UNITED STATES OF AMERICA

BEFORE THE

FEDERAL ENERGY REGULATORY COMMISSION

Cricket Valley Energy Center LLC and	)	
Empire Generating Company LLC	)	
v.	)	**Docket No. EL21-7-000**
New York Independent System	)	
Operator Inc.	)	

WRITTEN TESTIMONY
OF
DR. KATHLEEN SPEES AND DR. SAMUEL A. NEWELL

The Economic Impacts of Buyer-Side Mitigation in New York ISO Capacity Market

Our names are Dr. Kathleen Spees and Dr. Samuel A. Newell. We are employed by The Brattle Group as Principals. On behalf of the Natural Resource Defense Council, the Sustainable FERC Project, Earthjustice, Sierra Club, American Wind Energy Association, Alliance for Clean Energy New York, and Advanced Energy Economy, we submit this affidavit on The Economic Impacts of Buyer Side Mitigation in the New York Independent System Operator (NYISO) Capacity Market.

Our qualifications as experts derive from our extensive experience evaluating capacity markets and related market design questions. Our experience working for system operators across North America and internationally has given us a broad perspective on the practical implications of nuanced capacity market design rules under a range of different economic and policy conditions.[1] In New York, we have conducted analyses on behalf of the New York State Energy Research and Development Authority (NYSERDA) and the New York State Department of Public Service (NYSDPS) to analyze the costs of Buyer Side Mitigation (BSM) and potential expansions thereof, and to evaluate alternatives to BSM. We are also very familiar with the Minimum Offer Price Rule (MOPR) in PJM Interconnection, LLC's (PJM) capacity market that Cricket Valley Energy Center (CVEC) LLC and Empire Generating Company LLC (the "Complainants") seek to

[1] We have worked with regulators, market operators, and market participants on matters related to resource adequacy and investment incentives in PJM Interconnection, ISO New England, New York, Ontario, Alberta, California, Texas, Midcontinent ISO, Italy, Russia, Greece, Singapore, and Western Australia.

emulate. We have supported PJM by conducting every one of its periodic reviews of its capacity market and have developed design recommendations for competitive and self-supply exemptions to MOPR.[2] Dr. Newell has submitted testimony to the Federal Energy Regulatory Commission (FERC) on behalf of PJM in developing economic estimates of offer floor prices to implement the MOPR rules in that region. Dr. Newell has also submitted testimony on behalf of the Competitive Markets Coalition group of generating companies seeking to strengthen PJM's MOPR in its original purpose to prevent and mitigate the exercise of buyer market power.[3]

Dr. Spees is an economic consultant with expertise in wholesale electric energy, capacity, and ancillary service market design and analysis. She earned a Ph.D. in Engineering and Public Policy, an M.S. in Electrical and Computer Engineering from Carnegie Mellon University, and a B.S. in Mechanical Engineering and Physics from Iowa State University. Dr. Newell is an economist and engineer with more than 20 years of experience analyzing and modeling electricity wholesale markets, the transmission system, and ISO/RTO market designs. He earned a Ph.D. in Technology Management and Policy from the Massachusetts Institute of Technology, an M.S. in Materials Science and Engineering from Stanford University, and a B.A. in Chemistry and Physics from Harvard College.

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2 See our four independent reviews of PJM's capacity market and associated design parameters published in 2008, 2011, 2014, and 2018. The most recent of these is: Samuel A. Newell, David Luke Oates, Johannes P. Pfeifenberger, Kathleen Spees, J. Michael Hagerty, John Imon Pedtke, Matthew Witkin, and Emily Shorin, *Fourth Review of PJM's Variable Resource Requirement Curve*, Prepared for PJM Interconnection L.L.C., April 19, 2018.

3 FERC Docket No. ER13-535-000, filed "The Competitive Markets Coalition's Supporting Comments, at Attach. A, Affidavit of Dr. Samuel A. Newell on Behalf of the 'Competitive Markets Coalition' Group Of Generating Companies," supporting PJM's proposed tariff revisions to change certain terms regarding the Minimum Offer Price Rule in the Reliability Pricing Model, December 28, 2012 ("Affidavit of Dr. Samuel A. Newell on Behalf of the Competitive Markets Coalition").

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Executive Summary

The original and proper economic purpose of buyer-side mitigation (BSM) rules is to protect the market from the exercise of buyer market power: schemes where large net buyers or their representatives offer a small amount of uneconomic supply into the market below cost in order to suppress market clearing prices.[4] By taking a loss on that small position, a large net buyer could then benefit from a much larger short position in the market. The BSM was designed to prevent this behavior. The concept was to ensure that entities with the incentive and ability to engage in manipulative price suppression will be unable to do so by requiring their capacity market offers to reflect their full costs. Thus uneconomic new resources sponsored by large net buyers would fail to clear (or would set the prices at a higher level) and prevent the would-be gaming entity from achieving the benefits of manipulative price suppression. Symmetrical rules are imposed on large net sellers of capacity in order to prevent them from exercising economic or physical withholding.

More recently, the BSM has been inappropriately repurposed to exclude from the capacity market resources that earn revenues for supporting states', communities', or private consumers' clean energy mandates or sustainability goals; and the Complainants want to extend BSM's application even further along these lines. There is no sensible economic rationale for applying BSM to resources that are developed or maintained to address the harms of climate change or other environmental externalities. The policy support awarded to such resources reflects their environmental value; these resources are not "uneconomic" and their introduction is not in any way related to schemes of manipulative price suppression with uneconomic entry that the BSM was designed to address. Further, expanding BSM does not "level the playing field" as Complainants claim, since it does not privatize the costs of environmental externalities and does not attempt to undo the effects of all local, state, and federal policies that have always shaped the resource mix, including supporting the development of existing fossil plants and reduced the delivered cost of fossil fuels.

