IPPTF Carbon Pricing Proposal

Prepared for the
Integrating Public Policy Task Force

December 7, 2018

DRAFT FOR DISCUSSION PURPOSES ONLY

Table of Contents

Introduction

The State of New York (New York) is pursuing decarbonization of its economy with the goal of reducing carbon dioxide emissions 40% by 2030 and 80% by 2050, relative to 1990 levels.[1] In support of this and other objectives, New York has adopted policies to reduce emissions in the electric power sector, including the Clean Energy Standard. However, the wholesale electricity markets operated by the New York Independent System Operator (NYISO) do not fully align with these policy objectives. As a result, the wholesale markets are restricted in their ability to signal cost-effective carbon dioxide (carbon) abatement options and send effective price signals to retain needed units to sustain the reliable operation of the grid. Acknowledging the social cost of carbon emissions, and capturing those impacts in the wholesale electricity markets provides a market-oriented, cost effective, approach to harmonize state policy and NYISO markets.

The Integrating Public Policy Task Force (IPPTF) was created as a forum for the NYISO, New York State Department of Public Service, New York State Research and Development Authority, electricity market participants, members of the public, and interested stakeholders to explore concepts and proposals for incorporating the social cost of carbon emissions in wholesale energy markets to better harmonize the state's energy policies and the operation of those wholesale markets.

On April 30, 2018, a straw proposal was released outlining a potential design to incorporate the social cost of carbon dioxide emissions in the wholesale electricity markets (Carbon Pricing Straw Proposal). The Carbon Pricing Straw Proposal reflected stakeholder input and consideration of how the social cost of carbon emissions would be integrated into the existing NYISO wholesale energy markets and related processes.[2] On August 2, 2018, the NYISO published Carbon Pricing Draft Recommendations (Draft Recommendations) incorporating the prior Carbon Pricing Straw Proposal, analysis of the proposal and stakeholder comments. The Draft Recommendations aimed to propose market design concepts to incorporate the social cost of carbon emissions in a manner that (1) is economically efficient, (2) avoids major cost shifts among New York customers, (3) is transparent, and (4) provides market and regulatory stability.

This IPPTF Carbon Pricing Proposal continues to build on these prior documents and represents continued refinements of the market concepts based on additional input received from stakeholders, both during IPPTF meetings and in writing[3] and the analytical information provided to the task force. This IPPTF Carbon Pricing Proposal provides the basis of a carbon pricing market design for stakeholder consideration and discussion within the NYISO's shared governance process, starting with the Market Issues Working

[1] New York Public Service Commissions, *Order Adopting a Clean Energy Standard*, Issued and Effective August 1, 2016. Available at http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId=%7B44C5D5B8-14C3-4F32-8399-F5487D6D8FE8%7D.

[2] The Carbon Pricing Straw Proposal was developed based on knowledge and evaluation of all existing alternate proposals provided to the joint staff team.

[3] Stakeholder comments provided to the NYISO using the IPP_feedback@nyiso.com email address are posted with the IPPTF materials on the NYISO website.

Group (MIWG).

Overview of Carbon Pricing Concept

The NYISO would incorporate the social cost of carbon emissions into the NYISO-administered wholesale energy markets using a carbon price in dollars per ton of carbon dioxide emissions. The NYISO would apply the carbon price by debiting each energy supplier a charge for its carbon emissions at the specified price as part of its settlement. Suppliers would embed these additional carbon charges in their energy offers (referred to as the supplier's carbon adder or adjustment in $/MWh) and thus incorporate the carbon price into the unit commitment, dispatch, and price formation through the NYISO's existing processes. In addition to charging internal emitting generators, the NYISO would charge imports and credit exports the LBMP carbon impact to prevent the carbon charges on internal generation from causing emissions leakage and costly distortions.

Because the carbon charges on suppliers would increase the variable costs of carbon-emitting generation dispatched by the NYISO, a carbon charge would raise the energy market clearing prices whenever carbon-emitting resources are on the margin (referred to as the carbon pricing effect on LBMPs, or LBMPc). All suppliers, including clean energy resources, would receive the higher energy price, net of any carbon charges due on their emissions. A carbon charge would also provide incentives for innovative low carbon technologies that may not yet be developed. Low carbon dioxide emitting New York resources, including efficient carbon-emitting units, renewables, hydropower, and nuclear generators, would benefit from higher net revenues. Load Serving Entities (LSEs) would continue to be charged the LBMP for wholesale energy purchases, which would account for the carbon adder of the marginal units. The NYISO would return the carbon charge residuals (Carbon Residuals), collected from carbon dioxide emitting suppliers and net imports, to LSEs.[4]

The Gross Social Cost of Carbon

The New York Public Service Commission (PSC) would set the Gross Social Cost of Carbon (SCC) pursuant to the appropriate regulatory process. It is envisioned that the Gross SCC would be set in a manner that is comparable to and compliments existing New York State clean energy programs. Figure 1 reports the Gross SCC levels through 2030, consistent with the values used by the PSC to date. It also shows the resultant Net Social Cost of Carbon (net of the expected RGGI price). The NYISO would obtain and incorporate the full value of the Gross SCC without an initial transition mechanism. The details of the PSC's regulatory processes

[4] Residuals are the result of over (or under) collection in the NYISO markets. In this context, the residuals will be over collections that exist because the payments to suppliers do not equal the charges to loads.

are outside the scope of this proposal.

