

Metering Fundamentals for Demand Response

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Reliability-Based Demand Response

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Remote Learning

SME Bio

Mitchell Braun

Associate Distributed Resources Operations Engineer



Mitchell Braun joined the NYISO in 2020 as a Market Structures Co-Op/Intern within the New Resource Integration team. In this role, he worked extensively with the Gurobi Optimization Engine to begin formulating a model to forecast the impacts of increased renewable penetration and electrification on New York's grid infrastructure. Currently, Mitch is a Market Operations Associate Engineer within the Distributed Resources Operations team. As a member of the Distributed Resources Operations team, he helps facilitate the NYISO's Demand Response Markets, as well as aid in the development of the Distributed Energy Resources Participation Model.

Prior to joining the NYISO, Mitch spent four years at a pool installation company servicing inground pool pumps, gas and electric heaters, and automated regulation systems across New York.

Mitch has a Bachelor's in Physics from Siena College, as well as a Master's in Electrical Engineering from Clarkson University.

Session Objectives

- Identify the role of a Meter Authority
- 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

Topic 1: Role of a Meter Authority

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 (*i.e., a Member System or Meter Services Entity*)
 - The NYISO will accept revenue quality meter data only from an authorized MA a MA
 - The MA will provide hourly metered data to the NYISO

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 must comply with both the TO and the New York State (NYS) Public Service Commission (PSC) metering requirements for revenue settlements
- Non-Revenue Grade Meters may be utilized; however, they must meet an accuracy threshold of +/- 2%

Topic 2:

Types and purposes of metering devices used to measure and record energy usage and demand

Metering Fundamentals for Demand Response

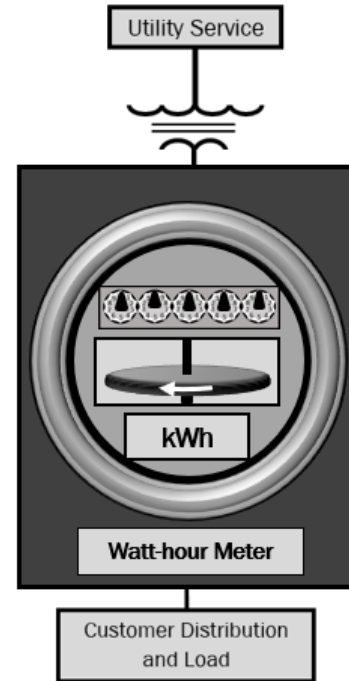
- **Types of Metering Devices***
 - Watthour Meter
 - Net Revenue Meter
 - Interval Meter
 - Demand Meter
 - Demand Recorders/Totalizers
 - Registers
 - Contact Devices
 - Submeters
 - Instrument Transformers

* 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

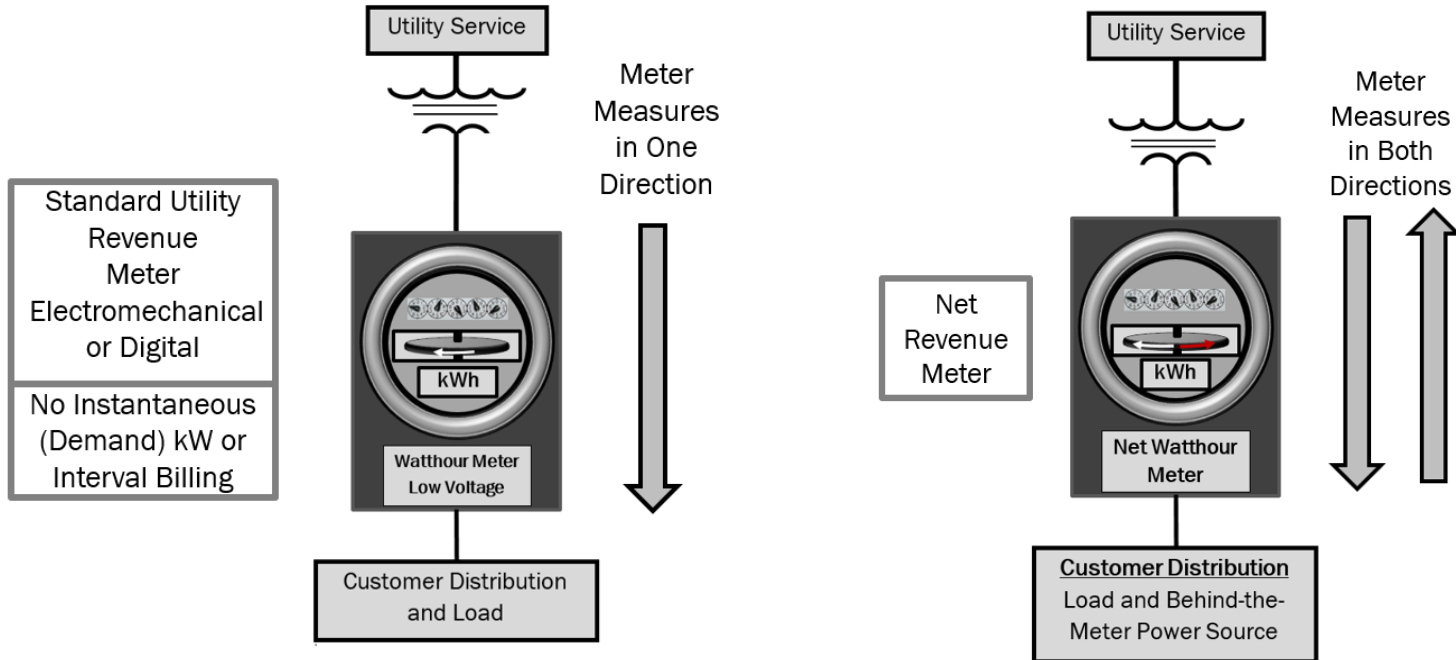
- A watthour meter used for billing purposes
- Meter indicates the amount of energy consumed
- The dials record the total usage of kWh
- Some meters are digital or a combination of mechanical and digital
- Not all watthour meters have a time stamp to indicate usage per a set time period (concept of interval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



