

# Clean Energy in New York State:

The Role and Economic Impacts of a  
Carbon Price in NYISO's Wholesale  
Electricity Markets

## SUMMARY FOR POLICY MAKERS

**Authors:**

Susan F. Tierney

Paul J. Hibbard

October 3, 2019



**ANALYSIS GROUP**  
ECONOMIC, FINANCIAL and STRATEGY CONSULTANTS

## Acknowledgments

This report has been prepared at the request of the New York Independent System Operator (NYISO) to supplement other analyses that have been conducted on the impacts of introducing a carbon pricing mechanism into the wholesale electricity markets administered by NYISO.

This is an independent report by Susan Tierney and Paul Hibbard of Analysis Group, Inc., and reflects the judgment of the authors alone. They wish to express their appreciation for the assistance of colleagues at Analysis Group: Sarah Cullinan (who recently left Analysis Group to take a position at the Massachusetts Department of Public Utilities); Benjamin Dalzell and Jacob Silver (who recently left Analysis Group to pursue graduate professional studies); and Scott Ario, Edmund Downie, and Grace Howland. Also, our work has benefited from input and comment from the participants in NYISO's Integrating Public Policy Task Force (IPPTF), a stakeholder forum hosted by NYISO to discuss concepts and proposals for incorporating carbon pricing into wholesale energy markets.

## About the authors

Dr. Tierney, a Senior Advisor in Analysis Group's Denver office, is an expert on energy and environmental policy analysis, regulation, and economics, with a focus on the electric and natural gas industries. Her former positions include Assistant Secretary for Policy at the U.S. Department of Energy, and serving as a state cabinet official for environmental affairs and a public utility commissioner for the Commonwealth of Massachusetts. She has testified before Congress and state legislatures, as well as in proceedings before state and federal courts and regulatory agencies. As a consultant, she has advised and worked for a variety of clients, including energy companies, government agencies, customer groups, investors, tribes, foundations, environmental groups, and other non-governmental groups.

Mr. Hibbard, a Principal in Analysis Group's Boston office, has public and private sector experience in energy and environmental technologies, economics, market structures, and policy. Mr. Hibbard's work has addressed the implications of new public policy programs; the impacts of infrastructure development options on market pricing and ratepayer costs; the evolution of electricity market structures and wholesale rate design; utility ratemaking practices; and the transfer of U.S. federal and state emission control programs to other countries. He served as chairman of the Massachusetts Department of Public Utilities, was a member of the Massachusetts Energy Facilities Siting Board, and has testified before Congress, state legislatures, and federal and state regulatory agencies. Mr. Hibbard also has authored numerous articles, white papers, and reports for journals, foundations, commissions, and industry organizations.

## About Analysis Group

Analysis Group is one of the largest international economics consulting firms, with more than 1,000 professionals across 14 offices in North America, Europe, and Asia. Since 1981, Analysis Group has provided expertise in economics, finance, health care analytics, and strategy to top law firms, Fortune Global 500 companies, government agencies, and other clients worldwide.

Analysis Group's energy and environment practice area is distinguished by expertise in economics, finance, market modeling and analysis, regulatory issues, and public policy, as well as deep experience in environmental economics and energy infrastructure development. We have worked for a wide variety of clients, including (among others) energy producers, suppliers and consumers, utilities, regulatory commissions and other federal and state agencies, tribal governments, power-system operators, foundations, financial institutions, and start-up companies.

## Preface

In February of 2019, NYISO engaged Analysis Group to study the potential impacts of introducing a carbon pricing mechanism into New York State's centrally organized wholesale electricity markets. Since that time, the setting for evaluating the need for and impacts of carbon pricing in New York has shifted in fundamental ways; consequently, Analysis Group's scope of work has evolved significantly over the course of the assignment.

At the start of the engagement in early 2019, Analysis Group set out to evaluate various topics not addressed in other studies of NYISO's proposed carbon pricing mechanism. Dr. Tierney and Mr. Hibbard from Analysis Group met early on with NYISO stakeholders to describe the anticipated areas of work and to identify a set of topics that would inform a balanced examination of benefits and costs of the carbon pricing proposal in NYISO markets. As discussed with stakeholders at the time, Analysis Group's focus was on supplementing and placing in a broader context the modeling results of prior studies.

