Metering Fundamentals for Demand Response

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Demand Response In-Depth Course

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Session Objectives

- Identify the role of a Meter Authority, Meter Service Provider, and *Meter Data Service Provider
- Identify the types and purpose of metering devices used to measure and record energy usage and demand

* Note: Meter Data Service Provider is specific to the Demand Response program

Metering Fundamentals for Demand Response

Meter Authority (MA)

- An entity that is responsible for the calibration, maintenance, operation, and reporting of metered data from an electric revenue meter used in the wholesale electricity markets administered by the NYISO
- The NYISO will accept revenue meter data only from an approved MA
- MAs are entities certified by the NYS PSC as a Meter Service Provider (MSP) or a Meter Data Service Provider (MDSP)
- Each New York Transmission Owner (TO) has been granted MSP and MDSP certifications by order of the NYS PSC
- The MA will provide instantaneous and hourly metered data to the NYISO and the TO

Metering Fundamentals for Demand Response

- **Meter Service Provider (MSP)**
  - An entity that provides meter services, consisting of the installation, maintenance, testing and removal of meters and related equipment
  - Must be certified by the NYS PSC
- **Meter Data Service Provider (MDSP)**
  - An entity providing meter data services, consisting of meter reading, meter data translation and customer association, validation, editing, and estimation
  - Must be certified by the NYS PSC

Metering Fundamentals for Demand Response

- **Telemetry**
  - Process of collecting real-time meter data and transmitting the data over a communications path to another location
- **Revenue Metering Equipment**
  - Includes the revenue meters, current transformers, voltage transformers, test switches, transducers, remote terminal units (RTU), wiring, connecting blocks, and the cabinets/panels that house the above
- **Revenue Quality Metering**
  - Use of Electric Revenue Metering Systems to provide data for energy billing purpose. The components of these systems are approved by both the TO and the New York State (NYS) Public Service Commission (PSC) for revenue settlements