Applying BSM to clean energy resources may prevent them from clearing the market, with several undesirable effects. First, it will deprive clean energy resources of revenues reflecting the capacity value they provide, which will interfere with the State's fulfillment of its clean energy mandates. Second, it will favor the retention of uneconomic fossil-fired generation that are not needed for reliability, further conflicting with the State's transition. Third, it will produce higher market clearing prices exceeding the level corresponding to actual supply conditions and effectuate a large wealth transfer from customers to incumbent suppliers. And fourth, contrary to the Complainants' claims, BSM's application to policy resources will eventually render the market unsustainable as these distortions become larger over time under New York's statutory mandate to achieve 70% renewable electricity by 2030 and 100% clean electricity by 2040.[5] The end state of applying BSM to clean energy resources would be a capacity market that excludes a large majority of the fleet, with market clearing outcomes having no relationship to underlying supply and demand fundamentals.

These distortions would be amplified by the Complainant's proposal to expand the applicability of BSM to all policy-supported resources throughout the state and to increase their minimum offer prices in the capacity auctions. Instead, BSM should be changed in the other direction to limit its

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4 Federal Energy Regulatory Commission (FERC), Docket No. EL07-39-000, "Order Conditionally Approving Proposal" at PP 100–P100106, March 7, 2008.

5 State of New York, Senate – Assembly, S. 6599 – A. 8429, "Article 75, Climate Change," June 18, 2019.

applicability to its original purpose. The most appropriate capacity price is the one that will prevail after the elimination of BSM rules from policy resources, such that the capacity market can continue supporting economic entry and exit by providing an accurate reflection of capacity surplus or shortfall.

THE APPLICATION OF BUYER-SIDE MITIGATION TO POLICY RESOURCES IS BASED ON FLAWED ECONOMIC LOGIC

The Complainants in this proceeding and their witness Dr. Roy Shanker claim that BSM should be applied to policy resources in order to protect the capacity market from the effects of state policies.[6] Similar to prior economic arguments presented to the FERC, the Complainants assert that state-supported resources inappropriately suppress capacity market prices, thus undermining investment signals and ultimately system reliability. Their proposed remedy is to apply BSM to policy resources, thus restoring prices to the levels that would prevail in the absence of state policies.

The Complainants' economic arguments are incomplete and flawed. A corrected economic analysis should consider that:

- State environmental policies address a well-understood market failure to reflect environmental externalities. The environmental value of policy-supported resources should not be considered an illegitimate distortion of markets that must be excluded, but rather a correction that is needed to achieve a more efficient outcome;
- The "correct" price for capacity is one that aligns supply and demand, not the price that would prevail in the absence of state policies as the Complainants' BSM proposal would aim to produce;
- Capacity markets with sloping demand curves cannot simultaneously produce low prices and poor resource adequacy as the Complainants assert;
- Broad application of BSM to policy resources will amplify (not mitigate) the regulatory risks affecting capacity investments; and
- Merchant generation investors operate in a market and regulatory context that has always required them to face uncertainties associated with a wide range of energy and environmental regulations at the federal, state, and local levels; these policies and associated economic subsidies have always influenced the resource mix (some in favor of incumbent fossil resources and others in favor of clean energy resources). Merchant investors should never have expected to be indemnified against risks associated with these policies (nor should they be required to return revenues to customers when policy changes favor their own investments).

Overall, the Complainants aim to solve a problem that doesn't exist. Their primary concern appears to be that as incumbent fossil generation owners, they no longer expect to earn a satisfactory return on their investments. While certainly a concern for incumbents, low capacity prices are not a problem from a societal or market design perspective. Low prices are simply a reflection of market conditions indicating ample capacity supply; they appropriately signal that no

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6 FERC, Docket No. EL21-7-000, "Complaint and Request for Fast Track Processing," at p. 14, October 14, 2020 ("Complaint").

new capacity is needed and that high-cost existing resources should retire. In fact, prices that are low enough to signal retirement of aging fossil resources will be necessary to achieve an orderly transition from fossil resources and toward clean energy.

The BSM should be maintained only for its narrow original purpose of addressing manipulative price suppression, not applied to clean energy policy resources. That will enable the capacity market to continue offering competitive benefits by producing accurate price signals that align with market fundamentals.

APPLYING BUYER-SIDE MITIGATION TO POLICY RESOURCES WILL INTERFERE WITH NEW YORK'S STATUTORY MANDATE TO TRANSITION TO A 100% CLEAN ELECTRICITY GRID BY 2040

New York's Climate Leadership and Community Protection Act (CLCPA) mandates a transition to 70% renewable electricity by 2030, 100% clean electricity by 2040, an 85% reduction in economy-wide greenhouse gas emissions, and another 15% greenhouse gas reduction via offsets by 2050.[7] Applying BSM to policy resources will interfere with the State's CLCPA mandates by excluding clean energy resources from clearing in the capacity market and causing the uneconomic retention of high-cost fossil fuel resources that would otherwise retire.[8] Specifically:

- Under the Status Quo BSM rules, approximately 7,200 MW of installed capacity (ICAP) (3,050 MW, reported as the annual average of summer and winter unforced capacity (UCAP) ratings) of policy resources will be subject to BSM by 2030. We project that none of that capacity will clear the capacity market. Instead, approximately 3,050 UCAP MW annual average of aging steam turbine plants will clear that would otherwise retire.
- Under an Expanded BSM rule with the same primary elements as proposed by the Complainants, approximately 17,700 ICAP MW (10,350 UCAP MW annual average) of policy resources would be subject to BSM by 2030. Approximately 8,250 UCAP MW would fail to clear the capacity market, replaced by approximately 7,025 UCAP MW annual average of primarily gas- and oil-fired power plants.

