

# NYISO Energy Marketplace

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#### New York Market Orientation Course (NYMOC) Webinar

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# **Energy Marketplace Objectives**

#### Market Features and Function

- Identify five features of the NYISO Energy Market
- Understand the bidding and scheduling process as it relates to the Two Settlement System

#### Load Forecasting and Bidding

- Describe the LSE and NYISO load forecasting process
- Identify the different load bidding and purchasing options



# **Objectives – cont'd**

# Supply Offers

- Describe the different offer parameters on a generator offer
- Distinguish between the different generator operating modes

### Commitment, Dispatch and Market Timeline

- Identify the inputs to the Day-Ahead and Real-Time commitment and dispatch process.
- Identify the key points of the DAM and RT Market timelines



# **Energy Market Features**

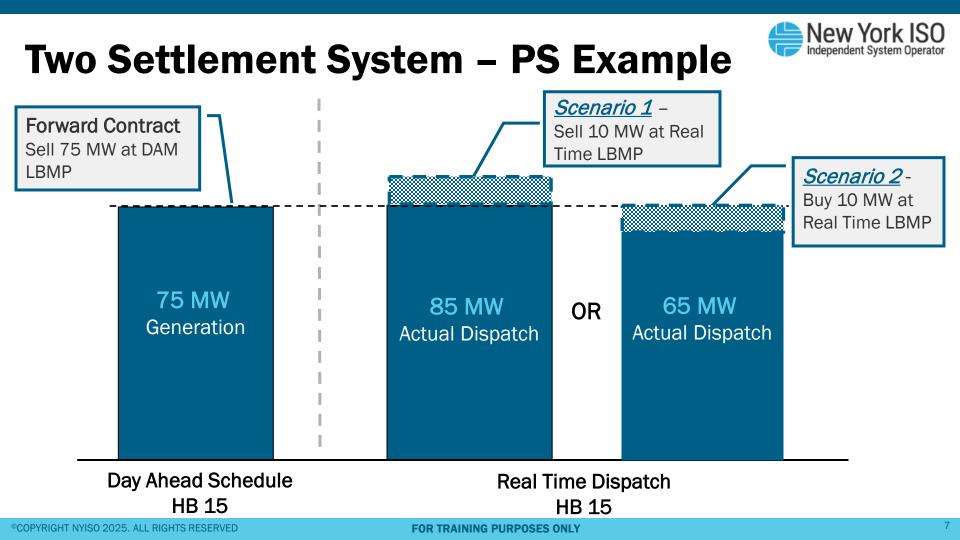
- Maintains reliability rules while satisfying system constraints
- Administers purchase/sale of electrical energy at the wholesale level
- Evaluates competitive bids/offers
- Provides load and generator schedules
- Produces prices for settlement mechanism

# **Two Settlement System**



### **Two Settlement System Day Ahead vs. Real Time Market**

Day Ahead Market	Real Time Market
Buy and Sell Energy the day prior to actual consumption or production	Buy and Sell the difference during the consumption day
DAM Settlement based upon schedules	<ul> <li>Real Time Market balances DAM Schedule to Actual Usage</li> </ul>
Financially binding	Balancing Market





#### **Two Settlement System – PS Example**

Power Supplier Selling into Day Ahead Market (DAM)					
Hour Beginning (HB)	DAM MWh	DAM LBMP \$/MWh	DAM Settlement \$		
HB 15	75 MWh	\$10/MWh	\$750		
Total DAM \$ HB 15					



