

Power Supplier Energy Settlements

Gina E. Craan

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

Accounting & Billing Workshop

February 2021

Albany, NY

- **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

- ‘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

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 Exercise

- ‘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 Exercise

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 RTD Gen Avg Actual Energy (MW) * {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

- ‘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

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 Exercise

- ‘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 Exercise

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