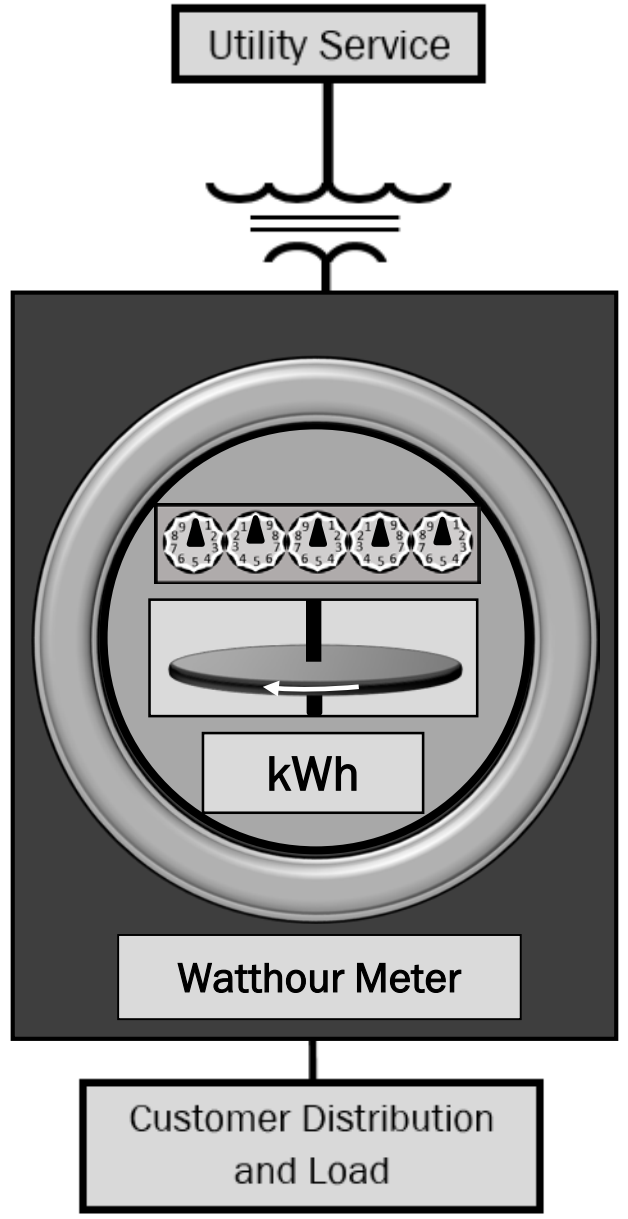
Types of Metering Devices*

- Watthour Meter
- Net Revenue Meter
- Interval Meter
- Demand Meter
- Demand Recorders/Totalizers
- Registers
- Contact Devices
- Submeters
- Instrument Transformers

* The NYS Department of Public Service maintains an approved meter list. Not all the devices listed can be used in the demand response program.

Metering Fundamentals for Demand Response

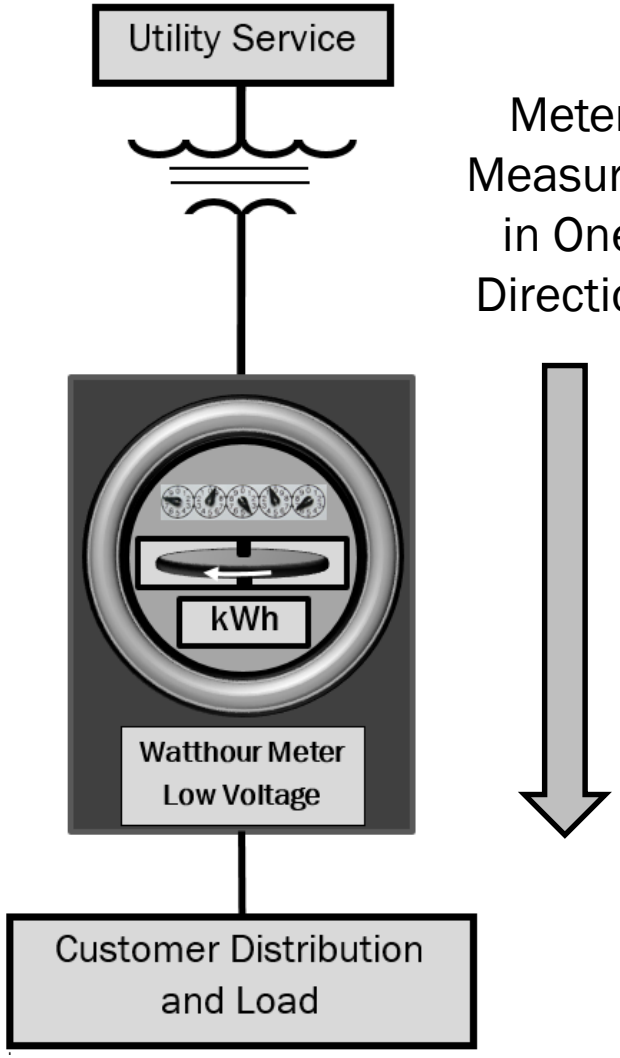
- **Watthour Revenue Meter**
  - A watthour meter used for billing purposes
  - Meter indicates the amount of energy consumed
  - The dials record the total usage of kWh
  - Some meters are digital or a combination of mechanical and digital
  - Not all watthour meters have a time stamp to indicate usage per a set time period (concept of interval or time of use)
  - May provide kWh or MWh data depending on the size of the customer