| | |
|-----------------|-------|
| This Month kWh | 15964 |
| Last Month kWh | 15123 |
| Total Usage kWh | 841 |

Metering Fundamentals for Demand Response

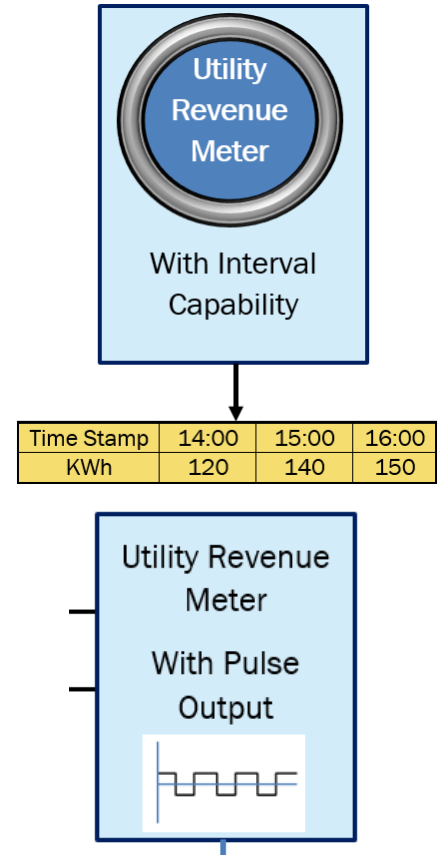
- Metering – Net Revenue Meter



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

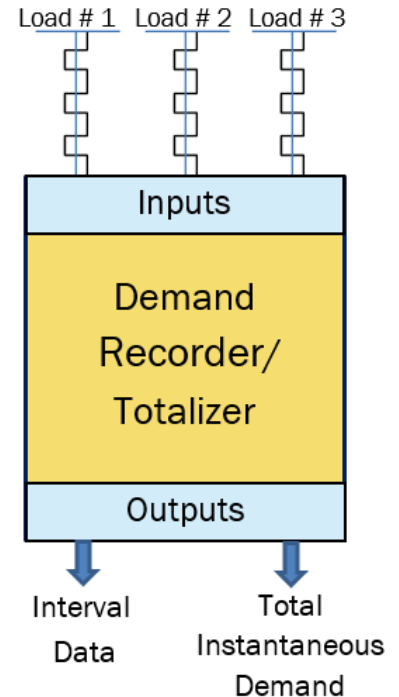
- A meter designed to display/record the instantaneous value of power, kW or MW
- Often referred to as an instantaneous meter
- Some meters can record and store the values based on a designated sampling rate while others can send the information to a Demand Recorder



