



TESCO METERING

# DER CONNECTIONS AND ADAPTERS

DERS to EVs to Grid Modernization

*TESCO's Meter School*  
**TESCOOL**  
*July 21-24, 2024*

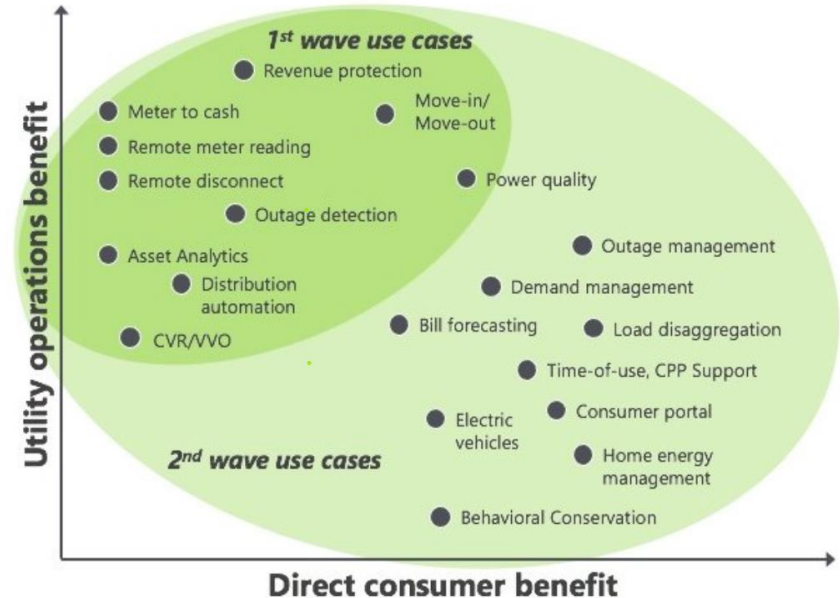
*July 23, 2024*

3:15 PM – 4:300 PM

Dan Falcone

# PRESENTATION GOALS

1. Provide a high-level overview of technology innovations and related market influences for meter operations departments in electric utilities
2. Offer an industry review of AMI technologies past and present with insight into next generation technology and impacts
3. Look ahead at ongoing and expanding DER penetration, preparation for VPPs, and Electrification Initiatives



\*<https://www.greentechmedia.com/squared/dispatches/s-from-the-grid-edge/how-to-ensure-the-next-generation-of-smart-meters-are-smart-enough-for-the-grid-edge>

# EVOLUTION OF METER OPERATIONS WORKLOAD

- History focused on billing accuracy, measurement, and consumption
- Evolution from mechanical meters to solid state to AMR to AMI
- Expansions of AMI use cases and reduced truck rolls
- Advent of advanced analytics, customer access to data, and interval billing
- Evolution to automated systems that are now a hub for everything from DER integrations to electrification planning
- Expertise with data management and large data sets
- Expertise with regulatory driven initiatives
- Evaluations of competing new technologies
- Physical Post Installation Inspections to Over the Air inspections via power quality reads
- Meter exchanges for rate changes to Over the Air Reprogramming
- Meters now see an Expected Useful Life (EUL) of 10-15 years instead of 20 years
- Less than 3% of the 125M+ Smart Meters installed across the US fulfill the initial 2009 promise of customer savings\*

\*<https://www.utilitydive.com/news/97-of-smart-meters-fail-to-provide-promise-d-customer-benefits-can-3b-in/632662/>

- Power Line Communication – leverages existing infrastructure
  - Cost effective, less bandwidth, interference
- Radio Frequency – unlicensed and licensed spectrums, mesh or point-to-point
  - Licensed vs Unlicensed
  - Base stations vs Collectors and Repeaters
  - Fixed pathway vs self-forming and self-healing
- Cellular Endpoints
  - Faster deployments, network reliability, cost, obsolescence concerns
- Hybrid Communications
  - Multiple communication methods on a single radio – Wi-Fi, Zigbee, PLC, Mesh, Cellular
- “Future – Proof” Meters with software updates and “apps”
  - Reduced restrictions from memory capacity and firmware prohibited upgrades

