Inputs used to Determine Schedules & Clearing Prices

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LBMP In-Depth Course

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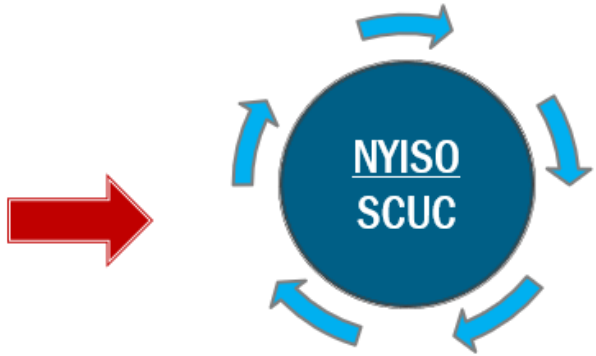
Session Overview

New York ISO

- Demand
- Reliability Requirements
- Energy and Ancillary Service Offers from Resources
- Virtual offers and bids
- Transmission Limits



Co-Optimization for lowest total production cost

- DAM Prices
- DAM Schedules

Session Topics

- **Inputs:**
  - Determining NYCA Load
  - Physical Supply Offers
  - Market-Based Ancillary Service Products
  - Economic-Based Demand Response Programs
  - Energy Market Transactions
  - Virtual Trading

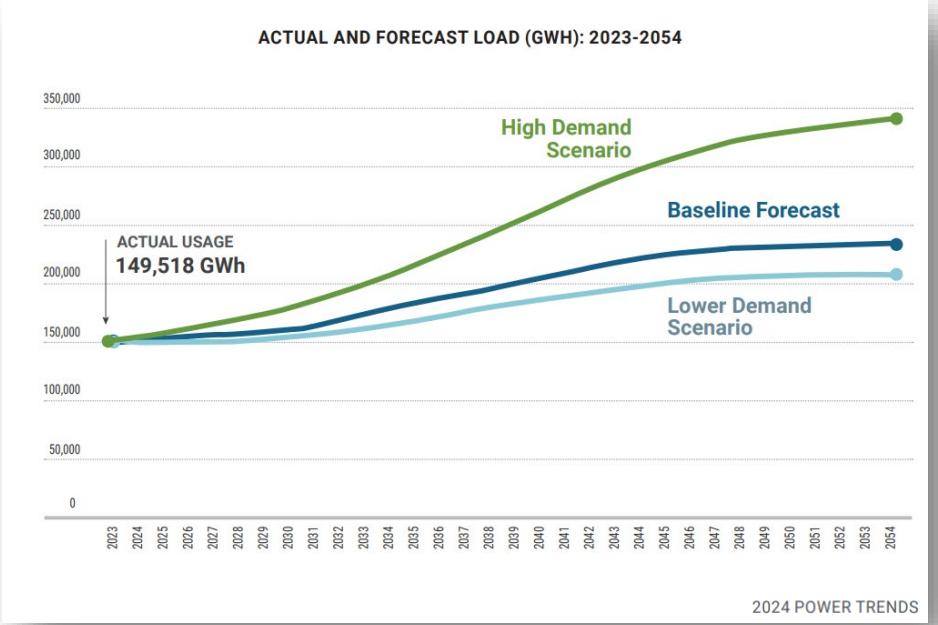
Session Objectives

- **Upon completion of this module, trainees will be able to:**
  - Identify the inputs associated with bid load
  - Explain the NYISO Load Forecast process
  - Compare and contrast physical supplier characteristics
  - List the components of a physical supply offer
  - Describe the inputs of both Regulation and Operating Reserve Service bids
  - Explain the bid components of demand side resources
  - State the different inputs associated with each transaction bid type
  - List the components of a Virtual Supply and Virtual Load bid

Determining NYCA Load

Determining NYCA Load

- Load Serving Entity Bids
- NYISO Load Forecasting



Defining Load Serving Entity

- **Load Serving Entity (LSE):**
  - An entity, including municipal electric systems and electric cooperatives, legally authorized and/or required by law, regulatory, agreement or contractual obligation to supply Energy, Capacity and/or Ancillary Services to retail customers located within NYCA
    - Also including entities taking service directly from NYISO to supply its own Load in NYCA
  - May bid into NYISO Day-Ahead Market
  - Bids contain components that are factored into the software evaluation processes for determining:
    - Schedules & subsequent Clearing Prices

Load Serving Entity Bid Composition

- **Load Serving Entities bid into DAM to procure energy from NYISO using:**
  - Fixed bids only

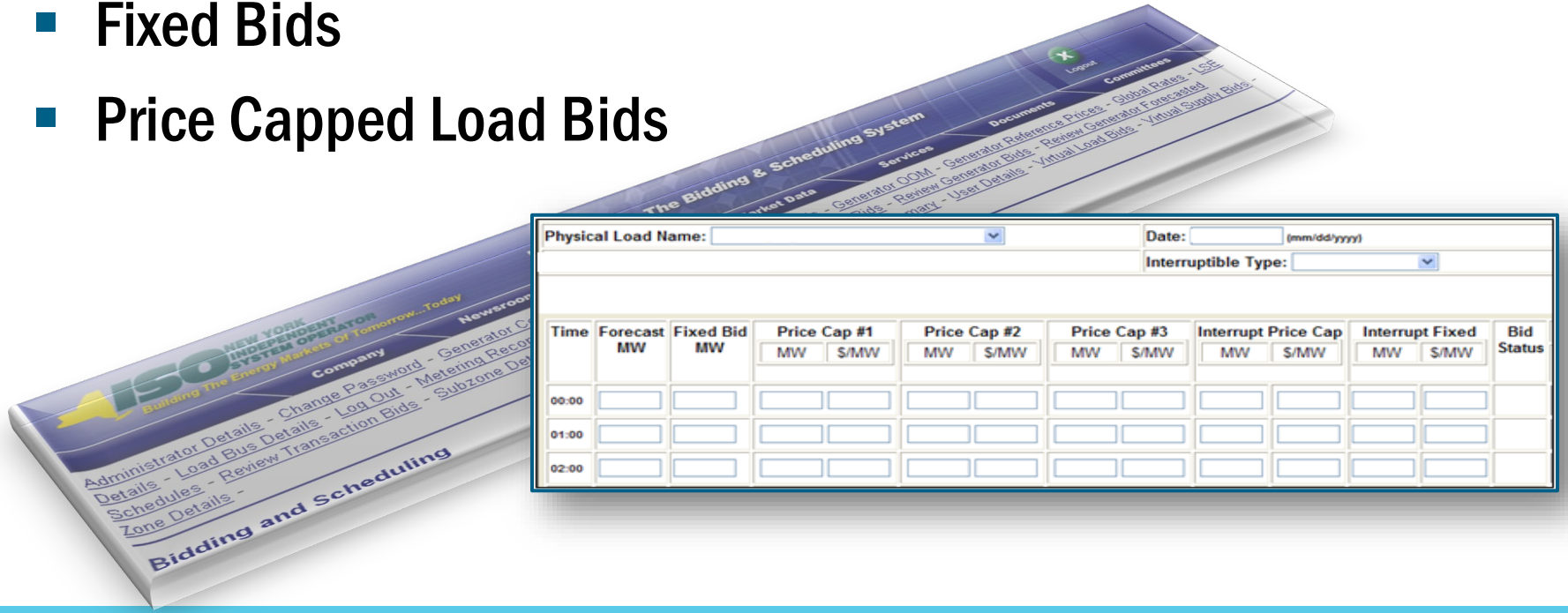
    OR
  - Price Capped Load bids only

    OR
  - Combination of Fixed and Price Capped Load bidding

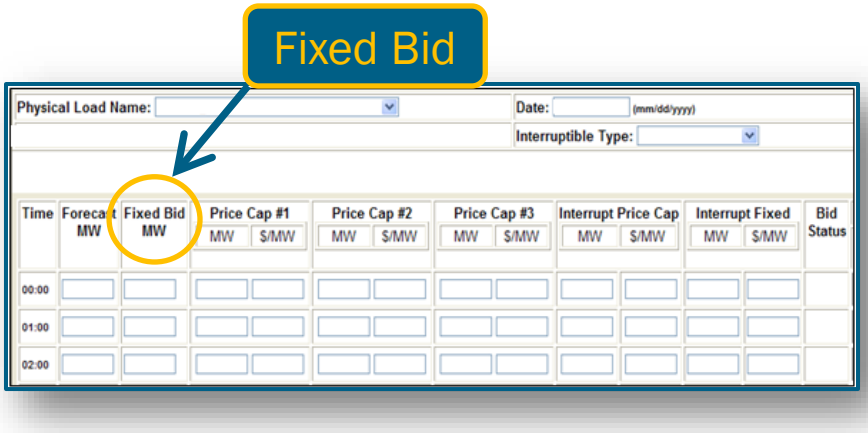
****If Real-Time Market energy purchase, then no bid entered – automatically assessed by NYISO*

Load Serving Entity Inputs

- Load Forecast (used for initial billing purposes)
- Fixed Bids
- Price Capped Load Bids