Overall, the application of BSM to policy resources would interfere with the transition to a 100% clean electricity mix. A more appropriate capacity market design would acknowledge the reality of the clean energy transition, support the orderly retirement of aging fossil plants, and adapt to an increasing reliance on clean energy resources to support resource adequacy.

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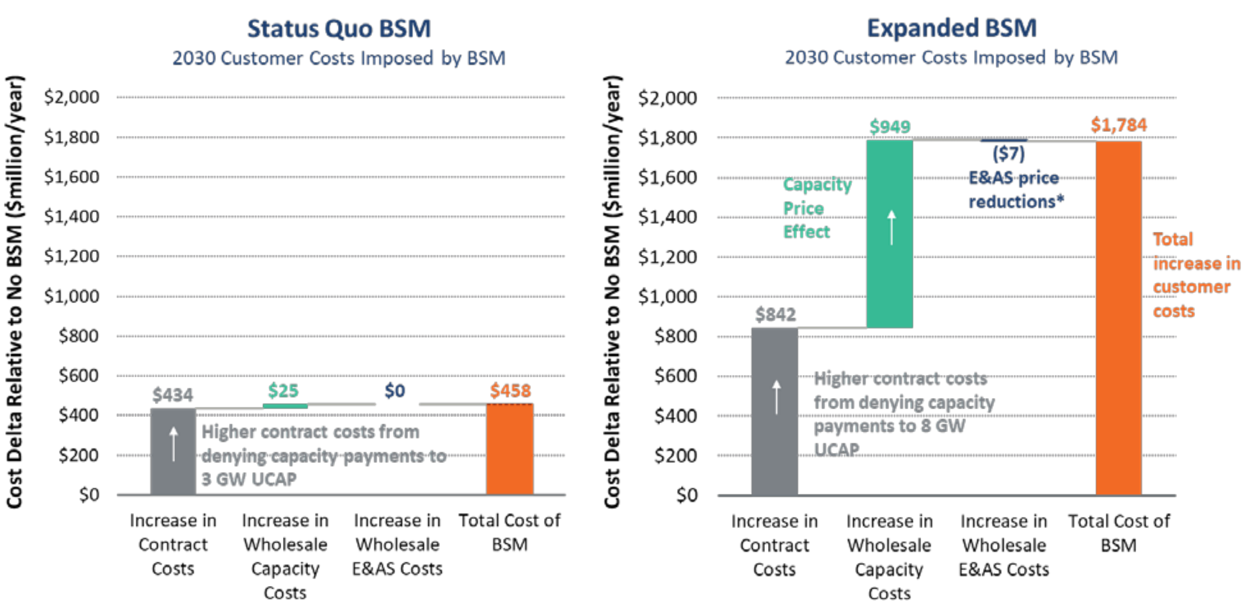
7 State of New York, Senate – Assembly, S. 6599 – A. 8429, "Article 75, Climate Change," June 18, 2019.

8 The assumptions and methodology used to develop the analytical results reported here are described in more detail in Exhibit B (Spees, *et al.*, "Quantitative Analysis of Resource Adequacy Structures," Prepared for NYSERDA and NYSDPS, July 1, 2020); the assumptions adopted at the time reflected our expectations regarding how various dockets and appeals would be resolved regarding the "Status Quo BSM" rules and an "Expanded BSM" rules assumptions and associated uncertainties. Those assumptions remain largely consistent with the current NYISO capacity market rules and the Complainants' proposal. These results were originally developed on behalf of the New York State Energy Research and Development Authority, and the New York Department of Public Service. *See* Exhibit B, Spees, *et al.*, "Quantitative Analysis of Resource Adequacy Structures," Prepared for NYSERDA and NYSDPS, July 1, 2020.

APPLYING BUYER-SIDE MITIGATION TO POLICY RESOURCES IMPOSES UNECONOMIC EXCESS COSTS ON CUSTOMERS AND ON SOCIETY AS A WHOLE

Misapplying BSM to policy resources will impose significant excess costs on customers, amounting to approximately $460 million per year under Status Quo BSM rules or $1,780 million per year by 2030 under the Expanded BSM rules proposed by the Complainants, as summarized in Figure 1. These excess costs appear in two ways: (1) as an increase in capacity prices affecting all transactions; and (2) as an increase in contract payments to policy resources because they are deprived of capacity market revenues that go instead to unnecessary substitute resources. Excess costs would be imposed immediately upon application of the Expanded BSM rules as approximately 3,100 UCAP MW of nuclear resources would immediately be affected. The costs would grow over time alongside the scope of the clean energy transition; by 2030 the excess customer costs would rise to approximately $950 million per year from inflated capacity prices plus $840 million per year in excess contract payments under the expanded BSM rules proposed by the Complainants. The excess contract payments reflect paying capacity to non-policy resources that are not actually needed to meet the reliability targets underlying the capacity market, rather than paying the policy resources for the capacity they provide.

