

Energy Settlements for Transaction Customers

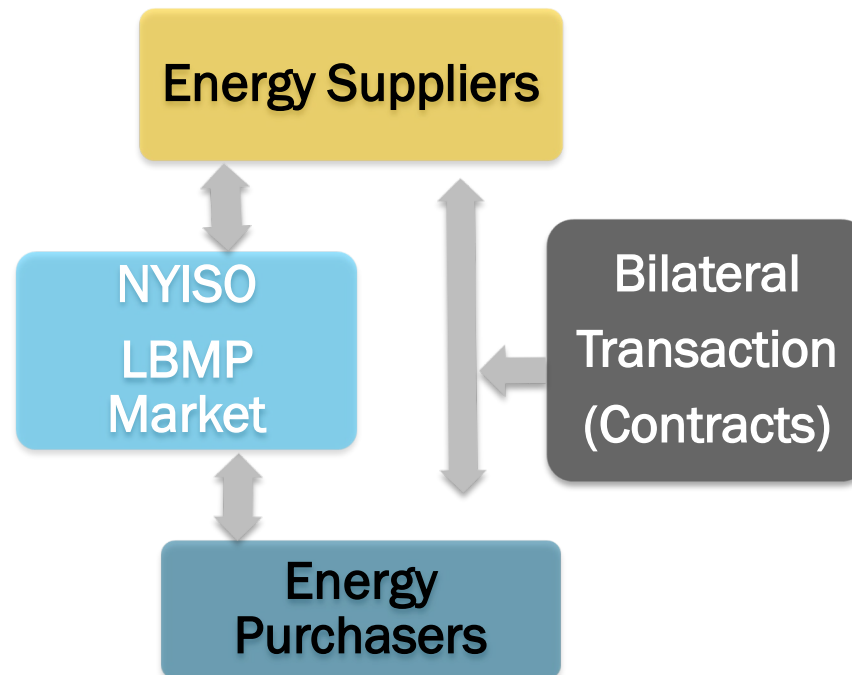
Mathangi Srinivasan Kumar

Market Training Program Administrator, Market Training,
New York Independent System Operator

Accounting & Billing Workshop

November 27 – December 1, 2023
Remote Learning

Buying and Selling Wholesale Energy in NY



Transactions – Characteristics and Settlements

LBMP Transactions

❖ Types

- Import
- Export

❖ Source/Sink

- NYISO Reference Bus
- External Proxy Bus

Bilateral Transactions

❖ Types

- Internal
- External
 - Import
 - Export
 - Wheel Through

❖ Source/Sink

- Trading Hub
- External Proxy Bus
- NYCA Load/ Gen Bus

Transactions – Characteristics and Settlements

LBMP Transactions

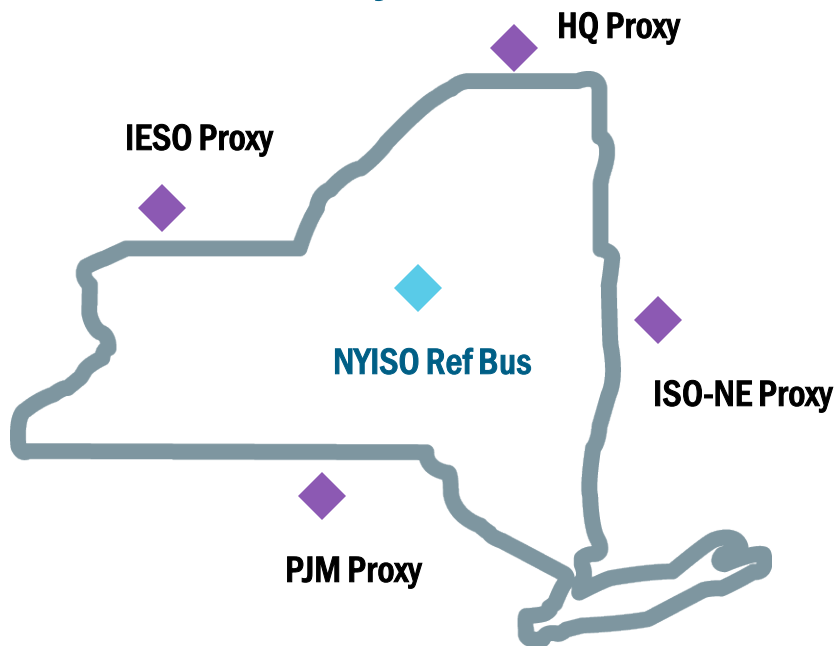
- ❖ Settlement - LBMP
 - Energy
 - Loss
 - Congestion

Bilateral Transactions

- ❖ Settlement - TUC
 - Loss
 - Congestion
 - Energy negotiated between buyer and seller

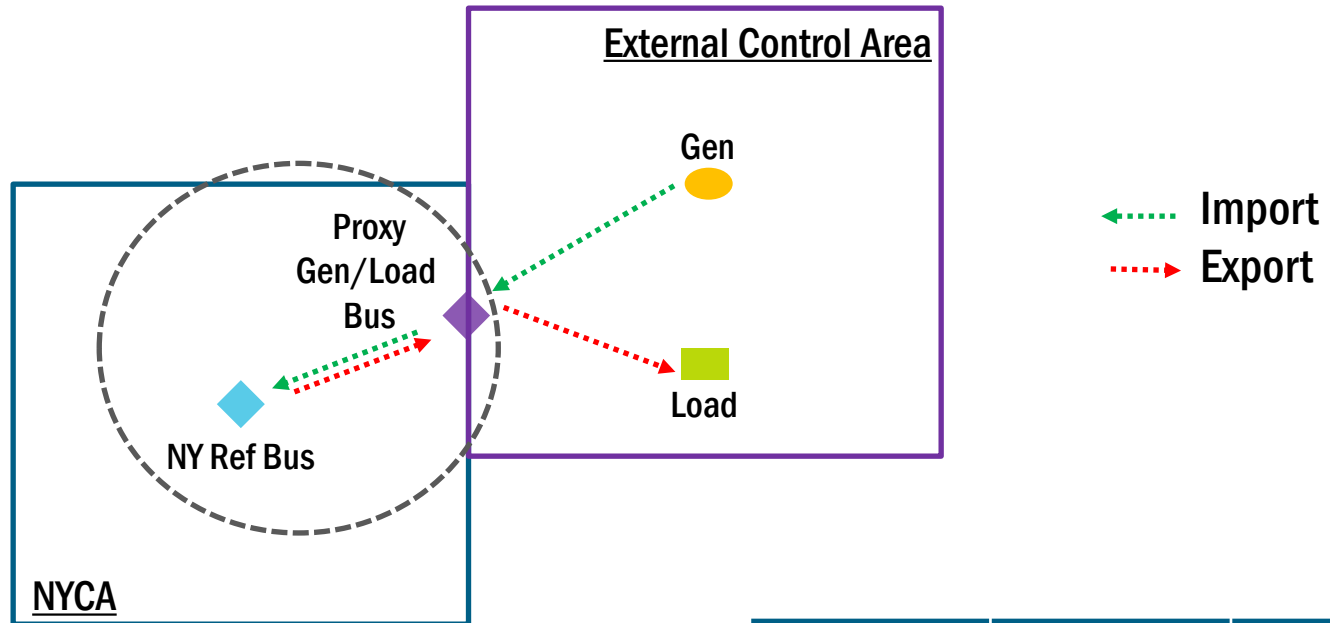
Transaction terms

External Proxy Bus



- Location outside the NYCA that is selected by the ISO to represent a load/gen bus in an adjacent Control Area
- LBMP prices for external proxy buses are calculated with reference to the NY reference bus
- NYISO designated for PJM, HQ, IESO, and ISO-NE

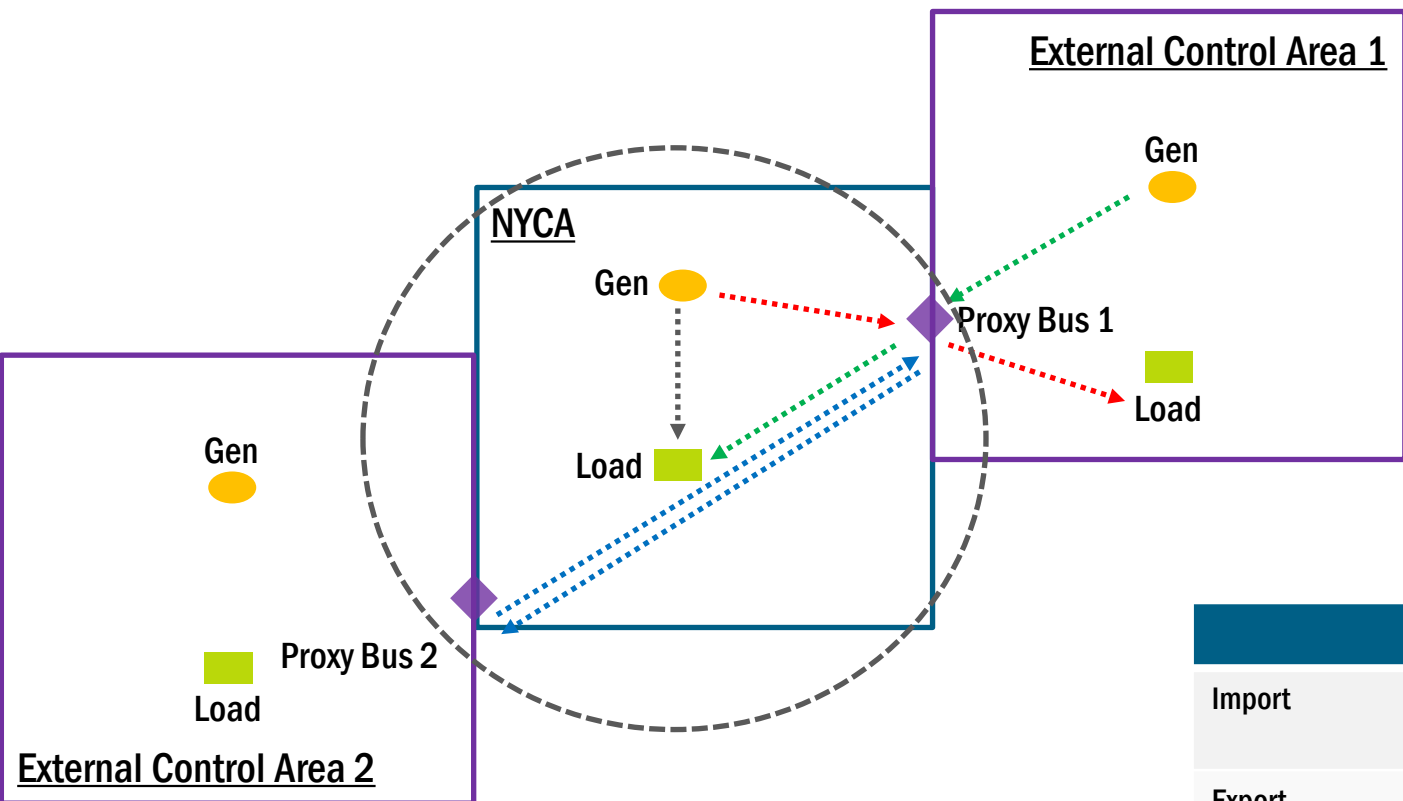
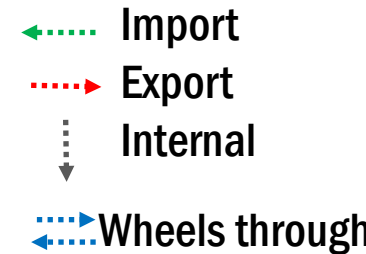
LBMP Transactions