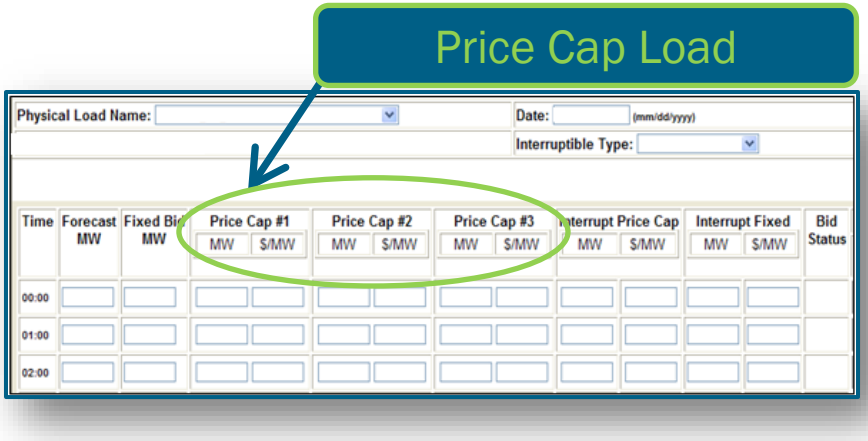


Load Serving Entity Inputs



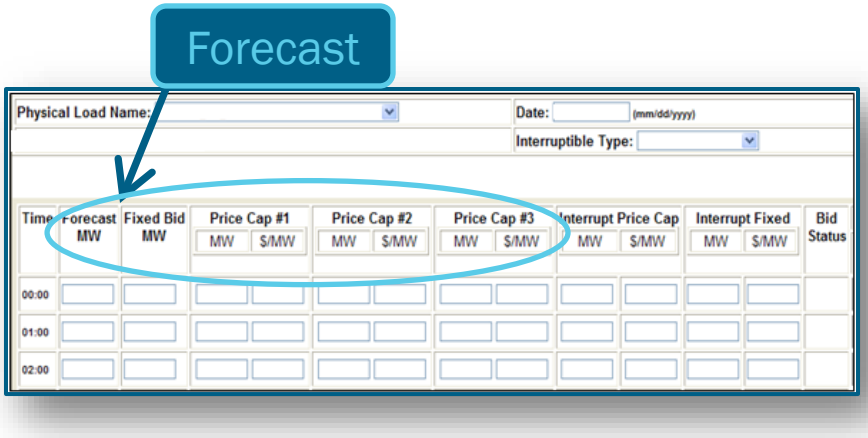
- **LSE Fixed Bids Only**
  - Indicates LSE is willing to pay for fixed bid MWs regardless of price
  - Minimum MW/HR amount for which a forward contract will be generated
    - Must be a whole number > 0
    - May not exceed LSE Forecast MW

Load Serving Entity Inputs



- **LSE Price Capped Bids Only**
  - Indicates LSE wants to be economically scheduled
  - MW and $/MW values define price LSE is willing to pay for given increments of load
    - Price Cap MWs must be a whole number > 0
    - $/MW values must increase in order
    - May not exceed LSE Forecast MW

Load Serving Entity Inputs



- **LSE Fixed & Price Capped Bids Combined**
  - Fixed bid MW and Price Cap bid MWs collectively may not exceed LSE Forecast MW
  - Indicates LSE is willing to pay regardless of price for portion of bid MW and remainder are to be economically scheduled

Let's Review

TRUE or FALSE: LSE entering a DAM bid must enter either a fixed bid or price-capped load bid.

TRUE

FALSE

NYISO Load Forecast

Determining NYCA Load

ISO Load Forecast

10/13/2021
10/14/2021
10/15/2021
10/16/2021
10/17/2021
10/18/2021

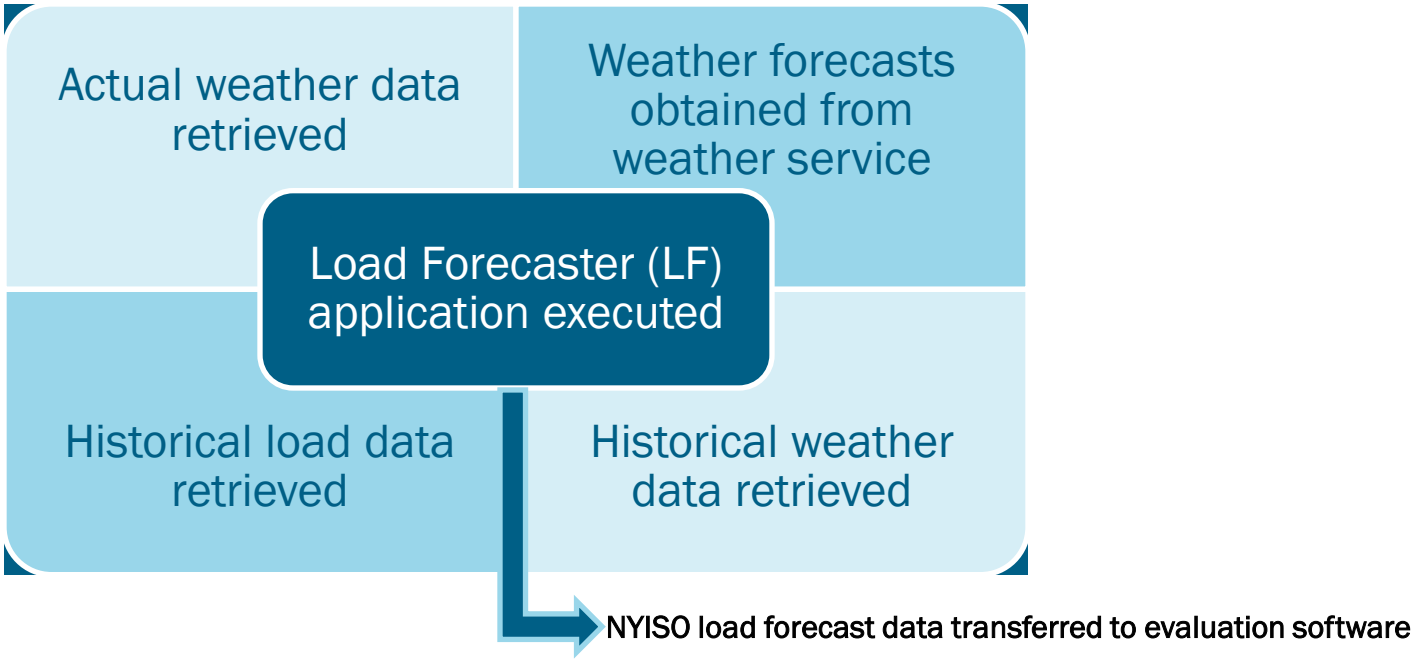
10/13/2021

Hour	CAPITL	CENTRL	DUNWOD	GENESE	HUD VL	LONGIL	MHK VL	MILLWD	N.Y.C.	NORTH	WEST	NYISO
00:00	1040	1382	487	959	782	1714	539	223	4497	527	1447	13597
01:00	1008	1345	464	915	753	1635	519	213	4322	523	1388	13085
02:00	987	1310	450	890	734	1583	507	208	4204	519	1352	12744
03:00	980	1298	442	876	727	1562	504	206	4146	518	1328	12587
04:00	997	1326	445	887	733	1589	515	211	4156	526	1337	12722
05:00	1056	1413	472	939	774	1686	565	226	4367	539	1402	13439
06:00	1173	1575	530	1038	852	1873	661	259	4845	563	1526	14895
07:00	1236	1683	580	1107	897	1971	712	284	5304	584	1617	15975
08:00	1227	1674	603	1120	903	2004	718	285	5598	590	1650	16372
09:00	1206	1660	616	1138	890	1994	714	285	5799	588	1672	16562
10:00	1195	1670	628	1156	891	1995	723	288	5902	585	1705	16738
11:00	1201	1674	634	1173	903	2020	728	292	5989	583	1731	16928
12:00	1214	1676	646	1187	926	2054	722	296	6067	586	1741	17115
13:00	1215	1696	652	1205	936	2139	713	304	6153	590	1769	17372
14:00	1231	1705	655	1206	943	2258	706	310	6196	589	1769	17568
15:00	1265	1722	661	1208	969	2353	699	316	6257	588	1748	17786
16:00	1313	1757	668	1206	1010	2439	707	322	6313	594	1739	18068
17:00	1382	1780	668	1201	1056	2493	743	333	6309	604	1719	18288
18:00	1454	1836	690	1228	1121	2625	796	356	6234	616	1719	18675
19:00	1437	1831	684	1225	1119	2588	795	353	6084	621	1722	18459
20:00	1379	1761	663	1180	1074	2495	751	339	5907	610	1671	17830
21:00	1301	1659	634	1109	1008	2356	694	317	5686	589	1603	16956
22:00	1208	1557	588	1027	932	2168	636	287	5377	569	1519	15868
23:00	1131	1461	541	957	865	1975	582	253	5021	551	1428	14765

- **NYISO Statewide Load Forecast**
  - A function to forecast load for each Zone in NYCA for next seven days
    - Zonal load forecasts are summed for total statewide load forecast
  - Used in reliability passes of evaluation software
  - Posted to NYISO.com by 8 a.m. each day

NYISO Statewide Load Forecast

- Zonal Load Forecast Process:



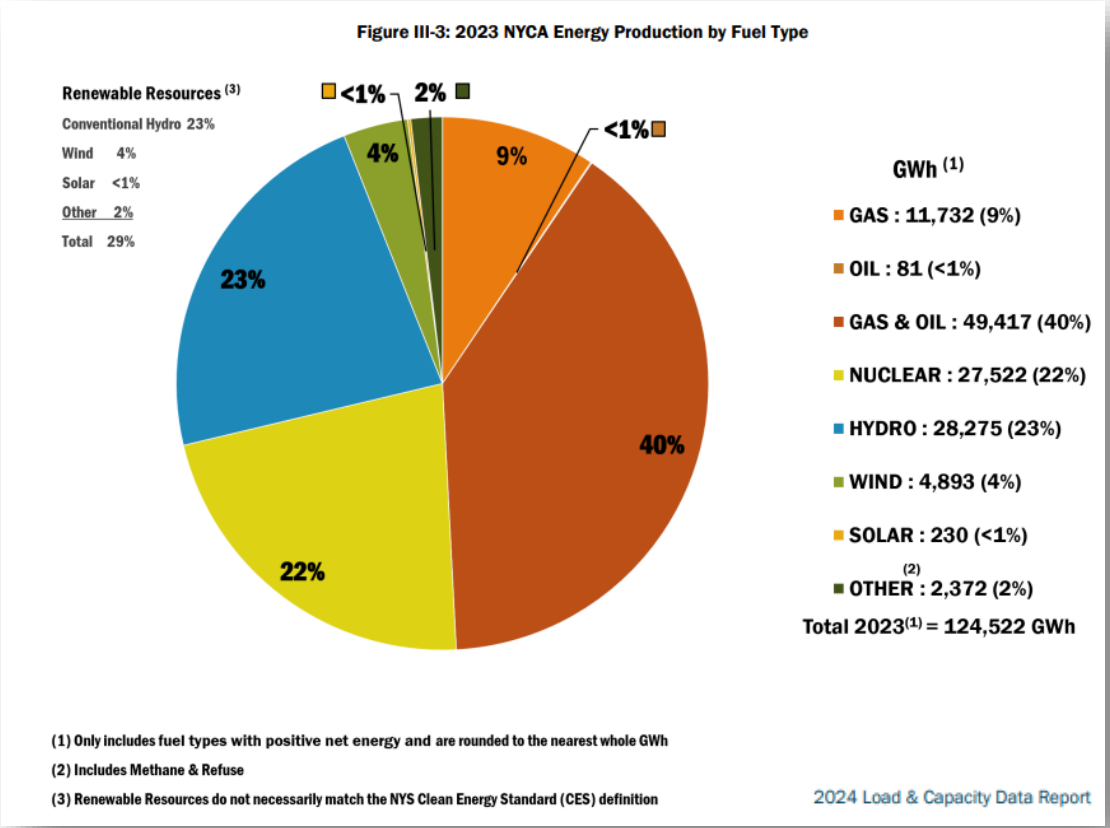
Physical Supply Offers

Defining Physical Suppliers

- **Physical Supplier:**
  - A facility that converts energy sources, e.g., mechanical, solar, etc. into electrical energy for consumption
    - Capable of supplying Energy and/or Ancillary Services
  - May offer into NYISO Day-Ahead & Real-Time Energy Markets
  - Offers contain components which are factored into the software evaluation processes for determining:
    - Schedules & subsequent Clearing Prices

Physical Supplier Fuel Types

- Generators participating in the NYISO markets vary by fuel source



Physical Supplier Unit Types

New York ISO

Baseload Unit	• Do not change their power output quickly • Generally, large hydro, oil/natural gas and nuclear plants
Intermittent Unit	• Resources with varying energy output, such as wind, solar, run-of-river hydroelectric power and other renewable resources
Peaking Unit	• Resources designed to help balance the fluctuating power requirements of the electricity grid
Quick-Start Unit	• Resources able to start and synchronize to grid quickly to respond to electric demands • Units with the ability to respond rapidly to support reliability

Summary of Generator Characteristics

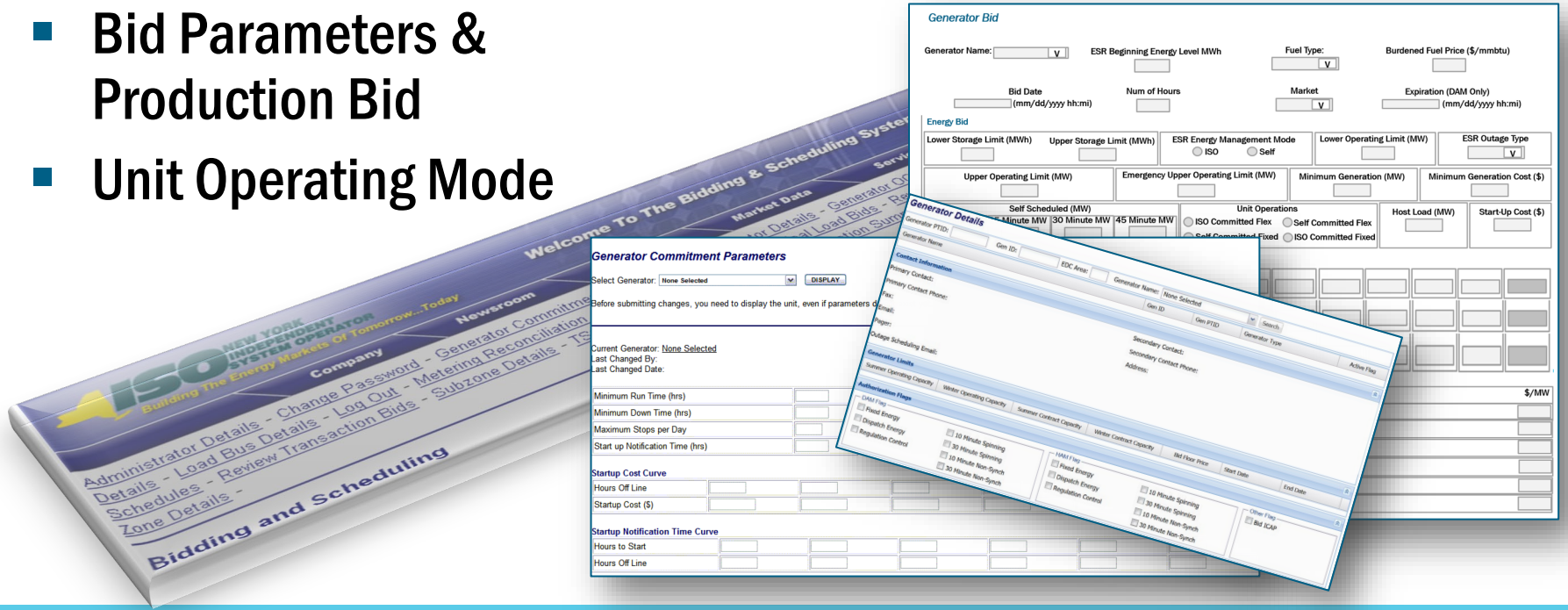
New York ISO

Generator Type	Fuel Types	Dual Fuel	Start-Up Time	Peaker vs. Baseload	Low/Moderate/High Fuel Cost	Fixed vs. Variable Costs
Fossil Fuel Suppliers	Oil Natural Gas	Yes/allows for flexibility when needed	Quick-Start Unit	Peaking Unit	Low Cost when using Natural Gas High cost when using oil	Low Fixed High Variable
Nuclear	BWR Uranium NWR Uranium	No	Long Start-Up Time	Baseload Unit	Moderate	High Fixed Low Variable
Hydro/Pumped Storage	Water	No	Quick-Start Unit	Baseload Unit	Low Cost	High Fixed Low Variable
Renewable Power Resources	Sunlight Wind Water	No	Intermittent Start Time	Non-Peaking Unit	Low Cost	High Fixed Low Variable
Energy Storage	Battery	No	Quick-Start Time	Peaking Unit	Low Cost	High Fixed Low Variable

Supply Offer Composition

Supplier Inputs

- Registration Parameters
- Commitment Parameters
- Bid Parameters & Production Bid
- Unit Operating Mode



Supplier Inputs

New York ISO

- **Registration Parameters**
  - Market Participant Administrators are required to submit certain Generator Limits and Physical Parameters upon registration
  - Require NYISO confirmation to be valid
    - Parameters may require certification and testing
  - Authorization Flags
    - Indicates the unit's capability to bid to provide various services
    - Authorization flags take precedence over bid parameters

Unit Registration Parameters

- MP Administrators will be required to provide the following parameters upon registration:

Parameter	Definition	Unit of Measure
Physical Upper Operating Limit (UOL)	Physical maximum MW level at which the supplier is willing to operate	MW
Physical Lower Operating Limit (LOL)*	Minimum MW level at which the supplier is willing to operate	MW
Normal Response Rate (NRR)	Represents how quickly resource can respond to dispatch instructions from the NYISO	MW/min.
Emergency Response Rate (ERR)	This response rate is used under reserve pickup conditions. ERR must be greater than or equal to the maximum NRR	MW/min.