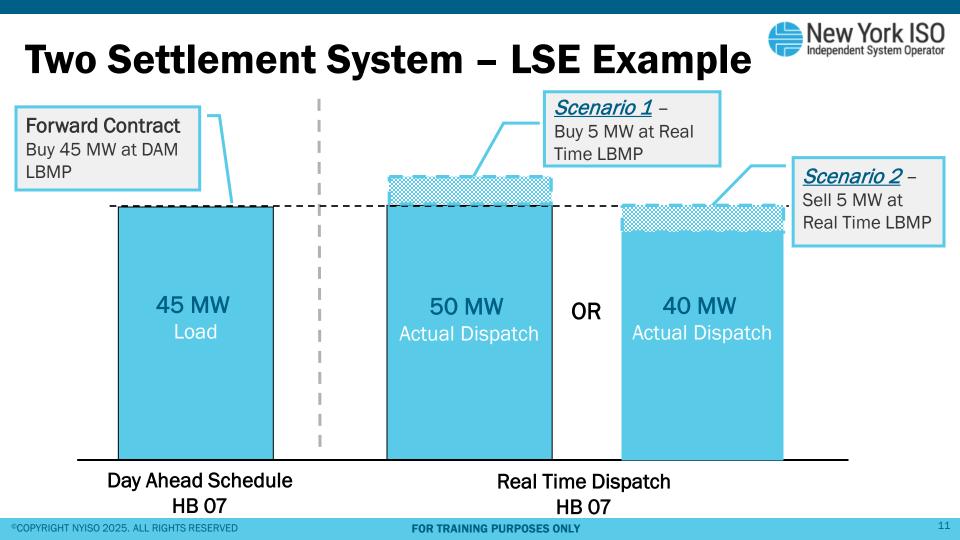
#### **Two Settlement System – PS Example**

Power Supplier Selling into Real Time Market (Balancing)					
НВ	DAM MWh	RT MWh <i>(RT – DAM)</i>	RT LBMP \$/MWh	RT Settlement \$	
HB 15 <i>Scenario 1</i>	75 MWh	85 MWh <i>(10 MWh)</i>	\$20/MWh	\$200	
HB 15 <i>Scenario 2</i>	75 MWh	65 MWh <i>(- 10 MWh)</i>	\$20/MWh	- \$200	
HB 15 Scenario *3*	0 MWh	75 MWh	\$20/MWh	\$1500	



#### **Two Settlement System – PS Example**

Total Power Supplier Settlement for HB 15						
Scenario	DAM \$	RT \$	Total \$ (DAM \$ + RT \$)			
Scenario 1	\$750	\$200	\$950			
Scenario 2	\$750	- \$200	\$550			
Scenario 3	\$O	\$1500	\$1500			





#### **Two Settlement System – LSE Example**

Power Supplier Selling into Day Ahead Market (DAM)					
Hour Beginning (HB)	DAM MWh	DAM LBMP \$/MWh	DAM Settlement \$		
HB 07	- 45 MWh	\$30/MWh	-\$1350		
		Total DAM \$ HB 07			



#### **Two Settlement System – LSE Example**

Load Serving E	Load Serving Entity Buying from Real Time Market (Balancing)					
НВ	DAM MWh	RT MWh <i>(RT – DAM)</i>	RT LBMP \$/MWh	RT Settlement \$		
HB 07 <i>Scenario 1</i>	- 45 MWh	- 50 MWh <i>(- 5 MWh)</i>	\$50/MWh	- \$250		
HB 07 <i>Scenario 2</i>	- 45 MWh	- 40 MWh <i>(5 MWh)</i>	\$50/MWh	\$250		
HB 07 Scenario *3*	0 MWh	- 45 MWh	\$50/MWh	- \$2250		



#### **Two Settlement System – LSE Example**

Total Load Serving Entity Settlement for HB 07						
Scenario	DAM \$	RT \$	Total \$ (DAM \$ + RT \$)			
Scenario 1	- \$1350	- \$250	- \$1600			
Scenario 2	- \$1350	\$250	- \$1100			
Scenario 3	\$O	- \$2250	- \$2250			

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FOR TRAINING PURPOSES ONLY



### Load Forecasting

- NYISO Load Forecast
- LSE Load Forecast
- Load Bidding and Purchasing
- Results



#### NYISO Load Forecasting

- NYISO Forecast used for Scheduling/Reliability
  - Historical Data
  - Weather
  - TO Forecast Submittals
  - Zonal basis, then summed
- Posted by 8 a.m. Each Day
  - 6 Days Provided