Figure 1: Gross and Net Social Cost of Carbon[5]

	Gross SCC	RGGI, Inc.	Net SCC
	$nominal/US-ton	$nominal/US-ton	$nominal/US-ton
2020	47.30	6.56	40.74
2021	48.30	6.98	41.32
2022	50.48	7.39	43.09
2023	52.74	7.81	44.93
2024	55.07	8.45	46.62
2025	57.48	9.09	48.39
2026	59.96	9.73	50.23
2027	62.52	10.35	52.18
2028	65.17	10.96	54.20
2029	66.54	11.58	54.96
2030	69.32	12.55	56.77

Some stakeholders have indicated that they would prefer the NYISO to set the SCC. The NYISO believes this is inconsistent with the goal of coordinating wholesale markets and public policy. Stakeholders have also indicated that they desire more information about how the SCC would be established and updated for wholesale market use, and have suggested that this information is required to understand how the process does not undermine confidence in the wholesale market. The NYISO expects these discussions to continue in the MIWG. Some stakeholders have indicated that more clarity on these related regulatory processes is needed prior to a NYISO governance vote on the proposal.

Application of the Carbon Price to Internal Suppliers

The majority of internal suppliers[6] participating in the wholesale energy markets would be subject to carbon charges in the wholesale energy market equal to the product of the applicable carbon price and their point-of-production carbon emissions.[7] The applicable carbon price would be based on the PSC's Gross SCC with adjustments for RGGI allowance prices for those suppliers required to hold RGGI allowances. Generally,

[5] The table is from Myers, Warren *Recommended CO2 Value to Use in IPPTF Analysis*, IPPTF (April 23, 2018), available at https://www.nyiso.com/documents/20142/1393516/IPPTF%20CO2%20Value%204%2023%202018%20final%20%20pd.pdf/9b8ad8e6-8766-368e-43cd-171b55391a1d. The Gross SCC derivation is explained in that document and is derived from the Interagency Working Group on Social Cost of Greenhouse Gases, United State Government, *Technical Support Document: Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866,* August 2016 (Appendix A), central value (3%). The expected RGGI price is based on the August 2017 Base Case forecast for RGGI prices (in black). The blue values are interpolated. In the implementation, the NYISO expects to use the same RGGI price as used in Reference Prices.

[6] Suppliers electrically located in the New York Control Area.

[7] "Point-of-production emissions" refer to the stack emissions or "burner tip" carbon dioxide emissions that can be directly tied to providing wholesale energy and ancillary services, including those associated with start-ups, no-load levels and generations, not lifecycle emissions, with a few exceptions discussed herein.

suppliers covered by RGGI (currently, fossil-fuel-fired electric generating units with capacity of 25 MW or greater) would be charged the Gross SCC *minus* the most recent RGGI price [8] and suppliers not covered by RGGI would incur a carbon price equal to the Gross SCC. [9]

Internal Suppliers would report the point-of-production emissions associated with providing wholesale electric market services, including energy and ancillary services. Emissions will include those associated with startups, no-load levels, and generation directly tied to providing wholesale electric market services.[10]

To maintain consistency with New York State policy, emissions from Clean Energy Standard eligible wholesale suppliers[11] would not subject to the carbon charge. Emissions associated with participation in the SCR, EDRP, DADRP, and DSASP programs would also not be subject to the carbon charge. These resources, approximately 1,390 MW of which currently participate in the NYISO markets, [12] are primarily non-emitting resources, approximately 90% of all program MWs are pure load reduction with no local generation, [13] and the remaining infrequently produce energy.

The NYISO would apply carbon charges to each supplier invoice. The NYISO would automatically populate hourly initial emissions estimates for the supplier, unless the supplier provides those data. The automatically populated data would be based on the approved carbon component of the supplier's wholesale energy market Reference Levels. The NYISO had originally proposed that suppliers would self-report their carbon emissions. However, this design was revised following feedback from stakeholders that they would prefer an automatic process.