FIGURE 1: CUSTOMER COSTS FROM IMPOSING BSM ON POLICY RESOURCES BY 2030



Sources and Notes: * Energy and AS prices decrease in some cases because excess capacity depresses prices in tight hours; and because higher contract payments (due to lack of capacity payments) cause energy prices to be more negative in over-generation hours. Costs reported in 2030$. *See* Exhibit B at p.7.

The primary beneficiaries of BSM are incumbent capacity market sellers, who enjoy elevated capacity prices and gain a greater share of capacity market sales. However, the net benefits enjoyed by these incumbent capacity suppliers would be much smaller than the excess costs imposed on consumers. By 2030, Status Quo BSM and Expanded BSM would increase capacity sellers' revenues by $460 million and $1,790 million annually; but their costs would also increase to maintain the excess capacity cleared by roughly $450 million and $790 million annually.[9] Hence their producer surplus would increase by only approximately $10 million and $1,000 million per year. That increase in producer surplus mostly reflects a wealth transfer from

[9] These estimates rely entirely upon the public presentation attached hereto as Exhibit B.

customers. The increased costs to maintain unneeded supply represents excess societal expenditure that benefits neither consumers nor producers.

TO CONTINUE OFFERING BROAD BENEFITS TO CONSUMERS, COMPETITIVE MARKETS MUST ALIGN WITH AND SUPPORT ENVIRONMENTAL POLICY GOALS

Far from "protecting" the capacity market, maintaining and expanding the application of BSM to policy resources will erode and eventually eliminate the benefits of the competitive capacity market. With Status Quo BSM and particularly with an Expanded BSM, the disconnect between market fundamentals and market clearing prices will grow as greater quantities of policy-supported clean energy resources come online over the coming years. The consequential growth in excess customer costs, societal costs, and wealth transfers to incumbent fossil plants will rapidly become unsustainable from a policy and economic perspective.

A better path forward is to eliminate the application of BSM to energy policy-supported resources so that the wholesale markets can help meet clean energy and reliability needs at low cost. The wholesale electricity markets are already largely set up to do so, with the energy, ancillary services, and capacity markets (absent BSM) complementing the State programs that reward resources for their environmental attributes. Together, all of these markets can guide the supply mix to cost effectively meet the state's energy and environmental needs, and can do so even more effectively with continued enhancements.

Regulators, the NYISO, and stakeholders in New York and other regions are already considering several enhancements to better align wholesale markets with states' environmental policies, including enhanced carbon pricing, enhanced energy and ancillary service market designs, and more accurate accreditation of storage and intermittent resources in the capacity market.[10] These reforms may take some time but will ultimately support the evolution of toward a fit-for-purpose wholesale market for the decarbonized grid.

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10 For example see NYISO, "Reliability and Market Considerations for a Grid in Transition," December 20, 2019; and NYISO, "IPPTF Carbon Pricing Proposal Prepared for the Integrating Public Policy Task Force," December 2018.

A. Background on Buyer Side Mitigation and its Proposed Expansion in New York

The New York capacity market is a centralized competitive platform within which the market operator procures the quantity of resources needed to meet regional resource adequacy or reliability needs. The NYISO uses an administrative demand curve to procure the quantity of capacity that it estimates will be needed to ensure that bulk system supply shortages are infrequent, occurring no more often than once in ten years in expectations (the "1-in-10" reliability standard). Import-constrained subregions such as New York City are represented by separate demand curves establishing a minimum quantity of capacity that must be located in that subregion.

Capacity sellers offer their resources into the market at the minimum price they are willing to accept to come online or stay in the market. For any given resource, the minimum price they are willing to accept is driven by a number of factors including primarily: (a) costs associated with bringing new supply into the market or maintaining an existing facility that needs re-investment; and (b) minus any anticipated net revenues that could be earned from energy markets, ancillary service markets, or other revenue sources (such as sales of renewable energy credits (RECs), steam, or gypsum). Many sellers would also adjust their capacity offer price based on any bilateral sales agreements for capacity or any co-products they may produce and based on their long-term view of future energy and capacity prices. Sellers that are able to pre-sell most of their capacity or energy through bilateral contracts would typically offer at a zero price, as would most sellers that have already come online and have few going-forward capital investments.

Capacity prices are set at the intersection of sellers' capacity market supply offers and the administrative demand curve in each location and system-wide. Under this framework, the market produces prices consistent with supply-demand conditions. The market produces low prices when the region has more than enough supply to meet resource adequacy needs; it produces high prices when capacity supply is scarce. For the two decades since New York's capacity market was implemented, it has produced competitive prices that signal the need for new entry; attracted new entry from generation, imports, and demand response when needed; and allowed for the orderly retirement or net exports of higher-cost resources when supply was long.[11]

One of the design elements of the capacity market is a comprehensive framework for mitigating the potential for both supply-side and demand-side market power abuses. The framework consists of a number of inter-related design elements. Chiefly, the monitoring and mitigation framework includes: (a) *sell side mitigation* provisions that impose capacity price offer caps that are intended to limit the ability of large net sellers from manipulative economic or physical withholding that could inflate market prices; (b) largely symmetrical *buy side mitigation* provisions that similarly impose offer floors on large net buyers to prevent manipulative suppression of market prices; and (c) *independent monitoring and mitigation* activities to regularly review market efficiency and competitiveness. Together, these comprehensive monitoring and mitigation rules support price formation that market participants can anticipate will largely reflect economic fundamentals and supply-demand conditions, without being driven by the private interests of a player with large buy- or sell-side market share.

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[11] Potomac Economics, Market Monitoring Unit for the NYISO, "2019 State of the Market Report for the New York ISO Markets," May 2020, at p.57 (Capacity Market Results and Design).