#### LSE Load Forecast

- Used for Initial Billing Purposes
- Provided 7 Days in Advance
- Can be Updated
  - After DAM closes up until 12:00 Noon the day after operating day



#### Monitoring LSE Load Forecasting

- NYISO Credit Department
  - Monitors LSE Load Forecasting 3x/Month
  - Benchmarks against:
    - Forecast vs. Actual Historical Load
    - Forecast vs. Monthly UCAP Requirements
  - NYISO Credit Dept. may contact LSE if under forecasting is observed
    - Improve LSE load forecasting accuracy
    - Reconcile variations



#### Load Bidding and Purchasing

- Load Serving Entities (LSE) bid to procure energy from NYISO
  - Fixed Bids
  - Price Capped Load Bids
- Real Time Energy Purchase (No Bid entered)

Load Bids entered in the DAM only



- Bids Submitted to Market Information System (MIS)
  - Interface between NYISO and Market Participants
  - Bid, Update, and View

Building The Energy Markets Of TomorrowToday	Welcome To The Bidding & Scheduling System	Logout
Company Newsroom	Products Market Data Services	Documents Committees
Details - Load Bus Details - Log Out - Metering Reconciliation	<u>ment Parameters</u> - <u>Generator Details</u> - <u>Generator OOM</u> - <u>Generator</u> - <u>Organization Details</u> - <u>Phγsical Load Bids</u> - <u>Review Generator Bi</u> /NTAC Rates - <u>Tie Details</u> - <u>Transaction Summary</u> - <u>User Details</u> -	ids - <u>Review Generator Forecasted</u>
Bidding and Scheduling		



- Fixed Bids
  - Load purchases forecasted MWs in DAM
  - Regardless of price

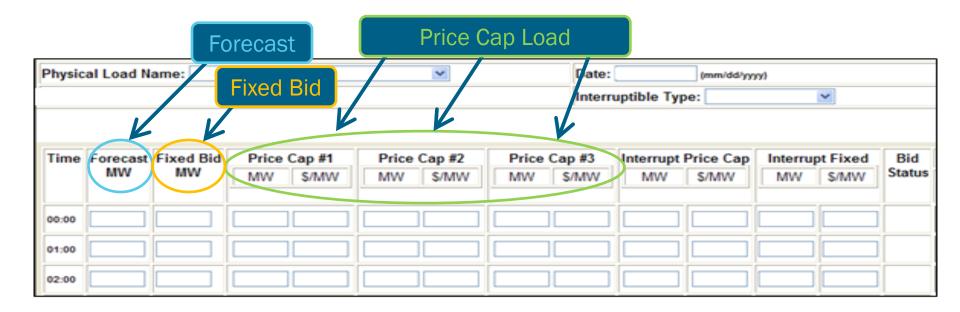


- Price Capped Load Bids
  - \$/MW Price Load is willing to pay
  - 3 Potential Increments
  - Increments are Increasing
    - Load Forecasts 100 MW
    - Bids: 50MW @\$25/MW, 30MW @\$45/MW, & 20MW @\$60/MW



- Combination of Fixed and Price Capped
  - Cannot exceed forecast MW
- Real Time Energy Purchase
  - Done automatically by NYISO







#### Load Bid Results

- Bid Status posted in MIS
  - Validation Passed
    - Data acceptable---no changes necessary
  - Validation Failed
    - Data will require changes
  - Evaluating
    - After DAM closes
    - Prior to posting



#### Load Bid Results

- Bid Status posted in MIS
  - Accepted
    - DAM schedule posted
  - Rejected
    - Settled in Real Time
- Results Posted
  - MW (MIS)
  - LBMP (NYISO.com)



# **LSE MW Settlement Overview**

Settlement Invoice	DAM Forecasted MWh	DAM Fixed Bid MWh	DAM Scheduled MWh	RT Actual MWH	DAM Settlement MWh	RT Settlement Balancing MWh
Initial	75	50	50	75 Based solely on the DAM Forecasted MWs	<b>50</b> Based on the DAM Fixed MWs and Accepted Price Cap Load Bids	25
True-up		-		<b>78</b> As reported by Metering Authority		3 Plus MP is responsible for interest accrual

LSE should update DAM Forecast by noon the day after the operating day to minimize interest accrual on any true-up invoices.