***Note additional Registration Parameters required if participating in Ancillary Services
*ESR Specific Parameter

Unit Registration Parameters (cont'd)

- MP Administrators will be required to provide the following parameters upon registration:

Parameter	Definition	Unit of Measure
Physical Upper Storage Limit*	Maximum amount of Energy an ESR is physically capable of storing	MWh
Physical Lower Storage Limit*	Minimum amount of Energy an ESR is physically capable of storing	MWh
Round Trip Efficiency*	Ratio of the Energy (in MWh) that can be injected to the grid to the Energy that must be withdrawn	%

***Note additional Registration Parameters required if participating in Ancillary Services
*ESR Specific Parameter

Supplier Inputs

New York ISO

- **Commitment Parameters**
  - Supplier commitment parameters involve non-time varying data
  - Changes made to these parameters go into effect immediately, affecting the consideration of generator bids in both the Day-Ahead and Real Time Markets

Unit Commitment Parameters

New York ISO

- Suppliers will submit the following commitment parameters:

Parameter	Definition	Unit of Measure
Start Up Notification Time	Time that notification must be given to generator in advance of being asked to startup. Value indicates generator will be at bid minimum generation, synchronized, and ready to receive base points	# of Hours
Start Up Cost Curve	Cost associated with unit coming online, in relationship to the amount of time unit was off-line	$
Maximum Stops per Day	This is the maximum number of times that a unit may be stopped and then started again in a single day. This number must be greater than or equal to one and less than 10	# of Times
Minimum Run Time	Represents the minimum number of hours a supplier unit must run once started by NYISO	# of Hours
Minimum Down Time	This is the minimum amount of time that the unit, once stopped, must remain down before being committed again	# of Hours

***Note additional Registration Parameters required if participating in Ancillary Services

*ESR Specific Parameter

Supplier Inputs

- **Bid Parameters and Production Bid**
  - Bid Parameters:
    - Market
    - Duration
    - Expiration Date
    - Operating Limits
    - Minimum Generation Requirements

Bid Parameters

- Suppliers will submit the following bid parameters:

Parameter	Definition	Unit of Measure
Market	Identifies which market, Day Ahead or Real Time, the bid parameters apply to and should be evaluated for	DAM RT Both
Number of Hours (Duration)	Indicates the number of hours a unit wants to run	# of Hours
Expiration Date	The field is optional for the DAM. Bids without an expiration entered do not expire and will be considered as available for a SRE run	mm/dd/yyyy hh:mm
Normal Upper Operating Limit (UOLN)	Indicates how many MWs a supplier expects to be able to be able to inject onto grid under normal conditions	MW
Emergency Upper Operating Limit (UOLE)	Maximum MW level at which the supplier is willing to operate under emergency conditions	MW

***Note additional Registration Parameters required if participating in Ancillary Services
*ESR Specific Parameter

Bid Parameters (cont'd)

- Suppliers will submit the following bid parameters:

Parameter	Definition	Unit of Measure
Upper Storage Limit*	Maximum amount of Energy an ESR is physically capable of storing	MWh
Lower Storage Limit*	Minimum amount of Energy an ESR is physically capable of storing	MWh
ESR Outage Type*	Reporting mechanism for ESR outage that identifies type of outage experienced, if applicable	Normal (N) Planned Outage (P) Forced Outage (F)
Minimum Generation (Min Gen) *Lower Operating Limit (LOL)* for ESRs*	Minimum MW level at which the supplier is willing to operate	MW
Minimum Generation Cost	Cost to operate at unit's minimum generation level	$

***Note additional Registration Parameters required if participating in Ancillary Services

*ESR Specific Parameter

Bid Parameters (cont'd)

- Suppliers will submit the following bid parameters:

Parameter	Definition	Unit of Measure
Beginning Energy Level*	Total amount of Energy stored by the Resource at the beginning of a market interval	MWh
Energy Level Management Modes*	Parameter that indicates how Energy Level Constraints will be managed	ISO-Managed Self-Managed
Opportunity Costs	Economic parameter to be utilized by NYISO's Market Mitigation and Analysis (MMA) team in Reference Levels	$/MW

***Note additional Registration Parameters required if participating in Ancillary Services
*ESR Specific Parameter

Supplier Inputs

- **Bid Parameters and Production Bid**
  - Production Bid:
    - Consists of Incremental Energy $/MWh Offers
      - Up to 11 Incremental Offer Blocks, monotonically increasing
      - Ranging from unit's Lower Operating Limit to Upper Operating Limit
    - Unit Reference Levels implemented to restrict maximum bid value
      - Physical parameters, including time & dollar-based references established for each Generator
    - Bid Restriction Offer Cap in effect
      - Restricted to the higher of $1,000/MWh or unit's verified cost-based offer
        - » If applicable may offer as high as $2,000/MWh
      - Restricted to no lower than -$1,000/MWh

Supplier Inputs

Unit Operating Mode

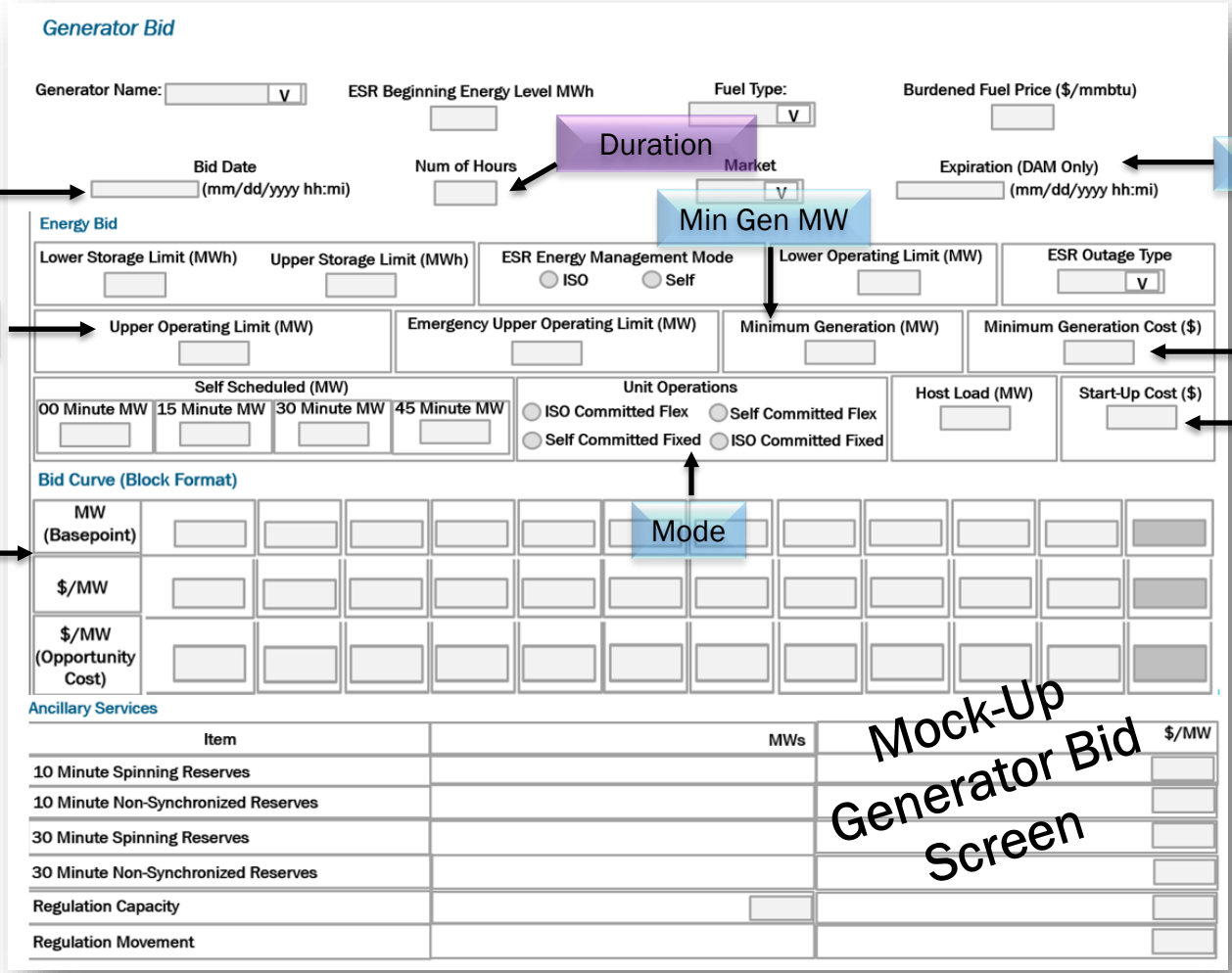
- Suppliers may bid in one of four modes
  - ISO-Committed Flexible
  - ISO-Committed Fixed
  - Self-Committed Flexible
  - Self-Committed Fixed
- Each mode indicates a supplier's economic evaluation requirements and its operating flexibility

Supplier Inputs

- Unit Operating Mode (cont'd)

Economics	MWs
– ISO Committed • Economically Selected – Self Committed • Price Taker	– Fixed • Fixed Output/Operating Levels • No Change to in-hour Schedule – Flexible • Flexible Output • Following NYISO Base Point Fluctuation

- ISO Committed Flex
- Self Committed Flex
- Self Committed Fixed
- ISO Committed Fixed



Bid Date/Hour

Duration

Expiration Date

Min Gen MW

UOLN

Min Gen Cost

Start Up Cost

Mode

Energy Offer

Mock-Up Generator Bid Screen

Let's Review

TRUE or FALSE: Supplier energy offers contain registration parameters, commitment parameters, bid parameters & production bid, as well as unit operating mode.