	Source or POI	Sink or POW
Import	External Proxy Gen Bus	NY Reference Bus
Export	NY Reference Bus	External Proxy Load Bus

*

Bilateral Transactions



	Source or POI	Sink or POW
Import	External Proxy Gen Bus	NY Load Bus
Export	NY Gen Bus	External Proxy Load Bus
Internal	NY Gen Bus	NY Load Bus
Wheelthrough	External Proxy Gen Bus	External Proxy Load Bus

Objectives Per Settlement Name:

- 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

Energy Market Transactions

Settlement Name:

- A. Day Ahead Market (DAM) Energy
- B. Balancing Market Energy
- C. DAM Replacement Energy for Curtailed Imports
- D. Real Time Market Replacement Energy for Curtailed Imports
- E. Trading Hub Energy Settlements
- F. Transmission Usage Charge (TUC)

Energy Market Transactions - DAM Energy

Settlement Description:

DAM LBMP Imports

- *Intended to credit transaction customers for DAM energy scheduled via Market Energy Import Transactions*

Energy Market [LBMP] Transactions

DAM Energy – IMPORTS

Settlement Eligibility:

Transaction customers will receive a payment for DAM Energy – Imports if the following exist:

- Source location is NYISO external control area proxy bus
- Sink location is NYISO market reference bus
- Transaction Contract Category = Import
- The transaction contract is scheduled in the NYISO DAM

Energy Market [LBMP] Transactions

DAM Energy - IMPORTS

Settlement Determinants:

- Hr DAM Energy Price: Src (\$/MWh)
- Hr DAM Loss Price: Src (\$/MWh)
- Hr DAM Cong Price: Src (\$/MWh)

- Hr DAM Sched Trans (MW): Trans

Note: Settlement is based on external proxy bus price components.

Energy Market [LBMP]Transactions



New York ISO
Independent System Operator

DAM Energy - IMPORTS

- **Settlement Intermediates**
 - Hr DAM LBMP Energy (MWh)
 - Hr DAM LBMP Energy Stlmnt (\$)
 - Hr DAM LBMP Loss Stlmnt (\$)
 - Hr DAM LBMP Cong Stlmnt (\$)
- **Settlement Results**
 - Hr DAM Total LBMP Stlmnt (\$)

Energy Market [LBMP] Transactions

DAM Energy - IMPORTS

Settlement Algorithm

Hr DAM Total LBMP Stlmnt (\$) =

Hr DAM LBMP Energy Stlmnt (\$) + Hr DAM LBMP Loss Stlmnt (\$) + Hr DAM LBMP Cong Stlmnt (\$)

Where:

Hr DAM LBMP Energy Stlmnt (\$) =

Hr DAM LBMP Energy (MWh) * Hr DAM Energy Price: Src(\$/MWh)

Hr DAM LBMP Loss Stlmnt (\$) =

Hr DAM LBMP Energy (MWh) * Hr DAM Loss Price: Src(\$/MWh)

Hr DAM LBMP Cong Stlmnt (\$) =

Hr DAM LBMP Energy (MWh) * {(-1) * Hr DAM Cong Price: Src(\$/MWh)}

And Hr DAM LBMP Energy (MWh) is calculated as:

Hr DAM LBMP Energy (MWh) = Hr DAM Sched Trans (MW): Trans

Energy Market [LBMP] Transactions

DAM Energy - IMPORTS

Settlement Scenario:

External generator in PJM wants to sell 50 MWs of power to NY (selling to NYISO LBMP market)

50 MWs of power sold (sched.) to NY in DAM for 1 hour - (Import from PJM)
Transaction is scheduled from the border of the control area (external proxy bus) to the NYISO Reference bus

PJM Proxy Bus (Source) LBMP = \$59.51

- PJM Proxy Bus Energy = \$56.97
- PJM Proxy Bus Loss = \$1.54
- PJM Proxy Bus Congestion = -\$1.00

Energy Market [LBMP] Transactions

DAM Energy - IMPORTS

Settlement Example:

$$\begin{aligned} \text{Hr DAM Total LBMP Stlmnt (\$)} &= \\ \$2848.50 + \$77.00 + \$50.00 &= \$2,975.50 \end{aligned}$$

Where:

$$\begin{aligned} \text{Hr DAM LBMP Energy Stlmnt (\$)} &= \\ = 50 \text{ MWhs} * \$ 56.97/\text{MWh} &= \$2,848.50 \end{aligned}$$

$$\begin{aligned} \text{Hr DAM LBMP Loss Stlmnt (\$)} &= \\ 50 \text{ MWhs} * \$ 1.54/\text{MWh} &= \$77.00 \end{aligned}$$

$$\begin{aligned} \text{Hr DAM LBMP Cong Stlmnt (\$)} &= \\ 50 \text{ MWhs} * \{(-1) * -\$ 1/\text{MWh}\} &= \$50.00 \end{aligned}$$

Transaction owner is PAID \$2,975.50 for those 50 MWs imported from PJM

Energy Market [LBMP] Transactions

DAM Energy –EXPORTS

Settlement Description:
DAM LBMP Exports

- *Intended to charge transaction customers for DAM energy scheduled via Market Energy Export Transactions*

Energy Market [LBMP] Transactions

DAM Energy –EXPORTS

Settlement Eligibility:

Transaction customers will receive a charge for DAM Energy –
Exports if all of the following exist:

- Source location is NYISO market reference bus
- Sink location is NYISO external control area proxy bus
- Transaction Contract Category = Export
- The transaction contract is scheduled in the NYISO DAM

Energy Market [LBMP] Transactions

DAM Energy –EXPORTS

Settlement Determinants:

- Hr DAM Energy Price: Sink (\$/MWh)
- Hr DAM Loss Price: Sink (\$/MWh)
- Hr DAM Cong Price: Sink (\$/MWh)

- Hr DAM Sched Trans (MW): Trans

Note: Settlement is based on external proxy bus price components.

Energy Market [LBMP] Transactions

DAM Energy –EXPORTS

- **Settlement Intermediates**
 - Hr DAM LBMP Energy (MWh)
 - Hr DAM LBMP Energy Stlmnt (\$)
 - Hr DAM LBMP Loss Stlmnt (\$)
 - Hr DAM LBMP Cong Stlmnt (\$)
- **Settlement Results**
 - Hr DAM Total LBMP Stlmnt (\$)

Energy Market [LBMP] Transactions

DAM Energy –EXPORTS

Settlement Algorithm:

Hr DAM Total LBMP Stlmnt (\$) =

Hr DAM LBMP Energy Stlmnt (\$) + **Hr DAM LBMP Loss Stlmnt (\$)** + **Hr DAM LBMP Cong Stlmnt (\$)**

Where:

Hr DAM LBMP Energy Stlmnt (\$) =

Hr DAM LBMP Energy (MWh) * **Hr DAM Energy Price: Sink (\$/MWh)**

Hr DAM LBMP Loss Stlmnt (\$) =

Hr DAM LBMP Energy (MWh) * **Hr DAM Loss Price: Sink (\$/MWh)**

Hr DAM LBMP Cong Stlmnt (\$) =

Hr DAM LBMP Energy (MWh) * **{{(-1) * Hr DAM Cong Price: Sink (\$/MWh)}}**

And Hr DAM LBMP Energy (MWh) is calculated as:

Hr DAM LBMP Energy (MWh) = (-1) * Hr DAM Sched Trans (MW): Trans

Energy Market [LBMP] Transactions

DAM Energy - EXPORTS

Settlement Scenario:

A power marketer wants to purchase 20 MWs of power to supply a load in ISONE
(Purchasing from the NYISO's LBMP market)

20 MWs of power purchased (sched.) from NY in DAM for 1 hour - (Export to ISONE)

Transaction is scheduled from the NYISO Reference bus to the external control area proxy bus

ISONE Proxy Bus (Sink) LBMP = \$71.23

- ISONE Proxy Bus Energy = \$65.73
- ISONE Proxy Bus Loss = \$5.00
- ISONE Proxy Bus Congestion = - \$.50

Energy Market [LBMP] Transactions

DAM Energy - EXPORTS

Settlement Example:

$$\text{Hr DAM Total LBMP Stlmnt (\$)} = (-\$1314.60) + (-\$100) + (-\$10) = \text{\textcolor{green}{-\$1424.60}}$$

Where:

$$\begin{aligned} \text{Hr DAM LBMP Energy Stlmnt (\$)} = \\ -20 * \$65.73 = \text{\textcolor{green}{-\$1314.60}} \end{aligned}$$

$$\begin{aligned} \text{Hr DAM LBMP Loss Stlmnt (\$)} = \\ -20 * \$5.00 = \text{\textcolor{green}{-\$100.00}} \end{aligned}$$

$$\begin{aligned} \text{Hr DAM LBMP Cong Stlmnt (\$)} = \\ -20 * (-1 * -.50) = \text{\textcolor{green}{-10.00}} \end{aligned}$$

$$\text{Hr DAM LBMP Energy (MWh)} = (-1) * 20 \text{ MW} = \text{\textcolor{blue}{-20MW}}$$