The NYISO would require suppliers to submit emissions true-ups within 60 days of the initial invoice (e.g., by mid-March for the January billing month). This timeline would allow true-ups to appear on the 4 month invoice. The NYISO would penalize suppliers who fail to submit the true-up within 60 days of the initial invoice. Suppliers would be able to further true-up emissions data after the 4 month invoice and

[8] The RGGI allowance prices used would, where possible, be the same as the RGGI allowance prices used in Reference Levels.

[9] Resources with non-standard treatment (for example, cogeneration resources).

[10] These are "Burner tip" carbon dioxide emissions and do not cover upstream/fugitive carbon dioxide emissions or other greenhouse gas emissions (methane, nitrous oxide, etc.). Emissions associated with heat and/or steam sales fall outside the scope of a wholesale electric sector carbon charge and such cogeneration resources will report emissions with the provision of wholesale electricity and ancillary services excluding emissions associated with heat and steam sales. These resources will be expected to work with the NYISO to establish a reference emissions allocation method. Similarly, tariff defined Behind-the-Meter Net Generation (BTM:NG) resources will report emissions associated with the provision of wholesale electricity and ancillary services. These resources will also be expected to work with the NYISO to establish a reference emissions allocation method. DER aggregators will also report emissions associated with the provision of wholesale energy and ancillary services. These resources will also be expected to work with the NYISO to establish a reference emissions allocation method.

[11] Clean Energy Standard Order, Appendix A available at http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId=%7bB3777382-228F-4268-A674-6B5B93B8614B%7d .

[12] NYISO Filing of 2018 Semi-Annual Reports on New Generation Projects and Demand Response Programs, available at https://www.nyiso.com/documents/20142/1405241/20180601-Trnsmttl-Ltr-Smannl-DR-NG-Rprts-public.pdf/10e64927-e93a-dbdb-28a6-a6866f23b87b.

[13] See Gilbraith, Nathaniel *NYISO Carbon Charge Proposal for: Wholesale Suppliers Subject to the Carbon Charge and Applicable Carbon Emissions*, IPPTF (October 22, 2018) available at https://www.nyiso.com/documents/20142/3716381/applicable%20carbon%20emissions_for%20discussion.pdf/7683a585-d9b2-fa86-53bd-1f5d6f652c71.

before the final bill closeout. The emissions data submission and timeline align with the current final bill closeout timeline.

Some stakeholders have asked that certain specific technology types should be considered non-emitting. Should state policy change so that a different set of units are considered non-emitting, the NYISO would use the successor to Appendix A of the Clean Energy Standard Order. Some stakeholders have also expressed concern that the proposed emissions submissions are too onerous and should be better aligned with existing federal emissions reporting requirements. This proposal balances the need for accurate wholesale bills with the existing reporting mechanisms.

The NYISO is not proposing to change existing energy market mechanics or supplier offer procedures in order to incorporate a carbon price. Suppliers are expected to add their carbon charges into each applicable component of their energy offers (*i.e.*, startup, minimum generation, and/or incremental cost curves). Supplier energy market payments would continue to be based on the full LBMP, which would rise due to the carbon charge when carbon-emitting resources are on the margin.[14]

The NYISO would calculate and publish the LBMPc for the Real-Time Market (RTC and RTD), including the "look-ahead" intervals. Publishing the LBMPc would provide carbon pricing transparency to the market.[15] The LBMPc is also needed to determine the adjustment to the payments for import and export transactions and effectuate the recommended allocation of Carbon Residuals.

The NYISO would determine and publish the LBMPc after the completion of each Real-Time Market run, as the NYISO's market software will not automatically calculate the LBMPc since the carbon charge will be included in suppliers' energy Bids, with fuel costs and other relevant costs. To calculate the LBMPc, the NYISO would identify the marginal unit and its approximate marginal carbon emissions. This, combined with the shift factors of the transmission constraints and delivery factors for transmission system losses would provide the necessary information to determine the carbon component of each Zonal LBMP and each external proxy generator bus price.[16] The NYISO would post a single LBMPc for each zone and external proxy generator bus. The binding real-time interval (nominally 5-minutes) would determine the Carbon Residual allocation and the import/export settlements.

Some stakeholders have indicated that the NYISO should calculate the LBMPc for every PTID so that it

[14] LBMPs will also rise when flexible hydropower or storage resources are on the margin since their opportunity costs will reflect the carbon effect on LBMPs.

[15] The LBMPc would be posted at a nominal 5-minute granularity. When the posting occurs will depend on the time required to calculate LBMPc. The NYISO is targeting posting as soon as possible after the completion of each market run. More information about the calculation can be found in the July 9, 2018 IPPTF presentation "LBMP Carbon Impact (LBMPc)," the October 29 IPPTF presentation "LBMP Carbon Impact (LBMPc) Calculation and Transparency," and the November 26, 2018 IPPTF presentation "Additional Updates to the Carbon Pricing Proposal."