## AMI with Alarms, Flags, Events, & Intervals

- Outage Reporting
- Theft and Tamper Events
- Interval Data Analysis
- Voltage Monitoring
- Temperature Monitoring
- Load Disaggregation
- RCDC for Credit, Move – In / Move – Out, PrePay
- Analytics Platforms

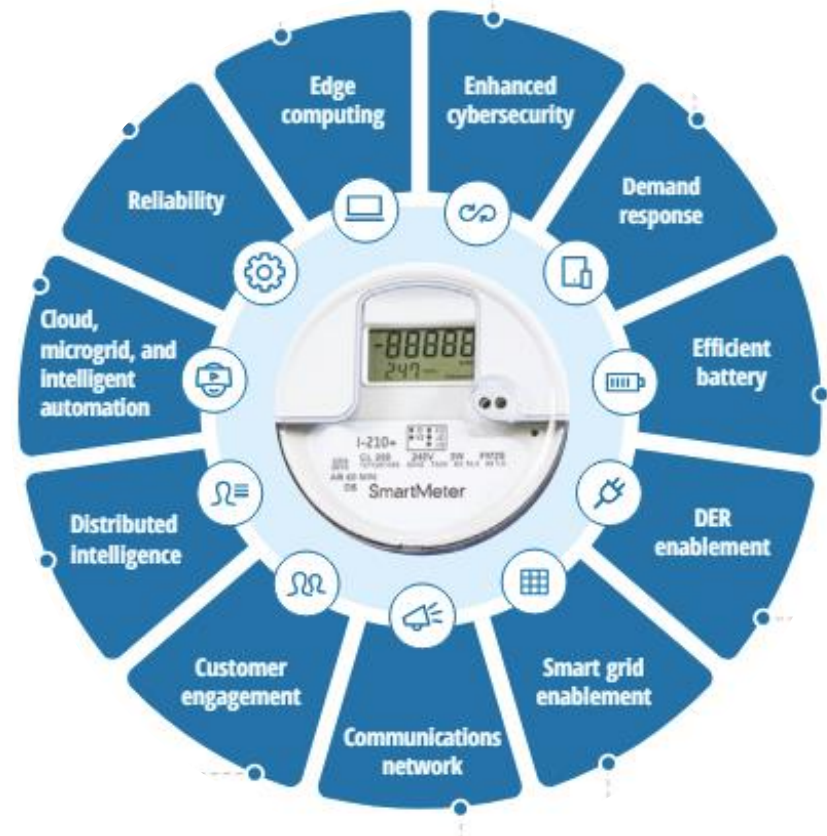
## AMI 2.0 with Distributed Intelligence & Edge Computing

- Location Awareness
- Bypass Detection & Magnetic Tamper
- 8+ Channels of Interval Data
- Impedance Detection
- Temperature Trending
- EV and Solar Detection
- Smart Prepay
- App Platforms

- AMI 1.0 operational benefits have been captured
- A second round of capital replacement is under way
- Costs are harder to justify as labor resources and reduced truck rolls have been already offset
- Consumers want benefits that are automated and easy to acquire
- Meters can now be paired to Apps via Wi-Fi

\*<https://www2.deloitte.com/us/en/pages/energy-and-resources/articles/next-gen-advanced-metering-infrastructure.html?nc=42>

\*"Any electric utility that deployed AMI prior to 2010 or which has not yet deployed AMI should be in the planning phases to replace their aging AMI assets today"



Many hardware-based providers are finding value leveraging relationships by shifting to software and loading into existing hardware with market fit (smart meters)

- Landis+Gyr and Sense (from CTs and modules to meters)



- In-home high resolution energy monitoring and machine learning via app

- Landis+Gyr and SPAN (from smart panels to utility connection via meters)



- Sub-metering at circuit level, prep for VPPs, and DER control

- Aclara and Utilidata (from adapters to meters)



- Distributed AI with NVIDIA module and KARMAN platform

- Itron and Schneider

- ADMS, IOT Solutions, VPP prep



# DISTRIBUTED ENERGY RESOURCES (DERs)

Small-scale units of local generation connected to the grid at the distribution level. These resources can include renewable energy systems, energy storage, demand response technologies, and electric vehicles.