But as work progressed, the Analysis Group team faced challenges in relying on such prior studies (conducted during 2017–2018) in light of a widening distance between the policy-related assumptions and analytic structure of those studies, on the one hand, and the changing policy conditions in the state, on the other. The most notable changes occurred as state policy makers considered Governor Andrew Cuomo's announcement in early 2019 that he supported much more aggressive goals for renewable energy development and reductions in greenhouse gas (GHG) emissions in the state's electric sector, with indications that New York State would pursue implementation of such goals primarily through actions of executive-branch agencies.

In late June 2019, the New York State Legislature passed the New York State Climate Leadership and Community Protection Act (Act), encoding into statute more-aggressive goals for renewable and zero-carbon electricity supply and for precipitous reductions in GHG emissions across the state's entire economy. The Act, signed by Governor Cuomo in July 2019, establishes statutory deadlines and responsibilities for a diverse set of actions in New York State, but is silent on whether a carbon price should be implemented within the NYISO wholesale markets.

This fundamental shift in the state's laws is now reality and bears directly on the setting for considering the carbon pricing policy. In response, Analysis Group has altered the premise of its analysis from *whether* New York would pursue aggressive goals for reducing carbon emissions and do so through administrative and other mechanisms, to *how* New York will best accomplish its goals and meet the Act's mandates for reducing GHG emissions in the power sector and in the economy at large.

This pivot has fundamentally changed the nature of this study. It now examines how NYISO's proposed carbon pricing mechanism can help New York meet its new statutory requirements for decarbonizing the electric system through efficient market design and at the lowest cost, and in turn how New York's wholesale competitive electric markets can help the state achieve its climate goals more broadly, efficiently, and effectively.

Please note that the study did not examine alternative designs for a carbon pricing mechanism; rather, it presumed carbon pricing would take the form that has been under discussion by NYISO and its stakeholders over the course of the past two years.

## Summary for Policy Makers

**New York State's new climate legislation, embracing Governor Andrew Cuomo's vision for a Green New Deal, is arguably the strongest set of climate policies adopted anywhere in the U.S.** In June of 2019, New York State lawmakers passed the Climate Leadership and Community Protection Act (the Act or CLCPA), setting a requirement for the state to eliminate greenhouse gas (GHG) emissions from all man-made sources in New York by 2050. (Other findings from the Act are excerpted at the end of this Summary for Policy Makers.) Among other things, the Act codifies a mandate for the electric system to rely on renewables for 70 percent of supply by 2030 and on zero-emitting resources for 100 percent of supply by 2040.

**The Act is the newest chapter of New York's economic, clean energy, and environmental leadership.** New York is already a major international economic force: If New York were a stand-alone country, it would be the world's 11<sup>th</sup> largest economy. The Act, which builds on years of leadership on clean energy policy, innovation, and supporting competitive markets, squarely positions New York as a leader among nations and American states in addressing the urgent issue of climate change. Considering that New York's economy accounts for one out of every 200 tons of energy-related carbon dioxide (CO<sub>2</sub>) emitted anywhere in the world, the Act's new commitments represent a significant action to reduce and mitigate the costly impacts of global climate change.

**This work will not be easy. New York must use every effective tool available to get the job done, and it must do so in the most efficient, lowest-cost way possible.** Achieving the many requirements of the CLCPA will involve an unprecedented and focused effort by policy makers, market administrators, and private actors. It will require further innovation in policy, markets, technology, business models, financing, service-delivery mechanisms, workforce training, and many other things. It will require a clear focus on the incentives expressed through energy markets and on the potential for market mechanisms to help transition the state's economy through the upcoming changes at the lowest possible cost. While these actions and investments will help avoid the damaging impacts of climate change, they also can introduce new costs for energy consumers. To keep these costs as low as possible, New York will need to draw on the long and successful history of market-based policies and pursue every effective tool at its disposal.

**The Act envisions using an array of measures, put in place as soon as possible.** The world, and New Yorkers, will be watching the steps that the state takes. New York policy makers know this, as shown by Governor Cuomo's announcement of the nation's largest contracts for offshore wind at the same time he signed the CLCPA in July 2019. Many more actions will be needed and implemented as quickly as possible. The Act recognizes that climate change is already imposing real burdens on New York's economy and on the people who live in the state, and encourages early action and steps to avoid "leakage" of emissions into other regions beyond New York, so as to help protect the competitiveness of New York's economy.