Transaction owner is CHARGED \text{\textcolor{green}{\\$1,424.60}} for those 20 MWs exported to ISONE

Energy Market [LBMP] Transactions

DAM Energy - IMPORTS & EXPORTS

Settlement Reference Material:

- **Tariff Reference**
 - Market Services Tariff (MST) - Article 4, Section 4.2
- **Accounting and Billing Manual**
 - Section 4.3.1 & Appendix B (Imports)
 - Section 6.2.1 & Appendix J (Exports)
- **Advisory Billing File**
 - Transaction Customer Section
 - *DAM LBMP Market LBMP \$*
 - Hourly Bill Code: 515
 - Daily Bill Code: 762
- **DSS Corporate Report**
 - Settlement Details – Transaction Customer – Day Ahead Market LBMP Energy

Energy Market Transactions

Settlement Name:

- A. Day Ahead Market (DAM) Energy
- B. Balancing Market Energy
- C. DAM Replacement Energy for Curtailed Imports
- D. Real Time Market Replacement Energy for Curtailed Imports
- E. Trading Hub Energy Settlements
- F. Transmission Usage Charge (TUC)

Market Energy Transactions - Balancing Market Energy

Settlement Description

■ Imports

- Intended to address any difference between Real-Time (RT) and Day-Ahead Market (DAM) energy scheduled via Market Energy Import Transactions

■ Exports

- Intended to address any difference between Real-Time (RT) and the Day-Ahead Market (DAM) energy scheduled via Market Energy Export Transactions

Energy Market [LBMP] Transactions

Balancing Market Energy - IMPORTS

Settlement Eligibility:

Transaction Customers will receive a charge (or payment) for Balancing Market Energy - Imports (\$) if all of the following conditions exist:

- The Transaction Contract is a Real-Time Energy Import Transaction
 - *Source Location is a NYISO external control area proxy bus*
 - *Sink Location is the NYISO market reference bus*
 - *TransCnt Transaction Category = Import*
 - *RTD Sched < DAM Sched = charge; or*
 - *RTD Sched > DAM Sched = payment*

Energy Market [LBMP] Transactions

Balancing Market Energy - IMPORTS

Settlement Determinants:

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

Energy Market [LBMP] Transactions

Balancing Market Energy - IMPORTS

- **Settlement Intermediates:**
 - RTD BalMkt LBMP Energy (MWh)
 - RTD BalMkt LBMP Engy Stlmnt (\$)
 - RTD BalMkt LBMP Loss Stlmnt (\$)
 - RTD BalMkt LBMP Cong Stlmnt (\$)

- **Settlement Results:**
 - RTD BalMkt Total LBMP Stlmnt (\$)

Energy Market [LBMP] Transactions

Balancing Market Energy - IMPORTS

- **RTD level calculation**
 - Each RTD interval is calculated for its respective hour
 - 12 intervals per hour
 - RTD intervals rolled up to an hourly value
 - Hourly value then rolled up to daily level

Market Energy [LBMP] Transactions

Balancing Market Energy - IMPORTS

Settlement Algorithm:

RTD BalMkt Total LBMP Stlmnt (\$) =

RTD BalMkt LBMP Engy Stlmnt (\$) + RTD BalMkt LBMP Loss Stlmnt (\$) + RTD BalMkt LBMP Cong Stlmnt (\$)

Where:

RTD BalMkt LBMP Energy Stlmnt (\$) =

RTD BalMkt LBMP Energy (MWh) * RTD RT Energy Price: Src (\$/MWh)

RTD BalMkt LBMP Loss Stlmnt (\$) =

RTD BalMkt LBMP Energy (MWh) * RTD RT Loss Price: Src (\$/MWh)

RTD BalMkt LBMP Cong Stlmnt (\$) =

RTD BalMkt LBMP Energy (MWh) * {(-1) * RTD RT Cong Price: Src (\$/MWh)}

And RTD BalMkt LBMP Energy (MWh) is calculated as:

RTD BalMkt LBMP Energy (MWh) =

{RTD RT Sched Trans: Trans (MW) - Hr DAM Sched Trans :Trans (MW)} * {RTD Interval Seconds ÷ 3,600 seconds}

Energy Market [LBMP] Transactions

Balancing Market Energy - IMPORTS

Settlement Scenario:

**External generator in PJM sold 50 MWs of power to NY
(scheduled in DAM)**

- Paid for 50 MWs at DAM LBMP
- In RT only 40 MWs scheduled
- Transaction Owner must balance position – buy back 10 MWs at RT LBMP
- Calculated at RTD level

PJM Proxy Bus (Source) RT LBMP = \$56.64

- PJM Proxy Bus RT Energy = \$54.67
- PJM Proxy Bus RT Loss = \$1.78
- PJM Proxy Bus RT Congestion = \$-0.19

Energy Market [LBMP] Transactions

Balancing Market Energy - IMPORTS

Settlement Example:

$$\text{RTD BalMkt Total LBMP Stlmnt (\$)} = -\$45.56 + -\$1.48 + -\$0.16 = \text{\textcolor{green}{-\$47.20}}$$

Where:

$$\text{RTD BalMkt LBMP Energy Stlmnt (\$)} = -0.8333 \text{ MWhs} * \$54.67/\text{MWh} = \text{\textcolor{green}{-\$45.56}}$$

$$\text{RTD BalMkt LBMP Loss Stlmnt (\$)} = -0.8333 \text{ MWhs} * \$1.78/\text{MWh} = \text{\textcolor{green}{-\$1.48}}$$

$$\text{RTD BalMkt LBMP Cong Stlmnt (\$)} = -0.8333 \text{ MWhs} * \{(-1) * \$-0.19/\text{MWh}\} = \text{\textcolor{green}{-\$0.16}}$$

$$\text{RTD BalMkt LBMP Energy (MWh)} = (40-50) * (300/3600) = (-10) * .08333 = \text{\textcolor{blue}{-0.8333}}$$

$$\text{Settlement/RTD interval} = -\$47.20$$

Sum the 12 RTD interval calculations for the hourly value (For training purposes, assume RTD interval and \$/MWh are constant for each interval)

$$\text{Total} = \text{\textcolor{green}{-\$566.40}}$$

Transaction Owner pays the NYISO **\\$566.40**

Energy Market [LBMP] Transactions

Balancing Market Energy - EXPORTS

Settlement Eligibility:

Transaction Customers will receive a payment (or charge) for Balancing Market Energy - Exports (\$) if all of the following conditions exist:

- The Transaction Contract is a Real-Time Energy Export Transaction
 - Source Location is the NYISO market reference bus
 - Sink Location is a NYISO external control area proxy bus
 - TransCnt Transaction Category = Export
 - *RTD Sched < DAM Sched = payment; or*
 - *RTD Sched > DAM Sched = charge*

Energy Market [LBMP] Transactions

Balancing Market Energy - EXPORTS

Settlement Determinants:

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

Energy Market [LBMP] Transactions

Balancing Market Energy - EXPORTS

Settlement Intermediates:

- RTD BalMkt LBMP Energy (MWh)
- RTD BalMkt LBMP Engy Stlmnt (\$)
- RTD BalMkt LBMP Loss Stlmnt (\$)
- RTD BalMkt LBMP Cong Stlmnt (\$)

Settlement Results:

- RTD BalMkt Total LBMP Stlmnt (\$)

Energy Market [LBMP] Transactions

Balancing Market Energy - EXPORTS

Settlement Algorithm:

RTD BalMkt Total LBMP Stlmnt (\$) =

RTD BalMkt LBMP Engy Stlmnt (\$) + RTD BalMkt LBMP Loss Stlmnt (\$) + RTD BalMkt LBMP Cong Stlmnt (\$)

Where:

RTD BalMkt LBMP Engy Stlmnt (\$) =

RTD BalMkt LBMP Energy (MWh) * RTD RT Energy Price: Sink (\$/MWh)

RTD BalMkt LBMP Loss Stlmnt (\$) =

RTD BalMkt LBMP Energy (MWh) * RTD RT Loss Price: Sink (\$/MWh)

RTD BalMkt LBMP Cong Stlmnt (\$) =

RTD BalMkt LBMP Energy (MWh) * {(-1) * RTD RT Cong Price: Sink (\$/MWh)}

And RTD BalMkt LBMP Energy (MWh) is calculated as:

RTD BalMkt LBMP Energy (MWh) =

[RTD RT Sched Trans: Trans (MW) - Hr DAM Sched Trans: Trans (MW)] * {RTD Interval Seconds ÷ 3,600 seconds} * -1

Energy Market [LBMP] Transactions

Balancing Market Energy - EXPORTS

Settlement Scenario:

MP charged for 20 MWs at DAM LBMP based on DAM schedule

In RT Transaction schedule was curtailed to 0 MWs.