The original purpose of BSM rules in the context of the overall market monitoring and mitigation framework was to prevent manipulative price suppression. The rules were intended to prevent entities with a large net buyer position from exercising buy-side market power. Without such a rule, a large net buyer could be in a position to game the capacity markets by bringing a small quantity of incremental capacity supply into the market, offering the supply at a zero price, and producing a low capacity price. In some cases, a large buyer supporting new entry would not be a problem. For example, if the incremental supply is relatively low cost and thus a better deal than purchasing generalized capacity from the market. However, the purchase can be viewed as manipulative price suppression if the incremental supply is very high cost, higher than the but-for capacity price that would otherwise have materialized. In that circumstance, the buyer would develop uneconomic supply (taking a financial loss on a small quantity of high-cost capacity supply) in order to achieve a lower capacity price (thus benefitting the much larger net buy position). This behavior is, by definition, manipulative because the uneconomic incremental supply resource is not a rational resource to develop when viewed in isolation. The incremental supply is pursued only for the purpose of suppressing market prices below the competitive levels that would prevail from individually rational entry and exit.

To prevent this manipulative price suppression, the BSM would restate the offer price from zero to a higher level based on the minimum offer price rule (MOPR). The higher MOPR price prevents this scheme from producing price suppression and makes it less likely that the resource in question would clear the capacity market. When applied to large net buyers and their supported resources, the BSM rules privatize the cost of any potentially uneconomic investments, while holding other parties in the market harmless. More importantly, the existence of the rule is intended to disincentivize the manipulative behavior and associated economic waste from taking place at all.

In New York, the current or "Status Quo BSM" rules currently apply to the downstate capacity zones G-J, apply only to new resources, and apply a MOPR price at the lesser of 0.75× Mitigation net Cost of New Entry (CONE) or a resource-specific value.[12] The rules further allow for Part A and Part B exemption tests that allow some resources to avoid the application of the BSM, if a forecast of future market conditions indicates that the supply will be needed or likely to clear the future capacity auctions; if the resources appear likely to clear then they can gain an exemption from BSM. This limited application of BSM is associated with the original narrow purpose of the rule, which was to prevent manipulative price suppression; these capacity zones were the only locations within which the market structure indicated that any large net buyer might have the incentive and ability to exercise market power.

The FERC has recently expanded the role of BSM in New York and in other regions to impose a MOPR more broadly to apply to resources that earn policy payments. The large majority of these resources in New York and other regions are those awarded policy payments in recognition of their contribution toward achieving states' environmental policies. The Complainants propose to expand BSM in New York further through several reforms: (1) to increase the applicable MOPR price to a technology-specific value in all cases (which will typically be much higher than the current default value); (2) to eliminate Part A and Part B exemptions that can allow certain resources to avoid BSM application in the delivery year; (3) to apply BSM broadly across all capacity zones in New York; and (4) to apply BSM to existing as well as new resources, with the

12 "Mitigation Net CONE" is an administrative estimate of the levelized cost of new supply that could be attracted into the capacity market.

greatest effect being the immediate application of BSM to approximately 3,100 UCAP MW of existing nuclear resources.[13] Overall these changes will substantially expand the scope of capacity resources affected by BSM.

The mechanics of BSM as applied to policy resources are illustrated in Figure 2. The left panel illustrates clearing outcomes if all capacity resources are allowed to offer at their preferred offer price. Most (though not necessarily all) policy resources will typically offer at a zero. These resources earn the (large) majority of their revenues through energy market and policy payments reflecting their environmental value; thus, these resources will be developed and online regardless of the capacity price. So, they would typically choose to offer at zero in the capacity market. Fossil plants and other capacity resources would offer at the minimum capacity price needed to earn a return on going-forward investments.[14] Clearing prices are set at the intersection of supply and demand.

When BSM is applied to a policy resource, its offer price is increased from zero to a higher level for the purposes of auction clearing. As illustrated in the right panel of Figure 2, the higher BSM-based price will re-order the capacity market offer supply curve, make it less likely for the policy resource to clear the market, and cause higher clearing prices.

When applied to policy resources, the mechanics of the BSM are identical as compared to the application in the context of manipulative price suppression. However, the economic purpose and impact are entirely different. Unlike in the context of manipulative price suppression, BSM, when applied to policy resources, is not intended to prevent the investments from taking place. The policy investments will proceed regardless of BSM because they are developed for the primary purpose of addressing climate change (they are not developed as a means of achieving capacity market price suppression, and would not be a cost-effective means of achieving price suppression). Thus the exclusion of these resources from clearing the market will not prevent such investments from taking place.

Another difference between the contexts of manipulative price suppression and policy resources is the scope and scale of the affected resources. In the context of manipulative price suppression, the typical behavior would be that the buyer would endure a small economic loss from developing a small quantity of uneconomic capacity resources, with that small loss more than offset by the gains to the much larger buy-side position. The scope of BSM tend to cover a small volume of supply. In the context of policy resources, there is no expectation that the quantities of excluded resources will remain small. In fact, regardless of BSM, these resources should be expected to become the large majority of the New York capacity market as the state proceeds toward its 100% clean electricity mandate.