Metering Fundamentals for Demand Response

■ Demand Recorders/Totalizer

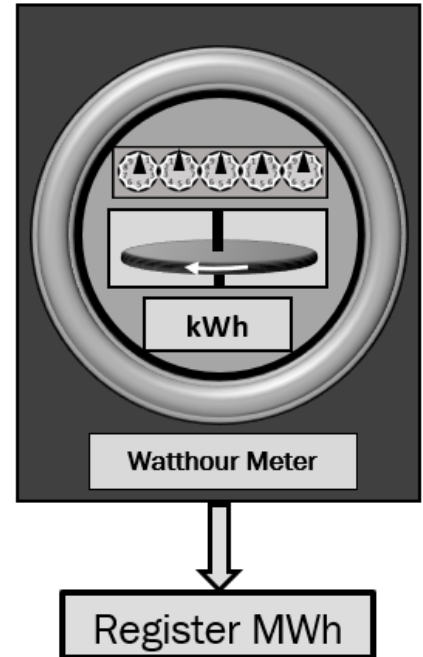
- Typically a solid state data recorder used to collect and totalize pulse data received from multiple electrical meters
- Can record both demand and interval energy values
- Remote data retrieval through optional communications
 - Examples: Ethernet, RS-232 Serial Port, Modems, Cellular Wireless



Metering Fundamentals for Demand Response

■ Registers

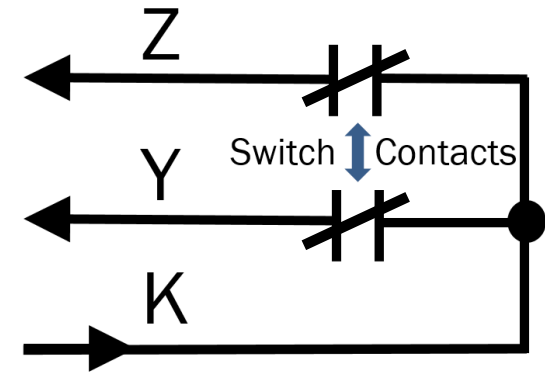
- Device used to capture the wathours from electromechanical or electronic meters
- Stores kWh or MWh consumption data for remote meter reading
- Some Registers may be able to track Interval and Demand



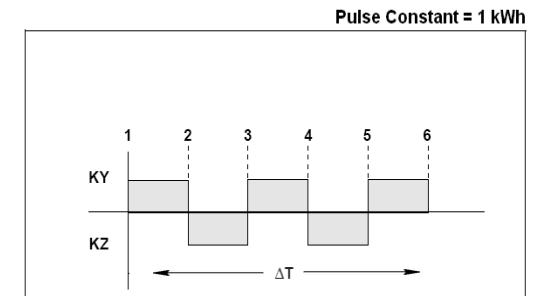
Metering Fundamentals for Demand Response New York ISO Independent System Operator

■ 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

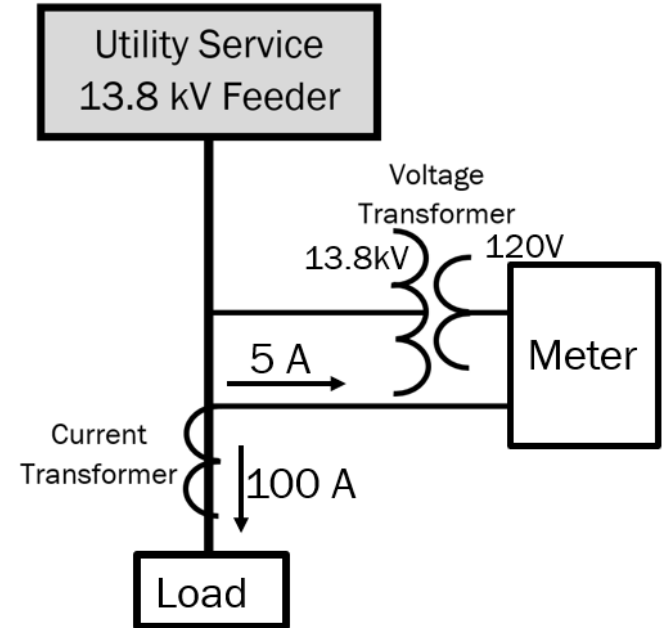
■ Automatic Meter Reading (AMR) Device

- 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



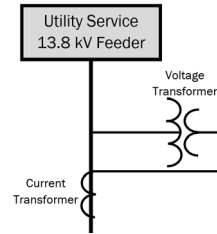
Metering Fundamentals for Demand Response

- **Use of Utility Grade Revenue Meters**
 - TO's revenue meters with Interval or Demand capability will 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 $\pm 2\%$ accuracy requirement
 - Installed by a MA or;
 - Installed by customer and certified by a professional engineer
 - Installation must meet ANSI C12 standards
 - Periodically tested and calibrated per standards referenced in the MSE Manual
 - Data must still be read by a certified MA/MSE

