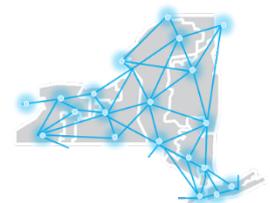


Ancillary Services

E-Learning Module



Ancillary Services

Module Objectives:

- Identify Three Cost Based Ancillary Services
- Identify Three Market Based Ancillary Services
- Explain the Purpose of Each Service
- Name the types of Suppliers & Recipients of Each Service

Ancillary Services - Introduction

- **In the NY State Wholesale Energy Market, Ancillary Services**
 - Support transmission of energy from resources to loads
 - Maintain reliable operation of NY State power system
- **NYISO Coordinates**
 - Provision of Ancillary Services
 - Arranges for Supply of Ancillary Services
 - Directs Actions of Ancillary Service Suppliers

Ancillary Services - Introduction

Ancillary Service	OATT Rate Schedule
Scheduling, System Control and Dispatch Service	OATT Rate Schedule 1
Voltage Support Service	OATT Rate Schedule 2
Regulation Response Service	OATT Rate Schedule 3
Energy Imbalance Service	OATT Rate Schedule 4
Operating Reserve Service	OATT Rate Schedule 5
Black Start Capability Service	OATT Rate Schedule 6

Ancillary Services - Introduction



Cost Based

- ❖ Includes:
 - Scheduling, System Control and Dispatch Service
 - Voltage Support Service
 - Black Start Capability Service
- ❖ Fixed rate for pre-determined time periods based on cost associated with having given service
 - ❖ Calculated using rules set forth in the tariff, specific to each ancillary service



Market Based

- ❖ Includes:
 - Operating Reserve Service
 - Regulation and Frequency Response Service
 - Energy Imbalance
- ❖ Variable rates based on the market clearing price
 - ❖ Calculated for the appropriate time interval (DAM – Hourly price, RT – 5 minute price)
 - ❖ Based on the offers (\$/MW) of the units selected to supply specific service

Cost Based Ancillary Services

Scheduling, System Control, and Dispatch (S,SC, & D)

- Rate Schedule 1
 - Purpose : Recovering NYISO Cost of Operations
 - Costs Associated with the Operation of the NYS Transmission System by the NYISO
 - Costs Associated with the Administration of the Tariffs by the NYISO
 - OATT (Open Access Transmission Tariff)
 - MST (Market Administration and Services Tariff)
 - FERC fees

Rate Schedule 1

Rate Schedule 1

Part 1

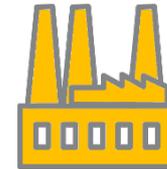
Allocation of NYISO Embedded Costs

$$\text{NYISO Embedded Costs (\$/MWh)} = \frac{\text{NYISO Costs to be Recovered}}{\text{Forecasted MWh Volumes}}$$

- 72% allocated to withdrawals
- 28% allocated to injections

Injections: Represents Supply side

Withdrawals: Represents Load side



Rate Schedule 1

Rate Schedule 1

Part 1

Part 1a

Allocation of NYISO Embedded Costs

$$\text{NYISO Embedded Costs (\$/MWh)} = \frac{\text{NYISO Costs to be Recovered}}{\text{Forecasted MWh Volumes}}$$

- 72% allocated to withdrawals
- 28% allocated to injections

Costs assessed to Non-Physical Market Activity

- Virtual Trading
- Transmission Congestion Contracts (TCC)
- Demand Response: SCR/EDRP

Collection from Part 1a is used to address under-collection of Part 1 collection from the previous year

Rate Schedule 1

Rate Schedule 1

Part 1

Allocation of NYISO Embedded Costs

$$\text{NYISO Embedded Costs (\$/MWh)} = \frac{\text{NYISO Costs to be Recovered}}{\text{Forecasted MWh Volumes}}$$

- 72% allocated to withdrawals
- 28% allocated to injections

Part 1a

Costs assessed to Non-Physical Market Activity

- Virtual Trading
- Transmission Congestion Contracts (TCC)
- Demand Response: SCR/EDRP