TRUE

FALSE

Market-Based Ancillary Service Products

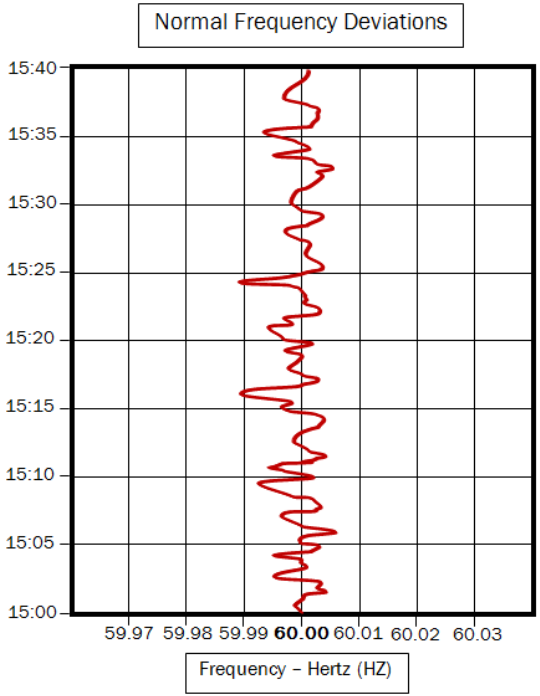
Defining Ancillary Services

- **Ancillary Services**
  - Support the transmission of energy from resources to loads, while maintaining reliable operation of the NYS Power System
  - NYISO is responsible for directing the actions of Generation Resources and other facilities that provide Ancillary Services to the NYISO
  - All Ancillary Service providers must be scheduled by the NYISO

Market-Based Ancillary Services

- **Market-Based**
  - Some Ancillary Services are provided at market-based prices, while others, due to the nature of the service, are provided at embedded cost-based prices
  - NYISO Market-Based Ancillary Services include:
    - Regulation and Frequency Response Service
    - Operating Reserve Service

Market-Based Ancillary Services



- **Regulation and Frequency Response Service**
  - Necessary for the continuous balancing of resources with load, and to assist in maintain scheduled Interconnection frequency at 60 Hz
  - Accomplished by committing Generators and Demand Side Resources whose output or demand is raised or lowered
  - NYISO offers regulation and frequency response services to serve Load within NYCA

Market-Based Ancillary Services

- **Regulation Service Bid**
  - NYISO selects Regulation Service in the Day-Ahead and Real-Time Market from qualified Resources that bid to provide Regulation Service
  - Bid information includes:
    - Flexible Unit Operating Mode
    - Static bid parameters
    - Production bid parameters

Regulation Service Bid

- Static bid parameters:

Parameter	Definition	Unit of Measure
Regulation Capacity Response Rate (RCRR)	Represents how quickly resource can respond to dispatch instructions from the NYISO for the purpose of providing Regulation Service	MW/min
Regulation Movement Response Rate (RMRR)	Represents how quickly resource can respond to dispatch instructions from the NYISO for the purpose of providing Regulation Movement. Defaults to RCRR/10 if RMRR not provided	MW/6 seconds

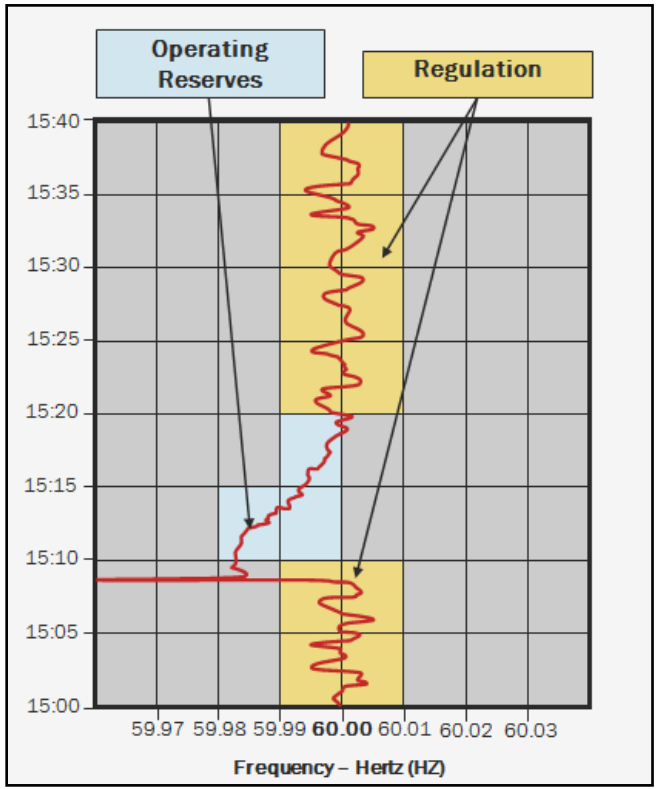
Regulation Service Bid

New York ISO

- Production bid parameters:

Parameter	Definition	Unit of Measure
Regulation Capacity Bid MW	Regulation Capacity available in one direction. Indicates the ability to regulate/move both up and down by the total MWs bid	MW
Regulation Capacity Price	Cost per MW of generation bid to respond to AGC signals	$/MW
Regulation Movement Price	Cost per MW of regulation movement instructed by AGC	$/MW

Market-Based Ancillary Services



- **Operating Reserve Service**
  - Available Backup Generation and/or Demand Response in the event of a Real Time System Contingency
  - For NYISO to respond timely, the reserves must be available from Generators and/or Demand Side Resources located within NYCA and in specific regions

Market-Based Ancillary Services

- **Operating Reserve Service Bid**
  - Resources capable of providing Operating Reserves in the Day-Ahead commitment may submit Availability Bids for each hour of the upcoming day
  - Bid information includes:
    - Flexible Unit Operating Mode
    - Upper Operating Limit
      - Normal
      - Emergency
    - Emergency Response Rate
    - Reserve Availability Bid

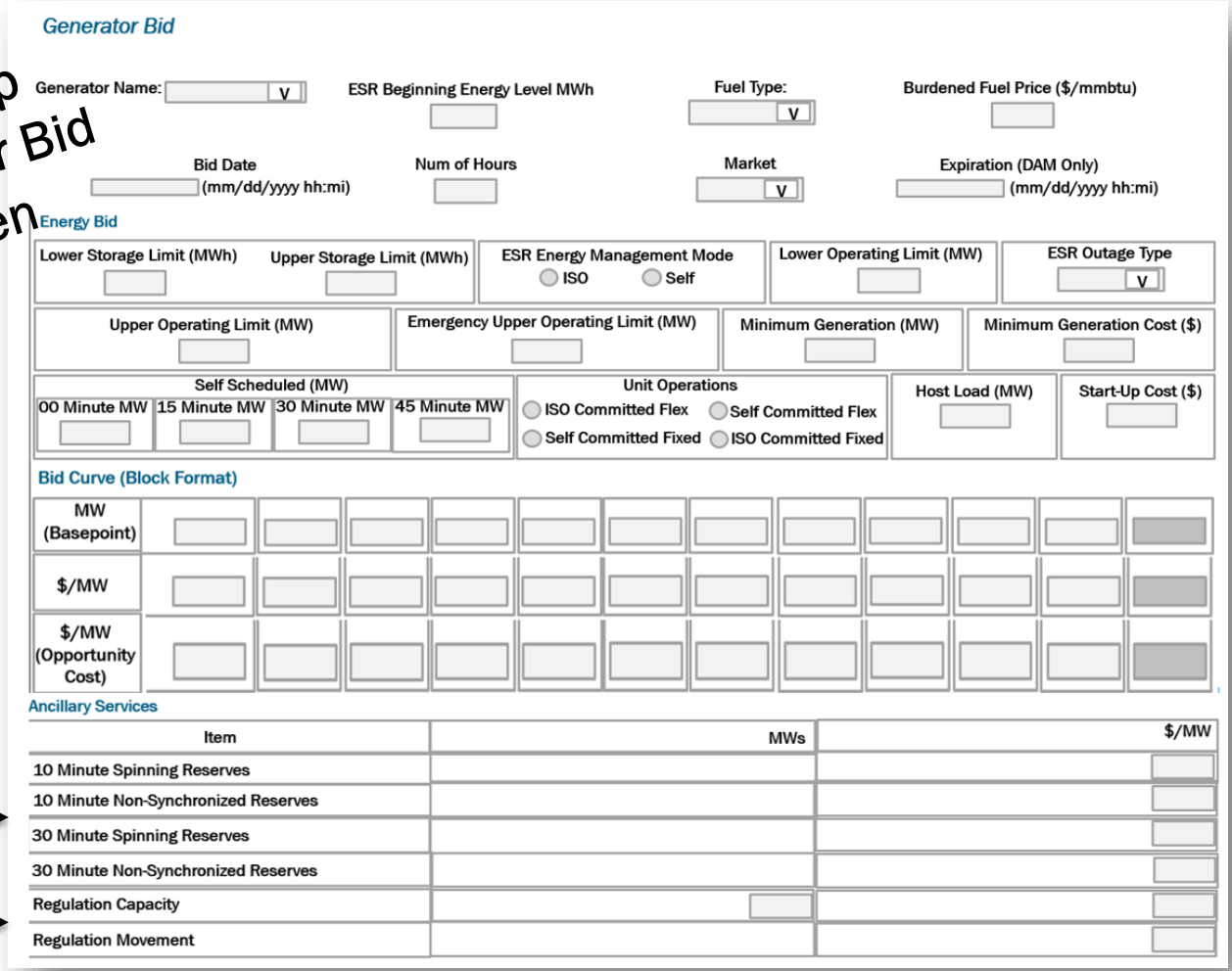
Operating Reserve Service Bid

New York ISO

- Static and production bid parameters:

Parameter	Definition	Unit of Measure
Normal Upper Operating Limit (UOLN)	Indicates how many MWs a supplier expects to be able to be able to inject onto grid under normal conditions	MW
Emergency Upper Operating Limit (UOLE)	Maximum MW level at which the supplier is willing to operate under emergency conditions	MW
Emergency Response Rate (ERR)	This response rate is used under reserve pickup conditions. ERR must be greater than or equal to the maximum Normal Response Rate	MW/min.
Reserve Availability Bid	Cost per MW of generation bid to hold MWs in reserve as backup generation for NYISO	$/MW

Mock-Up Generator Bid Screen



Generator Bid

Generator Name: V | ESR Beginning Energy Level MWh | Fuel Type: V | Burdened Fuel Price ($/mmbtu)

Bid Date (mm/dd/yyyy hh:mi) | Num of Hours | Market V | Expiration (DAM Only) (mm/dd/yyyy hh:mi)

Energy Bid

Lower Storage Limit (MWh) | Upper Storage Limit (MWh) | ESR Energy Management Mode: ISO / Self | Lower Operating Limit (MW) | ESR Outage Type V

Upper Operating Limit (MW) | Emergency Upper Operating Limit (MW) | Minimum Generation (MW) | Minimum Generation Cost ($)

Self Scheduled (MW): 00 Minute MW | 15 Minute MW | 30 Minute MW | 45 Minute MW

Unit Operations: ISO Committed Flex / Self Committed Flex / Self Committed Fixed / ISO Committed Fixed

Host Load (MW) | Start-Up Cost ($)

Bid Curve (Block Format)

MW (Basepoint)												
$/MW												
$/MW (Opportunity Cost)												

Ancillary Services

Item	MWs	$/MW
10 Minute Spinning Reserves		
10 Minute Non-Synchronized Reserves		
30 Minute Spinning Reserves		
30 Minute Non-Synchronized Reserves		
Regulation Capacity		
Regulation Movement		

Reserves Bid Information →

Regulation Bid Information →

Let's Review

Which two NYISO Market-Based Ancillary Services are inputs?

- Black Start Service
  Energy Imbalance
- Operating Reserve Service
  Voltage Support Service
- Regulation and Frequency Response Service
  Energy Imbalance
- Regulation and Frequency Response Service
  Operation Reserve Service

Economic-Based Demand Response Inputs

Defining Demand Side Resources

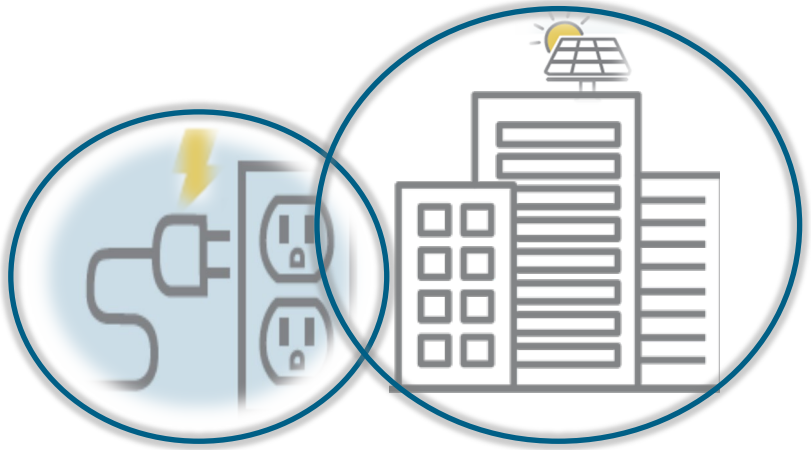
- Demand Response (DR) is the act of reducing energy consumption from the grid at the direction of the NYISO
- Demand Response is provided by Demand Side Resources, which are:
  - Electricity consumers located in NYS that enroll to take part in a specific DR program
  - Capable of reducing the power consumed from the grid for discrete periods of time as directed by the NYISO

Defining Demand Side Resources

- Examples of Demand Side Resources:
  - Industrial companies
  - Commercial buildings
  - Big box stores
  - Small retail stores
  - Hospitals
  - Colleges/Universities

Defining Demand Side Resources

- Consumption Reduction Methods:
  - Decreasing power consumption in the facility (Interruptible loads)
  - Using a qualified Local Generator to supply part of the resource's load
  - Using both load curtailment and a Local Generator



Economic-Based Demand Response

Economic-Based Programs – Resource determines when to participate (through supply offers)

- Purpose: Load reduction, competing with generation, is scheduled by NYISO based upon economic offers
  - Day-Ahead Demand Response Program (DADRP)
  - Demand-Side Ancillary Service Program (DSASP)

Demand Side Resource Offer Composition

Demand Side Resource Inputs

- **Day-Ahead Demand Response Program (DADRP)**
  - Day-Ahead Generator bid is placed for amount of load curtailment desired to be scheduled in the Day-Ahead Market
  - Bid includes:
    - Resource Operating Mode
    - Resource Commitment Parameters
    - Resource Production Bid

DADRP Commitment Parameters

- Resource will submit the following commitment parameters:

Parameter	Definition	Unit of Measure
Minimum Run Time	Represents the minimum number of hours a resource must run once started by NYISO; corresponds to Demand Side Resource's minimum shut down time	# of Hours
Start Up Cost Curve	Cost associated with unit coming online. For Demand Side Resource this value corresponds to curtailment initiation costs. First and only point on curve	$

DADRP Production Bid

- Resource will submit the following production bid parameters:

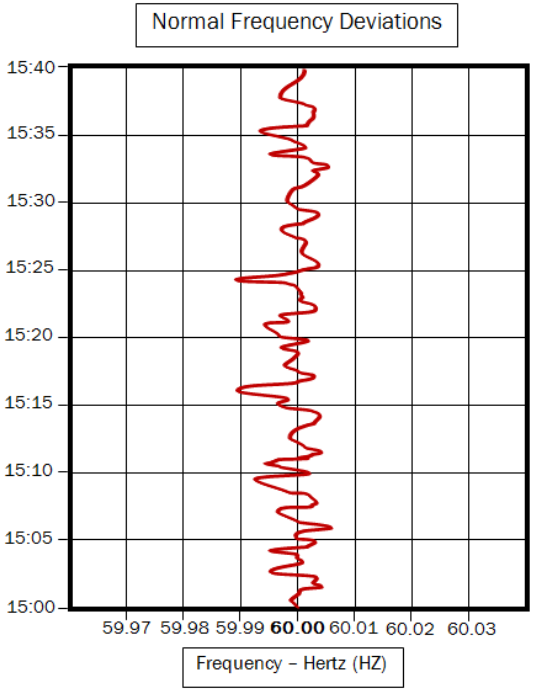
Parameter	Definition	Unit of Measure
Normal Upper Operating Limit (UOLN)	Corresponds to maximum amount of curtailable load being offered	MW
Minimum Generation	Minimum MW level at which the resource is willing to operate	MW
Minimum Generation Cost	Cost to operate at resource's minimum generation level	$
Incremental Bid Curve *(includes minimum offer floor)*	Series of monotonically increasing steps that indicate the quantities of Energy for a given price that a resource is willing to supply to the NYISO	$/MWh

Demand Side Resource Inputs

- **Demand Side Ancillary Services Program (DSASP)**
  - Allows Demand Side Resources to participate in Market-Based Ancillary Services
    - Regulation and Frequency Response Service
      - DSASP Resources will be committed to raise or lower demand using Automatic Generation Control (AGC)
    - Operating Reserve Service
      - DSASP Resources will provide demand response when economics of the energy bid indicate willingness to curtail load

***Must indicate *flexible* unit operating mode

DSASP Regulation Service Inputs



DSASP Regulation Service Bid

- Static bid parameters:

Parameter	Definition	Unit of Measure
Regulation Capacity Response Rate (RCRR)	Represents how quickly resource can respond to dispatch instructions from the NYISO for the purpose of providing Regulation Service	MW/min
Regulation Movement Response Rate (RMRR)	Represents how quickly resource can respond to dispatch instructions from the NYISO for the purpose of providing Regulation Movement. Defaults to RCRR/10 if RMRR not provided	MW/6 seconds

DSASP Regulation Service Bid

- Resource will submit the following commitment and bid parameters:

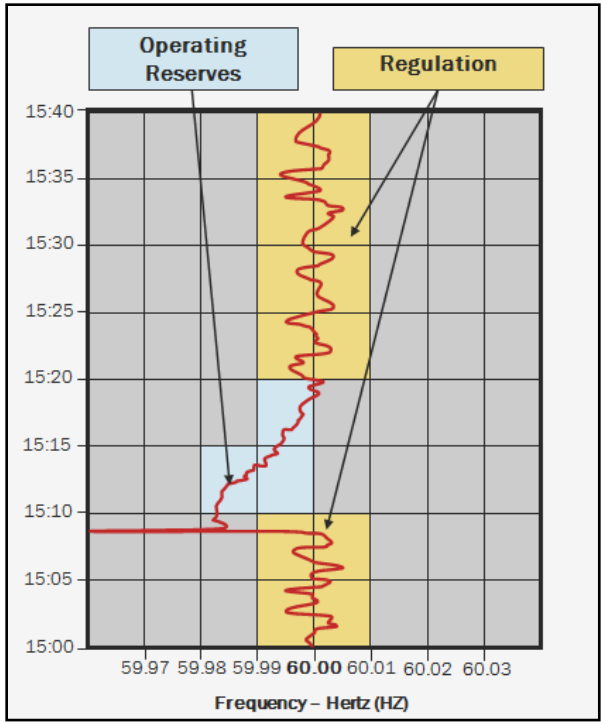
Parameter	Definition	Unit of Measure
Normal Upper Operating Limit (UOLN)	Indicates how many MWs a supplier expects to be able to be able to inject onto grid under normal conditions	MW
Emergency Upper Operating Limit (UOLE)	Maximum MW level at which the supplier is willing to operate under emergency conditions	MW
Minimum Generation	Minimum MW level at which the supplier is willing to operate	MW
Minimum Generation Cost	Minimum MW level at which the supplier is willing to operate	$
Start Up Cost Curve	Cost associated with unit coming online. For Demand Side Resource this value corresponds to curtailment initiation costs. First and only point on curve	$

DSASP Regulation Service Bid

- Resource will submit the following bid parameters:

Parameter	Definition	Unit of Measure
Incremental Bid Curve *(includes minimum offer floor)*	Series of monotonically increasing steps that indicate the quantities of Energy for a given price that a resource is willing to supply to the NYISO	$/MW
Regulation Capacity Bid MW	Regulation Capacity available in one direction. Indicates the ability to regulate/move both up and down by the total MWs bid	MW
Regulation Capacity Price	Cost per MW of generation bid to respond to AGC signals	$/MW
Regulation Movement Price	Cost per MW of regulation movement instructed by AGC	$/MW

DSASP Reserve Service Inputs



DSASP Reserve Service Bid

- Static bid parameter:

Parameter	Definition	Unit of Measure
Emergency Response Rate (ERR)	This response rate is used under reserve pickup conditions. ERR must be greater than or equal to the maximum Normal Response Rate	MW/min.

DSASP Reserve Service Bid

- Resource will submit the following commitment and bid parameters:

Parameter	Definition	Unit of Measure
Start Up Cost Curve	Cost associated with unit coming online. For Demand Side Resource this value corresponds to curtailment initiation costs. First and only point on curve	$
Normal Upper Operating Limit (UOLN)	Indicates how many MWs a supplier expects to be able to be able to inject onto grid under normal conditions	MW
Emergency Upper Operating Limit (UOLE)	Maximum MW level at which the supplier is willing to operate under emergency conditions	MW
Minimum Generation	Minimum MW level at which the supplier is willing to operate	MW
Minimum Generation Cost	Minimum MW level at which the supplier is willing to operate	$

DSASP Reserve Service Bid

- Resource will submit the following bid parameters:

Parameter	Definition	Unit of Measure
Incremental Bid Curve *(includes minimum offer floor)*	Series of monotonically increasing steps that indicate the quantities of Energy for a given price that a resource is willing to supply to the NYISO	$/MW
Reserve Availability Bid	Cost per MW of generation bid to hold MWs in reserve as backup generation for NYISO	$/MW

Energy Market Transactions

Defining Energy Market Transactions

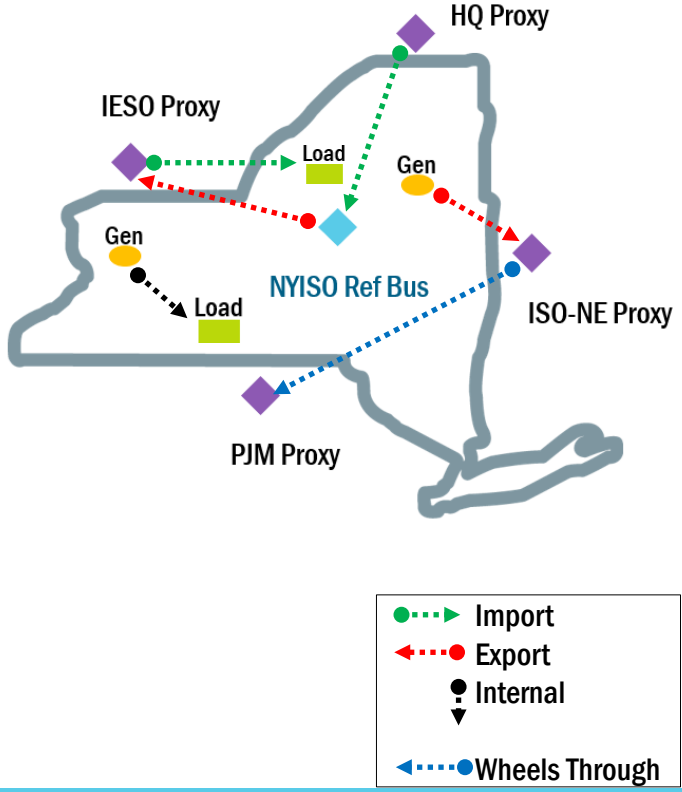
- **Transactions:**
  - Provide opportunities to buy and/or sell wholesale power with neighboring control areas
    - Source (*Point of Injection*) and Sink points (*Point of Withdrawal*) have important role…
      - Points distinguish transaction type
      - Points indicate bid information required for economic evaluation process
    - Contract owner referred to as Financially Responsible Party (FRP)
      - Initially creates contract in NYISO Market Information System (MIS)/Joint Energy Scheduling System (JESS)
      - Responsible for charges associated with transaction

Internal vs. External Transaction Types

- **Internal Transaction:**
  - Both Generator and Load are located within the NYCA
    - Internal Bilateral
- **External Transaction:**
  - Either Point of Injection (*POI*) or Point of Withdrawal (*POW*) **or** both are located outside the NYCA
    - Exports
    - Imports
    - Wheels Through

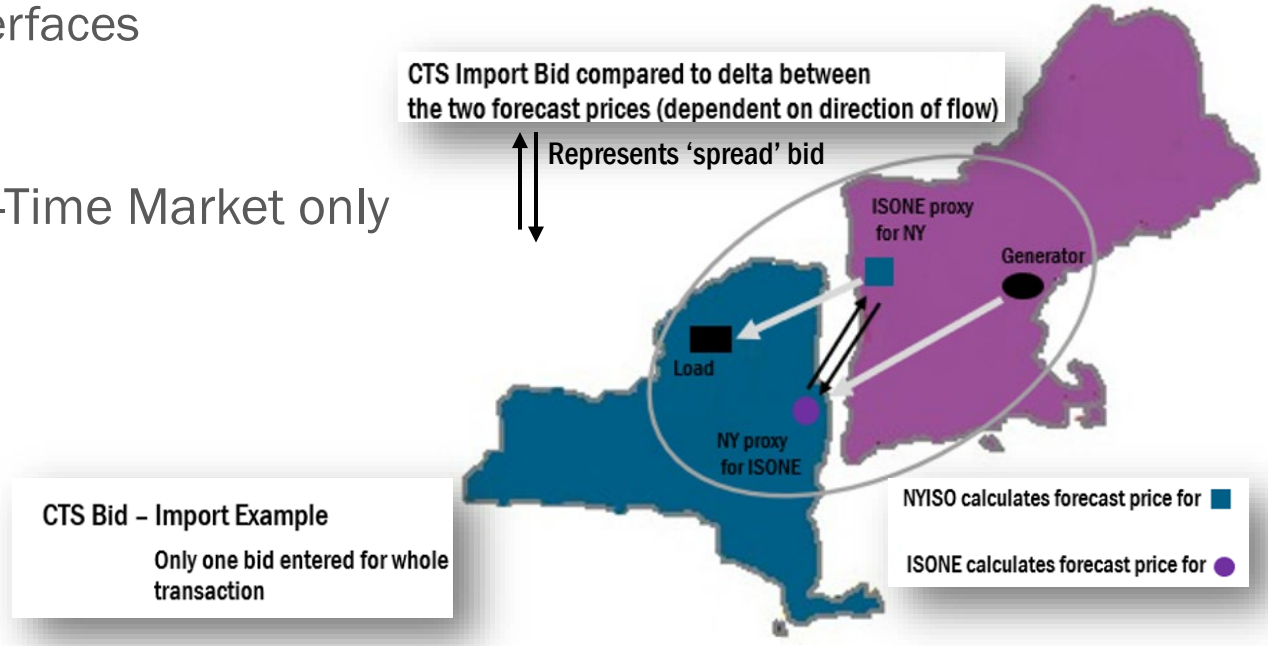
Energy Market Transaction Categories

- **LBMP Transactions**
  - Buys from/sells to the NYISO Energy Market
  - Two Types:
    - Imports
    - Exports
- **Bilateral Transactions**
  - Direct energy contract between parties
  - Price of energy negotiated between buyer and seller
  - Four Types:
    - Internal Bilateral
    - Imports
    - Exports
    - Wheels Through



