

Carbon Pricing

Import/Export Transaction Examples

Ethan D. Avallone

SENIOR MARKET DESIGN SPECIALIST – ENERGY MARKET DESIGN

Market Issues Working Group (MIWG)

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Agenda

- Purpose
- Background
- Import and Export Transactions
- Import Transaction Examples
- Export Transaction Examples

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Purpose

Purpose

- **At the December 17, 2018 IPPTF meeting, the NYISO presented the IPPTF Carbon Pricing Proposal**
 - This proposal provides the basis of a carbon pricing market design for stakeholder consideration and discussion within the NYISO's shared governance process, starting with MIWG.*
- **At this meeting, stakeholders requested the NYISO provide more detailed examples of import and export transactions under carbon pricing.**
 - In response to stakeholder feedback, this presentation provides additional examples.

*See 12/17/2018 IPPTF presentation at the following link:

<https://www.nyiso.com/documents/20142/3911819/20181217%20Carbon%20Pricing%20Proposal%20slides%20FOR%20POSTING.pdf/88530ccf-9a43-74ef-d31a-fb19d20f5418>



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Background

Background – IPPTF Carbon Pricing Proposal

- Apply carbon charges or credits to external transactions such that they compete with internal resources (and each other) as if the NYISO was not applying a carbon charge to internal suppliers (i.e., on a status quo basis)*
 - Imports would be paid the LBMP and get a carbon charge equal to the carbon impact (LBMPc), at the relevant border
 - Conceptually, this is similar to an internal generator
 - Exports would pay the LBMP and receive a carbon credit equal to the LBMPc at the relevant border
 - Wheel-through transactions have a two part carbon charge; they pay the LBMPc at the import interface and are paid the LBMPc at the export interface
 - Carbon charges only apply to transactions that flow in real-time
- The real-time LBMPc, based on the real-time system dispatch, will be used to determine charges and credits.

*For further information, please see the IPPTF Carbon Pricing Proposal at the following link:

<https://www.nyiso.com/documents/20142/2244202/IPPTF%20Carbon%20Pricing%20Proposal/60889852-2eaf-6157-796f-0b73333847e8>

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Background – IPPTF Carbon Pricing Proposal

- Import and export schedules will be determined as they are determined today, via the system optimization software, based on import and export bids
- Traders may incorporate expected payments/charges into their bids
 - Traders that do not do so face the prospect of receiving an undesired schedule
- The NYISO will create a new billing code for carbon charge settlements (i.e., the carbon charge will be a separate line item on bills and invoices)
 - For example, an import will see both a payment equal to the full LBMP (as they do now) and, under a separate billing code, a charge equal to the carbon impact on LBMP on its bill
- Carbon charges/credits will only occur when energy flows in real-time
 - For example, a day-ahead (DA) schedule that flows in real-time (RT) will result in a charge/credit. A DA schedule that is bought out in RT (no flow) will not incur a carbon charge/credit.
- Proxy Generator Bus LBMPs are currently published on the NYISO web site. The LBMPc will also be available on the NYISO web site (the exact timing still needs to be determined).

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Background - LBMP_C Posting

- The NYISO is targeting the following post for LBMP_C; however, the ultimate implementation will depend on whether the posting is technologically possible and necessary for market information:
 - Compute and post the zonal LBMP_C for RTD and RTC intervals, as well as RTC and RTD look-ahead intervals, to provide information for transactions.
 - Use the binding RTD interval (nominally 5-minutes) to determine the carbon credit allocation, import/export settlements, REC resource settlements, and provide further market transparency.
 - Post the zonal LBMP_C at a 5 minute granularity*
 - When the posting occurs will depend on the time required to calculate LBMP_C.
 - The NYISO is targeting posting as soon as possible after the completion of each market run.