**New York's low-carbon economy will continue to depend upon a vibrant and reliable electric system.**

Although buildings and the transportation sector are responsible for more than 80 percent of New York's energy-related CO<sub>2</sub> emissions, the Act assigns to the state's electric system an outsized role in helping to lower GHG emissions in the state's economy. This may in part reflect the fact that, over the past two decades, competitive electric markets have helped achieve near-continuous reductions in emissions of all air pollutants, while spurring innovation and investment in advanced energy technologies. The Act calls for the state's new Climate Action Council to include measures promoting "beneficial electrification" as part of the scoping plan that will make recommendations for attaining statewide GHG emission limits. The provisions to expand the role of electricity into transportation and buildings will go hand in hand with the Act's requirements that the state's electric system eventually eliminate its carbon emissions by 2040. But it will also dramatically change the demands on electric generating resources and transmission/distribution infrastructure used to reliably meet power demand.

**New York has a home-grown policy tool—a proposed carbon pricing mechanism—that, embedded in well-functioning electric markets, can help New York meet its climate goals at lowest cost.** NYISO can unleash the power and creativity of market forces through adoption of a carbon price in the state's wholesale electricity market. In fact, if NYISO were a state agency (which it is not), it would be obligated under Sections 7 and 8 of the Act to contribute to achieving the statewide GHG emission limits, and adoption of a carbon price would be a natural response to such a mandate.

**A carbon price in the NYISO markets can help deliver New York's clean energy transition in faster, cheaper, more reliable, more efficient, and more creative ways. This is the core part of the value proposition of a NYISO carbon pricing mechanism.**

- NYISO and key stakeholders have already developed a carbon pricing proposal that—once in place—can send positive signals to encourage early action, consistent with the Act's intent.

**NYISO's Carbon Pricing Proposal:  
The Essential Value Proposition**

What outcomes can we expect to result from the adoption of a carbon price in NYISO's wholesale electric markets? What incentives will a carbon price add to New York's successful Clean Energy Standard (CES) approach?

- **Reinforcing and enhancing the state's position** as the national leader on climate action.
- **Lower-cost** achievement of New York's aggressive climate targets, through market efficiencies in power-sector transactions and investments as a result of a price on carbon.
- **Lower risks** for consumers through shifting investment risk to investors while providing investors a clear market price signal tied to low-carbon attributes.
- **Faster entry** of clean energy projects into the market that can be financed through market revenues reflecting carbon costs (without the need for long-term renewable energy credit (REC) contracts).
- **Efficient market incentives to site clean energy resources where they are particularly needed** for reliability, for reducing energy prices, for avoiding air pollution, and for local jobs in downstate locations and close to disadvantaged communities.
- **Efficient market incentives for the addition of transmission investments** to give downstate New Yorkers better access to valuable low-carbon and renewable resources in upstate regions.
- **Better protection against the possibility of federal regulators' actions to mitigate a broader set of clean energy resources** in New York, by establishing an economic basis to avoid mitigation through a carbon pricing mechanism as part of the NYISO wholesale market design.
- **Near-term price signals** to investors in renewables, storage, combined heat and power, energy efficiency, and demand-side measures.
- **Faster and broader access to financing** for some renewable projects that are or would be cost-competitive with prices reflecting carbon emissions, even without REC contracts.
- **Incentives for entrepreneurs to develop unexpected and innovative solutions** to reducing carbon emissions.
- **Efficient market incentives for owners to invest in maintaining well-performing existing facilities** with zero- and low-carbon output, and in repowering under-performing generating units, while hastening the retirement of less-efficient, higher-emitting, and uneconomic fossil units.
- **Further enhancement and harmonization of state policy and competitive markets**—addressing the absence of a price on carbon, and more completely incorporating external costs and impacts in market outcomes.
- **Prevention of leakage** of carbon emissions from New York into other regions.
- **A home-grown policy mechanism** that could be adopted by other regions looking to control carbon emissions through a market-based mechanism.