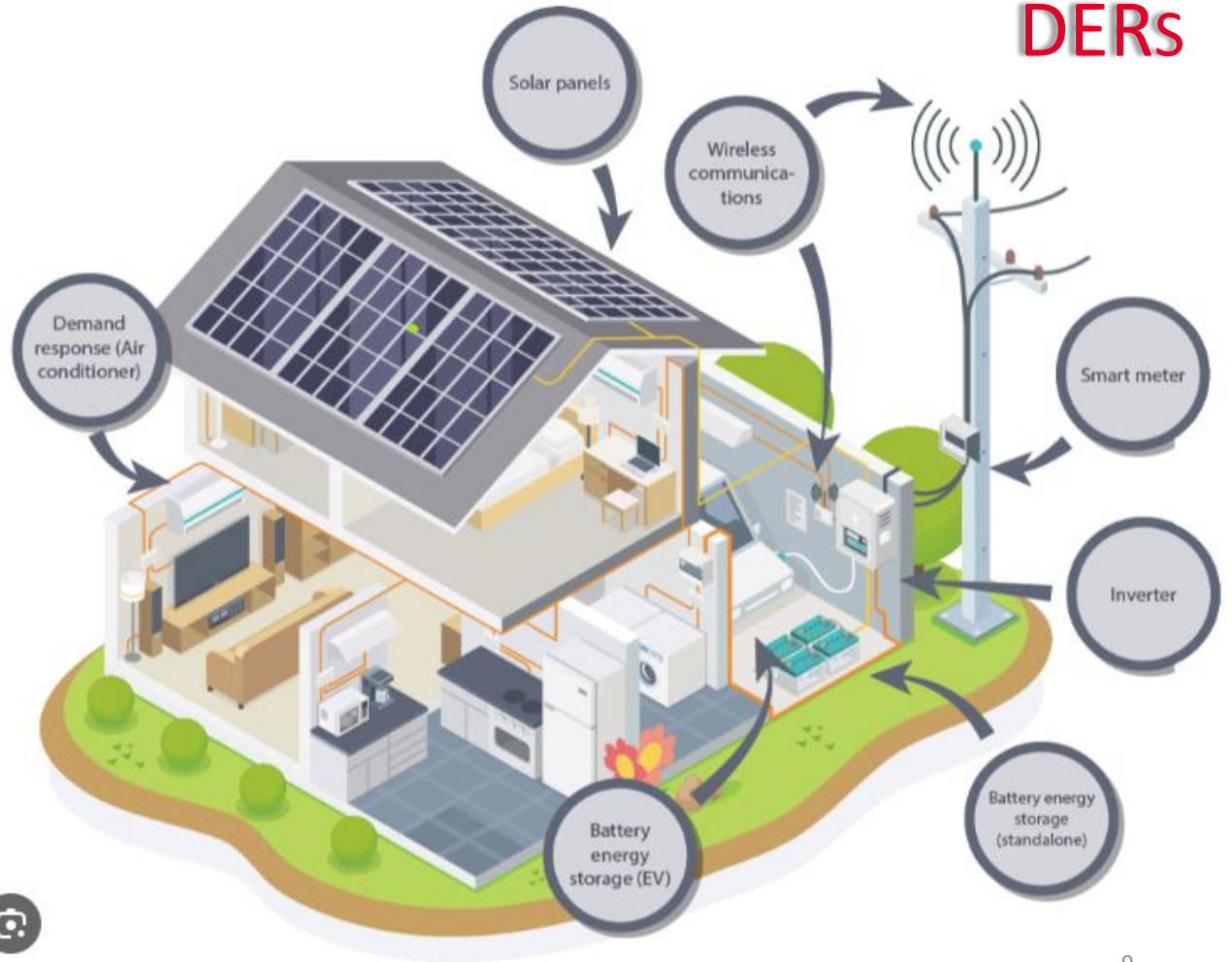
## Benefits

- Grid Reliability and Resilience
- Environmental
- Economic Efficiency
- Energy Independence
- Customer Empowerment
- LMI & REC Programs

