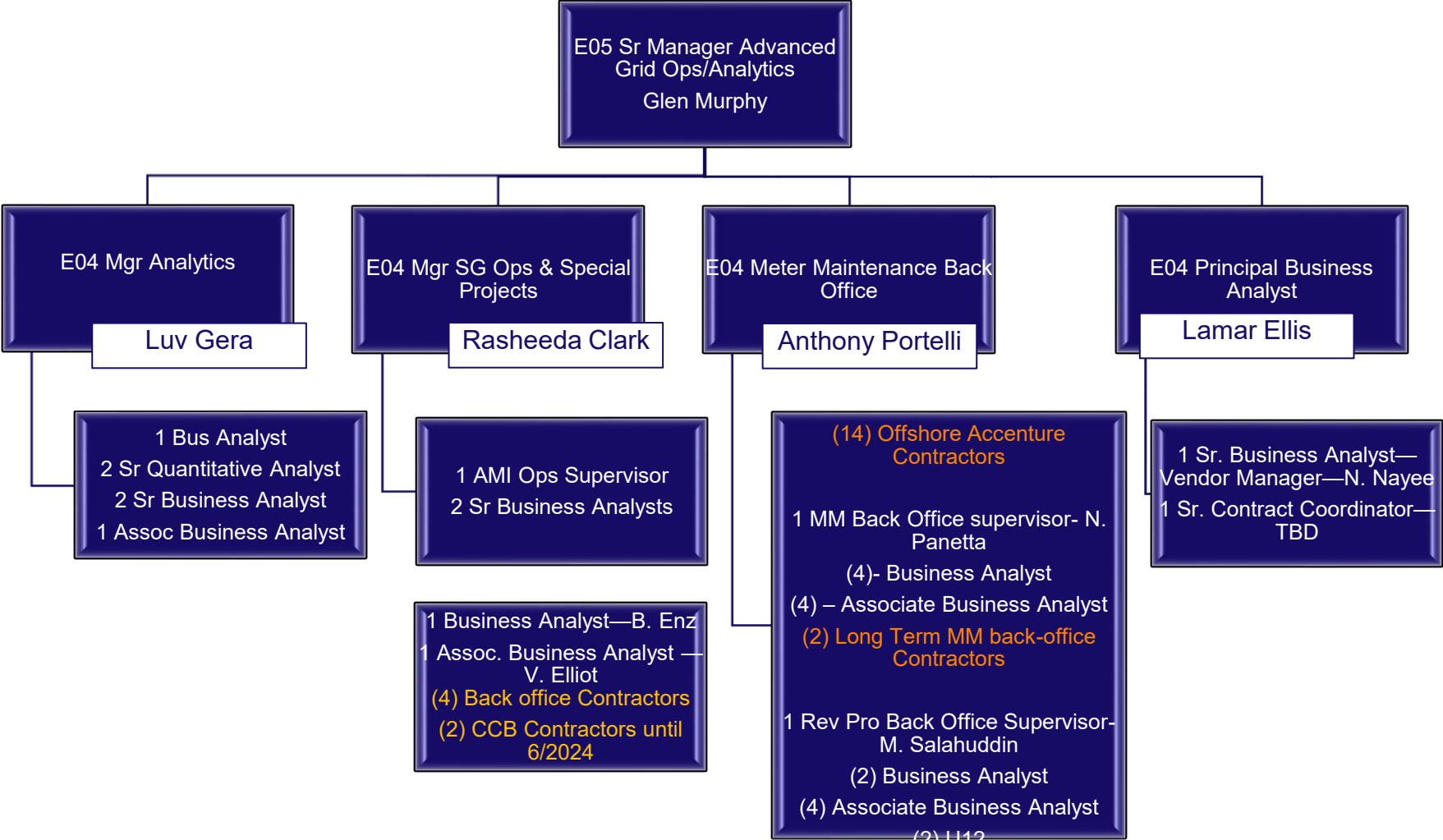
# PECO's SGSM TEAM

# PECO F&MS and SGS

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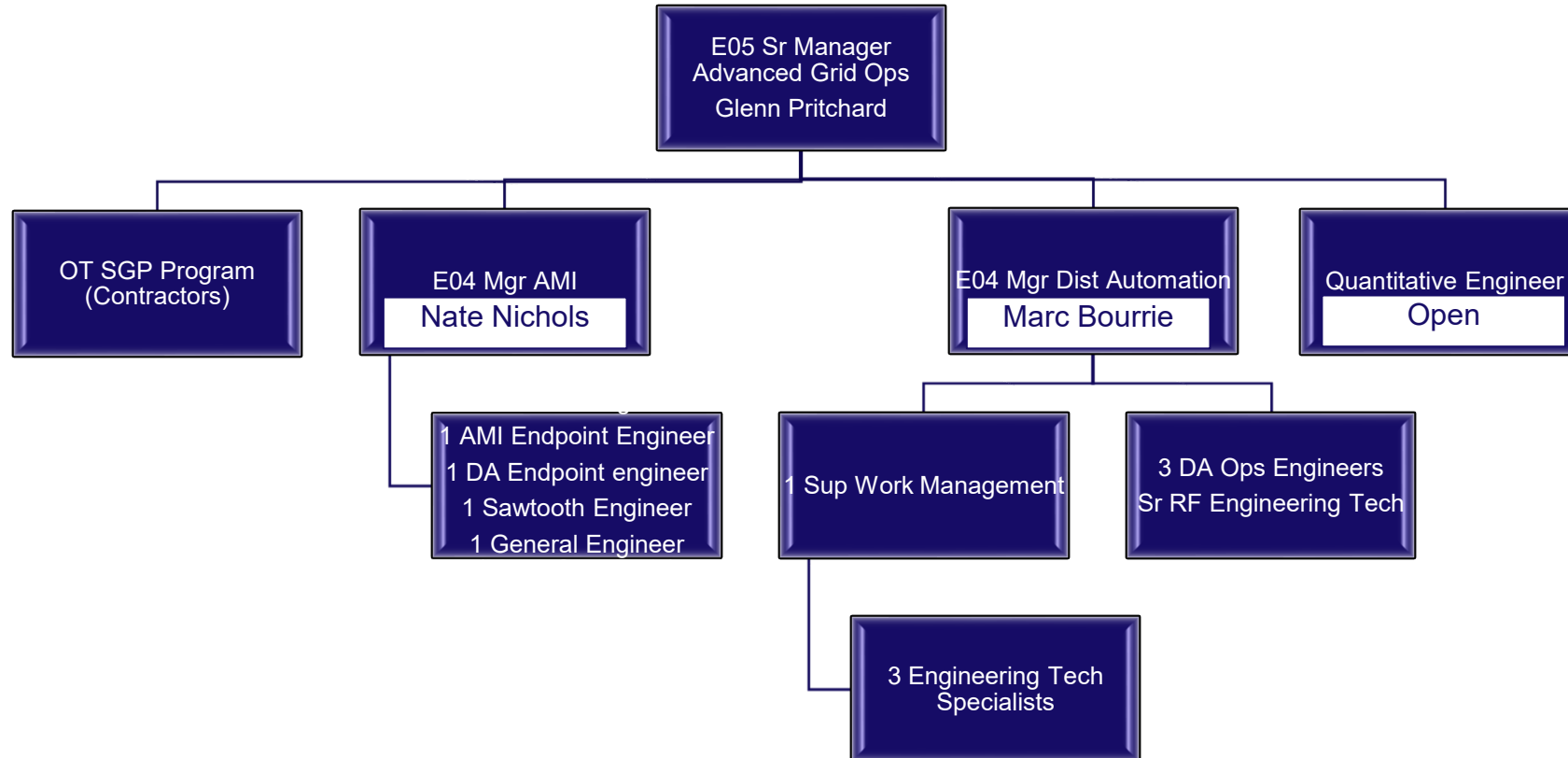


# PECO F&MS and SGS – SG Ops



# PECO F&MS and SGS – SG COE (Engineering)

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# PECO F&MS and SGS – Meter Maint

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