[16] See *LBMPc Formulation – Draft*, IPPTF (October 29, 2018) available at https://www.nyiso.com/documents/20142/3716686/10.29.2018%20LBMPc%20Formulation%20DRAFT.pdf/180e88ba-eb70-c55a-9b69-95e6ba1a285a.

could be used for contractual settlement. The NYISO believes that the current proposal to post the LBMPc for load zones and proxy generator busses will provide transparency while also balancing the complexity and the ability to post the information in a timely manner. Concerns were expressed about how the NYISO will identify the marginal units and that the NYISO should consider different methods for identifying these units. The NYISO expects these discussions to continue in the MIWG.

Application of the Carbon Price to External Transactions

Applying a carbon charge only to internal resources would make them less competitive compared to external resources. Imports would increase, potentially up to the transmission limits, and exports would decrease. Production would shift to resources outside of New York that would not otherwise generate—resources that are costlier and likely higher-emitting.[17] Such distortions would undermine the State's energy, environmental and economic objectives.

To avoid creating such distortions, the NYISO proposes to apply carbon charges 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 earn the LBMP without the carbon effect, at the relevant border; similarly, exports would buy energy at the LBMP without the carbon effect.[18] This would apply to all external transactions, with no unit-specific or portfolio-specific exceptions for existing or new clean energy resources. Carbon charges (and credits) would only apply to transaction MWs that flow in real-time because it provides the appropriate signal when comparing imports and exports to actual internal generation.[19] Import and export schedules would continue to be determined as they are today, via the system optimization software, based on import and export bids.[20]

The benefits of this approach are that it creates a level playing field for imports and exports, prevents distortions from the way imports and exports participate today (*i.e.*, the *status quo*), is transparent, implementable, and sends price signals within New York consistent with the State's value of carbon emissions.[21] The drawback of this approach is that it does not incentivize cost-effective carbon abatement

[17] This frequently referred to as "leakage."

[18] And wheel-through transactions would pass through without being subjected to carbon charges other than the difference between entry and exit points (as they are already assessed congestion and marginal losses today). They would face the equivalent of an import transaction at the entry point plus an export transaction at the exit point.

[19] The NYISO had initially proposed forecasting the LBMPc for external transactions and then charging/crediting that LBMPc. This was changed to the current proposal because the forecasting risk is more appropriately born by those who can best manage the risk. Traders are better situated to manage that risk than loads. Especially since emissions rates are highly correlated with the generator heat rates.

[20] Should the treatment of carbon dioxide emissions change in neighboring control areas or at the federal level, the NYISO would expect to review with stakeholders the need and appropriateness of these rules for imports and exports.

[21] The alternative approach that was considered was to charge for the SCC to external resources based on the marginal emissions consequences of the transaction. Under such an approach, importers would be paid the full LBMP and charged for the carbon emissions of the marginal emissions consequences of the transaction (note that this is not necessarily the marginal resource in the neighboring region. For example, if it causes a change in other exports from the neighboring region). Exporters would be charged the full LBMP and paid the full LBMP in the neighboring market; exports from NY would pay for their carbon emissions.

outside of New York; however, analysis from the Brattle Group[22] indicates that there are limited opportunities to achieve additional carbon abatement by incentivizing carbon abatement outside of New York. It finds that among NYISO's neighbors, there is no evidence of underutilized low-emitting resources whose output could increase if only offered a higher price. The only opportunity found to reduce emissions in the operating timeframe[23] would likely be reductions in coal-based imports from PJM.[24]

Some stakeholders have indicated that they would prefer the NYISO to charge external resources for their carbon emissions based on the marginal emissions consequences of the transaction and that the NYISO should use the long run marginal emissions consequences of the transaction. Stakeholders have also requested additional analysis to determine if there are additional non-New York emissions reduction opportunities. The NYISO recommends moving forward with the proposal above. If, following the implementation of carbon pricing, the distortions described by certain stakeholders appear, the NYISO and its stakeholders could consider enhancements to the treatment of external transactions at that time.

Allocation of the Carbon Residuals to Loads

LSEs would pay the full LBMP, including the effect of the carbon charge on LBMP, but the NYISO would allocate any Carbon Residuals collected from suppliers back to them. The NYISO would apply these Carbon Residuals to each LSE invoice. How the LSEs would allocate the Carbon Residuals to customers is outside the scope of this document.

Any wholesale allocation mechanism should be evaluated against at least two design objectives:

- **Aligning LBMPs with the marginal cost of serving load**, to incentivize customers to reduce emissions when economic to do so (accounting for externalities). LSEs in zones with higher carbon effects on LBMPs would still pay more on net than other LSEs, providing a stronger price signal to reduce consumption where marginal emission rates are highest.
- **Avoiding major cost shifts among customers**, as carbon charges will impact customer costs, and the allocation of carbon residuals may moderate that impact. More of the residuals would be allocated to the customers who bear a greater cost of carbon pricing, thus reducing (but not eliminating) differences among LSEs in the net cost they face from carbon pricing.