- A carbon price will send price signals to investors, entrepreneurs, and project developers to:
  - create innovative solutions and projects;
  - locate renewable projects closer to New York's population centers;
  - offer inventive and attractive services to help consumers reduce their demand and switch their vehicles and heating and cooling systems to electricity;
  - provide price signals to spur the development and expansion of electric-vehicle charging infrastructure across the state;
  - reduce emissions from fossil-fuel power plants that affect vulnerable communities; and
  - invest in additional transmission capacity to open up downstate New Yorkers' access to plentiful and relatively cheap zero-carbon/renewable resources in upstate New York.
- A carbon price will help retain existing generating units with zero or low carbon emissions in operation as long as safely possible. It will provide owners of many such plants—including units that will come to the end of their contracts for renewable energy credits (RECs) or zero-emissions credits (ZEC) over the next decade—with visibility into future wholesale-market revenues at levels that (for some generating resources) will support the ongoing investments needed to maintain those units in operation. This has material financial value to consumers, as New York transitions its electric system: For every 1,000 MW of nuclear capacity retained in any year, for example, New Yorkers will avoid the cost of replacing that zero-carbon energy with significantly larger and more costly amounts of capacity and investment in new zero-carbon-emitting power-supply projects. Meeting the Act's requirements over the next few decades will likely require market and policy mechanisms that result in *both* retaining nuclear capacity and adding renewable resources.
- Given the NYISO wholesale market's successful track record in delivering reliable power with billions of dollars in savings to consumers from increased efficiency, a carbon pricing mechanism can accelerate the electric-system transition at lower cost and less financial risk to consumers than otherwise. The state can leverage NYISO's markets to help realize the Act's directives to add 6,000 MW of solar photovoltaic (PV) by 2025 and 3,000 MW of storage capacity by 2030. In this context, a carbon price can spur faster access to sufficient revenue certainty, with local pricing incentives to site such projects in downstate locations, and with potential savings deriving from market efficiencies. Given NYISO's experience over the past two decades, we estimate such market efficiency savings (net present value) on the order of \$280–850 million between 2022 and 2040 (2019\$, 3 percent discount rate). This estimate is likely conservative, based on the unrealistically low assumption—given the decarbonization and electrification aspirations under the CLCPA—of a business-as-usual outlook for electricity demand. The full build-out of a zero-carbon economy over the next two decades will require significant investment in incremental low- and zero-carbon resources to accommodate decarbonization through electrification of buildings' and vehicles' energy use. Thus, the savings that can flow from an efficient carbon pricing mechanism in the electric sector will be vital in helping New York manage the costs of the clean energy transition.
- A carbon price will help support efficient electric-system reliability by sending investment signals to site new resources in areas where they will provide local reliability services at lower cost and with lower air pollution.
- The NYISO carbon pricing mechanism will explicitly address and mitigate leakage of carbon emissions from New York into other regions, consistent with the Act's directives for state policy.

**New York's wholesale power market, including a carbon price, will help to position private investment and operations to row in the direction of the state's climate goals.** New York has an integrated system of power suppliers and transmission facilities, coordinated and operated reliably and economically by NYISO. For over two decades, this system has operated efficiently based on a competitive market design. NYISO administers a market that is regulated by the Federal Energy Regulatory Commission (FERC), comprising a diverse set of more than 425 market participants—transmission owners with over 11,000 miles of transmission circuits, companies owning over 700 power plants, privately owned and publicly owned distribution utilities, end-use suppliers, consumer groups, environmental organizations, and others—and reliant on market rules designed to provide reliable and economical power to New Yorkers. Since 2000, private power companies and public power authorities have added nearly 13,000 MW of new power-production capacity (which now equals more than one-third of the capacity on today's NYISO system). Most of these more-modern and more-efficient power plants are located in downstate New York, where most of the state's power consumption occurs and where the operation of competitive and efficient markets minimizes production costs and investment risks for the state's consumers of electricity.

**Embedding a carbon price in the NYISO energy markets will create a strong synergy between the state's electricity market design and the Act's GHG-reduction targets.** Adoption of a carbon price would help to send efficient price signals to market participants about the value of clean energy resources and would establish an electric system strongly aligned with the goals of the Act. It is broadly understood that efficient competitive wholesale markets depend on transparent price signals that accurately reflect electric-system conditions, system needs, and the impacts of electricity production and consumption. With the Act, New York's electric system now needs to move quickly towards a lower-carbon footprint. The NYISO market design, therefore, should have a similar link, one that identifies the higher value that New York places on carbon-free and low-carbon resources through transparent wholesale market signals—something that the proposed carbon pricing mechanism can provide. Investors and developers depend upon such signals as they consider the types of investments, operational expenditures, and projects they bring to the system, and when and where to locate them. New York will benefit from aligning the NYISO market design with the state's climate goals, so that renewable energy and storage additions can enter the market at a pace that is both required under the Act and much faster than New York has ever seen.