Metering – Net Revenue Meter

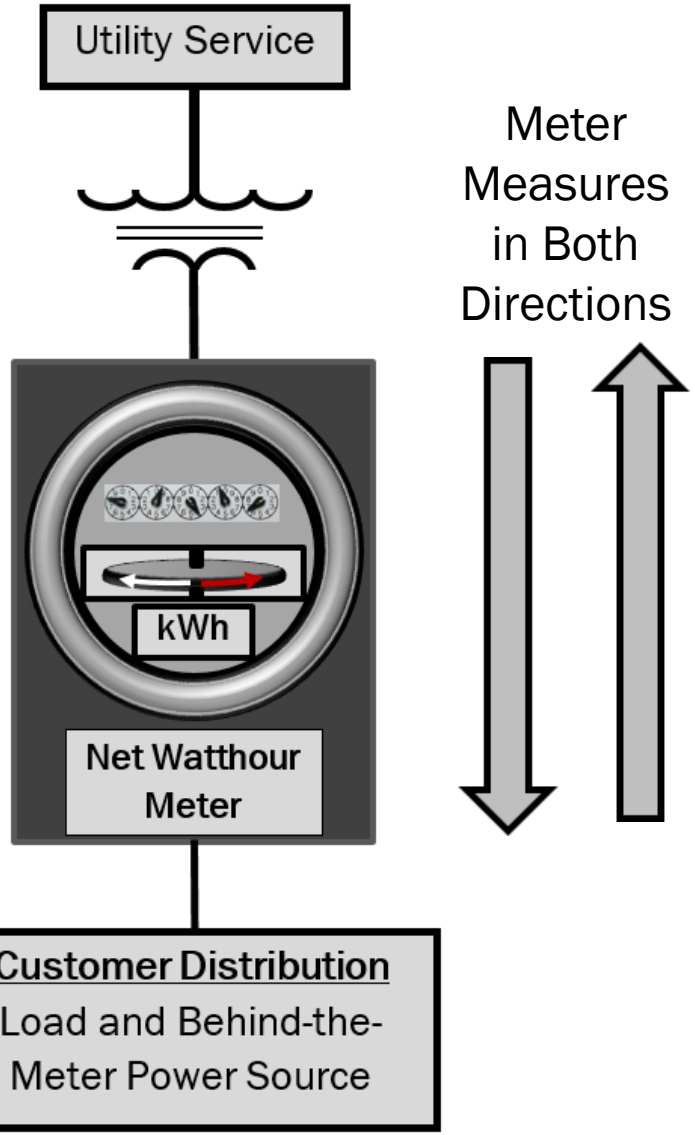
Standard Utility Revenue Meter Electromechanical or Digital