*The NYISO intends to provide a posting granularity similar to the current real-time zonal LBMP postings:
http://www.nyiso.com/public/markets_operations/market_data/pricing_data/index.jsp

Import and Export Transactions

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Import and Export Transactions

- **Import transactions into the NYISO market are paid the Proxy Generator Bus price for the applicable external control area.**
 - For example, an import with costs of \$40/MWh in the PJM market could sell at the \$50 PJM Keystone Proxy Generator Bus price in the NYISO market for a potential net revenue of \$10/MWh.
- **Export transactions out of the NYCA pay the Proxy Generator Bus price for the applicable external control area.**
 - For example, an export expecting a \$50/MWh price in NE could buy at the \$40/MWh NE NPX Proxy Generator Bus price in the NYISO market for a potential net revenue of \$10/MWh.
- **The examples in this presentation will focus on the Proxy Generator Bus price in the NYISO market.**

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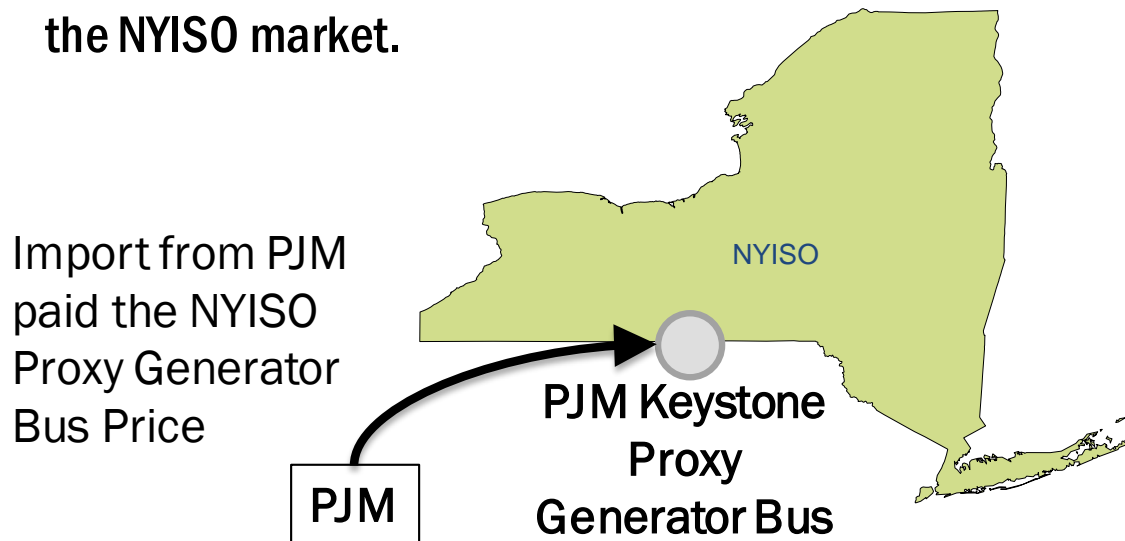
Import and Export Transactions

- **As stated, a carbon charge or credit only applies to transactions that actually flow in real time.**
 - Thus, a DA scheduled transaction that does not flow in RT will buy out of its position at the RT LBMP consistent with the NYISO's current settlement rules
 - An import transaction that does not flow in RT will not be charged LBMPc.
 - An export transaction that does not flow in RT will not be credited LBMPc.

Import Transaction Examples

Import Transaction Examples - Overview

- A Market Participant (MP) intending to import into the New York Control Area (NYCA) will sell power at the proxy generator bus for the applicable control area in the NYISO market.



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Import Example – Accurate Prediction

- In the example at right, the importer bids to sell at a proxy generator bus.
 - Under carbon pricing, imports would forecast LBMPc when bidding into the DA and RT Market.

Market	Day-Ahead	Real Time
Import Cost	\$30.00	\$30.00
Import Bid for Proxy LBMP	\$52.59	\$52.59
LBMP	\$53.18	\$53.18

Import Example - Accurate Prediction

- In the example at right, the importer bids to sell at a proxy generator bus.
 - Under carbon pricing, imports would forecast LBMPc when bidding into the DA and RT Market.
- The importer's bid is scheduled in the DA market.

Market	Day-Ahead	Real Time
Import Cost	\$30.00	\$30.00
Import Bid for Proxy LBMP	\$52.59	\$52.59
LBMP	\$53.18	\$53.18
LBMPc	N/A	\$22.59
LBMP minus LBMPc	N/A	\$30.59
Schedule	10	10
LBMP Settlement	\$531.80	0

Import Example – Accurate Prediction

- In the example at right, the importer bids to sell at a proxy generator bus.
 - Under carbon pricing, imports would forecast LBMPc when bidding into the DA and RT Market.
- The importer's bid is scheduled in the DA market.
 - The resource flows and has net revenue of \$5.90.