LBMP 1/26/18

# **Load Forecasting and Bidding**

#### LSE Bid Screen Recap

Physic	al Load N	ame: L	SE_123	<b>v</b>		untible Type:	HB 0 = \$40 HB 1 = \$50 HB 2 = \$30	
Time	Forecast MW	Fixed Bid MW	Price Cap #1 MW \$/MW	Price Cap #2 MW \$/MW	Price Cap #3 MW \$/MW	MW \$/MW	Interrupt Fixed MW \$/MW	Bid Status
00:00	120	120						
01:00	110		60 20	40 30	10 40			
02:00	100	70	20 25	10 35				

# **Supply Offers**



# **Supply Offers**

#### Supply Offer Process

- Unit Offer Parameters
- Incremental Energy Offers
- Unit Operating Modes

#### Results



# **Supply Offers**

### Suppliers submit offers to sell energy to the NYISO

- Day Ahead Market Offers
- Real Time Market Offers
- Offers Submitted to Market Information System (MIS)
  - Interface between NYISO and Market Participants
  - Offer, Update, and View

Suiteding The Energy Markets Of TomorrowToday	Welcome To The Bidding & Scheduling Sys	stem
Company Newsroom	Products Market Data Services	s Documents Committees
Administrator Details - Change Password - Generator Commit Details - Load Bus Details - Log Out - Metering Reconciliation Schedules - Review Transaction Bids - Subzone Details - TSC Zone Details -	<u>η</u> - <u>Organization Details</u> - <u>Physical Load Bids</u> - <u>Review Gen</u>	nerator Bids - Review Generator Forecasted
Bidding and Scheduling		



Supply Offer	Minimum Run Time	Minimum hours unit must run once started by NYISO
Parameters	Minimum Down Time	Minimum hours unit must be down once de-committed by NYISO
	Maximum Stops/Day	Number of times unit can be de- committed in dispatch day
	Response Rate	MW per minute
	Nesponse Nate	Normal Emergency
		Regulation
	Market	Day-Ahead (DAM)
		Real Time (RT)



Supply Offer Parameters (Cont'd)	Duration	Hours Unit wants to run
	Expiration Date of Offer	DAM Only
		Gen no longer available for Day Ahead Supplement
	Start Up	Time
		Cost
	Minimum Generation	Lower Operating Limit
		\$/MWh Cost
	Upper Operating Limit	Normal (UOLN)
		Emergency (UOLE)



Supply Offer Parameters *Applicable to Energy Storage Resources (ESRs) only	Lower Operating Limit	
	Upper Storage Limit	
	Lower Storage Limit	
	ESR Outage Type	
	Beginning Energy Level	
	Energy Level Management Mode	



Supply Offer Parameters *Applicable to Co-located Storage Resources (CSRs) only	CSR Injection Limit
	CSR Withdrawal Limit
	CSR Outage Type



#### **Supply Offers – Parameters**

#### Incremental Energy Offers

- \$/MWh Offers
- 11 Incremental Offer Blocks
- Ranges from Min Gen to Upper Operating Limit
- Variable Cost Recovery



### Supply Offers – Unit Operating Modes

Economics	MWs
ISO Committed     - Economically Selected	<ul> <li>Fixed</li> <li>Fixed Output/Operating Levels</li> <li>No Change to in-hour Schedule</li> </ul>
Self Committed     Price Taker	<ul> <li>Flexible         <ul> <li>Flexible Output</li> <li>Following NYISO Base Point Fluctuation</li> </ul> </li> </ul>
<ul> <li>ISO Committed Flex</li> <li>Self Committed Fixed</li> <li>ISO Committed Fixed</li> </ul>	



#### **Consider this...**

- A generator selecting 'Self-Committed' operating mode is likened to LSE entering 'Fixed Load Bid
  - In other words, it wants a schedule regardless of price
- A generator selecting 'ISO-Committed' operating mode is likened to LSE entering 'Price Capped Load Bid'
  - In other words, it wants to be scheduled based on its economic parameters



Unit Operating Mode in Action: Unit wants to be scheduled if LBMP is greater than or equal to its offer and wants to run at a specified MW output...