**A carbon price can work hand in hand with other policies to advance and amplify innovation in clean energy products and services, the control of air pollution, investment in advanced energy infrastructure, and improvements in public-health outcomes.** A carbon price in the NYISO market can help to speed up the state's clean energy transition through early action. It can do its work immediately and throughout the Act's ramp-up period as the state's new Climate Action Council determines by mid-2021 the scoping plan for climate measures, and as the New York Public Service Commission (NY PSC) establishes by no later than mid-2024 the programs that will require New York's load-serving entities to procure at least 6,000 MW of solar capacity (by 2025), 3,000 MW of storage capacity (by 2030), and 9,000 MW of offshore wind (by 2035). A carbon price in NYISO markets would complement and accelerate the impact of other state policies (such as the New York State Energy Research and Development Authority's (NYSERDA's) competitive solicitations and long-term procurements of RECs and ZECs that have been a recent hallmark of the state's clean energy policy instruments). A carbon price would create targeted financial incentives for innovative solutions and for clean energy resources to locate in areas now served by fossil units, and for reducing output and air emissions at fossil-fueled power plants (especially in downstate New York environmental justice locations). A carbon price

could help over time to better align retail and wholesale prices to send signals for efficient investment to reduce demand. It would send a signal to investors of the value of adding more transmission capacity between upstate and downstate New York, expanding the availability of plentiful, low-cost zero-carbon and renewable resources in upstate New York to downstate load centers (including those in New York City, which has adopted aggressive carbon-reduction and electrification goals of its own). A carbon price would provide an economic basis for avoiding FERC action to mitigate New York's market and avoiding consumer cost impacts of such mitigation policies. These many benefits support New York's other goals, some of which are embodied in the Act.

**There will be out-of-pocket costs to transition the state's electric and other energy systems, but a price on carbon in NYISO's market would help lower these costs.** Certainly, it will be difficult to achieve the goals of the Act without incurring costs.

New York policy makers have decided, at least implicitly in the findings of the Act, that the real costs of climate change are significant enough to warrant urgent, aggressive action to transition the state's economy away from fossil fuels. The Act is premised on policy makers' recognition that New Yorkers are already experiencing hardships and real economic costs—in the form of air pollution, harm to public health (especially for vulnerable populations), damage to property and critical infrastructure, declines in fish populations, and injury to key industries such as "agriculture, commercial shipping, forestry, tourism, and recreational and commercial fishing." The Act seeks to reduce and mitigate even worse impacts from a changing climate by requiring the actions the state will undertake to reduce GHG emissions.

**Given the newness of the Act, none of the prior studies that have performed quantitative modeling of consumer cost impacts from a carbon price in NYISO markets reflects the timing and depth of changes that will be needed in New York's electric system.**

For this reason, our report de-emphasizes the results of prior studies of consumer cost impacts and focuses on the incremental value of adding a carbon price to help drive accelerated changes at lower cost. Even with this caveat, we observe that previous studies indicate that a carbon price will lead to billions of dollars of positive economic benefits. Using results from a 2019 study by Resources for the Future, we calculate annual global social welfare benefits of \$118–755 million (2019\$). In addition, according to our calculations a Potomac Economics study indicates that a carbon price would result in a net present value (NPV) of benefits to New York consumers between 2022 and 2036 of \$1.72–3.25 billion (2019\$), depending

#### NYISO's Carbon Pricing Proposal: The Essence

NYISO's proposal would incorporate a carbon price in the NYISO-administered wholesale energy markets, in dollars per ton of CO<sub>2</sub> emissions resulting from power plant operations. The carbon price would be based on the social cost of carbon emissions, established by New York State officials.