No Instantaneous (Demand) kW or Interval Billing



Meter Measures in One Direction

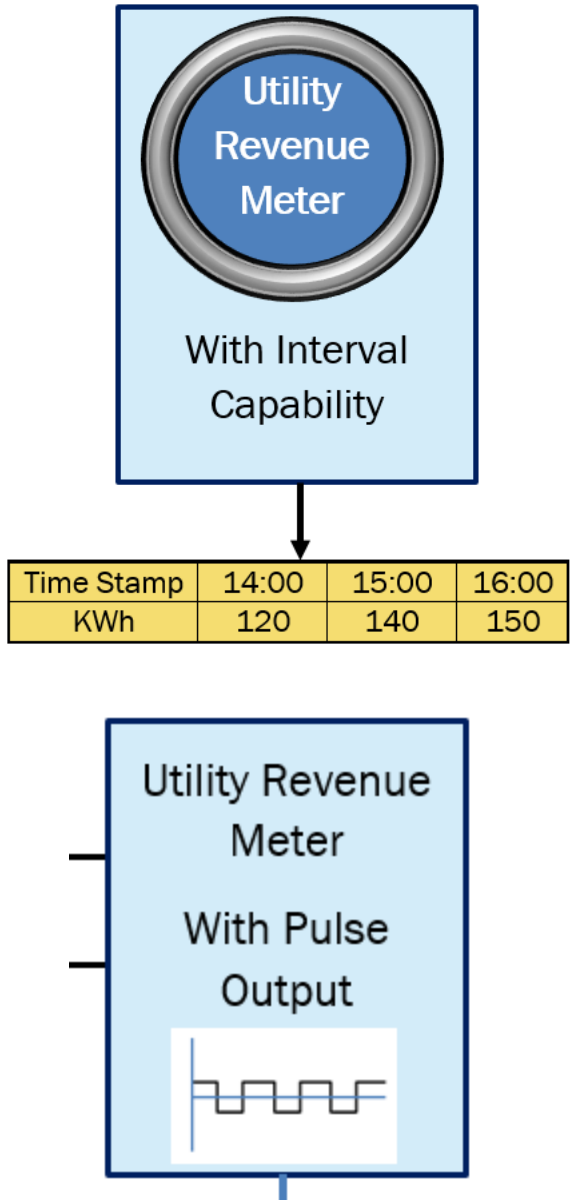
Net Revenue Meter



Meter Measures in Both Directions

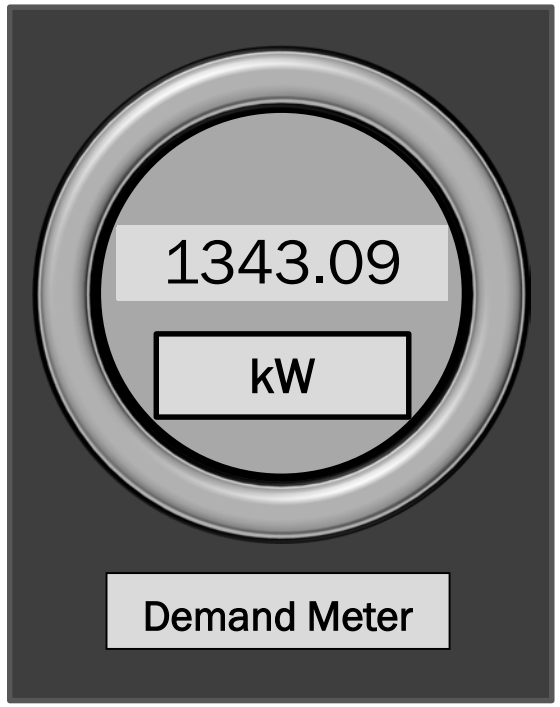
Metering Fundamentals for Demand Response

- **Interval Meter**
  - A meter which can record watthour energy usage at a predetermined interval, for example hourly
  - Sometimes referred to as a time-of-use (TOU) meter
  - Utilities may offer this type of meter option for customers taking advantage of demand response
  - Interval and instantaneous data can be produced by a standard wattmeter with a pulse generator



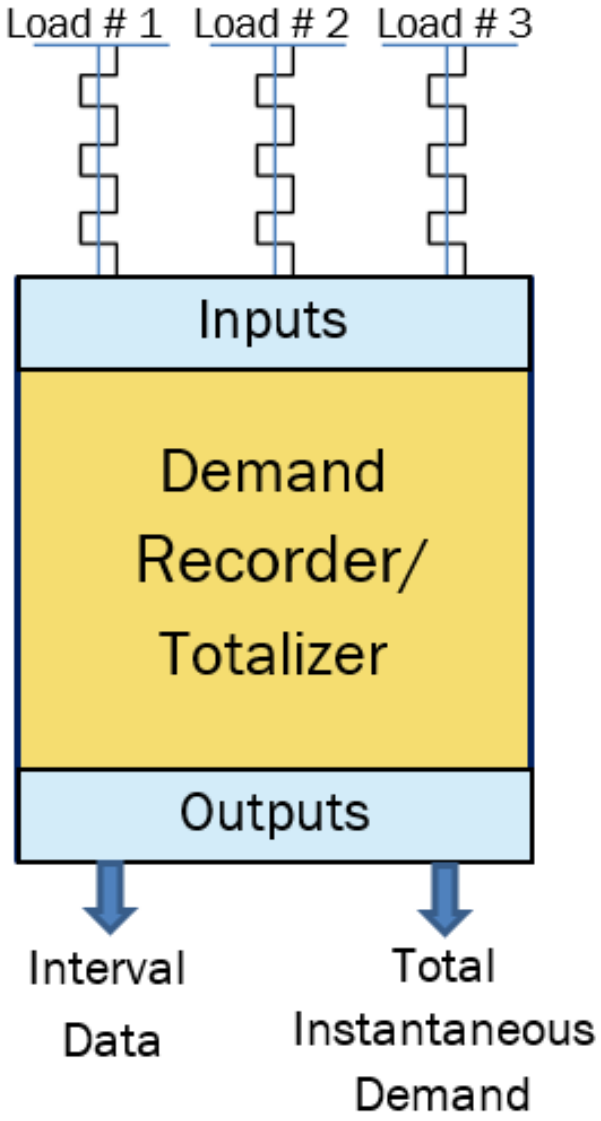
Metering Fundamentals for Demand Response

