

# Power Supplier Energy Settlements

---

**Gina E. Craan**

Manager, Market Training, *New York Independent System Operator*

## **Accounting & Billing Workshop**

November 27 – December 1, 2023

Remote Learning

- **Objectives Per Settlement Name:**
  - Day Ahead Market Energy
  - Balancing Market Basis MW
  - Balancing Market Energy
    - Provide Settlement Description
    - Identify Settlement Eligibility
    - Name Settlement Determinants
    - Name Settlement Intermediates
    - Explain Settlement Algorithm
    - Step Through Settlement Scenario
    - Perform Settlement Example
    - Note Settlement Reference Material

# Power Supplier Energy Settlements

- **Day-Ahead Market Energy Description**
  - Intended to compensate Power Suppliers for DAM Energy sales via Energy schedules to the NYISO.

# Day Ahead Market Energy

## ■ Settlement Eligibility

- Power Suppliers will be credited for Day-Ahead Market Energy if:
  - Power Supplier's gen bus is scheduled to sell energy in NYISO DAM
- Power Suppliers will be charged for Day-Ahead Market Energy if:
  - Scheduled transactional energy is greater than scheduled DAM energy

# Day Ahead Market Energy

## ■ Settlement Determinants

- Hr DAM Energy Price: Gen (\$/MW)
- Hr DAM Loss Price: Gen (\$/MW)
- Hr DAM Cong Price: Gen (\$/MW)
  
- Hr DAM Sched Gen (MW)
- Hr DAM Sched Trans: Gen (MW)

# Day Ahead Market Energy

## ■ Settlement Intermediates

- Hr NYISO DAM Energy (MWh)
- Hr DAM Energy Stlmnt: Gen (\$)
- Hr DAM Loss Stlmnt: Gen (\$)
- Hr DAM Cong Stlmnt: Gen (\$)

## ■ Settlement Results

- Hr Total DAM Stlmnt: Gen (\$)

# Day Ahead Market Energy

## ■ Settlement Algorithm

**Hr Total DAM Stlmnt: Gen (\$) =**

Hr DAM Energy Stlmnt: Gen (\$) + Hr DAM Loss Stlmnt: Gen (\$) + Hr DAM Cong Stlmnt: Gen (\$)

**Where:**

Hr DAM Energy Stlmnt: Gen (\$) =

Hr NYISO DAM Energy (MWh) x Hr DAM Energy Price: Gen (\$/MW)

Hr DAM Loss Stlmnt: Gen (\$) =

Hr NYISO DAM Energy (MWh) x Hr DAM Loss Price: Gen (\$/MW)

Hr DAM Cong Stlmnt: Gen (\$) =

Hr NYISO DAM Energy (MWh) x (-1) (Hr DAM Cong Price: Gen (\$/MW))

Hr NYISO DAM Energy (MWh) =

Hr DAM Sched Gen (MW) – Hr DAM Sched Trans: Gen (MW)

# Day Ahead Market Energy

## ■ Settlement Scenario 1

- ‘Generator A’ submits DAM offer
  - Selling energy to NYISO
  - Offering 50MWs in HB 3
- Schedule is accepted by NYISO
- DAM Energy Price is \$25.25
- DAM Loss Price is \$3.06
- DAM Congestion Price is - \$5.49
- DAM LBMP for HB 3 is \$33.80
- Generator will receive a Day Ahead Energy Settlement for HB 3



# Day Ahead Market Energy

## ■ Settlement Example 1

Hr Total DAM Stlmnt: Gen (\$) = **\$1,690.00**  
**\$1,262.50 + \$153 + \$274.50**

**Where:**

Hr DAM Energy Stlmnt: Gen (\$) = **\$1,262.50**  
**50 x \$25.25**

Hr DAM Loss Stlmnt: Gen (\$) = **\$153**  
**50 x \$3.06**

Hr DAM Cong Stlmnt: Gen (\$) = **\$274.50**  
**50 x (-1) (- \$5.49)**

Hr NYISO DAM Energy (MWh) = **50**  
**50 - 0**

# Day Ahead Market Energy

## ■ Settlement Scenario 2

- ‘Generator A’ submits DAM offer HB 7
  - Accepted DAM Schedule 125 MWs
  - DAM Transaction Schedule 35 MWs
- DAM Energy Price is \$31.29
- DAM Loss Price is \$2.10
- DAM Congestion Price is - \$0.01

# Day Ahead Market Energy

## ■ Settlement Example 2

Hr Total DAM Stlmnt: Gen (\$) = **\$3,006.00**  
**\$2,816.10 + \$189 + \$0.9**

**Where:**

Hr DAM Energy Stlmnt: Gen (\$) = **\$2,816.10**  
**90 x \$31.29**

Hr DAM Loss Stlmnt: Gen (\$) = **\$189**  
**90 x \$2.10**

Hr DAM Cong Stlmnt: Gen (\$) = **\$0.9**  
**90 x (-1) (- \$0.01)**

Hr NYISO DAM Energy (MWh) = **90**  
**125 – 35**

# Day Ahead Market Energy

## ■ Summary

- Power Suppliers Eligible to Receive Payment
  - Selling Energy to NYISO
- Payments Based on:
  - Accepted DAM Schedule
  - DAM LBMP