MP must balance position so they sell back 20 MWs at RT LBMP

Calculated at RTD level

ISONE Proxy Bus (Sink) RT LBMP = \$46.31

- ISONE Proxy Bus Energy = \$41.08
- ISONE Proxy Bus Loss = \$2.96
- ISONE Proxy Bus Congestion = \$-2.26

Energy Market [LBMP] Transactions

Balancing Market Energy - EXPORTS

Settlement Example:

$$\text{RTD BalMkt Total LBMP Stlmnt (\$)} = 68.60 + 4.94 + 3.77 = \$77.31$$

Where:

$$\text{RTD BalMkt LBMP Engy Stlmnt (\$)} = 1.67 * 41.08 = \$68.60$$

$$\text{RTD BalMkt LBMP Loss Stlmnt (\$)} = 1.67 * 2.96 = \$4.94$$

$$\text{RTD BalMkt LBMP Cong Stlmnt (\$)} = 1.67 * (-1 * -2.26) = \$3.77$$

$$\text{RTD BalMkt LBMP Energy (MWh)} = \{(0 - 20) * (300/3600)\} * -1 = -20 * .08333 * -1 = 1.67 \text{ MWh}$$

$$\text{Settlement/RTD interval} = \$77.31$$

Sum the 12 RTD interval calculations for the hourly value

(For training purposes, assume RTD interval and \$/MWh are constant for each interval)

$$\text{Total} = \$77.31 * 12 = \$927.72$$

Transaction Owner is PAID \$972.72

Energy Market [LBMP] Transactions

Balancing Market Energy – Imports and Exports

Settlement Reference Material:

- **Tariff Reference**
 - MST - Article 4, Section 4.5
- **Accounting and Billing Manual**
 - Section 4.3.3 & Appendix B (Imports)
 - Section 6.2.2 & Appendix J (Exports)
- **Advisory Billing File**
 - Transaction Customer Section
 - *R/T LBMP Market LBMP \$*
 - Hourly Bill Code: 520
 - Daily Bill Code: 767
- **DSS Corporate Report**
 - Settlement Details – Transaction Customer – Balancing Market LBMP Energy

Energy Market Transactions

Settlement Name:

- A. Day Ahead Market (DAM) Energy
- B. Balancing Market Energy
- C. DAM Replacement Energy for Curtailed Imports
- D. Real Time Market Replacement Energy for Curtailed Imports
- E. Trading Hub Energy Settlements
- F. Transmission Usage Charge (TUC)

DAM Replacement Energy for Curtailed Imports

- Applies to Import Bilateral transactions only, not LBMP transactions
- For curtailed transactions, Load obligation is met by purchasing energy from the NYISO market at LBMP prices
- Load obligation referred to as Replacement energy
- Applies to both Day Ahead and RT Markets

Note: Additional settlements related to Bilaterals will be discussed later, but this settlement is included in this section because it is tied to the LBMP.

Energy Market Transactions - DAM Replacement Energy for Curtailed Imports

Settlement Description:

Intended to address any shortfall between the amount of DAM Energy Profile (MW) [Bid] and the DAM Energy Scheduled (MW) via Bilateral Import Transactions

Energy Market Transactions

DAM Replacement Energy for Curtailed Imports

Settlement Eligibility:

Transaction Customers will receive a charge for Day Ahead Market (DAM) Replacement Energy (\$) if all of the following conditions exist:

- **The Transaction Contract is a DAM Bilateral Import Transaction**
 - TransCnt Transaction Type = “TUC”
 - Source Location is a NYISO external control area proxy bus
 - Sink Location is an internal NYISO load bus
 - TransCnt Transaction Category = Import

- **The Transaction Contract is scheduled in the NYISO DAM at an amount less than the amount bid in the DAM by the Transaction Customer on the DAM Transaction Bid**
 - Hr DAM Sched Trans: Trans (MW) < Hr DAM Energy Profile (MW)

Energy Market Transactions

DAM Replacement Energy for Curtailed Imports

Settlement Determinants:

- **Hr DAM Energy Profile (MW)**
- **Hr DAM Sched Trans (MW): Trans**
- **Hr DAM Energy Price: Src (\$/MWh)**
- **Hr DAM Loss Price: Src (\$/MWh)**
- **Hr DAM Cong Price: Src (\$/MWh)**

Energy Market Transactions

DAM Replacement Energy for Curtailed Imports

- **Settlement Intermediates**
 - Hr DAM Repl Energy (MWh)
 - Hr DAM Repl Energy Stlmnt (\$)
 - Hr DAM Repl Loss Stlmnt (\$)
 - Hr DAM Repl Cong Stlmnt (\$)

- **Settlement Results**
 - Hr Total DAM Repl Stlmnt (\$)

Energy Market Transactions

DAM Replacement Energy for Curtailed Imports

Settlement Algorithm:

Hr Total DAM Repl Stlmnt (\$) =

Hr DAM Repl Engy Stlmnt (\$) + **Hr DAM Repl Loss Stlmnt (\$)** + **Hr DAM Repl Cong Stlmnt (\$)**

Where:

Hr DAM Repl Engy Stlmnt (\$) =

Hr DAM Repl Energy (MWh) * **Hr DAM Energy Price: Src (\$/MWh)**

Hr DAM Repl Loss Stlmnt (\$) =

Hr DAM Repl Energy (MWh) * **Hr DAM Loss Price: Src (\$/MWh)**

Hr DAM Repl Cong Stlmnt (\$) =

Hr DAM Repl Energy (MWh) * **{(-1) * Hr DAM Cong Price: Src (\$/MWh)}**

And **Hr DAM Repl Energy (MWh)** is calculated as:

Hr DAM Repl Energy (MWh) =

(Hr DAM Energy Profile (MW) - Hr DAM Sched Trans (MW): Trans) * -1

Energy Market Transactions

DAM Replacement Energy for Curtailed Imports

Settlement Scenario:

MP bids 50 MWs via a bilateral import from ISONE

MP is scheduled for only 40 MWs due to interface capacity limitation

- The terms of the bilateral contract - to provide MWs to a load - must be maintained so the transaction owner must procure replacement energy to meet that obligation.
- The NYISO supplies the load with energy from the Day-Ahead LBMP Market
- Thus the cost to purchase these MWs are at the DAM LBMP rate
- **PJM Proxy Bus (Source) LBMP = \$56.64**
 - PJM Proxy Bus Energy = \$54.67
 - PJM Proxy Bus Loss = \$1.78
 - PJM Proxy Bus Congestion = \$-0.19

Energy Market Transactions

DAM Replacement energy for Curtailed Imports

Settlement Example:

$$\text{Hr Total DAM Repl Stlmnt (\$)} = -546.70 + -17.80 + -1.90 = -\$566.40$$

Where:

$$\text{Hr DAM Repl Engy Stlmnt (\$)} = -10\text{MWh} * \$54.67 = -\$546.70$$

$$\text{Hr DAM Repl Loss Stlmnt (\$)} = -10\text{MWh} * \$1.78 = -\$17.80$$

$$\text{Hr DAM Repl Cong Stlmnt (\$)} = -10\text{MWh} * (-1 * -\$0.19) = -\$1.90$$

$$\text{Hr DAM Repl Energy (MWh)} = ((+50\text{MWs}) - (+40\text{MWs})) * -1 = -10 \text{ MW}$$

MP PAYS \$566.40 for the 10MW Replacement Energy

Energy Market Transactions

DAM Replacement Energy for Curtailed Imports

Settlement Reference Material:

- **Tariff Reference**
 - MST – Attachment B, Section 17.3.3.5
- **Accounting and Billing Manual**
 - Section 7.2.1.1 & Appendix K
- **Advisory Billing File**
 - Transaction Customer Section
 - *DAM LBMP Market LBMP\$*
 - Hourly Bill Code: 515
 - Daily Bill Code: 762
- **DSS Corporate Report**
 - Settlement Details – Transaction Customer – Day Ahead Market Replacement Energy

Energy Market Transactions

Settlement Name:

- A. Day Ahead Market (DAM) Energy
- B. Balancing Market Energy
- C. DAM Replacement Energy for Curtailed Imports
- D. Real Time Replacement Energy for Curtailed Imports**
- E. Trading Hub Energy Settlements
- F. Transmission Usage Charge (TUC)

Energy Market Transactions - Real Time Replacement Energy for Curtailed Imports

Settlement Description:

Intended to address any shortfall between the amount of RT Transaction Energy Profile (MW) [Bid] and the actual Real-Time Energy Scheduled (MW) via Bilateral Import Transactions

Energy Market Transactions

Real Time Replacement Energy for Curtailed Imports

Settlement Eligibility:

Transaction Customers will be eligible for a charge or credit for Real Time Market Replacement Energy (\$) if all of the following conditions exist:

- The Transaction Contract is a Real-Time Bilateral Import Transaction
 - Source Location is a NYISO external control area proxy bus
 - Sink Location is an internal NYISO load bus
 - TransCnt Transaction Category = Import

- Note: Due to the potential for DAM replacement energy payback, all Bilateral Imports are eligible for the settlement

Energy Market Transactions

Real Time Replacement Energy for Curtailed Imports

Settlement Determinants:

- Hr RT Energy Profile (MW)
- RTD RT Sched Trans (MW): Trans
- Hr DAM Energy Profile (MW)
- Hr DAM Sched Trans (MW): Trans
- RTD RT Energy Price: Src (\$/MWh)
- RTD RT Loss Price: Src (\$/MWh)
- RTD RT Cong Price: Src (\$/MWh)
- RTD Interval Seconds

Energy Market Transactions

Real Time Replacement Energy for Curtailed Imports

Settlement Intermediates:

- Hr DAM Repl Energy (MW)
- RTD BalMkt Repl Energy (MWh)
- RTD BalMkt Repl Engy Stlmnt (\$)
- RTD BalMkt Repl Loss Stlmnt (\$)
- RTD BalMkt Repl Cong Stlmnt (\$)

Settlement Results:

- RTD Total BalMkt Repl Stlmnt (\$)

Energy Market Transactions

Real Time Replacement Energy for Curtailed Imports

Settlement Algorithm:

RTD BalMkt Total Repl Stlmnt (\$) is calculated as:

$$\text{RTD BalMkt Total Repl Stlmnt (\$)} = \text{RTD BalMkt Repl Engy Stlmnt (\$)} + \text{RTD BalMkt Repl Loss Stlmnt (\$)} + \text{RTD BalMkt Repl Cong Stlmnt (\$)}$$

Where:

$$\begin{aligned} \text{RTD BalMkt Repl Engy Stlmnt (\$)} = \\ \text{RTD BalMkt Repl Energy (MWh)} * \text{RTD RT Energy Price: Src (\$/MWh)} \end{aligned}$$

$$\begin{aligned} \text{RTD BalMkt Repl Loss Stlmnt (\$)} = \\ \text{RTD BalMkt Repl Energy (MWh)} * \text{RTD RT Loss Price: Src (\$/MWh)} \end{aligned}$$

$$\begin{aligned} \text{RTD BalMkt Repl Cong Stlmnt (\$)} = \\ \text{RTD BalMkt Repl Energy (MWh)} * \{(-1) * \text{RTD RT Cong Price: Src (\$/MWh)}\} \end{aligned}$$