Market	Day-Ahead	Real Time
Import Cost	\$30.00	\$30.00
Import Bid for Proxy LBMP	\$52.59	\$52.59
LBMP	\$53.18	\$53.18
LBMPc	N/A	\$22.59
LBMP minus LBMPc	N/A	\$30.59
Schedule	10	10
LBMP Settlement	\$531.80	0
LBMPc Charge/Credit	0	-\$225.90
Net Settlement	\$531.80	-\$225.90
Bid Cost	-\$300.00	\$0.00
Net Revenue	N/A	\$5.90

Import Example – Under-Predict LBMPc

■ In the example at right, the importer bids to sell at a proxy generator bus.

- Under carbon pricing, imports would forecast LBMPc when bidding into the DA and RT Market.

Market	Day-Ahead	Real Time
Import Cost	\$30.00	\$30.00
Import Bid for Proxy LBMP	\$30.00	\$30.00
LBMP	\$31.00	\$53.18

Import Example –

Under-Predict LBMPc

■ In the example at right, the importer bids to sell at a proxy generator bus.

- Under carbon pricing, imports would forecast LBMPc when bidding into the DA and RT Market.

■ The importer's bid is scheduled in the DA market.

Market	Day-Ahead	Real Time
Import Cost	\$30.00	\$30.00
Import Bid for Proxy LBMP	\$30.00	\$30.00
LBMP	\$31.00	\$53.18
LBMPc	N/A	\$22.59
LBMP minus LBMPc	N/A	\$30.59
Schedule	10	10
LBMP Settlement	\$310.00	0

Import Example –

Under-Predict LBMPc

In the example at right, the importer bids to sell at a proxy generator bus.

- Under carbon pricing, imports would forecast LBMPc when bidding into the DA and RT Market.

The importer's bid is scheduled in the DA market.

- The resource flows and has net revenue of -\$215.90.
- This is due to the fact that an emitting resource was on the margin in RT, whereas the import expected a non-emitting resource to be marginal.

Market	Day-Ahead	Real Time
Import Cost	\$30.00	\$30.00
Import Bid for Proxy LBMP	\$30.00	\$30.00
LBMP	\$31.00	\$53.18
LBMPc	N/A	\$22.59
LBMP minus LBMPc	N/A	\$30.59
Schedule	10	10
LBMP Settlement	\$310.00	0
LBMPc Charge/ Credit	0	-\$225.90
Net Settlement	\$310.00	-\$225.90
Bid Cost	-\$300.00	\$0.00
Net Revenue	N/A	-\$215.90

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Import Example – DA LBMPc Higher

- In the example at right, the importer bids to sell at a proxy generator bus.
 - Under carbon pricing, imports would forecast LBMPc when bidding into the DA and RT Market.

Market	Day-Ahead	Real Time
Import Cost	\$30.00	\$30.00
Import Bid for Proxy LBMP	\$52.59	\$52.59
LBMP	\$75.00	\$53.18

Import Example – DA LBMPc Higher

- In the example at right, the importer bids to sell at a proxy generator bus.
 - Under carbon pricing, imports would forecast LBMPc when bidding into the DA and RT Market.

- The importer's bid is scheduled in the DA market.

Market	Day-Ahead	Real Time
Import Cost	\$30.00	\$30.00
Import Bid for Proxy LBMP	\$52.59	\$52.59
LBMP	\$75.00	\$53.18
LBMPc	N/A	\$22.59
LBMP minus LBMPc	N/A	\$30.59
Schedule	10	10
LBMP Settlement	\$750.00	0