- **Demand Meter**
  - A meter designed to display/record the instantaneous value of power, kW or MW
  - Often referred to as an instantaneous meter
  - Some meters can record and store the values based on a designated sampling rate while others can send the information to a Demand Recorder



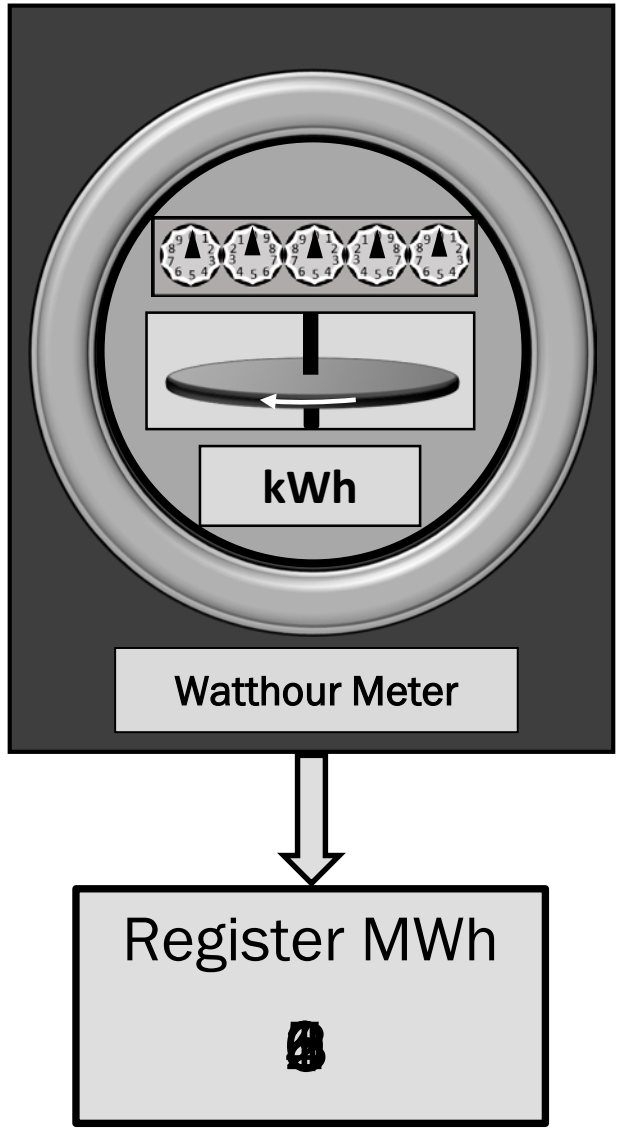
Metering Fundamentals for Demand Response

- **Demand Recorders/Totalizer**
  - Typically a solid state data recorder used to collect and totalize pulse data received from multiple electrical meters
  - Can record both demand and interval energy values
  - Remote data retrieval through optional communications
    - Examples: Ethernet, RS-232 Serial Port, Modems, Cellular Wireless