Part 2

Allocation of Uplift Charges and Residual Adjustments

- 100% allocated to withdrawals

Voltage Support Service (VSS)

- Rate Schedule 2

- Purpose: Ensures sufficient supply of Reactive Power to maintain desired voltage levels (Force/Pressure) on the NYCA Transmission System in real time operations
- Must be provided to support delivery of electrical energy on the NYS Transmission System
- VSS Accomplished Through use of
 - Generators
 - Other Qualified VSS Providers



Rate Schedule 2

- **Supplier's MVar Capability**
 - **VSS Suppliers**
 - **Must meet Service Requirements:**
 - Perform Reactive Power Capability (MVar) Testing
 - Submit MVar Test Data to NYISO
 - Have Automatic Voltage Regulator (AVR)
 - Maintain specific voltage level as directed
 - **Receive Weekly Payments**
 - Based on Annual VSS Rate
 - Lag and Lead Var Capability

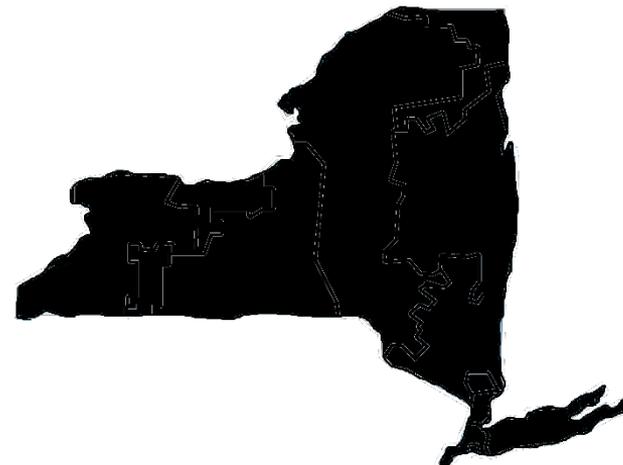
Rate Schedule 2

- Recipients of Service
 - VSS Costs Allocated to:
 - Internal Load
 - Exports
 - Wheels-through
 - Charges Assessed are Based on:
 - Estimated Annual VSS Costs



Black Start Service

- **Rate Schedule 6**
 - Purpose: NYCA System Restoration
 - Represents generators capable of starting without an outside electric supply, following a system-wide blackout
 - Resources Selected According to Following Considerations:
 - Location in grid
 - Startup time
 - Response rate
 - Maximum output



Rate Schedule 6

■ Black Start Suppliers

- Submit to performance testing as requested
- Provide embedded cost information annually
- Receive Black Start Payment for availability