# Day Ahead Market Energy

## ■ Settlement Reference Material

- Accounting and Billing Manual Section 4
  - Advisory Billing File
  - Power Supplier
    - Day Ahead Forward Energy \$
  - Hourly Bill Code 204
  - Daily Bill Code 301
- DSS Corporate Report
  - Settlement Details - Power Supplier - Day Ahead Market Energy

# Power Supplier Energy Settlements

- Objectives Per Settlement Name:
  - Day Ahead Market Energy
  - Balancing Market Basis MW
  - Balancing Market Energy

- **Balancing Market Basis MW Description**
  - Number representing the generation output value used as the basis for the determination of the amount of the given Generator's balancing market Energy (MW), for the given RTD-interval.

# Balancing Market Basis MW

## ■ Eligibility

- Balancing Market Basis MW
  - Calculated for all Generators located within the New York Control Area (NYCA), assigned to an organization.



# Balancing Market Basis MW

## ■ Determinants

- Hr Gen MA Reported (MWh)
- RTD Gen Avg Actual Energy (MW)
- RTD Basepoint
- RTD Interval Seconds
- RTD AGC Basepoint (MW)
- Hr Gen Upper Op Limit (MW)
- RTD Avg Energy Limit (MW)

# Balancing Market Basis MW

## ■ Determinants

- RTD Gen Avg Actual Injection Energy (MW)\*
- RTD Gen Avg Actual Withdrawal Energy (MW)\*
- Hr Gen Lower Op Limit (MW)\*

*\* Specific to ESRs*

# Balancing Market Basis MW

## ■ Determinants

- RTD Out of Merit Type Desc
- RTD Out of Merit Type ID
  
- RTD RT Sched Reg Avail (MW)
- RTD Reserve Pickup Ind
  
- RTD PURPA Units Class Type

# Balancing Market Basis MW

## ■ Intermediates

- Hr Gen Avg Actual Energy (MWh)
- RTD Gen Adjusted Energy (MW)

## ■ Results

- RTD RT Gen Basis Energy (MW)
- Hr RT Gen Basis Energy (MWh)

# Balancing Market Basis MW

## ■ Intermediates

- RTD Gen Adjusted Injection Energy (MW)\*
- RTD Gen Adjusted Withdrawal Energy (MW)\*
- Hr Gen ISO PTS Avg Actual Injection Energy (MWh)\*
- Hr Gen ISO PTS Avg Actual Withdrawal Energy (MWh)\*
- RTD Gen Injection Tolerance (MW)\*
- RTD Gen Withdrawal Tolerance (MW)\*

## ■ Results

- RTD Gen Default Balancing Basis (MW)\*

**\* Specific to ESRs**

# Balancing Market Basis MW

## ■ Algorithm

**RTD RT Gen Basis Energy (MW) =**

**Scenario 1** - RTD Gen Adjusted Energy (MW) or

**Scenario 2** - Minimum (RTD Basepoint, RTD Gen Adjusted Energy (MW)) or

**Scenario 3** - Minimum (RTD AGC Basepoint, RTD Gen Adjusted Energy (MW)) or

**Scenario 4** - Minimum (RTD Avg Energy Limit (MW), RTD Gen Adjusted Energy (MW)) or

**Scenario 5** - RTD Gen Default Balancing Basis (MW)

# Balancing Market Basis MW

## ■ Algorithm

RTD RT Gen Basis Energy (MW) =  
**Scenario 1** - RTD Gen Adjusted Energy (MW) if:

1. In Large Event Reserve Pickup
2. PURPA Class (Fixed)
3. Out of Merit for Reliability
4. Wind Unit & Wind Output Not Limited

RTD Gen Avg Actual Energy (MW) \* {Hr Gen MA Reported (MWh) / Hr Gen Avg Actual Energy (MWh)}

### Where:

Hr Gen Avg Actual Energy (MWh) =  
 $\sum \text{RTD Gen Avg Actual Energy (MW)} * \{\text{RTD Interval Seconds}/3600\}$  for all RTD Intervals in the given hour