**ISO Committed Flex** 

**Self Committed Flex** 

#### **Self Committed Fixed**



Unit Operating Mode in Action: Unit wants to be scheduled no matter the LBMP and wants to run at a specified MW output...

**ISO Committed Flex** 

**Self Committed Flex** 

#### **Self Committed Fixed**



Unit Operating Mode in Action: Unit wants to be scheduled no matter the LBMP and willing to run at varying levels of output...

**ISO Committed Flex** 

**Self Committed Flex** 

#### **Self Committed Fixed**



Unit Operating Mode in Action: Unit wants to be scheduled if LBMP is greater than or equal to its offer and willing to run at varying levels of output...

**ISO Committed Flex** 

**Self Committed Flex** 

#### **Self Committed Fixed**



Mock-Up
 Generator Bid
 Screen

Generator Bid         Generator Name:       ESR Beginning Energy Level MWh       Fuel Type:         Bid Date       Num of Hours       Market       Expiration (DAM only)         [mm/dd/yyyy hh:mi)       [mm/dd/yyyy hh:mi)       [mm/dd/yyyy hh:mi)         Energy Bid       CSR lajection Limit (MW)       CSR Withdrawal Limit (MW)       CSR Outage Type         [www.store.com/download com/download				
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30 Minute Non-Synchronized Reserves Regulation Capacity				
Regulation Capacity				
	Regulation Movement			



#### Supply Offer Results

- Offer Status posted in MIS
  - Validation Passed
    - Data acceptable---no changes necessary
  - Validation Failed
    - Data will require changes
  - Evaluating
    - After DAM (or RT) closes
    - Prior to posting



#### Supply Offer Results

- Offer Status posted in MIS
  - Accepted
    - Unit is committed
    - DAM schedule posted
  - Rejected
    - Unit is not committed

#### New York ISO

### **Supply Offers**

#### Supply Offer Results

- Results Posted in MIS
  - Market
  - MW
- Prices Posted on NYISO.com
  - LBMP



Building The Energy Meinels Of TomorrowToday	Welcome To The Bidding & Scheduling System	Lopout
Company Newsroom	Products Market Data Services	Documents Committees
		E Details Load Bus Details Log Out <u>Organization Details_</u> - <u>Physical Load Bids_</u> - <u>Review Generator Bids</u> Details <u>User Details Virtual Load Bids Virtual Supply Bids_</u> - <u>Zone Details_</u> -

#### Generator Bid Results

		Bid Identification					Schedule	es (MW)			
Date	Market	Generator	Status	Time	Energy	10 Min Spin	10 Min Non-Synch	30 Min Spin	30 Min Non-Synch	Regulation Capacity	Op Cap Reserve
10/12/2013 00:00 EDT	DAM		VALIDATION PASSED								
10/12/2013 00:00 EDT	DAM		BID ACCEPTED	00:00	40	15		0		6	0
10/12/2013 01:00 EDT	DAM		VALIDATION PASSED					_			
10/12/2013 01:00 EDT	DAM		BID ACCEPTED	01:00	40	15		0		6	0
10/12/2013 02:00 EDT	DAM		VALIDATION PASSED		30	15		0		6	0
10/12/2013 02:00 EDT	DAM		BID ACCEPTED	02:00		15		U		U	U
10/12/2013 03:00 EDT	DAM		VALIDATION PASSED		30	15		0		6	0
10/12/2013 03:00 EDT	DAM		BID ACCEPTED	03:00				_			

Page Ref: E



#### • Out of Economic Merit – OOM

- Generator asked to produce different level of output from schedule
- Necessary to maintain <u>system reliability</u>
- Requested by
  - NYISO
  - Transmission Owner