Power plant operators would include in their NYISO market offer prices their expected cost of carbon, in dollars per unit of electricity sold. NYISO would determine the economic dispatch order of supply sources, taking into account these costs of emitting carbon. Like today, the clearing price of electricity in different locations would be based on the price of the "marginal" unit—the last unit turned on to meet demand.

Because the carbon charges included in suppliers' offer prices would increase the costs of carbon-emitting generation dispatched by NYISO, a carbon charge would raise the energy market clearing prices whenever carbon-emitting resources are on the margin. All suppliers, including clean energy resources, would receive the higher energy price. While suppliers of power with zero or low CO<sub>2</sub> emissions would benefit from higher net revenues, fossil generators' payments would reflect a deduction for the carbon charges related to their emissions.

Retail electricity suppliers (known as "Load Serving Entities" in the NYISO market) would be charged the locational price for power they need for their consumers, with that price reflecting carbon-related costs. They would also receive a credit to substantially offset the impact of carbon pricing, because NYISO would return to consumers the carbon charges collected from generators that emit CO<sub>2</sub>.

The carbon charge would provide incentives to suppliers of power with low or no carbon emissions, including for innovative low-carbon technologies that may not yet be developed or be commercial in wholesale markets that do not provide compensation for the value those resources provide. Imports of power into New York would have a carbon adder, thus discouraging leakage of CO<sub>2</sub> emissions into neighboring regions.



upon the scenario modeled and use of the social versus private discount rate. Finally, again according to our calculations, results from a Brattle/IPPTF study indicate NPV benefits would be between \$119–605 million (2019\$) for the same period.

**A carbon price can help move New York's clean energy economy forward, in ways that are hard to predict.**

Just as we do not really know the costs or benefits to consumers of New York's transition to a lower-carbon electricity system and economy, we do not really know what the exact costs of adding a carbon price into NYISO's market will be. Yet we strongly expect, based on the efficiencies achieved in electricity pricing since the start of competitive wholesale electricity markets and on the similarly successful history of sulfur dioxide and nitrogen oxides emissions pricing in electricity markets, that New York's economy and consumers will benefit from the operation of a carbon price to internalize the costs of carbon emissions into market prices *alongside* the deployment of myriad other public policies aimed at advancing the state's energy transition.

**Powering more of the economy on electricity can help reduce New York's carbon emissions at lower cost than actions to directly reduce emissions in buildings and vehicles.** This positioning of the electric system to help reduce carbon emissions in the economy is consistent with the academic literature, which strongly suggests that an electric system composed of diverse, zero-carbon supplies coupled with an economy that is more reliant on electricity increases the possibility of significantly reducing GHG emissions at lower costs than other approaches. This increases the relevance and importance of transparent carbon pricing in such electricity-market transactions.

As indicated in the Summary Table below, a carbon price in the NYISO markets can be a powerful policy in New York's toolkit to accomplish its clean energy transition as quickly as possible, and a concrete sign of New York's national leadership in addressing the urgency of climate change.