The NYISO proposes that the Carbon Residual be allocated among LSEs via a proportional allocation

[22] Newell, Sam, *Revenue Allocation and Seams Options*, IPPTF (September 24, 2018) available at https://www.nyiso.com/documents/20142/2625121/2018_09_20%20Zonal%20and%20Seams%20Issues.pdf/17f965c7-bcda-3b9f-9b1e-19958d2c6574.

[23] Marginality must be considered in the operating timeframe, not the investment timeframe because if there are no existing underutilized low emitting resources that could produce more energy if only offered a higher price, setting a low import rate could cause unintended consequences. For example, diverting clean resources from other locations where they offset higher emissions. Setting a high import charge could discourage investment outside of New York in low-emitting resources but that can be addressed through other mechanisms.

[24] Based on some additional feedback the NYISO also considered whether the external proxy bus LBMPs should be posted without the carbon effects rather than establishing a settlement mechanism that applies a carbon charge to imports and a credit to exports for each transaction. This approach was not adopted because it would complicate existing contractual arrangements including Transmission Congestion Contracts.

(Proportional Allocation) that provides an equal percentage of carbon charges back to each LSE, that is, it equalizes the ($/MWh Residual Allocation)/LBMPc. The methodology would compensate for zonal differences in the carbon component of the LBMP. This allocation avoids major cost shifts among customers.

The NYISO originally proposed the carbon charge impact levelizing approach[25] (Levelizing Allocation), which was thought to prioritize avoiding major cost shifts among customers; more of the residuals would be allocated to the customers who bear a greater cost of carbon pricing, thus reducing differences among LSEs in the net cost they face from carbon pricing. Further analysis[26] indicated that the Levelizing Allocation over-shot the allocation to the customers who bear higher carbon costs once the impact on REC and ZEC prices, TCC values and the dynamic effects on LBMPs were accounted for. Therefore, the NYISO proposes the Proportional Allocation described above to effectively avoid major cost shifts among customers.

Two other alternative approaches were considered; returning the Carbon Residuals to all LSEs on a load-ratio share basis (Load-Ratio Allocation)[27] and returning the Carbon Residuals to LSEs using an allocation such that all zones would see the same net percentage increase in LBMP, net of the residual allocation (Proportional Percentage Levelization). Compared to the proposed approach, both would provide LSEs with a price signal more reflective of the carbon implications of their consumption. However, they could create equity concerns by causing greater differences in the net cost of carbon pricing across LSEs and were therefore not selected.

Stakeholders provided feedback during the IPPTF that the $/MWh Carbon Residual allocation rate received by the LSE should be public information. Today, the LBMP posting by load zone provides transparency to what LSEs are paying. When the carbon pricing proposal is adopted, the amount paid by consumers will be offset by the $/MWh Carbon Residual allocation rate attributable to that load zone. The NYISO proposes to provide transparency by posting the $/MWh Carbon Residual allocation rate per load zone on its website.

Interaction of the Carbon Charge with Existing Renewable Energy Credits

Some stakeholders expressed concern that if the NYISO implements carbon pricing in the wholesale energy markets, certain resources may receive compensation for the same carbon reduction benefits twice; once from state REC payments, and once from the NYISO's carbon charge. In response to these concerns, the NYISO initially proposed charging resources with pre-existing REC contracts the zonal LBMPc.

[25] Each LSE faces the same $/MWh net of carbon payments, when possible.

[26] Newell, Sam, *Revenue Allocation and Seams Options*, IPPTF (September 24, 2018) available at https://www.nyiso.com/documents/20142/2625121/2018_09_20%20Zonal%20and%20Seams%20Issues.pdf/17f965c7-bcda-3b9f-9b1e-19958d2c6574.

[27] Each LSE receives the same $/MWh residual allocation.

At two stakeholder meetings and in written and verbal comments, stakeholders described concerns with the concept of charging resources with pre-existing REC contracts the LBMPc. The concerns expressed were questioning if there was a double payment, questioning the effectiveness of the proposed remedy and illustrating unintended consequences of the proposal.

The NYISO spent several months considering the feedback from its stakeholders and investigating approaches for resources with pre-existing REC contracts. The NYISO is no longer proposing to include a mechanism for charging resources with pre-existing REC contracts the LBMPc because:

- Carbon pricing's primary focus is on internalizing the cost of carbon emissions within the wholesale market,
- The REC payment does not necessarily equate solely to a payment for carbon abatement or avoidance, whereas Carbon Pricing is focused solely on internalizing the cost of carbon emissions within the wholesale market, and
- Charging the LBMPc to resources with pre-existing RECs could create unintended consequences, such as increasing the uncertainty in the value of RECs going forward. This increased uncertainty could make it difficult for renewable developers to secure bank financing and place existing REC holders at risk given existing contract structures.