## Challenges

- Grid Integration
- Regulatory and Policy
- Economic Barriers
- Technical Challenges
- Customer Satisfaction
- Dated Infrastructure & Installation Cost





\*<https://www.cummins.com/news/2021/11/04/what-are-distributed-energy-resources-and-how-do-they-work>

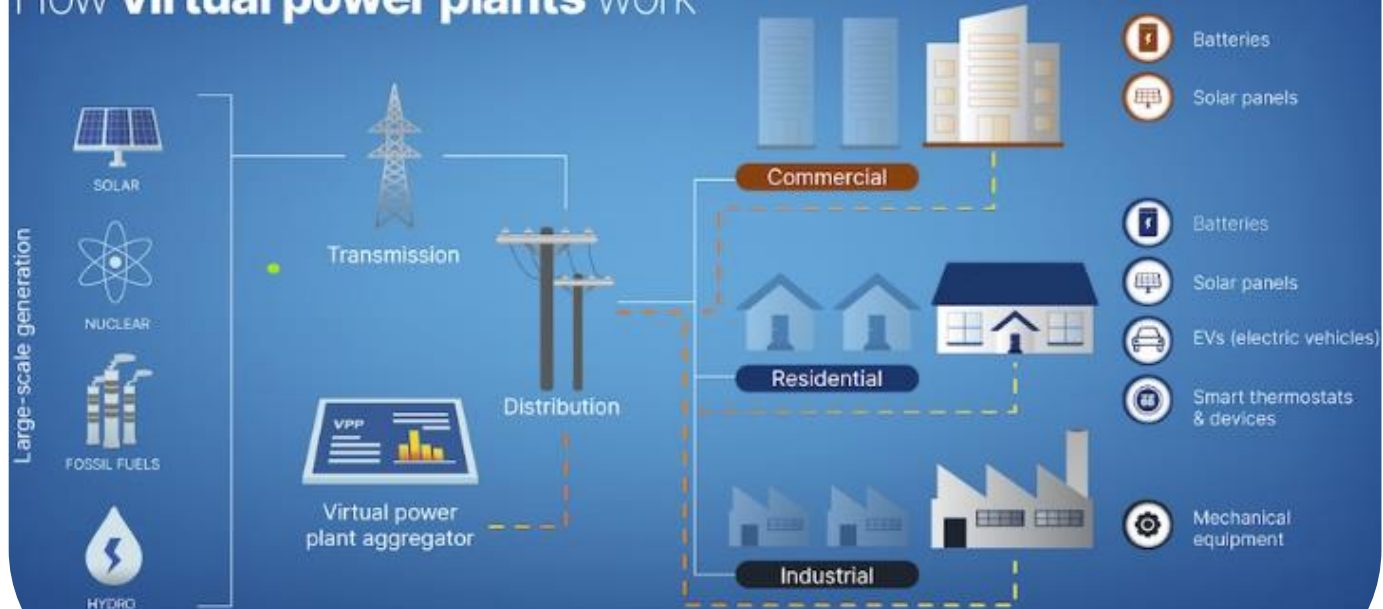
A system that integrates various Distributed Energy Resources (DERs) such as solar panels, wind turbines, energy storage systems, electric vehicles, and demand response units, using advanced software to manage and optimize their collective output as if they were a single power plant.

## Functions and Capabilities

- Combine multiple DERs into a single manageable entity
- Real time monitoring and control
- Demand response via load shifting and peak shaving
- Energy trading – participate in energy markets to sell excess or provide services like frequency regulations

Regulatory involvement, AI and software integration, and cyber security pose risks but also offer opportunities