#### OOM - Supplemental Payments

- Bid Production Cost Guarantee <u>BPCG</u>
  - NYISO guarantees generator will not incur net loss if generator is committed in DAM or <u>above DAM schedule</u>
    - Meets eligibility criteria
    - Sum of all hourly values for given day results in net loss
- BPCG References
  - MST Attachment C
  - OATT Schedule 1 Section 4B
  - MPUG 7.3.1



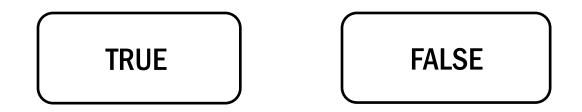
#### OOM - Supplemental Payments

- Day Ahead Margin Assurance Payment <u>DAMAP</u>
  - Payment for generators required to buy back Energy or Ancillaries in RT, due to <u>dispatching below DAM schedule</u>
    - Meets eligibility criteria
- DAMAP References
  - MST Attachment J
  - Accounting & Billing Manual





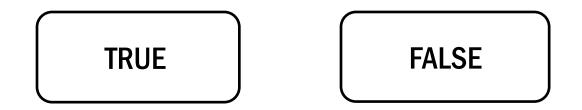
# **TRUE or FALSE:** Accepted Day-Ahead Schedules are Financially binding







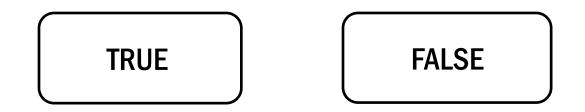
# **TRUE or FALSE:** The RT Market Balances DAM Schedules to Actual Production







# **TRUE or FALSE:** LSEs Bid into the DAM and RT Market to Purchase Energy





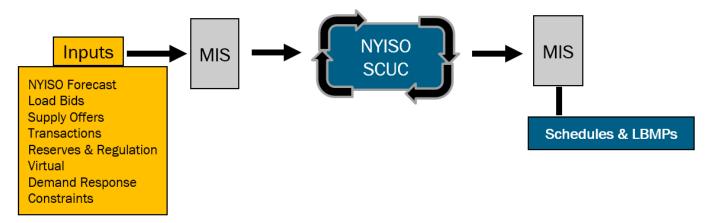
#### Objectives

- Commitment and Dispatch
  - Minimize the as-bid production cost
  - Satisfy system constraints and reliability rules
- Time-Line
  - Bidding available up to 14 days prior to Operating Day
  - DAM closes 5 a.m.
  - DAM Schedules and LBMP Posted by 11 a.m.
  - RT closes 75 minutes prior to Operating Hour



#### **Market Process - DAM**

- DAM uses Security Constrained Unit Commitment (SCUC)
  - DAM Schedules
  - DAM LBMP
  - Each Hour of the Day





- RT Market uses
  - Real Time Commitment (RTC)
    - Committing Generators for Dispatching
    - Advisory RT Base Points
    - Advisory RT LBMPs



- RT Market also uses
  - Supplemental Resource Evaluation (SRE)
    - Additional Resource Committal
    - Process used to commit additional resources outside of SCUC and RTC
      - » Used to preserve system reliability and ensure sufficient resources to meet forecasted load and reserve requirements

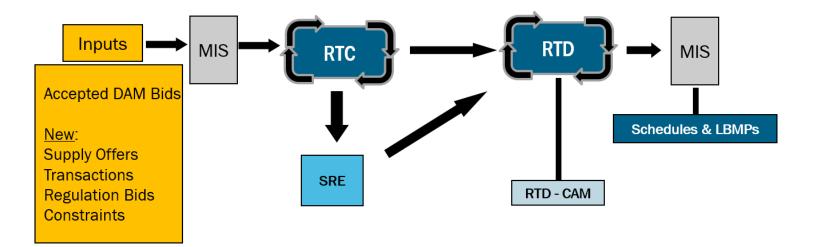


- RT Market also uses
  - Real Time Dispatch (RTD)
    - Dispatches Units in RT
    - 5 Minute Base Points
    - Real Time LBMP
    - Corrective Action Mode (RTD-CAM)