Carbon Pricing Impact on other NYISO Administered Markets

The IPPTF process also considered the effect on other NYISO-administered markets and processes.

In order to understand the potential impacts on the Installed Capacity (ICAP) market and the ICAP Demand Curve, several cases were run using the current Net EAS Model, using two separate datasets, and presented to the IPPTF.[28]

Generator revenue changes would impact the Installed Capacity market; however, the changes to the reset process implemented in 2016 were intended to allow for the ICAP Demand Curves to capture changes in market conditions over time, including the impacts of changes to market rules. As contemplated by the revised procedures, the resulting impacts of implementing Carbon Pricing in the wholesale electricity markets should be rolled into Net EAS Revenue estimates through the existing annual update process. Adjustments to the Net EAS Model to allow for incorporation of Carbon Pricing once implemented will be evaluated and discussed as part of the upcoming reset process. No additional changes to ICAP policies or

[28] Patterson, Ryan, *Effects of Carbon Pricing on ICAP Demand Curve Net EAS Revenues*, IPPTF (October 11, 2018), available at https://www.nyiso.com/documents/20142/3715284/IPPTF%20-%20Net%20EAS%20Carbon%20Impact.pdf/4a757498-836d-1edf-2ed7-76cc59da452c.

procedures were identified.

The NYISO's existing Planning processes will capture price changes as necessary. No extensive changes to Planning processes would be necessary. No other changes to NYISO administered markets have been identified.

Conclusion and Next Steps

Based on the work done within the IPPTF, incorporation of the societal cost of carbon emissions into the NYISO-administered wholesale energy markets will efficiently align state decarbonization policies and wholesale electricity markets. The NYISO anticipates continued collaboration with its stakeholders, the New York State Department of Public Service, and the New York State Energy Research and Development Authority on pricing carbon emissions in the wholesale energy markets within the NYISO's shared governance process.

Glossary of Terms

Carbon Price: The dollar per ton ($/ton) price the NYISO charges suppliers for their carbon emissions.

Carbon Charge: For internal suppliers, the total dollar amount charged for their emissions. For importers, the total dollar amount charged such that they compete on a status quo basis as if the NYISO was not applying a carbon charge to internal suppliers.

Carbon Adder: The additional costs in dollars per MWh ($/MWh) that suppliers include in their energy market offers due to the carbon charges.

Carbon Effect on LBMPs: The LBMP increase in dollars per MWh ($/MWh) due to the carbon adder of the marginal unit for each time interval and location. Also referred to as LBMPc.

Carbon Charge Residuals (or Carbon Residuals): The total dollar amount of carbon charges collected by the NYISO from suppliers and allocated to loads.

Energy Reference Level: A resource's estimated marginal cost to produce energy in the wholesale energy markets.

References

- NYISO, *Carbon Pricing Straw Proposal: A Report Prepared for the Integrating Public Policy Task Force*, April 30 2018. Available at (https://www.nyiso.com/documents/20142/1393516/Carbon%20Pricing%20Straw%20Proposal%2020180430.pdf/e9003d1e-0557-5292-0f7f-24dbcfd68ac5)
- NYISO, *Carbon Pricing Draft Recommendations: A report prepared for the Integrating Public Policy Task Force*, August 2 2018. Available at https://www.nyiso.com/documents/20142/2179214/Carbon%20Pricing%20Draft%20Recommendations%2020180802.pdf/575a6d2b-ad09-d8f8-e566-39a0c04f9a43).
- New York Public Service Commission, *Order Adopting a Clean Energy Standard*, Issued and Effective August 1, 2016. Available at http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId=%7B44C5D5B8-14C3-4F32-8399-F5487D6D8FE8%7D .
- Interagency Working Group on Social Cost of Greenhouse Gases, United States Government, *Technical Support Document: Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866*, August 2016. Available at https://www.epa.gov/sites/production/files/2016-12/documents/sc_co2_tsd_august_2016.pdf.
- Presentations to and communications with the IPPTF are available at https://www.nyiso.com/ipptf. For more information on the different parts of the proposals please refer to the IPPTF presentations including:
    - 4/23/2018 Recommended CO2 Values to Use in IPPTF Analysis https://www.nyiso.com/documents/20142/1393516/IPPTF%20CO2%20Value%204%2023%202018%20final%20%20pd.pdf/9b8ad8e6-8766-368e-43cd-171b55391a1d.
    - 5/21/2018 Applicable New York Wholesale Electricity Supplier Emissions https://www.nyiso.com/documents/20142/1397776/IPPTF_IT2%20applicable%20carbon%20emissions-%20FOR%20POSTING%2020180521.pdf/063c1050-8f46-0615-d6f0-cb8734fbd09a.
    - 6/4/2018 Reposted Carbon charge residuals: Allocation Options https://www.nyiso.com/documents/20142/1401870/2018-06-04_IPPTF%20residual%20allocation-repost.pdf/ec456c48-fa08-2a65-8e6a-d92988445fd9.
    - 6/18/2018 Issue Track 2: Other Wholesale Processes https://www.nyiso.com/documents/20142/1401910/IT2%20Other%20Wholesale%20Processes.pdf/08bf6017-2cff-fd5c-befb-b44eb5009a6f.