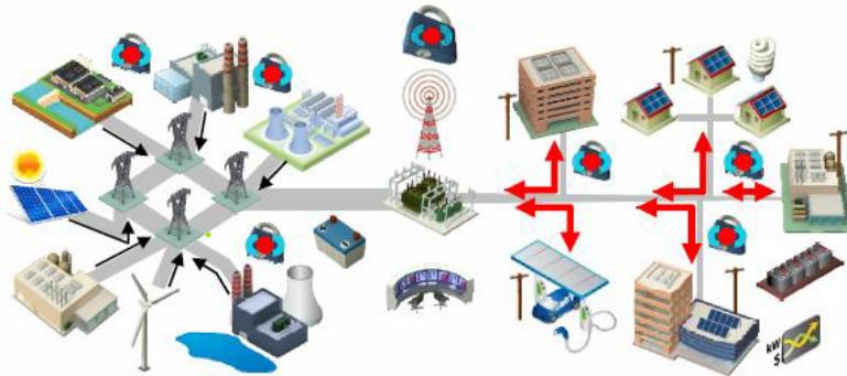
## How **virtual power plants** work



\*<https://www.solarreviews.com/blog/virtual-power-plants>

- **AMI**
  - DI, Edge Computing, Monitoring, 2-Way Comms
- **Grid Automation and Control**
  - SCADA, ADMS
- **Integration of DERs**

This is the process of updating and enhancing the traditional electric grid to improve its reliability, efficiency, resilience, and ability to integrate with new technologies. It involves implementation of advanced technologies and practices to meet the changing needs and challenges of the energy landscape.



- Encryption, Firewalls, Intrusion Detection



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This is replacing fossil fuel-based technologies with those that are powered by electricity. This shift aligns to sustainability goals, reduces greenhouse gas emissions, and enhances energy efficiency.

- Electric Vehicles
- Appliances
- Electric Hot Water
- Air Source Heat Pumps

Regulatory Frameworks, subsidies, rebates, and pricing initiatives all drive increases.

Many of these changes require added home wiring, service panel upgrades, and challenges with location of assets and availability of circuits.

3X Market Size of Smart Grid

>\$100B in next 2 years

[tescometering.com](https://tescometering.com)

PRECEDENCE  
RESEARCH

SMART METERS MARKET SIZE 2022 TO 2032 (USD BILLION)



Source: [www.precedenceresearch.com](https://www.precedenceresearch.com)

PRECEDENCE  
RESEARCH

ELECTRIFICATION MARKET SIZE, 2023 TO 2032 (USD BILLION)



Source: [www.precedenceresearch.com](https://www.precedenceresearch.com)

Many competing systems and technology solutions exist to solve the crux of the electrification problem – growing demand, aging infrastructure, cost avoidance and load / source limitations for both the utility and consumer.

Consumers can adopt some solutions independently via a DER application while others require varying levels of utility interaction and/or approval.

- Meter Socket Adapters (MSAs)
- New DER ready ANSI form 42S / 43S meter / sockets
- Smart Panels
- Load And Energy Management Systems
- Power Control Systems (PCS)



# WHAT DOES IT ALL MEAN FOR METER OPERATIONS?

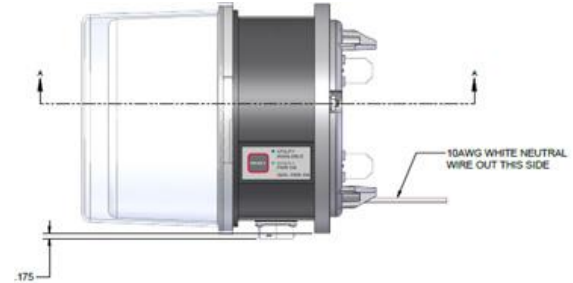
- Education and Training
- Resource Allocation
- Funding for AMI 2.0
  - How to EOL current hardware & software
  - Trending equipment failure rates
  - Replacement schedule
  - New vs existing networks
- Standardization and Interoperability
- Customer Driven Programs



**Ultimately, this will result in the evolution of the Meter Operations practice!**



- Requirement for the user to shut off the main disconnect to the house is now eliminated.
- Requirement for the user to unplug the generator is removed.
- More robust voltage sensing.
- Increased the robustness of the disconnect contact sensing.
- Increased power for the disconnect motor drive to enable the BPTM to overcome sticky motor shafts with greater ease as well as to allow it to be used with Aclara meters with relay disconnects.





Dan Falcone

**ConnectDER**



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

ISO 9001:2015 Certified Quality Company  
ISO 17025:2017 Accredited Laboratory