Energy Market Transaction Categories cont'd

- **Coordinated Transaction Scheduling (CTS)**
  - Mechanism to bid external transactions at CTS enabled interfaces
    - NY-PJM
    - NY-ISONE
  - Applicable to Real-Time Market only
  - Two Types:
    - Imports
    - Exports



Energy Market Transaction Inputs

New York ISO

Transaction Type	Bid Type
Internal Bilateral	• *Bid MW* only • Scheduled automatically to serve internal load
Import	• *Bid $/MW* up to 11-point Bid curve or *Spread Bid $/MW* if CTS • Represents minimum FRP is willing to be paid for importing power • Evaluated against Proxy (Source) LBMP
Export	• *Bid $/MW* up to 11-point Bid curve or *Spread Bid $/MW* if CTS • Represents maximum FRP is willing to pay for purchasing and exporting power • Evaluated against Proxy (Sink) LBMP
Wheels Through	• *Decremental Bid* • Represents the congestion cost the FRP is willing to pay for wheeling power

****Transactions must bid for minimum 1 hour****

Virtual Trading

Defining Virtual Trading

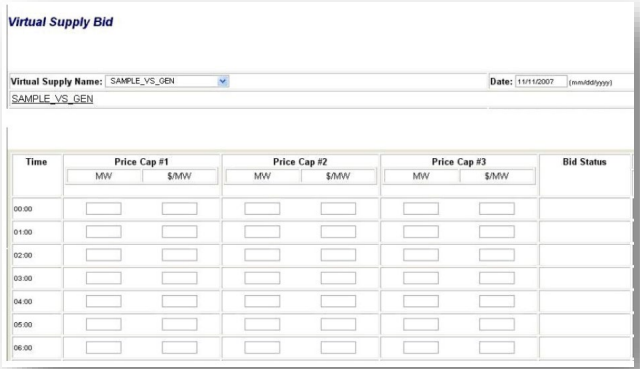
- **Virtual Trading:**
  - The submission of bids for the financial purchase or sale of energy, rather than or in addition to the physical delivery or purchase of energy in NYISO-administered energy markets
    - Financial transactions only, having no effect on real time physical energy consumption and does not comprise physical commitment of energy resources for system reliability
    - Impacts Day-Ahead Market LBMP calculation

      Bid Load = [Physical Load + Virtual Load – Virtual Supply]

      - Virtual bids can set price

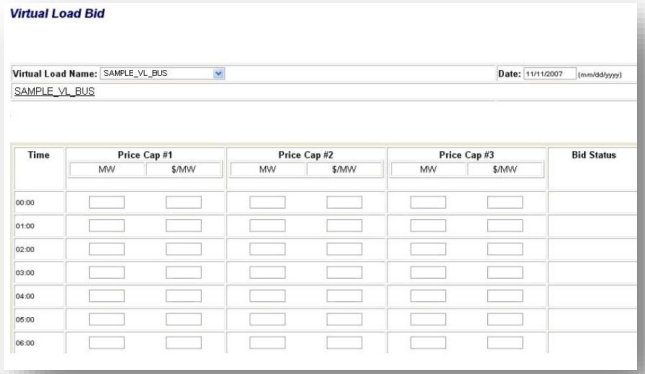
Virtual Trading Inputs

- **Virtual Supplier Bids**
  - Virtual Supplier offers to ***sell*** *in Day-Ahead Market* and automatically ***buys*** *back same MWs in Real-Time Market*
  - Bidding is done in DAM only
    - Offered as zonal price-capped blocks of energy
      - Includes MW and $/MW values
      - Up to three price-capped blocks may be offered, per zone, for each hour of the day



Virtual Trading Inputs

- **Virtual Load Bids**
  - Virtual Load bids to ***buy*** *in Day-Ahead Market* and automatically ***sells*** *back same MWs in Real-Time Market*
  - Bidding is done in DAM only
    - Offered as zonal price-capped blocks of energy
      - Includes MW and $/MW values
      - Up to three price-capped blocks may be offered, per zone, for each hour of the day

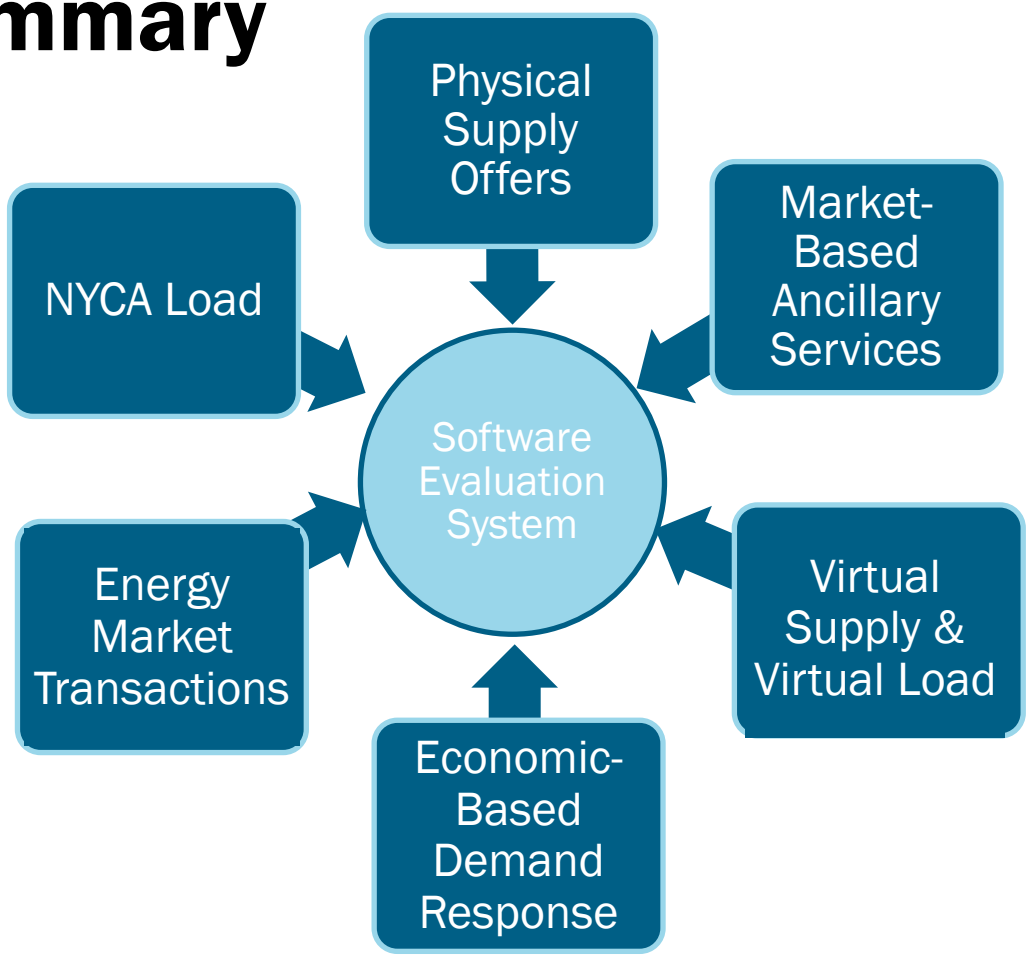

Virtual Load Bid

Virtual Load Name: SAMPLE_VL_BUS Date: 11/11/2007 (mm/dd/yyyy)

SAMPLE_VL_BUS

Time	Price Cap #1		Price Cap #2		Price Cap #3		Bid Status
	MW	$/MW	MW	$/MW	MW	$/MW	
00:00							
01:00							
02:00							
03:00							
04:00							
05:00							
06:00							

Inputs Summary



Let's Review

New York ISO

Draw a line from each of the inputs listed to the applicable *purpose* for its inclusion as an input to LBMP:

Physical Supply Offers	Evaluated and potentially scheduled to meet system demand and/or ancillary service requirements alongside traditional generators
Market-Based Ancillary Services	No effect on physical consumption or physical commitment of resources; however, bids are factored into the determination of day-ahead market energy prices
Virtual Supply & Virtual Load	Determines the total amount of energy to be scheduled and subsequently injected onto NYCA grid for a given point in time
Economic-Based Demand Response	Contributes to NYCA system supply and/or demand by way of contracts between private entities and/or neighboring control areas
Energy Market Transactions	Physical parameters and associated costs that are submitted in an effort to aid in meeting system demand and NYCA reliability requirements
NYCA Load	Provisions used to meet certain reliability requirements by scheduling, and in some instances dispatching, qualified and capable system resources

Additional Resources

- Tariffs - OATT & MST
- Day Ahead Scheduling Manual
- Transmission and Dispatching Operations Manual
- Ancillary Service Manual
- Day-Ahead Demand Response Manual
- ESR e-Learning Module
- Accounting & Billing Manual
- Market Participant User's Guide