Energy Market Transactions

Real Time Replacement Energy for Curtailed Imports

Settlement Algorithm:

And RTD BalMkt Repl Energy (MWh) is calculated as:

If

Hr DAM Energy Profile (MW) > Hr RT Energy Profile (MW),

THEN

RTD BalMkt Repl Energy (MWh) =

$$\left(\{ \text{Hr DAM Sched Trans (MW): Trans} - \text{RTD RT Sched Trans (MW): Trans} \} * \{ \text{RTD Interval Seconds} \div 3,600 \text{ seconds} \} \right) * -1$$

ELSE

RTD BalMkt Repl Energy (MWh) =

$$\left(\{ \text{Hr RT Energy Profile (MW)} - \text{RTD RT Sched Trans (MW): Trans} - \text{Hr DAM Repl Energy (MW)} \} * \{ \text{RTD Interval Seconds} \div 3,600 \text{ seconds} \} \right) * -1$$

Energy Market Transactions

Real Time Replacement Energy for Curtailed Imports

Settlement Scenario:

RT Energy Profile MWs = +40 MWs

RT Schedule = +25 MWs

No DAM Transaction Schedule

- The terms of the bilateral contract - to provide MWs to a load - must be maintained so the transaction owner must procure replacement energy to meet that obligation.
 - The NYISO supplies the load with energy from the RT LBMP Market
 - Thus the cost to purchase these MWs are at the RT LBMP rate
- **PJM Proxy Bus (Source) RT LBMP = \$56.64**
 - PJM Proxy Bus Energy = \$54.67
 - PJM Proxy Bus Loss = \$1.78
 - PJM Proxy Bus Congestion = \$-0.19

Energy Market Transactions

Real Time Replacement Energy for Curtailed Imports

Settlement example:

$$\text{RTD BalMkt Total Repl Stlmnt (\$)} = -68.34 + -2.23 + -0.24 = -\$70.81$$

Where:

$$\text{RTD BalMkt Repl Engy Stlmnt (\$)} = -1.25 \text{ MWh} * \$54.67 = -\$68.34$$

$$\text{RTD BalMkt Repl Loss Stlmnt (\$)} = -1.25 \text{ MWh} * \$1.78 = -\$2.23$$

$$\text{RTD BalMkt Repl Cong Stlmnt (\$)} = -1.25 \text{ MWh} * ((-1) * \$-0.19) = -\$0.24$$

$$\text{RTD BalMkt Repl Energy (MWh)} = ((40-25) * (300/3600)) * -1 = (15 * 0.08333) * -1 = -1.25 \text{ MWh}$$

$$\text{Settlement/RTD interval} = -\$70.81$$

Sum the 12 RTD interval calculations for the hourly value *(For training purposes, assume the RTD interval and \$/Mwh are constant for each interval in the hour)*

$$\text{Settlement /Hour} = -\$70.81 * 12 = -\$849.72$$

MP PAYS \$849.72

Energy Market [LBMP] Transactions

Real Time Market Replacement Energy for Curtailed Imports

Settlement Reference Material:

- **Tariff Reference**

- MST - Attachment B, Section 17.3.3.5

- **Accounting and Billing Manual**

- Section 7.2.2.1 & Attachment K

- **Advisory Billing File**

- Transaction Customer Section
 - *Balancing Market Replacement Energy \$*
- Hourly Bill Code: 520
- Daily Bill Code: 767

- **DSS Corporate Report**

- Settlement Details – Transaction Customer – Balancing Market Replacement Energy

Energy Market Transactions

Settlement Name:

- A. Day Ahead Market (DAM) Energy
- B. Balancing Market Energy
- C. DAM Replacement Energy for Curtailed Imports
- D. Real Time Market Replacement Energy for Curtailed Imports
- E. Trading Hub Energy Settlements
- F. Transmission Usage Charge (TUC)

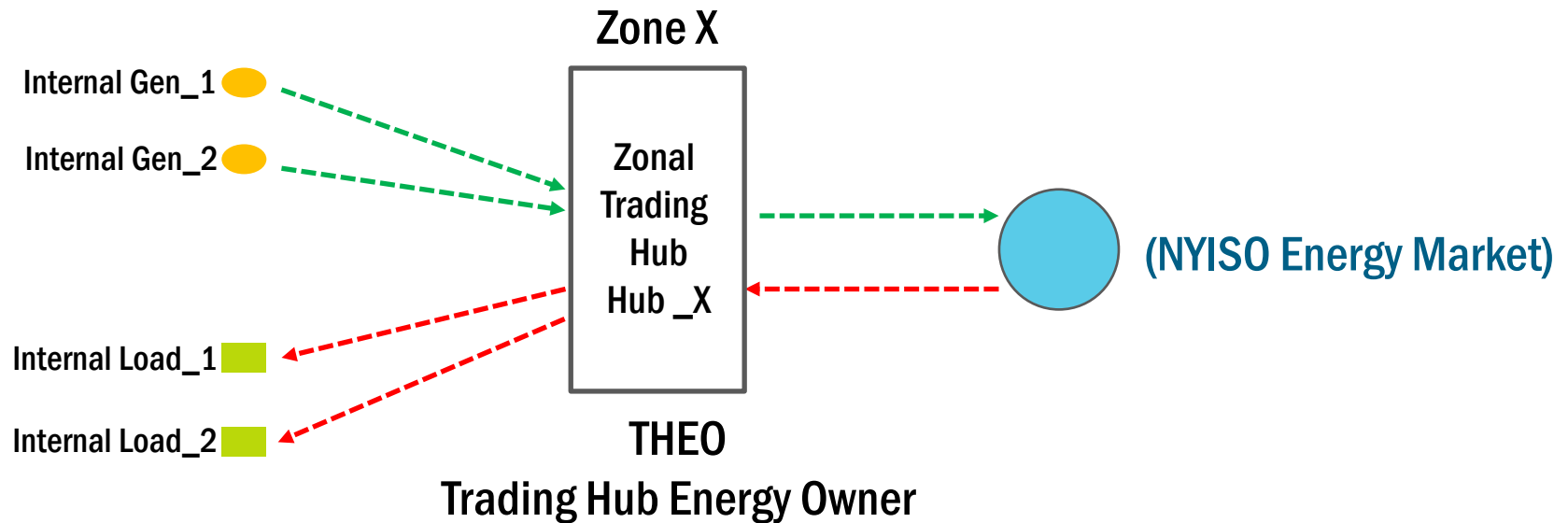
Energy Market Transactions - Trading Hub Energy Settlements

Settlement Description:

Intended to credit / charge a Trading Hub Energy Owner (THEO) for the DAM (or RT) energy scheduled via a trading hub sink or trading hub source

- 1. DAM Energy Settlement at Trading Hub Point of Withdrawal (Sink) bus**
- 2. RT Energy Settlement at Trading Hub Point of Withdrawal (Sink) bus**
- 3. DAM Energy Settlement at Trading Hub Point of Injection (Source) bus**
- 4. RT Energy Settlement at Trading Hub Point of Injection (Source) bus**

Trading Hubs - Illustration



Energy Market Transactions – Trading Hubs

Settlement Eligibility:

- **Transaction with trading hub as a sink, THEO sells MWs to NYISO LBMP market**
 - Source location is a NYISO gen bus
 - Sink location is a NYISO Trading Hub load bus
 - The transaction is scheduled in the NYISO DAM
- **Transaction with trading hub as a source, THEO purchases MWs from NYISO LBMP market**
 - Source location is a NYISO trading hub gen bus
 - Sink location is a NYISO load bus
 - The transaction is scheduled in the NYISO DAM

Energy Market Transactions – Trading Hubs

Settlement Detail:

- **Settlements calculation on a transaction-level basis**
 - Transaction with trading hub as a sink, THEO sells MWs to NYISO LBMP market (source is NYISO Gen Bus)
 - Transaction with a trading hub as a source, THEO purchases MWs from NYISO LBMP market (sink is NYISO Load Bus)
- **Settlements at the respective market's zonal LBMP**
 - DAM settlement at the hourly level
 - RT settlement at the time-weighted integrated hourly level (not the RTD level)

Energy Market Transactions – Trading Hubs

Settlement Detail: (cont'd)

- **MPs must have a balanced position when using trading hubs**
 - Must source the same number of MWs as they sink
 - LBMP settlements will offset each other
 - TUC settlement applied and addressed in the Internal Bilateral section

Energy Market Transactions – Trading Hubs

Settlement Determinants:

- DAM / RT Hrly Trading Hub MW
 - *Hr DAM / RT Trading Hub – Sink (MW)*
 - *Hr DAM / RT Trading Hub – Src (MW)*
- DAM / RT Energy Price: Sink (\$/MWh)
- DAM / RT Energy Price: Src (\$/MWh)
- DAM / RT Loss Price: Sink (\$/MWh)
- DAM / RT Loss Price: Src (\$/MWh)
- DAM / RT Cong Price: Sink (\$/MWh)
- DAM / RT Cong Price: Src (\$/MWh)

**Calculation is similar to LBMP Energy Market Transactions*

Energy Market Transactions – Trading Hubs

Settlement Intermediates:

- **DAM / RT Hrly Trading Hub Energy \$**
 - Hr DAM / RT Trading Hub LBMP Energy Stlmnt – Sink (\$)
 - Hr DAM / RT Trading Hub LBMP Energy Stlmnt – Src (\$)
- **DAM / RT Hrly Trading Hub Loss \$**
 - Hr DAM / RT Trading Hub LBMP Loss Stlmnt – Sink (\$)
 - Hr DAM / RT Trading Hub LBMP Loss Stlmnt – Src (\$)
- **DAM / RT Hrly Trading Hub Cong \$**
 - Hr DAM Trading Hub LBMP Cong Stlmnt – Sink (\$)
 - Hr DAM Trading Hub LBMP Cong Stlmnt – Src (\$)
- **DAM / RT Hrly Trading Hub LBMP \$**
 - Hr DAM Trading Hub Total LBMP Stlmnt – Sink (\$)
 - Hr DAM Trading Hub Total LBMP Stlmnt – Src (\$)

Settlement Resultants:

- DAM / RT Hrly Trading Hub LBMP \$

Energy Market Transactions – Trading Hubs

Settlement Scenario:

- THEO sinks MWs into the trading hub sourced from a generator
 - Generator to Trading Hub
- THEO then sinks those MWs (sourced from the hub) to two different loads
 - Trading Hub to Load
- THEO sinks 20 MWs from internal generator _A1 to Hub_B and then sources 15 MWs from Hub_B to internal load_B1 and 5 MWs to internal load_B2

Energy Market Transactions – Trading Hubs

Settlement Example:

THEO is charged/credited for the energy scheduled via the trading hub for each bilateral transaction.