■ Black Start Service Costs

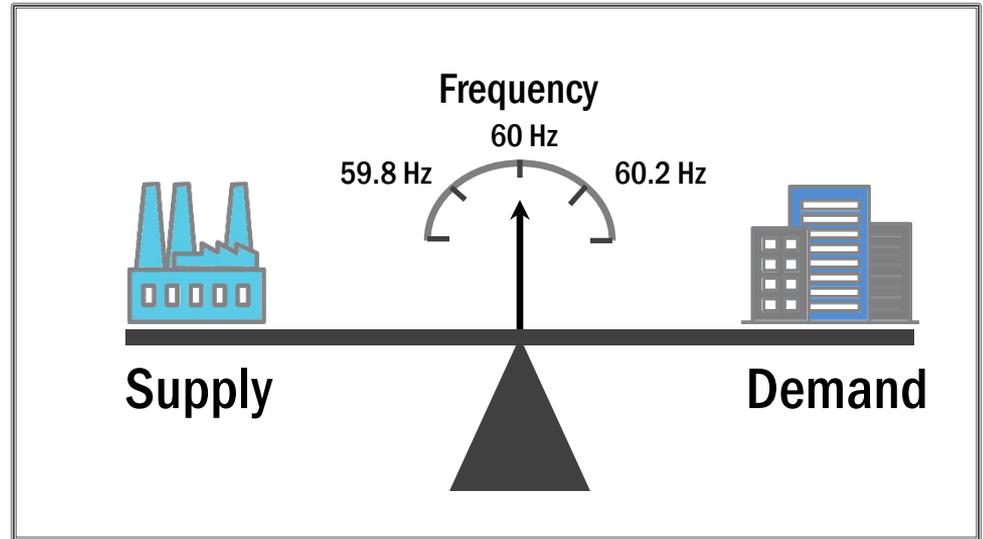
- Allocated to Internal Load Withdrawal



Market Based Ancillary Services

Regulation and Frequency Response Service

- **Rate Schedule 3**
 - Purpose: Necessary for the continuous balancing of resources with load - supply and demand balance
 - Assists in maintaining scheduled Interconnection Frequency at 60 Hz



Rate Schedule 3

Regulation may be accomplished by:

Dispatching on-line generators

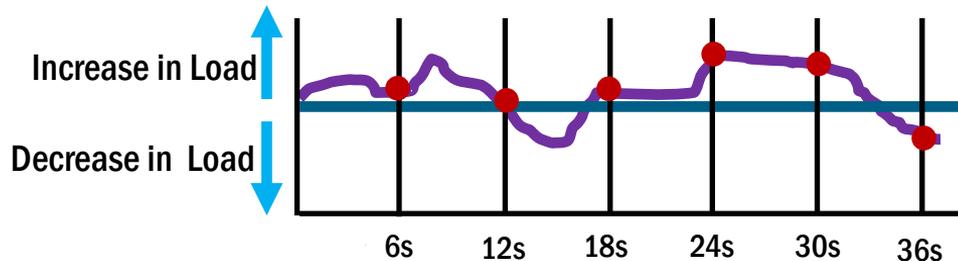
Generation output maybe raised or lowered to follow 6 second changes in load

Demand Side Regulation Providers

Resource's load maybe lowered or raised to follow 6 second changes in load

Energy Storage Resources and Limited Energy Storage Resources

Flywheels or batteries that could withdraw or inject energy to follow 6 second changes in load

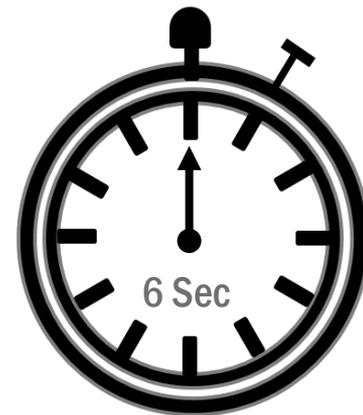


— - RTD Base Load
● - 6 second signals for Regulation providers to balance Load

Rate Schedule 3

- Regulation is bid in by units that:
 - Have installed equipment capable of responding to six second signals
 - Bid as 'Flexible' Supplier

- Criteria considered in Co-Optimization
 - Energy Bids
 - Regulation Service Bids
 - Capacity Bid MW & Price
 - Movement Bid Price



Rate Schedule 3

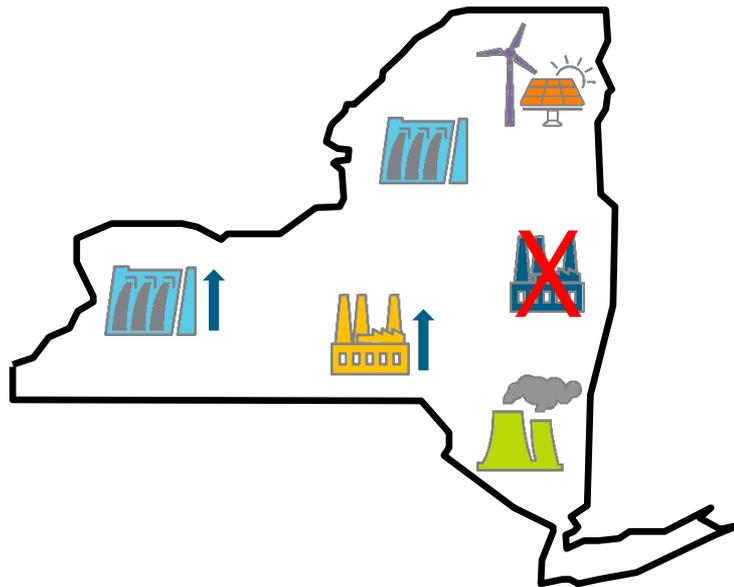
- **Payment for Service**
 - Suppliers Scheduled to Provide Regulation service are eligible for Regulation Capacity Settlements
 - Suppliers Instructed to Regulate in Real Time are eligible for Regulation Movement Settlements
- **Regulation Service Charges**
 - Regulation Service Assessed to
 - Internal Load