Import Example – DA LBMPc Higher

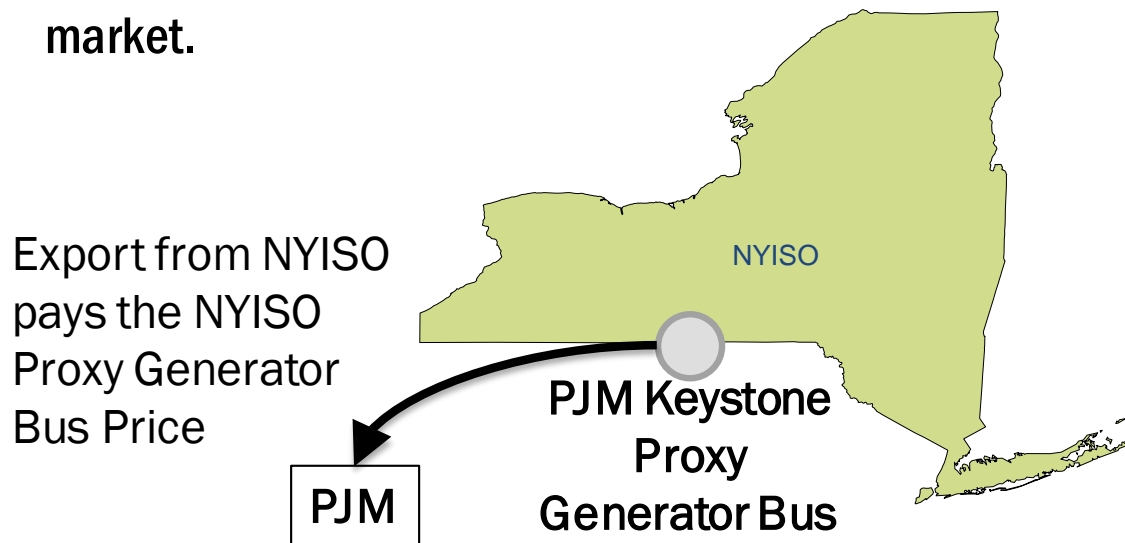
- In the example at right, the importer bids to sell at a proxy generator bus.
 - Under carbon pricing, imports would forecast LBMPc when bidding into the DA and RT Market.
- The importer's bid is scheduled in the DA market.
 - A different resource, likely with lower emissions cost, is marginal in RT.
 - The resource flows and has net revenue of \$224.10.

Market	Day-Ahead	Real Time
Import Cost	\$30.00	\$30.00
Import Bid for Proxy LBMP	\$52.59	\$52.59
LBMP	\$75.00	\$53.18
LBMPc	N/A	\$22.59
LBMP minus LBMPc	N/A	\$30.59
Schedule	10	10
LBMP Settlement	\$750.00	0
LBMPc Charge/Credit	0	-\$225.90
Net Settlement	\$750.00	-\$225.90
Bid Cost	-\$300.00	\$0.00
Net Revenue	N/A	\$224.10

Export Example

Overview

- An MP intending to export from the New York Control Area (NYCA) will purchase power at the proxy generator bus for the applicable control area in the NYISO market.



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Export Example – Accurate Prediction

- In the example at right, the exporter bids to buy at a proxy generator bus.
 - Under carbon pricing, exports would forecast LBMPc when bidding into the DA and RT Market.

Market	Day-Ahead	Real Time
Export Price (External Energy Price)	\$31.00	\$31.00
Export Bid for Proxy LBMP	\$53.59	\$53.59
LBMP	\$53.18	\$53.18

Export Example – Accurate Prediction

- In the example at right, the exporter bids to buy at a proxy generator bus.
 - Under carbon pricing, exports would forecast LBMPc when bidding into the DA and RT Market.
- The exporter's bid is scheduled in the DA market.

Market	Day-Ahead	Real Time
Export Price (External Energy Price)	\$31.00	\$31.00
Export Bid for Proxy LBMP	\$53.59	\$53.59
LBMP	\$53.18	\$53.18
LBMPc	N/A	\$22.59
LBMP minus LBMPc	N/A	\$30.59
Schedule	10	10
LBMP Settlement	\$531.80	0

Export Example – Accurate Prediction

- In the example at right, the exporter bids to buy at a proxy generator bus.
 - Under carbon pricing, exports would forecast LBMPc when bidding into the DA and RT Market.
- The exporter’s bid is scheduled in the DA market.
 - The resource flows and has net revenue of \$4.10.