Metering Fundamentals for Demand Response

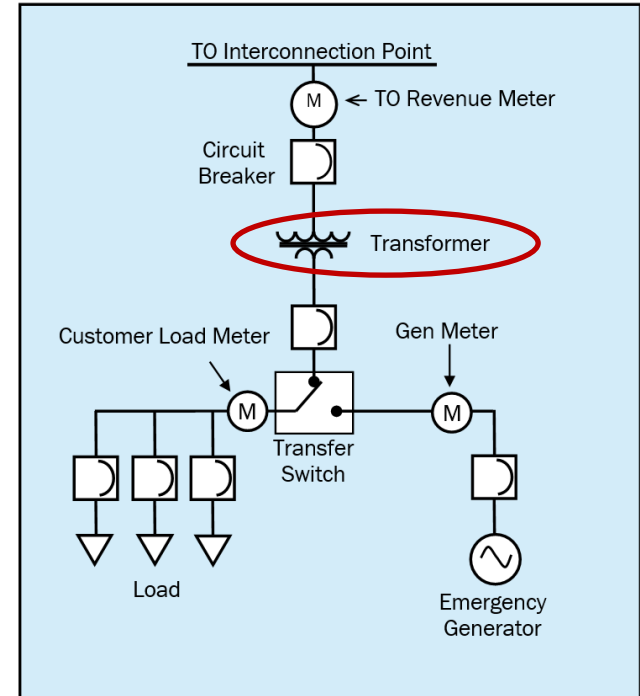
■ Potential Errors for Meter Accuracy

- Current Measurement
- Voltage Measurement
- AC/DC Conversion
- Calibration of Meter

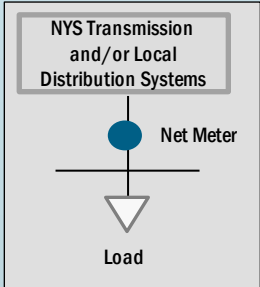
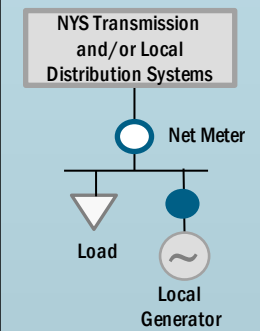


■ Customer Meter Compensation

- 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



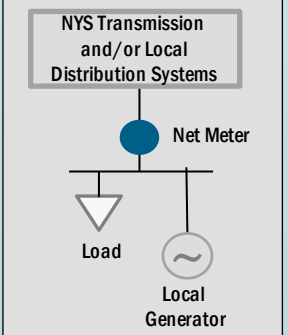
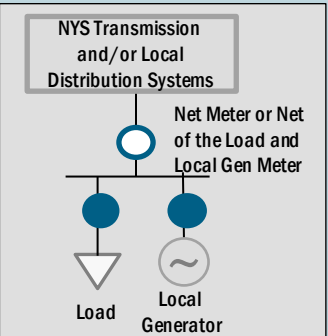
Metering Configuration Requirements

| Response Type | Type of Load Reduction | Meter Configuration for Measurement of Load Reduction | Meter Configuration for Measurement of Load Reduction |
|-----------------|---|---|--|
| C - Curtailment | Curtailing the resource facility's load | Entire facility's net meter data |  |
| G - Generator | Use of a Local Generator | Local Generator's meter data |  |

● Meter(s) used to report meter data into DRIS as evidence of Load Reduction

Net Meter data is used to report meter data for the purpose of establishing SCR's Average Coincident Load baseline

Metering Configuration Requirements

| Response Type | Type of Load Reduction | Meter Configuration for Measurement of Load Reduction | |
|---------------|--|--|--|
| B- Both | (i) Curtailment and use of a Local Generator | (a) Entire facility's Load meter data, or (b) Net of entire facility's Load meter data and Local Generator's meter data |  |
| | (ii) Use of a Local generator | (a) Entire facility's net meter data, or (b) Net of entire facility's Load meter data and Local Generator's meter data |  |

● Meter(s) used to report meter data into DRIS as evidence of Load Reduction

Net Meter data is used to report meter data for the purpose of establishing SCR's Average Coincident Load baseline

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

a) interval meter

b) watthour meter

c) demand meter

d) submeter

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

a) interval meter

b) watthour meter

c) demand meter

d) submeter

The NYISO will accept revenue meter data only from an approved _____.

a) interval meter

b) wathour meter

c) demand meter

d) Meter Authority (MA)

TRUE or FALSE: A standard TO Provided Watthour meter meets the requirements of an Interval Meter for the Demand Response program.

TRUE

FALSE

A customer has a demand meter that displays the instantaneous value of load being consumed. In addition to a Meter Authority (MA), what else would be needed for the meter to be used in a Reliability-Based Demand Response Program?

a) interval meter

b) wathour meter

c) demand meter

Metering Fundamentals for Demand Response - Summary

- **Meter Authority**– 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 (*i.e., a Member System or Meter Services Entity*)
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Additional Resources

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