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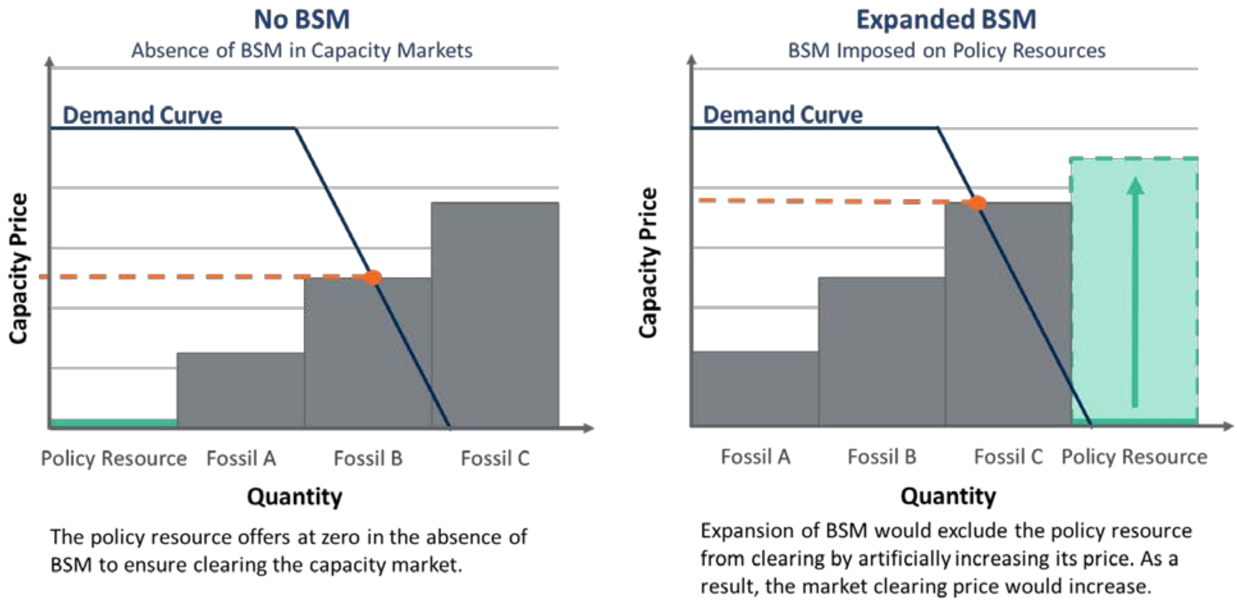
[13] *See* Exhibit B at p. 12, consistent with Complaint, at Attach. A, Shanker Affidavit, at p. 6.

[14] In the non-forward New York market, these other resources may also offer at zero but would tend to enter or exit the market in advance based on whether projected clearing prices would be sufficient to earn a return. The effect on realized prices is the same as in our stylized description here if we assume that market participants have perfect foresight of future market conditions.

FIGURE 2: EXPANSION OF BSM WOULD INCREASE THE CLEARING PRICE



B. The Application of Buyer Side Mitigation Rules to Policy Resources is Based on Flawed Economic Logic

The Complainants present an economic analysis that largely reflects analysis that has previously been presented to the FERC on this same topic. The stated concerns are as follows. States such as New York are attracting large quantities of new resources to meet clean energy goals through a variety of programs and contract solicitations that the Complainants consider to be "subsidies."[15] Because these activities can reduce near-term capacity market prices and/or displace "non-subsidized" resources, BSM advocates argue that it is necessary to protect wholesale capacity markets from the price-suppressive impacts of state policies. They argue that without intervention, market prices will be inappropriately low, merchant capacity suppliers will not earn adequate returns on investment, this would discourage new capacity from entering the market, and thus threaten future reliability. Their proposed remedy is to use BSM on policy resources to restore capacity prices to the "correct" level, *i.e.*, the price that would have prevailed in the absence of the state policies.

The rationale that the Complainants provide for applying BSM to policy resources is based on incomplete and flawed economic logic. A corrected economic analysis reveals a simpler truth: that the "correct" capacity price is the one that accurately reflects underlying fundamentals of supply and demand. This is the accurate price that should signal when and where capacity investments are needed (and when high-cost resources can retire). The logical conclusion under this corrected economic analysis is that BSM should be eliminated from application to policy resources so that capacity prices can be utilized to rationalize supply with demand.

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[15] We do not subscribe to the view that such state programs and/or solicitations should be considered "subsidies" in the traditional sense, nor that subsidies are inappropriate or inherently problematic if they are pursued in light of policy goals. Instead, we see the introduction of clean energy policies as generally providing compensation for environmental externalities not otherwise provided for by the market itself.

B.1. State Policies Address Well-Understood Market Failures Such as Environmental Externality Costs

The complaint quotes Commissioner Danly observing, "these [BSM] exemptions will, regardless of the policy objectives they may seek to achieve, impede a market's ability to set prices that accurately reflect market forces." But prices "reflecting market forces" alone do not ensure economic efficiency where major externalities exist, as in this case. A negative externality is a negative side effect of an economic activity that adversely affects a party not involved in the transaction. The adversely affected third party has no influence over whether the transaction takes place, but is nevertheless harmed. Environmental externalities such as those caused by greenhouse gas and air quality emissions from fossil fuel-fired power plants are the classic textbook example of externalities.[16] Once emitted into the air, greenhouse gases cause a number of adverse effects on residents, businesses, and environment in New York, nationally, and globally in the present day and for hundreds of years.[17] Other pollutants such as NO_X, SO_X, and particulates cause even more immediate detrimental health outcomes such as asthma and early death.[18] Absent policies to address these externalities, neither the purchaser of the power (NYISO in this case) nor the producer of the emissions (the power plant owner) pays the full cost associated with these negative externalities.[19] Such unpriced or underpriced externalities will tend to be produced at a quantity that exceeds the economically efficient level from a societal perspective. The consequence of ignoring these environmental externalities is that market pricing alone would drive resource investments and operations toward an inefficiently large quantity of fossil fuel-fired power plants, imposing inefficiently large externality costs.