Summary for Policy Makers: Incremental Value Proposition of Adding a Carbon Pricing Mechanism in NYISO Markets In Conjunction with Reliance on Administrative Actions by New York State Agencies		
Outcome	Impact of a Carbon Pricing Mechanism in NYISO Markets	Other Observations
<b>State policy leadership</b>	A carbon price can be exported to other states and regions, supporting New York's market approach.	Support for a carbon price will further position New York State as a national policy innovator and leader, and encourage other states to act.
<b>Speed of adoption</b>	A NYISO carbon pricing mechanism can be implemented relatively quickly.	NYISO and its stakeholders have already done a great deal of work to explore this proposal, which can shorten the lead time for filing at/approval by FERC.
<b>Accelerated entry of renewable projects</b>	A price on carbon will increase the opportunity for financing of clean energy resources to enter the market in the absence of a long-term REC contract.	Some clean energy technologies (e.g., offshore wind) will likely require support through long-term REC contracts in order to get financing. But a price on carbon in wholesale prices will help some renewable projects (e.g., onshore wind, some solar projects) gain financing without a contract.
<b>Incentives for innovation</b>	A carbon price in the NYISO energy market will increase incentives for entrepreneurs and others to develop new supply-side and demand-side technologies, products, and services.	Although Clean Energy Standard (CES) procurements may elicit innovative and valuable proposals, a carbon price can produce solutions not anticipated in administrative procurements, and spur or accelerate research and development (R&D) and commercialization activities for emerging clean energy technologies.
<b>Incentives for energy efficiency and other customer-based actions</b>	A carbon price has the potential to improve price signals over time to consumers reflecting the full costs of using electricity, and influence consumer access to and use of demand-management technology and practices.	The wholesale market's ability to influence consumers' behavior will be affected by retail pricing approaches adopted by utilities, the NY PSC, and Load Serving Entities. Nevertheless, carbon pricing at the wholesale level will likely contribute to societally efficient consumption decisions.
<b>Incentives for efficient transmission investments</b>	A location-based carbon price will create strong incentives for cost-effective investment in increased transfer capability between upstate and downstate.	Given the Act's goals to decarbonize the electric system and to electrify much of the energy used in New York's buildings and vehicles, additional transmission capability will be needed to provide downstate population centers with improved access to distant zero-carbon resources.
<b>Acceleration of fossil retirements and reduced use of natural gas</b>	The NYISO carbon price will put financial pressure on existing inefficient fossil units to retire and reduce use of fossil fuels, especially in downstate New York areas. It will also drive increased efficiencies in remaining fossil generation.	A price on carbon can accelerate retirements and/or efficient repowering of fossil units above and beyond policy requirements to retire peaking units, with positive impacts on air quality in downstate disadvantaged communities.
<b>Compatibility with other policy instruments</b>	A carbon price can be a seamless complement to other state policies (e.g., energy efficiency, REC and ZEC contracting) by providing a means to value low-carbon investment and operations in the electric system.	The pace and depth of New York's electric-system transition will require simultaneous reliance on multiple policies. A carbon price is not duplicative; instead, it efficiently and transparently reduces reliance on and the cost of meeting administrative clean energy policies.
<b>Ability to harmonize policy and markets</b>	The NYISO carbon price will internalize the cost of GHG emissions into the electric markets, and improve the performance of the wholesale market.	With the Act, New York's electric system's needs are now firmly linked to a lower-carbon footprint. NYISO's market design should similarly incorporate this price signal and introduce the cost of carbon into electricity decisions.
<b>Alignment with wholesale market design</b>	A NYISO carbon pricing mechanism will support the efficient operation of the NYISO markets.	The carbon pricing mechanism will dovetail seamlessly into the operation of NYISO wholesale markets.
<b>Consumer cost impacts</b>	The NYISO market's two-decade track record of extracting efficiencies out of the electric system's operations can provide confidence that an improved market design, aligned with the state's carbon reduction goals, will produce savings to consumers.	In light of the Act's recent and much more aggressive decarbonization targets, the results of prior modeling of the impacts of a carbon price do not shed light on (and likely underestimate) the relative value of a carbon price in producing consumer savings compared to exclusive reliance on CES procurements and administrative actions.
<b>Public health impacts</b>	Given the location of fossil generation in downstate New York, a carbon price will reduce local air pollution there.	A carbon price will dovetail with other state policies (e.g., the Peaker Rule) to encourage retirements and repowering.
<b>Impacts on disadvantaged communities</b>	Given the location of fossil generation in downstate New York, a carbon price will reduce emissions in downstate environmental justice areas.	A carbon price will dovetail with other state policies (e.g., the Peaker Rule) to encourage retirements and repowering.
<b>Limitation of CO<sub>2</sub> emissions leakage to other regions</b>	A carbon pricing mechanism will limit leakage due to the proposal's treatment of emissions related to cross-boundary electricity flows.	The Act identifies leakage as an issue the state should address and avoid; relying on CES procurements alone will not be as effective as a carbon price for this issue.
<b>Revenue streams to public entities</b>	Given the portfolio of zero-carbon supplies owned/controlled by the New York Power Authority (NYPA), the carbon pricing mechanism will increase revenues to NYPA as a power provider in the NYISO markets.	These incremental additional revenues to NYPA can be used in a variety of net-positive ways to New York (e.g., investment in infrastructure to support clean energy, low-cost financings, discounted service offerings, R&D, and innovation that would otherwise be paid for in NYPA rates).