Source	Sink	MW	Zonal LBMP for Zone B	Trading Hub LBMP Settlement	
<div>Trans. #1</div> Internal GEN_A1	Zonal Load HUB_B	20	\$35	<div>THEO receives</div> $\$35 \times 20 = \700	
<div>Trans. #2</div> Zonal Gen HUB_B	Load_B1	-15	\$35	<div>THEO pays</div> $\$35 \times (-15) = \-525	
<div>Trans. #3</div> Zonal Gen HUB_B	Load_B2	-5	\$35	<div>THEO pays</div> $\$35 \times (-5) = \-175	

Note: TUCs for the transactions will be addressed in a later section.

Transactions net to \$0

Energy Market Transactions

Trading Hub Transactions - DAM

Settlement Reference Material:

- **Tariff Reference**
 - MST - Article 4, Section 4.2.7 (DAM)
 - MST - Article 4, Section 4.5.7 & 4.5.8 (RT)
- **Accounting and Billing Manual**
 - Section 7.7 & Appendix K
- **Advisory Billing File**
 - Transaction Customer Section
 - *Hrly Trading Hub \$*
 - Hourly Bill Code: 544 (DAM), 549 (RT)
 - Daily Bill Code: 783 (DAM), 787 (RT)
- **DSS Corporate Report**
 - Settlement Details – Transaction Customer – Day Ahead Market Trading Hub LBMP Energy
 - Settlement Details – Transaction Customer – Real Time Market Trading Hub LBMP Energy

Energy Market Transactions

Settlement Name:

- A. Day Ahead Market (DAM) Energy
- B. Balancing Market Energy
- C. DAM Replacement Energy for Curtailed Imports
- D. Real Time Market Replacement Energy for Curtailed Imports
- E. Trading Hub Energy Settlements
- F. Transmission Usage Charge (TUC)

Energy Market Transactions – Transmission Usage Charges (TUC)

Settlement Name:

- A. DAM TUC (Import, Export, Wheel, Internal)
- B. Balancing Market TUC (Import, Export, Wheel, Internal)

Energy Market Transactions

DAM Transmission Usage Charge – Bilateral Imports

Settlement Description:

- **Intended to charge TUCs to Transaction Customers with Bilateral Import Transaction Contracts in the NYISO (DAM) for the usage of the New York Control Area (NYCA) transmission grid (losses and congestion)**

Energy Market Transactions

DAM Transmission Usage Charge – Bilateral Imports

Settlement Eligibility:

- ***Transaction Customers will receive a charge for Day Ahead Market (DAM) Transmission Usage Charges (TUC) (\$) if all of the following conditions exist:***
 - The Transaction Contract is a DAM Bilateral Import Transaction
 - Source Location is a NYISO external control area proxy bus
 - Sink Location is an internal NYISO load bus
 - TransCnt Transaction Category = Import
- ***The Transaction Contract is bid into the NYISO DAM***
 - DAM Energy Profile (MW) $\neq 0$

Energy Market Transactions

DAM Transmission Usage Charge – Bilateral Imports

Settlement Determinants:

- Hr DAM Cong Price: Sink (\$/MWh)
- Hr DAM Cong Price: Src (\$/MWh)
- Hr DAM Loss Price: Sink (\$/MWh)
- Hr DAM Loss Price: Src (\$/MWh)
- DAM Energy Profile (MW)

- Hr DAM TUC GTR Ind
- Hr GTR Cong Relief (MW)
- Hr DAM GTR Cong Price: Sink (\$/MWh)
- Hr DAM GTR Cong Price: Src (\$/MWh)
- Capability Period
- Hr GTR Contract: Summer (MW)
- Hr GTR Contract: Winter (MW)

Energy Market Transactions

DAM Transmission Usage Charge – Bilateral Imports

Settlement Intermediates

- Hr DAM TUC Energy (MWh)
- Hr DAM TUC Loss Stlmnt (\$)
- Hr DAM TUC Cong Stlmnt (\$)
- Hr DAM TUC Relief Credit (\$)
- Hr GTR Cong Relief Ratio

Settlement Results

- Hr Total DAM TUC Stlmnt (\$)

Energy Market Transactions

DAM Transmission Usage Charge – Bilateral Imports

Settlement Algorithm:

$$\text{Hr Total DAM TUC Stlmnt (\$)} = \\ (\text{Hr DAM TUC Loss Stlmnt (\$)} + \text{Hr DAM TUC Cong Stlmnt (\$)})$$

Where

Hr DAM TUC Loss Stlmnt (\$) is calculated as:

$$\text{Hr DAM TUC Loss Stlmnt (\$)} =$$

$$\text{Hr DAM TUC Energy (MWh)} * [\{ \text{Hr DAM Loss Price: Sink (\$/MWh)} - \text{Hr DAM Loss Price: Src (\$/MWh)} \}] * -1$$

Where Hr DAM TUC Cong Stlmnt (\$) is calculated as:

If Hr DAM TUC GTR Ind = “N”

$$\text{Hr DAM TUC Cong Stlmnt (\$)} =$$

$$\text{Hr DAM TUC Energy (MWh)} * [\{ (-1) * (\text{Hr DAM Cong Price: Sink (\$/MWh)} - \text{Hr DAM Cong Price: Src (\$/MWh)}) \}] * -1$$

And

$$\text{Hr DAM TUC Energy (MWh)} = \text{Hr DAM Energy Profile (MW)}$$

Energy Market Transactions

DAM Transmission Usage Charge – Bilateral Imports

Settlement Scenario:

Import from PJM (source) to NYISO Load in NYC (sink)

- DAM schedule of 30 MWs
- Load has negotiated a price for the energy with a supplier in PJM outside of the NYISO
- Transaction Owner must pay loss and congestion costs to the NYISO
- Hr DAM TUC GTR Ind = 'N'

Hr DAM Loss Price: Sink (\$/MWh) = \$5.58

Hr DAM Cong Price: Sink (\$/MWh) = \$-2.56

Hr DAM Loss Price: Src (\$/MWh) = \$1.54

Hr DAM Cong Price: Src (\$/MWh) = \$0.00

Hr DAM Energy Profile (MW) = 30MW

Energy Market Transactions

DAM Transmission Usage Charge – Bilateral Imports

Settlement Example:

$$\text{Hr Total DAM TUC Stlmnt (\$)} = -\$121.20 + -\$76.80 = -\$198.00$$

Where

$$\text{Hr DAM TUC Loss Stlmnt (\$)} = 30 * (\$5.58 - \$1.54) * -1 = -\$121.20$$

Hr DAM TUC GTR Ind = "N".

therefore Hr DAM TUC Energy (MWh) = Hr DAM Energy Profile (MW) = 30MW

$$\text{Hr DAM TUC Cong Stlmnt (\$)} = 30 * (-1 * (-\$2.56 - \$0)) * -1 = -\$76.80$$

Energy Market Transactions – DAM Transmission Usage Charge - Bilateral Exports

Settlement Description:

Intended to charge TUCs to Transaction Customers with Bilateral Export Transaction Contracts in the NYISO (DAM) for the usage of the New York Control Area (NYCA) transmission grid (losses and congestion)

Energy Market Transactions –

DAM Transmission Usage Charge - Bilateral Exports

Settlement Eligibility:

- *Transaction Customers will receive a charge for Day Ahead Market (DAM) Transmission Usage Charges (TUC) (\$) if all of the following conditions exist:*
 - The Transaction Contract is a DAM Bilateral Export Transaction
 - Source Location is an internal NYISO generation bus
 - Sink Location is a NYISO external control area proxy bus
 - TransCnt Transaction Category = Export
- *The Transaction Contract is scheduled into the NYISO DAM*
 - Hr DAM Sched Trans (MW): Trans \neq 0

Energy Market Transactions –

DAM Transmission Usage Charge - Bilateral Exports

Settlement Determinants:

- Same as DAM Transmission Usage Charges - Bilateral Import Transactions except:
 - Use Hr DAM Sched Trans (MW): Trans instead of Hr DAM Energy Profile (MW)

Energy Market Transactions –

DAM Transmission Usage Charge - Bilateral Exports

Settlement Algorithm:

Same as DAM Transmission Usage Charges - Bilateral Import Transactions except:

- Hr DAM TUC Energy (MWh) = Hr DAM Sched Trans (MW): Trans

Energy Market Transactions – DAM Transmission Usage Charges (TUC) –Wheels through

Settlement Description:

Intended to charge TUCs to Transaction Customers with Wheel-through Transaction Contracts in the NYISO (DAM) for the usage of the New York Control Area (NYCA) transmission grid (losses and congestion).