- 7/9/2018 LBMP Carbon Impact (LBMPc) https://www.nyiso.com/documents/20142/1406035/IT%202%20LBMP%20Carbon%20Impact%20FINAL.pdf/0cf758f2-8320-125d-1e4d-0e992965bfb3.
- 7/9/2018 Application of the carbon Price to External Transactions https://www.nyiso.com/documents/20142/1406035/2018-07-09_IPPTF%20carbon-price-externals.pdf/e9e9b851-a513-34fe-7662-8244d287111e.
- 7/16/2018 Emissions Reposting, Billing & Bilaterals https://www.nyiso.com/documents/20142/1406076/IT%202%20Emissions%20Reporting%20Billing%20Bilaterals%20FINAL.pdf/97926ae8-f1b2-aaae-a555-3fde548aa203.
- 8/20/2018 Withholding of Carbon Pricing from REC Contract Holders https://www.nyiso.com/documents/20142/2178951/Withholding%20of%20Carbon%20Pricing%20from%20REC%20Contract%20Holders%20Aug%2020%202018%20Presentation.pdf/afe4b2b-0d1a-24cc-2aef-76ce8da7767d.
- 10/11/2018 Carbon Pricing: Treatment of Existing REC Contracts https://www.nyiso.com/documents/20142/3715284/20180924%20NY%20REC%20Resources.pdf/0b79de72-a948-22d8-9439-3cce7bad4c61.
- 10/11/2018 IT 2 Transition for Demand Curve Proxy and Net EAS Revenues https://www.nyiso.com/documents/20142/3715284/IPPTF%20-%20Net%20EAS%20Carbon%20Impact.pdf/4a757498-836d-1edf-2ed7-76cc59da452c.
- 10/15/2018 Application of the Carbon Price to transactions at the NYISO Borders https://www.nyiso.com/documents/20142/3715785/2018-10-15%20IPPTF%20carbon-price-externals.pdf/37836fc1-2672-aad1-2057-004152ea60ec.
- 10/22/2018 NYISO Carbon Charge Proposal for: Wholesale Suppliers Subject to the Carbon Charge and Applicable Carbon Emissions https://www.nyiso.com/documents/20142/3716381/applicable%20carbon%20emissions_for%20discussion.pdf/7683a585-d9b2-fa86-53bd-1f5d6f652c71.
- 10/29/2018 LBMP Carbon Impact (LBMPc): Calculation and Transparency https://www.nyiso.com/documents/20142/3716686/10.29.2018%20LBMPc%20Formulation%20DRAFT.pdf/180e88ba-eb70-c55a-9b69-95e6ba1a285a.
- 10/29/2018 LBMPc Formulation https://www.nyiso.com/documents/20142/3716686/10.29.2018%20LBMPc%20Formulation%20DRAFT.pdf/180e88ba-eb70-c55a-9b69-95e6ba1a285a.
- 10/29/2018 Carbon Residual Allocation: Proposal Update https://www.nyiso.com/documents/20142/3716686/10.29.2018%20IPPTF%20-%20Carbon%20Residual%20Allocation%20FINAL.pdf/35b5eb94-e885-82e3-796c-bd20a8e25f5d.
- 12/3/2018 Carbon Pricing: Treatment of Existing REC Contracts Proposal Update https://www.nyiso.com/documents/20142/3760282/20181203%20Carbon%20Pricing%20-%20NY%20REC%20Resources%20vFinal.pdf/1aac0a92-bcff-f19f-d58f-c4c94b397168.