Rate Schedule 5

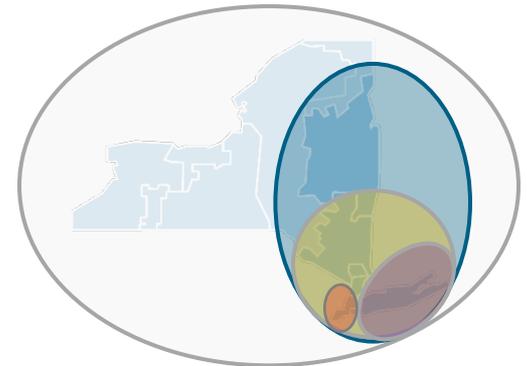
- Operating Reserve Service

- Purpose: Backup Generation in the Event of a System Contingency



Rate Schedule 5

- **Reserves Must be from:**
 - Units in NYCA and within Specific Regions
 - Demand Side Resources within NYCA
- **Suppliers of Service**
 - Reserve Providers must bid in DAM as a ‘Flexible’ Supplier
 - Flexible output; follow NYISO base points
 - Criteria considered in Co-Optimization
 - Energy Bids
 - Reserve Availability Bids
 - Response Rate
 - Upper Operating Limit



Market Based - Rate Schedule 5

- Activation of Service
 - Reserve Pickup
 - Large Event RPU - Initiated if Load exceeds current energy dispatch opportunities
 - Dispatch-able resources receive new base points w/ 10 min. ramp time
 - Small Event RPU - used to reduce transmission line loading
 - Maximum Generation Pickup
 - Regulation is suspended during Reserve and Max Gen. Pickup

Rate Schedule 5

- **Payment for Service**
 - Suppliers Scheduled to Provide Operating Reserves
 - Eligible for Operating Reserve Settlements
 - Suppliers Instructed to Convert Reserves to Energy in Real Time
 - Eligible for Real Time LBMP Energy Settlements
- **Operating Reserve Recipient Charges**
 - Operating Reserves Assessed to
 - Internal Load
 - Exports



Rate Schedule 4

■ Energy Imbalance Service

- Internal Energy Imbalances

- Addresses differences between Supply and Demand within the NYCA
 - Resolved through the RT Market Process

- External Energy Imbalances

- Addresses differences in energy exchange (Transactions) between NYCA and Other Control Areas
 - Resolved through the Inadvertent Energy Accounting Process

Ancillary Services: Summary

Ancillary Service	Injection	Non-Physicals (Virtuals, TCCs, & EDRP/SCR)	Internal Loads	Exports	Wheels-through
Rate Schedule 1 (S,SC and D)	✓	✓	✓	✓	✓
Rate Schedule 2 (VSS)			✓	✓	✓
Black Start Service			✓		
Regulation Service			✓	✓	
Operating Reserve			✓		
Energy Imbalance	✓		✓	✓	✓

Additional Resources

- **Tariffs - OATT & MST**
- **Ancillary Services Manual**
- **Accounting & Billing Manual**
- **Technical Bulletins**
- **Miscellaneous Pricing Files**

Questions?

For any future assistance, please contact NYISO Stakeholder Services at stakeholder_services@nyiso.com or by phone at (518) 356-6060