Energy Market Transactions –

DAM Transmission Usage Charges (TUC) –Wheels through

Settlement Eligibility

- ***Transaction Customers will receive a charge for Day Ahead Market (DAM) Transmission Usage Charges (TUC) (\$) if the following conditions exist:***
 - The Transaction Contract is a DAM Bilateral Wheel-through Transaction
 - Source Location is a NYISO external control area proxy bus
 - Sink Location is a NYISO external control area proxy bus
 - TransCnt Transaction Category = Wheel-through
- ***The Transaction Contract is scheduled into the NYISO DAM***
 - Hr DAM Sched Trans (MW): Trans \neq 0

Energy Market Transactions – DAM Transmission Usage Charges (TUC) –Wheels through

Settlement Determinants:

- Same as DAM Transmission Usage Charges - Bilateral Import Transactions except:
 - Use Hr DAM Sched Trans (MW): Trans instead of Hr DAM Energy Profile (MW)

Energy Market Transactions – DAM Transmission Usage Charges (TUC) –Wheels through

Settlement Algorithm:

Same as DAM Transmission Usage Charges - Bilateral Import Transactions except:

- Hr DAM TUC Energy (MWh) = Hr DAM Sched Trans (MW): Trans

Energy Market Transactions –

DAM Transmission Usage Charges (TUC) - Internal Bilateral

Settlement Description:

Intended to charge TUCs to Transaction Customers with Bilateral Internal Transaction Contracts in the NYISO (DAM) for the usage of the New York Control Area (NYCA) transmission grid (losses and congestion)

Energy Market Transactions –

DAM Transmission Usage Charges (TUC) –Internal Bilateral

Settlement Eligibility

- ***Transaction Customers will receive a charge for Day Ahead Market (DAM) Transmission Usage Charges (TUC) (\$) if all of the following conditions exist:***
 - The Transaction Contract is a DAM Bilateral Internal Transaction
 - Source Location is an internal NYISO generation bus
 - Sink Location is an internal NYISO load bus
 - TransCnt Transaction Category = Internal
- ***The Transaction Contract is scheduled into the NYISO DAM***
 - Hr DAM Sched Trans (MW): Trans <> 0

Energy Market Transactions –

DAM Transmission Usage Charges (TUC) - Internal Bilateral

Settlement Determinants:

- Same as DAM Transmission Usage Charges - Bilateral Import Transactions except:
 - Use Hr DAM Sched Trans (MW): Trans instead of Hr DAM Internal Bilateral (MW)

Energy Market Transactions –

DAM Transmission Usage Charges (TUC) –Internal Bilateral

Settlement Algorithm:

Same as DAM Transmission Usage Charges - Bilateral Import Transactions except:

- Hr DAM TUC Energy (MWh) = Hr DAM Sched Trans: Trans (MW)

Energy Market Transactions –

DAM Transmission Usage Charges (TUC) – Internal Bilateral

- Trading Hub Transactions are a type of Internal Bilateral
- TUC settlement for Trading Hubs is the same as an Internal Bilateral Transaction
- Trading Hub transactions also have the LBMP energy settlement associated with them – addressed previously.

Energy Market Transactions –

DAM Transmission Usage Charges (TUC) –Internal Bilateral

Settlement Scenario:

- **THEO sinks MWs into the trading hub sourced from a generator**
 - Generator to Trading Hub
- **THEO then sinks those MWs (sourced from the hub) to two different loads**
 - Trading Hub to Load
- **THEO sinks 20 MWs from internal generator Gen_A1 to Hub_B and then sources 15 MWs from Hub_B to internal load_B1 and 5 MWs to internal load_B2**

Transmission Usage Charge

DAM TUC – Internal Bilateral

Settlement Example:

- THEO is charged/credited for the transmission usage charge (TUC) per MW on each bilateral transaction.

Source	Sink	MW	TUC = Sink LBMP- Source LBMP	Losses & congestion revenue (TUC) X MW	Trading Hub LBMP Settlement
Trans. #1 Internal GEN_A1	Zonal Load HUB_B	20	$\$35 - \$25 = \$10$	\$200	THEO receives $\$35 \times 20 = \700
Trans. #2 Zonal Gen HUB_B	Load_B1	-15	$\$35 - \$35 = \$0$	\$0	THEO pays $\$35 \times (-15) = \-525
Trans. #3 Zonal Gen HUB_B	Load_B2	-5	$\$35 - \$35 = \$0$	\$0	THEO pays $\$35 \times (-5) = \-175

THEO charged \$200 in TUCs.

Energy Market Transactions- DAM Transmission Usage Charge (TUC)

Settlement Reference Material:

- **Tariff Reference**
 - OATT – Schedule 7, Section 6.7.1.1
- **Accounting and Billing Manual**
 - Section 7.1.1 (Internals)
 - Section 7.2.1. (Imports)
 - Section 7.3.1 (Exports)
 - Section 7.4.1 (Wheels)
 - Appendix K
- **Advisory Billing File**
 - Transaction Customer Section
 - *Day Ahead TUC \$*
 - Hourly Bill Code: 504
 - Daily Bill Code: 753
- **DSS Corporate Report**
 - Settlement Details – Transaction Customer – Day Ahead Market Transmission Usage Charges

Energy Market Transactions - Transmission Usage Charges (TUC)

Settlement Name:

- A. DAM TUC (Import, Export, Wheel, Internal)
- B. Balancing Market TUC (Import, Export, Wheel, Internal)

Energy Market Transactions

Balancing Market TUC – Bilateral Import

Settlement Description:

- **Intended to charge any additional TUCs (due to additional transaction bidding) to Transaction Customers with Bilateral Import Transaction Contracts in the NYISO Real Time Market (HAM) for the usage of the NYCA transmission grid (losses and congestion)**
- **A charge when RT Energy Profile MW > DAM Energy Profile MW**
- **Determined at the Real Time Dispatch (RTD) interval level for each Bilateral Import Transaction.**

Energy Market Transactions

Balancing Market TUC – Bilateral Import

Settlement Eligibility:

- *Transaction Customers will receive a charge for Balancing Market Transmission Usage Charges (TUC) (\$) if all of the following conditions exist:*
- **The Transaction Contract is a real-time Bilateral Import Transaction**
 - Source Location is a NYISO external control area proxy bus
 - Sink Location is an internal NYISO load bus
 - TransCnt Transaction Category = Import
- **The Transaction Contract is bid into the NYISO real-time market above that in the DAM**
 - Hr RT Energy Profile (MW) > Hr DAM Energy Profile (MW).

Energy Market Transactions

Balancing Market TUC – Bilateral Import

Settlement Determinants:

- Hr DAM Energy Profile (MW)
- Hr RT Energy Profile (MW)
- RTD RT Cong Price: Sink (\$/MWh)
- RTD RT Cong Price: Src (\$/MWh)
- RTD RT Loss Price: Sink (\$/MWh)
- RTD RT Loss Price: Src (\$/MWh)
- RTD Interval Seconds

Energy Market Transactions

Balancing Market TUC – Bilateral Import

Settlement Intermediates:

- RTD BaIMkt TUC Sched (MW)
- RTD BaIMkt TUC Sched (MWh)
- RTD BaIMkt TUC Loss Stlmnt (\$)
- RTD BaIMkt TUC Cong Stlmnt (\$)

Settlement Results

- RTD Total BaIMkt TUC Stlmnt (\$)

Energy Market Transactions

Balancing Market TUC – Bilateral Import

Settlement Algorithm:

$$\text{RTD Total BalMkt TUC Stlmnt (\$)} = \\ (\text{RTD BalMkt TUC Loss Stlmnt (\$)} + \text{RTD BalMkt TUC Cong Stlmnt (\$)})$$

Where:

$$\begin{aligned} \text{RTD BalMkt TUC Loss Stlmnt (\$)} = \\ \text{RTD BalMkt TUC Sched (MWh)} * \{ \text{RTD RT Loss Price: Sink (\$/MWh)} - \text{RTD RT Loss Price: Src (\$/MWh)} \} * -1 \end{aligned}$$

$$\begin{aligned} \text{RTD BalMkt TUC Cong Stlmnt (\$)} = \\ \text{RTD BalMkt TUC Sched (MWh)} * \{ (-1) * (\text{RTD RT Cong Price: Sink (\$/MWh)} - \text{RTD RT Cong Price: Src (\$/MWh)}) \} * -1 \end{aligned}$$

And RTD BalMkt TUC Sched (MWh) is calculated as:

$$\begin{aligned} \text{RTD BalMkt TUC Sched (MWh)} = \\ \text{RTD BalMkt TUC Sched (MW)} * (\text{RTD Interval Seconds} \div 3,600 \text{ seconds}) \end{aligned}$$

Where:

$$\begin{aligned} \text{RTD BalMkt TUC Sched (MW)} = \\ \text{Hr RT Energy Profile (MW)} - \text{Hr DAM Energy Profile (MW)} \end{aligned}$$

Energy Market Transactions

Balancing Market TUC – Bilateral Import

Settlement Scenario:

Import from PJM (source) to NYISO Load in NYC (sink)

- DAM Energy Profile = 30 MWs
- DAM Schedule = 30 MWs
- RT Energy Profile = 50 MWs
 - Customer wanted to schedule additional MWs above their DAM schedule

RTD RT Loss Price: Sink (\$/MWh) = \$5.01

RTD RT Loss Price: Src (\$/MWh) = \$1.78

RTD RT Cong Price: Sink (\$/MWh) = \$0.00

RTD RT Cong Price: Src (\$/MWh) = \$-0.19

RTD Interval length = $300/3600 = .0833$

Energy Market Transactions

Balancing Market TUC – Bilateral Import

Settlement Example:

$$\text{RTD Total BalMkt TUC Stlmnt (\$)} = -\$5.39 + \$0.32 = \text{\textcolor{green}{-\$5.07}}$$

Where:

$$\text{RTD BalMkt TUC Loss Stlmnt (\$)} = 1.67 * \{\$5.01 - \$1.78\} * -1 = 1.67 * \$3.23 * -1 = \text{\textcolor{green}{-\$5.39}}$$

$$\text{RTD BalMkt TUC Cong Stlmnt (\$)} = 1.67 * \{-1 * (\$0 - (-\$0.19))\} * -1 = 1.67 * -\$0.19 * -1 = \text{\textcolor{green}{\$0.32}}$$

$$\text{RTD BalMkt TUC Sched (MWh)} = (50-30) * .833 = 20 * .833 = \text{\textcolor{blue}{1.67 MWh}}$$

$$\text{Settlement/RTD interval} = -\$5.07$$

Sum the 12 RTD interval calculations for the hourly value (For training purposes, assume RTD interval and \$/MWh are constant for each interval)

$$\text{Total} = \text{\textcolor{green}{\$-60.84}}$$

Transaction Owner pays the NYISO **\text{\textcolor{green}{\\$60.84}}**

Energy Market Transactions – Balancing Market (TUC) – Bilateral Export

Settlement Description:

- Intended to charge any additional TUCs (as a result of additional transaction bidding) to Transaction Customers with Bilateral Export Transaction Contracts in the NYISO Real Time Market for the usage of the NYCA transmission grid (losses and congestion)
- Is a charge when $RT \text{ Sched MW} > DAM \text{ Sched MW}$
- Determined at the Real Time Dispatch (RTD) interval level for each Bilateral Export Transaction