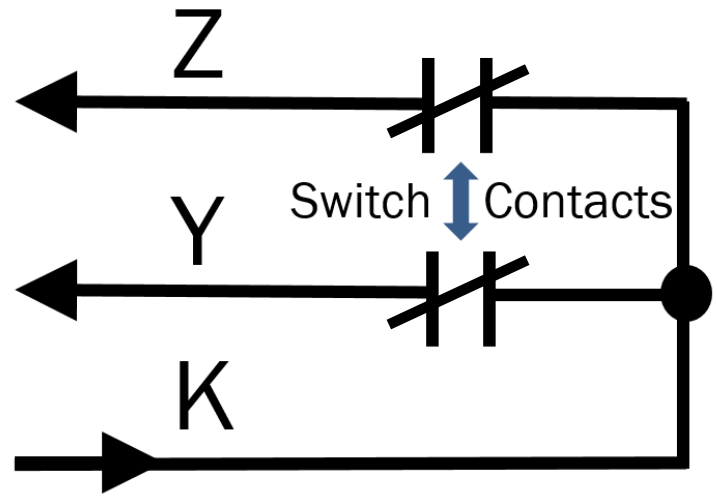
Metering Fundamentals for Demand Response

- **Registers**
  - Device used to capture the watthours from electromechanical or electronic meters
  - Stores kWh or MWh consumption data for remote meter reading
  - Some Registers may be able to track Interval and Demand

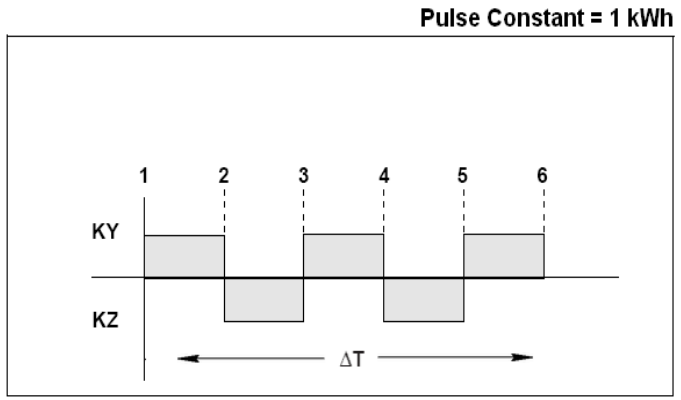


Metering Fundamentals for Demand Response

- **Contact Devices**
  - A device attached to an induction or solid state wattmeter that creates contact closures as the meter measures energy
  - The contact closures create pulses
  - Sometimes referred to as a pulse generator or pulse initiator
  - Creates a digital output
  - The number or count of pulses relates to the energy used in kWh
  - The frequency of the pulses relates to the energy demand