# Balancing Market Basis MW

## ■ Algorithm

**RTD RT Gen Basis Energy (MW) =**

**Scenario 2 - Minimum (RTD Basepoint, RTD Gen Adjusted Energy (MW)) if:**

1. Operator Intervention

**RTD RT Gen Basis Energy (MW) =**

**Scenario 3 - Minimum (RTD AGC Basepoint, RTD Gen Adjusted Energy (MW)) if:**

1. Regulating

**RTD RT Gen Basis Energy (MW) =**

**Scenario 4 - Minimum (RTD Avg Energy Limit (MW), RTD Gen Adjusted Energy (MW)) if:**

1. Non-Regulating
2. Wind Unit & Wind Output Limited

**\*\*\*Note RTD Avg Energy Limit (MW) represents Compensable Power\*\*\***



# Balancing Market Basis MW

## ■ Algorithm

RTD RT Gen Basis Energy (MW) =

**Scenario 5** - RTD Gen Default Balancing Basis (MW) if:

1. Energy Storage Resource

RTD Gen Adjusted Injection Energy (MW) + RTD Gen Adjusted Withdrawal Energy (MW)

**Where:**

RTD Gen Adjusted Injection Energy (MW) =

RTD Gen Avg Actual Injection Energy (MW) \* {Hr Gen MA Reported (MWh) / Hr Gen ISO PTS  
Avg Actual Injection Energy (MWh)}

Hr Gen ISO PTS Avg Actual Injection Energy (MWh) =

$\sum$  RTD Gen Avg Actual Injection Energy (MW) \* {RTD Interval Seconds/3600} for all RTD  
Intervals in the given hour

RTD Gen Adjusted Withdrawal Energy (MW) =

RTD Gen Avg Actual Withdrawal Energy (MW) \* {Hr Gen MA Reported (MWh) / Hr Gen ISO PTS  
Avg Actual Withdrawal Energy (MWh)}

Hr Gen ISO PTS Avg Actual Withdrawal Energy (MWh) =

$\sum$  RTD Gen Avg Actual Withdrawal Energy (MW) \* {RTD Interval Seconds/3600} for all RTD  
Intervals in the given hour

# Balancing Market Basis MW

## ■ Summary

- Basis for Determining Generator's Balancing Market Energy (MW)
  - RTD Interval Level
- Basis MW Dependent on Operating Scenario

# Balancing Market Basis MW

## ■ Settlement Reference Material

- Accounting and Billing Manual Section 4
  - Appendix C
- Advisory Billing File
  - Power Supplier
    - Hrly Integrated R/T Balancing MWh
  - Hourly Bill Code 207
  - Daily Bill Code 303
- DSS Corporate Report
  - Settlement Details - Power Supplier - Balancing Energy

- **Objectives Per Settlement Name:**
  - Day Ahead Market Energy
  - Balancing Market Basis MW
  - **Balancing Market Energy**

- **Balancing Market Energy Description**
  - Intended to credit or charge Market Participants acting as Power Suppliers for Balancing Market Energy sold or purchased in the NYISO Balancing Energy Market.
  - Settlement accounts for Energy variations in a Generator's real-time dispatch from what is sold in the NYISO DAM and/or DAM Transaction Schedules.

# Balancing Market Energy

## ■ Settlement Eligibility

- Balancing Market Energy Settlements are Performed for each RTD interval
  - Nominally Five Minutes in Length
  - Based on Generator's Measured Performance
    - Relative to: Scheduled Operation and Bid Parameters
- Generator is not - Group Unit, Station Service Group, Curtailable Load, or Self Supply

# Balancing Market Energy

## ■ Settlement Determinants

- Gen Type Desc
- Hr DAM Sched Gen (MW)
- Hr DAM Sched Trans: Gen (MW)
- RTD RT Sched Trans: Gen (MW)
  
- RTD Interval Seconds
  
- RTD RT Energy Price: Gen (\$/MW)
- RTD RT Loss Price: Gen (\$/MW)
- RTD RT Cong Price: Gen (\$/MW)

# Balancing Market Energy

- **RTD Interval Seconds**
  - Typically 300 seconds/5 minute RTD Interval
  - Sometimes more or less...
  
  - Calculated as:  
(Current Interval Time Stamp – Previous Interval Time Stamp)



# Balancing Market Energy

## ■ RTD Interval Seconds Example

- Calculated as:

(Current Interval Time Stamp – Previous Interval Time Stamp)

- HB 8

8:00:00 AM	300
8:05:00 AM	300
8:05:24 AM	24
8:06:42 AM	78
8:15:00 AM	498
8:20:00 AM	300
8:25:00 AM	300
8:30:00 AM	300
8:35:00 AM	300
8:40:00 AM	300
8:45:00 AM	300
8:50:00 AM	300
8:55:00 AM	300

# Balancing Market Energy

## ■ Settlement Intermediates

- RTD Gen BalMkt Basis (MW)
- RTD Gen BalMkt Energy (MW)
  
- RTD BalMkt Energy Stlmnt: Gen (\$)
- RTD BalMkt Loss Stlmnt: Gen (\$)
- RTD BalMkt Cong Stlmnt: Gen (\$)