Energy Market Transactions – Balancing Market (TUC) – Bilateral Export

Settlement Eligibility:

- *Transaction Customers will receive a charge for Balancing Market Transmission Usage Charges (TUC) (\$) if all of the following conditions exist:*
- **The Transaction Contract is a real-time Bilateral Export Transaction**
 - Source Location is a NYISO gen bus
 - Sink Location is a NYISO external control area proxy bus
 - TransCnt Transaction Category = Export
- **The Transaction Contract scheduled into the NYISO RT market is above that in the DAM**
 - $\text{RTD RT Sched Trans (MW):Trans} > \text{Hr DAM Sched Trans (MW): Trans}$

Energy Market Transactions – Balancing Market (TUC) – Bilateral Export

Settlement Determinants

- Hr DAM Sched Trans (MW): Trans
- RTD RT Sched Trans (MW): Trans
- RTD RT Cong Price: Sink (\$/MWh)
- RTD RT Cong Price: Src (\$/MWh)
- RTD RT Loss Price: Sink (\$/MWh)
- RTD RT Loss Price: Src (\$/MWh)
- RTD Interval Seconds

Energy Market Transactions – Balancing Market (TUC) – Bilateral Export

Settlement Intermediates:

- RTD BalMkt TUC Sched (MW)
- RTD BalMkt TUC Sched (MWh)
- RTD BalMkt TUC Cong Stlmnt (\$)
- RTD BalMkt TUC Loss Stlmnt (\$)

Settlement Results:

- RTD Total BalMkt TUC Stlmnt (\$)

Energy Market Transactions – Balancing Market (TUC) – Bilateral Export

Settlement Algorithm:

$$\text{RTD Total BalMkt TUC Stlmnt (\$)} = \\ (\text{RTD BalMkt TUC Loss Stlmnt (\$)} + \text{RTD BalMkt TUC Cong Stlmnt (\$)})$$

Where:

$$\begin{aligned} \text{RTD BalMkt TUC Loss Stlmnt (\$)} = \\ \text{RTD BalMkt TUC Sched (MWh)} * \{ \text{RTD RT Loss Price: Sink (\$/MWh)} - \text{RTD RT Loss Price: Src (\$/MWh)} \} * -1 \end{aligned}$$

$$\begin{aligned} \text{RTD BalMkt TUC Cong Stlmnt (\$)} = \\ \text{RTD BalMkt TUC Sched (MWh)} * \{ (-1) * (\text{RTD RT Cong Price: Sink (\$/MWh)} - \text{RTD RT Cong Price: Src (\$/MWh)}) \} * -1 \end{aligned}$$

And

$$\begin{aligned} \text{RTD BalMkt TUC Sched (MWh)} = \\ \text{RTD BalMkt TUC Sched (MW)} * (\text{RTD Interval Seconds} \div 3,600 \text{ seconds}) \end{aligned}$$

Where:

$$\begin{aligned} \text{RTD BalMkt TUC Sched (MW)} = \\ \text{RTD RT Sched Trans (MW): Trans} - \text{Hr DAM Sched Trans (MW): Trans} \end{aligned}$$

Energy Market Transactions – Balancing Market (TUC) –Wheels through

Settlement Description:

- **Intended to charge any additional TUCs (due to additional transaction bidding) to Transaction Customers with Wheel-through Transaction Contracts in the NYISO Real Time Market for the usage of NYCA transmission grid (losses and congestion).**
- **Is a charge when RT Sched MW > DAM Sched MW**
- **Determined at the Real Time Dispatch (RTD) interval level**

Energy Market Transactions – Balancing Market (TUC) – Wheels through

Settlement Eligibility:

- *Transaction Customers will receive a charge for Balancing Market Transmission Usage Charges (TUC) (\$) if the following conditions exist:*
- **The Transaction Contract is a real-time Wheel-through Transaction**
 - Source Location is a NYISO external control area proxy bus
 - Sink Location is a NYISO external control area proxy bus
 - TransCnt Transaction Category = Wheel-through
- **The Transaction Contract scheduled into the NYISO RT market is above that in the DAM**
 - $\text{RTD RT Sched Trans (MW):Trans} > \text{Hr DAM Sched Trans (MW): Trans}$

Energy Market Transactions – Balancing Market (TUC) – Wheels through

Settlement Determinants:

- Same as Bilateral Export Balancing Market TUC

Energy Market Transactions – Balancing Market (TUC) – Wheels through

Settlement Intermediates:

- Same as Bilateral Export Balancing Market TUC

Settlement Results

- Same as Bilateral Export Balancing Market TUC

Energy Market Transactions – Balancing Market (TUC) – Wheels through

Settlement Algorithm:

- **Same as Bilateral Export Balancing Market TUC**

Energy Market Transactions – Balancing Market (TUC) – Internal Bilateral

Settlement Description:

- **Intended to charge any additional TUCs (as a result of additional transaction bidding) to Transaction Customers with Internal Bilateral Transaction Contracts in the NYISO Real Time Market for the usage of the NYCA transmission grid (losses and congestion).**
- **Is a charge (when $RT\ Bid\ MW > DAM\ Bid\ MW$) to the Transaction Customer for the given transaction scheduled in the NYISO Real Time (RT) Market**
- **Determined at the Real Time Dispatch (RTD) interval level for each Internal Bilateral Transaction**

Energy Market Transactions – Balancing Market (TUC) – Internal Bilateral

Settlement Eligibility:

- *Transaction Customers will receive a charge for Balancing Market Transmission Usage Charges (TUC) (\$) if all of the following conditions exist:*
- **The Transaction Contract is a real-time Internal Bilateral Transaction**
 - Source Location is an internal NYISO gen bus
 - Sink Location is an internal NYISO load bus
 - TransCnt Transaction Category = Internal
- **The Transaction Contract is bid into the NYISO RT market above that in the DAM**
 - Hr RT Internal Bilateral (MW) > Hr Internal Bilateral (MW)

Energy Market Transactions – Balancing Market (TUC) – Internal Bilateral

Settlement Determinants

- Hr DAM Internal Bilateral (MW)
- Hr RT Internal Bilateral (MW)
- RTD RT Cong Price: Sink (\$/MWh)
- RTD RT Cong Price: Src (\$/MWh)
- RTD RT Loss Price: Sink (\$/MWh)
- RTD RT Loss Price: Src (\$/MWh)

- RTD Interval Seconds

Energy Market Transactions – Balancing Market (TUC) – Internal Bilateral

Settlement Intermediates:

- RTD BalMkt TUC Sched (MW)
- RTD BalMkt TUC Sched (MWh)
- RTD BalMkt TUC Loss Stlmnt (\$)
- RTD BalMkt TUC Cong Stlmnt (\$)

Settlement Results:

- RTD Total BalMkt TUC Stlmnt (\$)

Energy Market Transactions – Balancing Market (TUC) – Internal Bilateral

Settlement Algorithm:

RTD Total BalMkt TUC Stlmnt (\$) =

(RTD BalMkt TUC Loss Stlmnt (\$) + RTD BalMkt TUC Cong Stlmnt (\$))

Where:

RTD BalMkt TUC Loss Stlmnt (\$) =

RTD BalMkt TUC Sched (MWh) * {RTD RT Loss Price: Sink (\$/MWh) - RTD RT Loss Price: Src (\$/MWh)} * -1

RTD BalMkt TUC Cong Stlmnt (\$) =

RTD BalMkt TUC Sched (MWh) * { (-1) * RTD RT Cong Price: Sink (\$/MWh) - RTD RT Cong Price: Src (\$/MWh)} * -1

And

RTD BalMkt TUC Sched (MWh) =

RTD BalMkt TUC Sched (MW) * {RTD Interval Seconds ÷ 3,600 seconds}

Where:

RTD BalMkt TUC Sched (MW) =

Hr RT Internal Bilateral (MW) - Hr DAM Internal Bilateral (MW)

Energy Market Transactions - Balancing Market TUC

Settlement Reference Material:

- **Tariff Reference**
 - OATT – Schedule 7, Section 6.7.1.2
- **Accounting and Billing Manual**
 - Section 7.1.2 (Internals)
 - Section 7.2.2 (Imports)
 - Section 7.3.2 (Exports)
 - Section 7.4.2 (Wheels)
 - Appendix K
- **Advisory Billing File**
 - Transaction Customer Section
 - *Hrly R/T TUC \$*
 - Hourly Bill Code: 508
 - Daily Bill Code: 757
- **DSS Corporate Report**
 - Settlement Details – Transaction Customer – Balancing Market Transmission Usage Charges

Appendix

DAM TUC - Bilateral Imports and Grandfathered Transmission Rights (GTR)

Energy Market Transactions DAM TUC - Bilateral Imports-GTR

- **Hr GTR Congestion Relief (MW)**
 - Hourly grandfathered transmission rights contracted (MW)
 - Represents the amount of transaction energy rights specified on existing transmission contracts prior to the NYISO markets that is considered grand-fathered transmission rights in NYISO settlements and therefore exempted from the DAM TUC congestion component
 - Summer or Winter contracted MW values

Energy Market Transactions DAM TUC -

Bilateral Imports-GTR

■ Hr GTR Cong Relief Ratio

- Hourly Grandfathered Transmission Rights (GTR) Congestion Relief Ratio
- Represents a ratio of the amount of GTRs to the total amount of DAM Transaction Scheduled Energy corresponding to the GTR
 - equals 1 when DAM scheduled energy (MW) < total GTR (MW)
 - used to allocate GTRs to applicable Transaction Contracts

Energy Market Transactions DAM TUC New York ISO Independent System Operator

Bilateral Imports-GTR

- Hr DAM TUC Relief Credit (\$)
 - Hourly Day Ahead Market (DAM) Transmission Usage Charge (TUC) Relief Credit (\$)
 - Represents the amount of credit to be used to offset a Transaction Contract's DAM TUCs due to Grandfathered Transmission Rights (GTR)

Energy Market Transactions DAM TUC - Bilateral Imports-GTR

Settlement Algorithm:

If Hr DAM TUC GTR Ind = “Y”

Refer to Billing and Accounting Manual Sections 7.1.1 and 7.5 and Appendix K.1.2