#### **Market Process – Real Time**

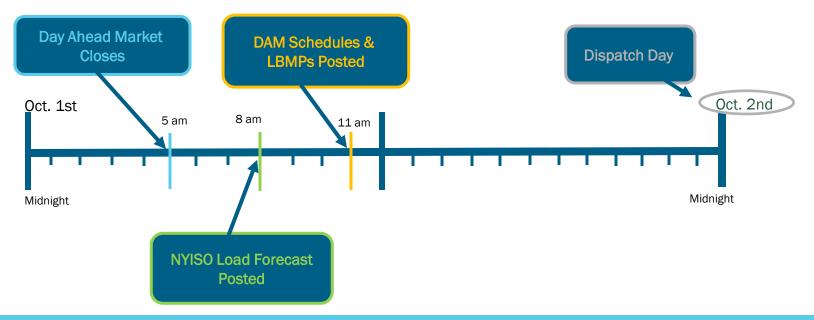
- Real Time Commitment and Real Time Dispatch
  - Includes Supplemental Resource Evaluation (SRE) and RTD Corrective Action Mode (RTD CAM)





#### **Market Process - DAM Time Line**

#### One Day before Dispatch Day





#### **Market Process - RT Market Time Line**

Operating Day – Oct 2<sup>nd</sup> HB 10

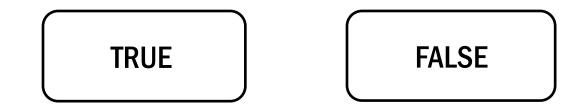


NYISO provides advisory commitment information for a 2.5 hour optimization period





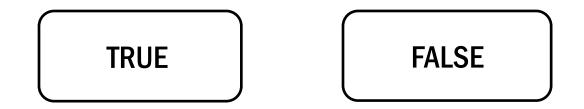
#### **TRUE or FALSE: SCUC is used in the DAM Process**







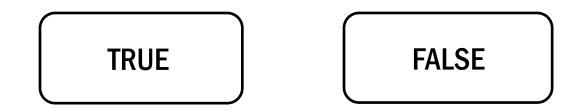
# **TRUE or FALSE:** RTC Dispatches units to run in the RT Market







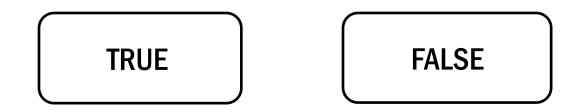
# **TRUE or FALSE:** The DAM closes at 5:00 AM the day before dispatch







# **TRUE or FALSE:** RT Bidding closes 75 minutes prior to the Operating Hour



## **Energy Marketplace NYISO Website Information**



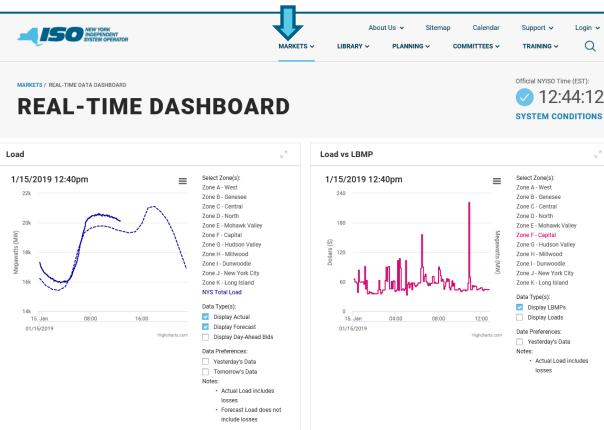
#### **Energy Market – Load Forecast Data**