Contacts Z and Y toggle back and forth based on energy consumed, creating pulses

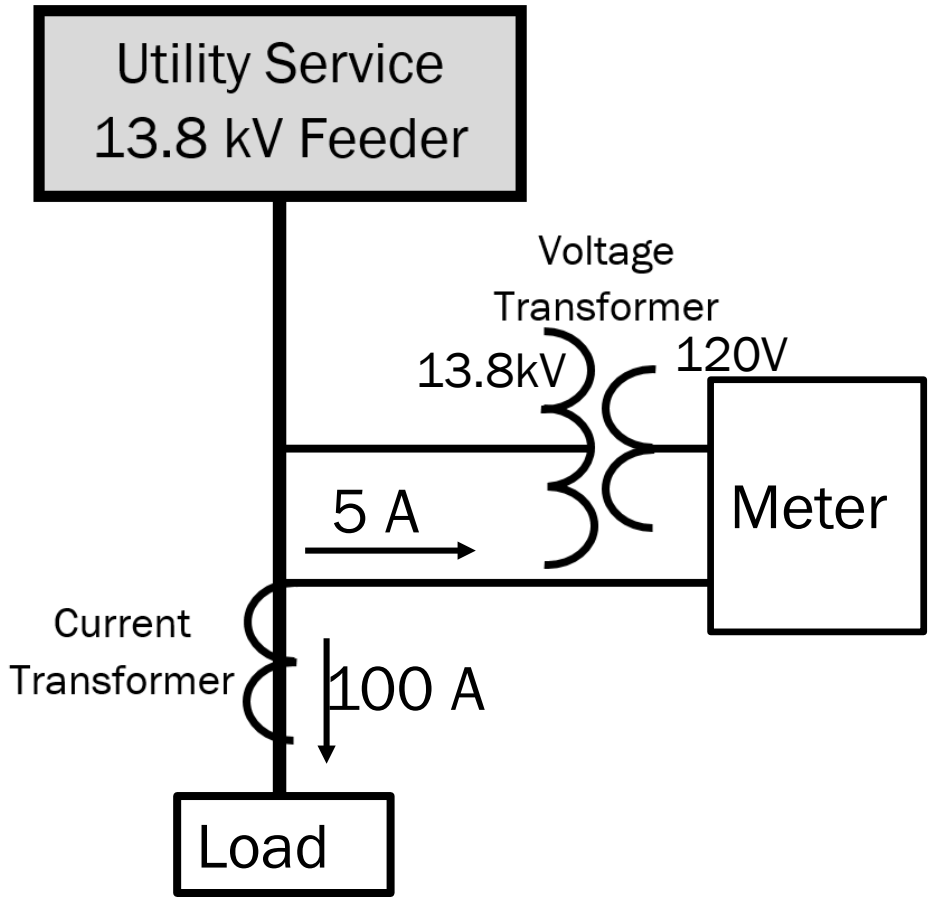


Metering Fundamentals for Demand Response

- **Submeters**
  - Revenue grade meter for multiple feeders or electric loads
  - Typically Interval and Net Metering capable
  - Typically can provide instantaneous KW values
  - Multiple communications option for remote reading
- **Automatic Meter Reading (AMR) Device**
  - Usually mounted inside of Watthour Meter case
  - Small antennae used for radio transmitting a KWh value
  - Calibrated to meter internal register
  - Read by receiver mounted in vehicle or transmitted through a network to a host processor

Metering Fundamentals for Demand Response

- **Instrument Transformers**
  - Current Transformer (CT)
    - Provides a reduced current signal to meter representative of the current being supplied to the load
  - Voltage or Potential Transformer (PT)
    - Provides a reduced voltage level to meter representative of the voltage being supplied to the load
  - Instruments used for revenue purpose must be approved by the NYS PSC