Externalities are by definition not "market forces," but rather market failures. Under their existence markets fail to allocate the resources efficiently and the current market price would not be the "correct" one. As a general matter, public policies can address externalities and market failures in one of two ways: one is *command-and-control* policies that regulate behavior directly; the other is to develop market-based policies that align private incentives with social efficiency.[20]

Environmental externalities can be incorporated into electricity markets through policy mechanisms, whether through emissions pricing mechanisms (*e.g.,* carbon pricing) that charge

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16 N. Gregory Mankiw, *Principles of Microeconomics*, 5th ed. Mason, (OH: South-Western Cengage Learning, 2009), p. 204.

17 United States Environmental Protection Agency, "Climate Change Indicators: Greenhouse Gases," accessed on November 16, 2020.

18 Michael Guarnieri, John R Balmes, "Outdoor Pollution and Asthma," The Lancet 383 (9928): 1581–1592. doi:10.1016/s0140-6736(14)60617-6 (2014).

19 The Regional Greenhouse Gas Initiative (RGGI) has imposed some costs on emitters, but the allowance prices are far below the Social Cost of Carbon adopted by the New York Public Service Commission (NYPSC) for setting zero-emissions credit (ZEC) prices and VDER tariffs, and likely further below the State's willingness to pay for carbon reduction as implied by its aggressive decarbonization goals. In setting ZEC prices, the NYPSC adopted a social cost of carbon of $50.11/short ton (in nominal dollars) for Tranche 3, which runs from April 2021 through March 2023. By comparison, the most recent RGGI auction at the time of this writing cleared at $6.82/short ton on September 2, 2020 (available at https://www.rggi.org/auctions/auction-results/prices-volumes). *See also* NYPSC, Case 15-E-0302, *Proceeding on Motion of the Commission to Implement a Large-Scale Renewable Program and a Clean Energy Standard*, "Order Adopting a Clean Energy Standard," at 136, August 1, 2016.

20 N. Gregory Mankiw, *Principles of Microeconomics*, 5th ed. Mason, (OH: South-Western Cengage Learning, 2009), p. 154–210.

emitters and indirectly reward non-emitters and/or through clean energy attribute payments that reward non-emitters directly. Carbon pricing can take many forms, from a tax or charge approach that sets a price per ton emitted; to a cap-and-trade approach that sets a cap on emissions and lets the market determine the price of allowances; to a hybrid, such as RGGI that is nominally "cap-and-trade" but that includes adjustable caps to serve as price collars. In all of these cases, carbon pricing raises the cost for emitters to produce, making them less competitive and raising market clearing prices for energy; non-emitters earn the higher prices without being charged. Clean energy attribute payments work more directly by paying non-emitters to produce carbon-free energy. They are usually provided through long-term contracts that support clean resources, as in New York's ZEC and REC programs. The mechanisms used to support clean energy resources will continue to evolve as the State, NYISO, and stakeholders continue to assess the most effective and efficient opportunities to support the clean energy transition, as discussed in Section E below.

Many economists (and some pro-BSM) advocates argue that a carbon pricing mechanism would be a better way to address these environmental externalities and enable all resources to compete based on market prices for energy (that account for carbon-related externalities), capacity, and ancillary services. For example, FERC recently held a technical conference on carbon pricing; and the Electric Power Supply Association recently sponsored a study by Energy + Environmental Economics (E3) presenting carbon pricing as the most efficient way for states to achieve their environmental objectives.[21] We agree with many of the arguments in favor of carbon pricing, but caution that electricity sector carbon pricing alone may be an incomplete solution in the context of States' environmental mandates.

We too believe that carbon pricing would help support the state's objectives cost-effectively, through resource-neutral competition that accurately signals where and when clean energy production displaces the most carbon emissions, while also appropriately rewarding storage and higher-efficiency gas-fired generation that partially reduce emissions. The ideal is for a carbon pricing regime to apply uniformly and comprehensively in its geographic scope (across state and national borders) and in its coverage of all economic sectors. However, without this comprehensive scope, carbon pricing could induce unintended effects such as leakage or disincentives to electrify heating and transportation demand. In the case of NYISO's proposal to charge carbon emitting generators in New York for their emissions at a state Commission-determined social cost of carbon, our work showed that proposed border adjustments and allocation of carbon revenues to customers could largely avoid these adverse effects.[22] These results are not necessarily generalizable to other ISO markets or if carbon prices become much higher, but carbon pricing should continue to be pursued, especially at a national and economy-wide level in order to achieve carbon abatement in the most cost-effective fashion.

However carbon pricing should not be presented as the only "legitimate" or "efficient" policy option for incorporating carbon externalities into electricity markets. Even if carbon pricing is pursued, the practical reality is that carbon prices alone may not be set high enough to support sufficient investment to meet mandated clean energy targets in the timeframe required by State

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[21] E3, "Least Cost Carbon Reduction Policies in PJM," at p. 9, March 28, 2020.