		MARKETS ~	Ab Library ~	bout Us 🗸 Sitem PLANNING 🗸	nap Calendar	Support 🗸	Login 🗸 🗸 🔍							
LOAD DAT					tact Customer Su sholder_services@r									
Markets Real-Time Dashboard Interactive Energy Pricing Map	Load Forecast		27	Actual Load			لام							
System Conditions Energy Market & Operational Data	Date January 16,	Download Last Updated		✓ Integrated R	eal-Time									
Pricing Data Power Grid Data	2019 January 15,	htm EST csv pdf 01/14/1907-05					SO L	oad F	orec	ast				
Load Data Reports & Info Postings by Date Custom Reports Ancillary Services	2019 Archive	ntm EST		01/16/2019 01/17/2019 01/18/2019 01/19/2019 01/20/2019										
Installed Capacity Market (ICAP) Transmission Congestion Contracts (TCI Distributed Energy Resources (DER) v				01/21/2019 01/16/2019 Hour CA	APITL CENTRI	. DUNWOD G	ENESE HUD	VL LONGIL	MHK VL N	MILLWD 7	N.Y.C.	NORTH	WEST	NYISO
Distributed Energy Resources (DER) 🗸					1222     1710       1192     1672			771997441916	768 745	286 276	5120 4890	590 584	1563 1526	15825 15278

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#### FOR TRAINING PURPOSES ONLY

#### **Energy Market Real - Time Data**





#### FOR TRAINING PURPOSES ONLY

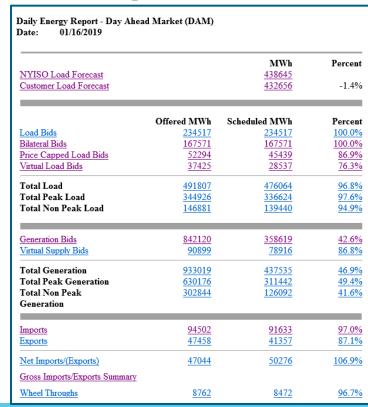
#### **Energy Market – DAM and Balancing**



#### Market Reports

		Μ	IARKETS Y LIB	About l	Js v Sit Planning v	emap Calendar	Support ✓ TRAINING ✓	Login 🗸
REPORTS & IN						ntact Customer Sup ikeholder_services@ny		
Markets	Capacity, Ener	gy and Mar	ket Advisory	⊌7	Events	, Announcements	and Fuel Mix	⊾ <sup>2</sup>
Real-Time Dashboard	<ul> <li>NYISO Capac</li> </ul>	ity		^	✓ Real-	Time Events		
Interactive Energy Pricing Map	<ul> <li>Daily Energy</li> </ul>				✓ Opera	ational Announcem	ents	
System Conditions	Date January 16,		d Last Updated 01/15/19 09:42		✓ Real-	Time Fuel Mix		
Energy Market & Operational Data 🔺	2019	csv htm	EST					
Pricing Data	January 15, 2019	csv htm	01/14/19 09:41 EST					
Power Grid Data	Archive	e						
Load Data								
Reports & Info	✓ Balancing Ma	arket Adviso	ory	~				
Postings by Date								
Custom Reports								
Ancillary Services								

#### **Energy Report – DAM and Balancing Market Reports**



	Offered MWh	Scheduled MWh	Percent
Bilateral Bids	<u>18150</u>	<u>18150</u>	
Generation Bids	<u>335327</u>	<u>218230</u>	<u>65.1%</u>
Imports Exports	<u>134471</u> <u>57013</u>	<u>131693</u> <u>56054</u>	<u>97.9%</u> <u>98.3%</u>
Net Imports/(Exports)	77458	<u>75639</u>	97.7%

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h New York ISO

Independent System Operator

#### **Marketplace Summary**



#### Market Features and Function

- Identify five features of the NYISO Energy Market
- Understand the bidding and scheduling process as it relates to the Two Settlement System

#### Load Forecasting and Bidding

- Describe the LSE and NYISO load forecasting process
- Identify the different load bidding and purchasing options

#### **Marketplace Summary**



#### Supply Offers

- Describe the different offer parameters on a generator offer
- Distinguish between the different generator operating modes

#### Commitment, Dispatch and Market Timelines

- Identify the inputs to the Day-Ahead and Real-Time commitment and dispatch process.
- Identify the key points of the DAM and RT Market timelines



#### **Additional Resources**

- Tariffs: MST and OATT
- Day Ahead Scheduling Manual
- Transmission and Dispatching Operations Manual
- Market Participant User's Guide (MPUG)