**New York State Climate Leadership and Community Protection Act of 2019  
Legislative Findings and Declaration**

1. Climate change is adversely affecting economic well-being, public health, natural resources, and the environment of New York.
2. The severity of current climate change and the threat of additional and more severe change will be affected by the actions undertaken by New York and other jurisdictions to reduce GHG emissions.
3. Action undertaken by New York to reduce GHG emissions will have an impact on global emissions and the rate of climate change. Such action will encourage other jurisdictions to implement complementary strategies and provide an example of how such strategies can be implemented. It will also advance the development of green technologies and sustainable practices within the private sector.
4. It shall be a goal of the state of New York to reduce GHG emissions 100% over 1990 levels by 2050, with an incremental target of at least a 40% reduction by 2030, in line with international scientists' projections of what is necessary to avoid the most severe impacts of climate change.
5. Although substantial emissions reductions are necessary to avoid the most severe impacts of climate change, complementary adaptation measures will also be needed to address those risks that cannot be avoided.
6. New York should minimize the risks associated with climate change through a combination of measures to reduce statewide GHG emissions and improve the resiliency of the state with respect to the unavoidable impacts of climate change.
7. Climate change especially heightens the vulnerability of disadvantaged communities, which bear environmental and socioeconomic burdens as well as legacies of racial and ethnic discrimination. Actions undertaken to mitigate GHG emissions should prioritize the safety and health of disadvantaged communities, control potential regressive impacts of future policies on these communities, and prioritize the allocation of public investments in these areas.
8. Creating good jobs and a thriving economy is a core concern of New York State. Shaping the ongoing transition in our energy sector to ensure that it creates good jobs and protects workers and communities that may lose employment in the current transition must be key concerns of our climate policy.
9. Workers are at the front lines of climate change. It is in the state's interest to ensure labor harmony and promote efficient performance of work on climate change related work sites by requiring worker training and adequate compensation.
10. Ensuring career opportunities are created and shared geographically and demographically is necessary to ensure increased access to good jobs for marginalized communities while making the same neighborhoods more resilient.
11. The complexity of the ongoing energy transition, the uneven distribution of economic opportunity, and the disproportionate cumulative economic and environmental burdens on communities mean that there is a strong state interest in setting a floor statewide for labor standards, but allowing and encouraging individual agencies and local governments to raise standards.
12. By exercising a global leadership role on greenhouse gas mitigation and climate change adaptation, New York will position its economy, technology centers, financial institutions, and businesses to benefit from national and international efforts to address climate change.

## Final Report Table of Contents

### Summary for Policy Makers

- I. Introduction**
    - A. Background
      - 1. New York State leadership in clean energy
      - 2. Federal interest in New York's clean power policies
      - 3. NYISO efforts to explore a carbon price in the wholesale market
    - B. The NYISO carbon pricing proposal
    - C. Studies of the impacts of the NYISO carbon pricing proposal
      - 1. Brattle/IPPTF Study (2018)
      - 2. Other studies
    - D. Purpose and scope of this Analysis Group study
  - II. The context for NYISO's consideration of incorporating a price on carbon into its wholesale energy market**
    - A. Introduction
    - B. Current conditions in New York's wholesale electric system
    - C. New York State's public policy context
    - D. FERC regulation of wholesale electricity markets
    - E. Economic and public policy literature on carbon pricing
  - III. Implications of a NYISO carbon pricing mechanism for assisting New York in accomplishing its CLCPA goals**
    - A. Introduction
    - B. New York's upcoming clean energy challenge: The numbers
    - C. New York's clean energy challenge: Framing the issue of the costs
    - D. A carbon price: Its value as an arrow in New York's policy quiver
  - IV. Impacts related to the risk that FERC will impose broader mitigation of policy-driven resources in NYISO markets**
    - A. Introduction
    - B. Potential impacts of hypothetical FERC mitigation of NYISO markets
  - V. Impacts on potential repowering of generating units (and/or repurposing of sites)**
  - VI. Impacts on public health from air emission reductions**
  - VII. Impacts on use of fossil fuels in New York State**
  - VIII. Impacts on consumers' electricity costs and social welfare**
    - A. Framing the consumer cost and social welfare issue
    - B. Brattle/IPPTF and Potomac estimates of consumer costs
  - IX. Impacts on revenues to New York's public power entities**
  - X. A NYISO carbon-pricing mechanism: Its overall value proposition**
  - XI. Conclusion**
- Technical Appendix: Methodological Issues, Data, and Assumptions**