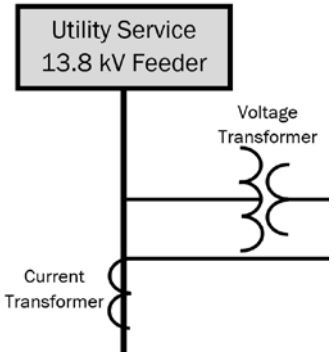


Meter Fundamentals for Demand Response

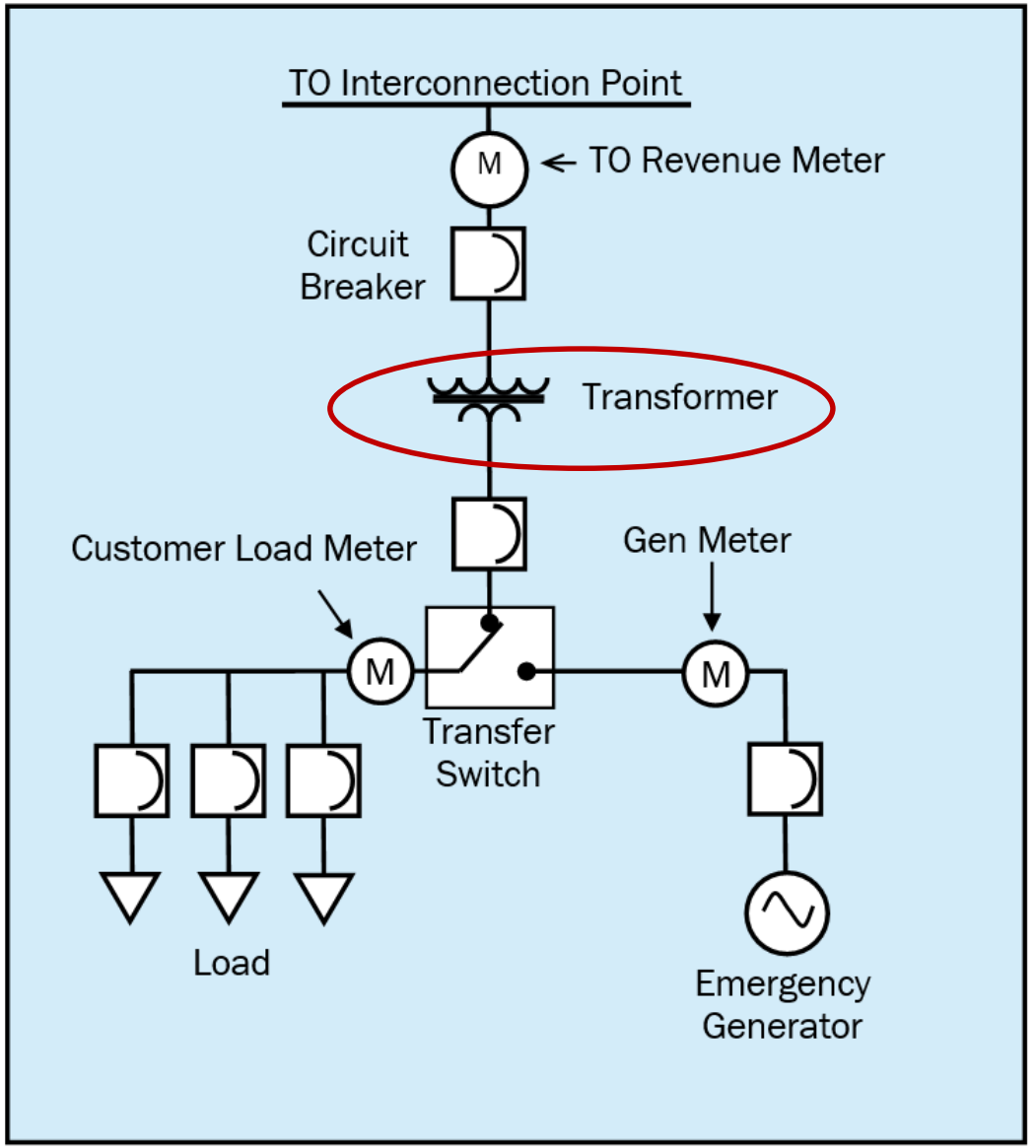
- **Use of Utility Grade Revenue Meters**
  - TO's revenue meters with Interval or Demand capability may meet the requirements for Demand Response
- **Use of Non-Revenue Grade Meters**
  - Allowed in EDRP and SCR for reporting interval meter data
  - Meter must meet ±2% accuracy
  - Installed by an MSP or;
  - Installed by customer and certified by a professional engineer
    - Installation must meet ANSI C12 standards
    - Periodically tested and calibrated per MSP standards
  - Data must still be read by a certified MDSP

Meter Fundamentals – Meter Accuracy

- **Potential Errors for Meter Accuracy**
  - Current Measurement
  - Voltage Measurement
  - A/D Conversion
  - Calibration of Meter



- **Customer Meter Compensation**
  - Losses between TO Revenue Meter and Customer Load Meter
  - Could cause the TO Revenue Meter to Read higher than Customer Load Meter
  - Customer Load Meter may be compensated to bring reading with 2% of the TO Revenue Meter



Let's Review

This type of meter provides the instantaneous value of energy being consumed?

_____

This type of meter provides energy usage over a specific time period?

_____

The NYISO will accept revenue meter data only from an approved

_____

Summary - Types of Metering Devices

- Watthour Meter
- Net Revenue Meter
- Interval Meter
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Discussion Points

Does a standard TO Provided Watthour meter meet the requirements of an Interval Meter for the Demand Response program?

A customer has a demand meter that displays the instantaneous value of load being consumed. What else would be needed for the meter to be used in the Demand Response program?

Resources

- NYISO Revenue Metering Requirements Manual
- New York State Department of Public Service Approved Meter List
- New York State Department of Public Service 16 NYCRR Part 92
- New York State Electric Meter Engineers' Committee – Guide for Uniform Practices in Revenue Quality Metering