Market	Day-Ahead	Real Time
Export Price (External Energy Price)	\$31.00	\$31.00
Export Bid for Proxy LBMP	\$53.59	\$53.59
LBMP	\$53.18	\$53.18
LBMPc	N/A	\$22.59
LBMP minus LBMPc	N/A	\$30.59
Schedule	10	10
LBMP Settlement	\$531.80	0
LBMPc Charge/ Credit	0	\$225.90
Net Settlement	-\$531.80	\$225.90
Export Revenue	\$310.00	\$0.00
Net Revenue	N/A	\$4.10

Export Example –

Under-Predict LBMPc

- In the example at right, the exporter bids to buy at a proxy generator bus.

Market	Day-Ahead	Real Time
Export Price (External Energy Price)	\$31.00	\$31.00
Export Bid for Proxy LBMP	\$30.00	\$30.00
LBMP	\$25.00	\$53.18

Export Example –

Under-Predict LBMPc

- In the example at right, the exporter bids to buy at a proxy generator bus.
 - Under carbon pricing, exports would forecast LBMPc when bidding into the DA and RT Market.
- The exporter’s bid is scheduled in the DA market.

Market	Day-Ahead	Real Time
Export Price (External Energy Price)	\$31.00	\$31.00
Export Bid for Proxy LBMP	\$30.00	\$30.00
LBMP	\$25.00	\$53.18
LBMPc	N/A	\$22.59
LBMP minus LBMPc	N/A	\$30.59
Schedule	10	10
LBMP Settlement	-\$250.00	0

Export Example –

Under-Predict LBMPc

- In the example at right, the exporter bids to buy at a proxy generator bus.
 - Under carbon pricing, exports would forecast LBMPc when bidding into the DA and RT Market.
- The exporter’s bid is scheduled in the DA market.
 - The export bid has not included an adjustment to account for the LBMPc.
 - The resource flows and has net revenue of \$285.90

Market	Day-Ahead	Real Time
Export Price (External Energy Price)	\$31.00	\$31.00
Export Bid for Proxy LBMP	\$30.00	\$30.00
LBMP	\$25.00	\$53.18
LBMPc	N/A	\$22.59
LBMP minus LBMPc	N/A	\$30.59
Schedule	10	10
LBMP Settlement	-\$250.00	0
LBMPc Charge/ Credit	0	\$225.90
Net Settlement	-\$250.00	\$225.90
Export Revenue	\$310.00	\$0.00
Net Revenue	N/A	\$285.90

Export Example –

DA LBMPc Higher

- In the example at right, the exporter’s bid is scheduled in the DA market.

Market	Day-Ahead	Real Time
Export Price (External Energy Price)	\$31.00	\$31.00
Export Bid for Proxy LBMP	\$80.00	\$80.00
LBMP	\$75.00	\$53.18

Export Example –

DA LBMPc Higher

- In the example at right, the exporter’s bid is scheduled in the DA market.
 - A resource with lower emissions cost is marginal in RT.

Market	Day-Ahead	Real Time
Export Price (External Energy Price)	\$31.00	\$31.00
Export Bid for Proxy LBMP	\$80.00	\$80.00
LBMP	\$75.00	\$53.18
LBMPc	N/A	\$22.59
LBMP minus LBMPc	N/A	\$30.59
Schedule	10	10
LBMP Settlement	-\$750.00	0

Export Example – DA LBMPc Higher

■ In the example at right, the exporter's bid is scheduled in the DA market.

- A resource with lower emissions cost is marginal in RT.
- The resource flows with net revenue of -\$214.10.

Market	Day-Ahead	Real Time
Export Price (External Energy Price)	\$31.00	\$31.00
Export Bid for Proxy LBMP	\$80.00	\$80.00
LBMP	\$75.00	\$53.18
LBMPc	N/A	\$22.59
LBMP minus LBMPc	N/A	\$30.59
Schedule	10	10
LBMP Settlement	-\$750.00	0
LBMPc Charge/ Credit	0	\$225.90
Net Settlement	-\$750.00	\$225.90
Export Revenue	\$310.00	\$0.00
Net Revenue	N/A	-\$214.10

The Mission of the New York Independent System Operator, in collaboration with its stakeholders, is to serve the public interest and provide benefits to consumers by:

- Maintaining and enhancing regional reliability
- Operating open, fair and competitive wholesale electricity markets
- Planning the power system for the future
- Providing factual information to policy makers, stakeholders and investors in the power system



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