Proposal Summary Table

Design Topic	Carbon Pricing Proposal[29]
Setting the Gross Social Cost of Carbon	The New York Public Service Commission would set the Gross Social Cost of Carbon pursuant to the appropriate regulatory process.
Application of Carbon Price to Internal Suppliers	**Approach:** Internal suppliers would be subject to carbon charges equal to the product of their point-of-production carbon emissions and the applicable per-unit carbon price **Emissions:** Internal suppliers, including self-scheduled resources, would report emissions of their supply fleet ▪ Tier 1 eligible resources under the Clean Energy Standard are assumed to have zero emissions ▪ Cogeneration resources would be charged based on the portion of their emissions associated with electrical generation ▪ Behind-the-meter generation resources would be charged for emissions associated with net injections to the grid ▪ **Emissions associated with participation in the SCR, EDRP, DADRP, and DSASP programs would not be subject to the carbon charge** **Carbon Price:** The NYISO would determine the carbon charge (in $/ton) depending on whether internal physical suppliers are covered by RGGI ▪ Suppliers covered by RGGI would be charged a carbon price equal to the Gross SCC minus the most recently posted quarterly carbon price ▪ Suppliers not covered by RGGI would be charged a carbon price equal to the Gross SCC **Market Operations:** ▪ Suppliers would be expected to embed the carbon charge into their energy offers ▪ Suppliers would continue to receive the full LBMP and will be debited their carbon charges during settlement ▪ **The NYISO would apply carbon charges to each supplier invoice, automatically populating initial emissions estimates for the supplier, unless the supplier provides those data.** ▪ Differences between **estimated/** self-reported emissions and actual emissions would be corrected via the true-up settlements process **LBMPc:** ▪ **The NYISO would calculate and publish the LBMPc for RTC and RTD, including look-ahead intervals. Publishing the LBMPc would be used to provide market transparency, adjust payments for import and export transactions, and effectuate the recommended allocation of Carbon Residuals.**
Application of Carbon Price to External Transactions	**Approach:** ▪ Imports and exports would compete with internal resources on a status quo basis, as if there were no incremental carbon charge applied within the NYISO ▪ No unit-specific or portfolio-specific exceptions **Market Operations:** ▪ Transactions would see the full LBMP but imports would be debited and exports would be credited a carbon charge that reflects the expected carbon effect on the LBMP

[29] Unless otherwise noted, items in bold in this column represent an update from the NYISO's April 30, 2018 "Carbon Pricing Straw Proposal," available at the following link: https://www.nyiso.com/documents/20142/1393516/Carbon%20Pricing%20Straw%20Proposal%2020180430.pdf/e9003d1e-0557-5292-0f7f-24dbcfd68ac5.

	▪ **Only transactions flowing in real-time will be debited/credited the real-time LBMPc.[30]**
Allocation of Carbon Charge Residuals to Loads	▪ Wholesale load would continue to pay the full LBMP, but will be allocated a portion of the carbon charge residuals, **using the proportional allocation methodology[31]** ▪ Allocation by Load Serving Entities to customers would be under PSC jurisdiction pursuant to the appropriate regulatory process ▪ **The NYISO proposes to provide transparency by posting the $/MWh carbon charge allocation rate per load zone on its website.**
Interactor of the Carbon Charge with Renewable Energy Credits	▪ **The NYISO is not proposing to include a mechanism for charging resources with pre-existing REC contracts[32]**
Changes to Other NYISO Markets and Planning Processes	**Capacity Market:** ▪ The NYISO would direct the Demand Curve Reset Consultant to consider the effects of carbon pricing on the net cost of new entry of the proxy unit **Transmission Planning:** ▪ The NYISO's existing Planning processes will capture price changes as necessary. No extensive changes to Planning processes would be necessary.

[30] Previously, the NYISO had proposed to forecast, set, and publish applicable carbon charges and credits (in $/MWh) for each interface prior to day-ahead and real-time offer submission deadlines.

[31] The NYISO originally recommended the levelized allocation methodology, as described in the "Allocation of the Carbon Residuals to Loads" section of this document.

[32] See the "Interaction of a Carbon Charge with Existing Renewable Energy Credits" section for more information on this topic.

Appendix

LBMPc - To calculate an after-the-fact estimate of LBMPc for a target resource (*e.g.,* load zone or proxy) the NYISO will first calculate the incremental production at the marginal units for a 1 MW incremental demand at the target resource and then approximate its marginal carbon charges as the summation of the product of this incremental marginal unit production with the unit's cost of carbon.

M = the set of Marginal Resources

NC = the set of binding transmission constraints

$GF_{i,k}$ = the shift factor for resource i on constraint k (the Shift Factor measures the increment of constraint flow for an incremental injection at resource i and a corresponding withdrawal at the Reference Bus)

DF_i = the delivery factor for bus i to the system Reference Bus

CB_i = the reference level estimated net carbon charge from the bid of each marginal resource

P_i = resource i energy injection.

Given a target resource j, the incremental marginal resource production, P_i, is calculated by solving a system of equations of the following form.

$$power\ balance: \sum_{i=1}^{M} (DF_i * P_i) = DF_j$$

$$transmission\ constraint\ k \in\ NC: \sum_{i=1}^{M} (GF_{i,k} * P_i) = GF_{j,k}$$

The LBMP Carbon Impact, LBMPc will be calculated based on the estimated carbon adder present in the bid of each marginal unit.

$$LBMP_{c,j} = \sum_{i=1}^{M} CB_i * P_i$$