## ■ Settlement Results

- RTD Total BalMkt Stlmnt: Gen (\$)

# Balancing Market Energy

## ■ Settlement Algorithm

**RTD Total BalMkt Stlmnt: Gen (\$)** =

RTD BalMkt Energy Stlmnt: Gen (\$) + RTD BalMkt Loss Stlmnt: Gen (\$) +  
 RTD BalMkt Cong Stlmnt: Gen (\$)

**Where:**

RTD BalMkt Energy Stlmnt: Gen (\$) =

RTD Gen BalMkt Energy (MW) x RTD RT Energy Price: Gen (\$/MW) x RTD Interval Seconds/  
 3600 seconds

RTD BalMkt Loss Stlmnt: Gen (\$) =

RTD Gen BalMkt Energy (MW) x RTD RT Loss Price: Gen (\$/MW) x RTD Interval Seconds/  
 3600 seconds

RTD BalMkt Cong Stlmnt: Gen (\$) =

RTD Gen BalMkt Energy (MW) x (-1) (RTD RT Cong Price: Gen (\$/MW)) x RTD Interval Seconds/  
 3600 seconds

# Balancing Market Energy

## ■ Settlement Algorithm

### Where:

RTD Gen BalMkt Energy (MW) =

RTD Gen BalMkt Basis (MW) - Hr DAM Sched Gen (MWh) - {RTD RT Sched Trans: Gen (MW) -  
Hr DAM Sched Trans: Gen (MW)}

# Balancing Market Energy

## ■ Settlement Scenario 1

- ‘Generator A’ sells Energy in RT Market
  - DAM Accepted Schedule of 50 MWs for HB 3
  - RTD Gen BalMkt Basis (MW) is 65 MWs for HB 3
- No Transactions Scheduled for HB 3
- Each Interval of HB 3 is 300 seconds
- RT Energy Price for 03:00:00 is \$33.65
- RT Loss Price for 03:00:00 is \$1.72
- RT Congestion Price for 03:00:00 is \$0
- RT LBMP for 03:00:00 is \$35.37
- Generator will receive a Real Time Energy Settlement for HB 3

# Balancing Market Energy

## ■ Settlement Example 1

RTD Total BalMkt Stlmnt: Gen (\$) = **\$44.21**  
**\$42.06 + \$2.15 + \$0**

### Where:

RTD BalMkt Energy Stlmnt: Gen (\$) = **\$42.06**  
**15 x \$33.65 x 300/3600**

RTD BalMkt Loss Stlmnt: Gen (\$) = **\$2.15**  
**15 x \$1.72 x 300/3600**

RTD BalMkt Cong Stlmnt: Gen (\$) = **\$0**  
**15 x (-1) (- \$0) x 300/3600**

### Where:

RTD BalMkt Energy (MW) = **15**  
**65 - 50 - {0 - 0}**

# Balancing Market Energy

## ■ Settlement Scenario 2

- ‘Generator A’ provides Energy in RT Operating HB 15
  - DAM Accepted Schedule of 130 MWs for HB 15
  - RTD Gen BalMkt Basis (MW) is 162 MWs for HB 15
- DAM and RT Transaction Schedule 28 MWs for HB 15
- Each Interval of HB 15 is 300 seconds
- RT Energy Price for 15:30:00 is \$917.89
- RT Loss Price for 15:30:00 is \$90.87
- RT Congestion Price for 15:30:00 is -\$4.49

# Balancing Market Energy

## ■ Settlement Example 2

RTD Total BalMkt Stlmnt: Gen (\$) = **\$2,702**  
**\$2,447.71 + \$242.32 + \$11.97**

### Where:

RTD BalMkt Energy Stlmnt: Gen (\$) = **\$2,447.71**  
**32 x \$917.89 x 300/3600**

RTD BalMkt Loss Stlmnt: Gen (\$) = **\$242.32**  
**32 x \$90.87 x 300/3600**

RTD BalMkt Cong Stlmnt: Gen (\$) = **\$11.97**  
**32 x (-1)(-\$4.49) x 300/3600**

### Where:

RTD BalMkt Energy (MW) = **32**  
**162 - 130 - {28 - 28}**



# Balancing Market Energy

## ■ Summary

- Balancing Market Energy Settlement
  - Intended to credit or charge Market Participants for:
    - Balancing Market Energy Sold or Purchased
    - In NYISO Balancing Energy Market
- Payments Based on:
  - RTD BalMkt Energy (MW)
  - RT LBMP

# Balancing Market Energy

## ■ Settlement Reference Material

- Accounting and Billing Manual Section 4
  - Appendix C
- Advisory Billing File
  - Power Supplier
    - Balancing Energy \$
  - Hourly Bill Code 209
  - Daily Bill Code 304
- DSS Corporate Report
  - Settlement Details - Power Supplier - Balancing Energy