[22] Samuel A. Newell, Roger Lueken, Jürgen Weiss, Kathleen Spees, Pearl Donohoo-Vallet, Tony Lee, The Brattle Group, "Pricing Carbon into NYISO's Wholesale Energy Market to Support New York's Decarbonization Goals," August 10, 2017.

laws.[23] Clean energy attribute payments, competitive clean energy solicitations, and customer-backed contracts for clean energy resources are all alternative approaches that can be pursued for addressing environmental externalities, each with advantages and disadvantages relative to carbon pricing in terms of timing, economic efficiency, risk allocation, and implementation feasibility. Further, different communities and customers (within New York) or state governments (in other regions) will place different values on their deemed cost of carbon emissions and so will not be able to establish a single market-wide carbon price. Overall, we anticipate that a combination of carbon pricing and clean energy attribute payments of some form together will be utilized to achieve New York's 100% clean energy mandate. Given the interplay and partial substitutability between RECs and carbon pricing, it is curious that the BSM advocates would view energy revenues incorporating carbon to be legitimate but RECs and ZECs not to be. While they are not the same mechanism, they both serve to address environmental externality costs by affecting the relative revenues of emitting and non-emitting generators, and they have similar effects on capacity market prices. For example, a high enough carbon price would retain high-cost nuclear plants just like a ZEC payment does, so it is difficult to see why the capacity market treatment should be so radically different if using one mechanism or combination of mechanisms versus another.

A more consistent approach is to acknowledge that states, communities, and customers have a legitimate interest in addressing environmental externalities. As the demand side of wholesale electricity markets, customers and their elected representatives have the proper role of establishing how much they are willing to pay to address environmental externalities and what combination of contracts and policies they wish to use to express that value. An efficient marketplace should aim to assist states and customers by providing options for achieving their environmental goals at the lowest possible cost.

B.2. The "Correct" Capacity Price is the One that Aligns Supply with Demand (Not the Price that would Prevail in the Absence of State Policies)

The efficient outcome in a market, or set of interconnected markets, is that which maximizes social welfare: the sum of consumer and producer surplus. Absent environmental externalities and with market participants acting competitively, this outcome would result at the price where the marginal cost of supply (to producers) is equal to the marginal value of additional consumption (to consumers). However, when environmental externalities are introduced, the intersection of (private) supply and demand *will not represent the efficient outcome.* This inefficient outcome is the one that the complainants seek to re-establish with the expanded MOPR. Instead, the correct capacity price is that which aligns supply and demand, given other policies and/or markets that policymakers have identified as necessary to address the externality.

Compensating non-emitting resources for their environmental value lowers their net cost of providing capacity (regardless of whether that compensation is achieved through carbon pricing or clean energy payments). Clean energy resources correctly appear more competitive as capacity providers, just like resources with high energy and ancillary services value, and they should be

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23 Especially as the emissions target tightens toward zero, the carbon price would have to be very high to continue to favor investment in new clean resources over running existing fossil-fired generators in a small number of hours. For example the finding that "carbon taxes alone are unlikely to produce emissions pathways in line with the net-zero emissions targets by 2050," in Larsen, *et al.*, *Expanding the Reach of a Carbon Tax: Emissions Impacts of Pricing Combined with Additional Climate Actions*, October 2020.

allowed to clear the capacity market and be recognized for the resource adequacy value they contribute to the system.

If the capacity market consequently produces low prices, this is correctly signaling an oversupply of capacity, that no more investments are needed for resource adequacy, and that the least valuable resources should retire. Reliability will not be threatened by replacing traditional capacity with clean capacity, as clean resources will be assigned capacity ratings reflecting only the reliability value they actually provide. In fact, NYISO's resource accreditation for intermittent resources is already a fraction of their nameplate capacity and will decline as their market share increases. Thus, as the clean energy transition proceeds it will take greater quantities of wind, solar, and battery supplies to replace a single retiring gas plant. Through this continuously-adjusting displacement rate, reliability can be maintained over the course of the transition. For the same reasons, the market (absent BSM on policy resources) can provide the right price signals and result in efficient outcomes with the least-cost set of economic retirements, entry, and retention of resources needed to maintain resources adequacy.

Forcing policy resource offers upward through BSM rules would generally prevent them from clearing. It would result in an artificially high capacity clearing price and induce inefficient behaviors and uneconomic incentives: it would retain costly existing supply that would otherwise retire, attract costly new supply that is not needed, and dis-incentivize customers from utilizing more electricity given inflated prices that signal a false scarcity of capacity supply. Thus, the application of BSM to policy resources causes the capacity market to depart from supply-demand fundamentals.

The inefficiency of the outcome is especially apparent considering that policy resources will be developed and operate regardless of whether or not they clear the capacity market. Thus the BSM distorts the capacity market by inducing the procurement of additional capacity to meet reliability objectives. The capacity market would simulate a fictional reality as if the policy resources that help meet demand every hour of the year did not exist. Under that fictional scenario, the reliability value of the policy resource in question would be ignored, would not be paid for, and thus would need to be made up for through the purpose of capacity from other suppliers. This scenario becomes perverse when applied to a state such as New York with a 100% clean electricity mandate. All policy-supported resources that physically supply resource adequacy could be excluded from being counted in the capacity market, while the capacity market would remain a multi-billion-dollar-per-year "shadow market" that exists primarily to pay resources that are not actually needed for resource adequacy.

Overall, the Complainants offer a solution to a non-problem. The grievance from the standpoint of incumbent fossil generators is that their resources will eventually become uneconomic in a region with a significant clean energy mandate. Such resources will not enjoy the same revenues they would in a world where emissions do not matter.

However, low prices are not a problem from a more holistic market design, reliability, or economic perspective. Low prices would be produced only when supply is long, new entry is not needed, and retirements can be accommodated. Applying BSM to policy resources creates a fundamental disconnect between market pricing outcomes that deviate from the underlying fundamentals of supply (including that associated with state policy resources) and demand (as expressed through resource adequacy requirements).

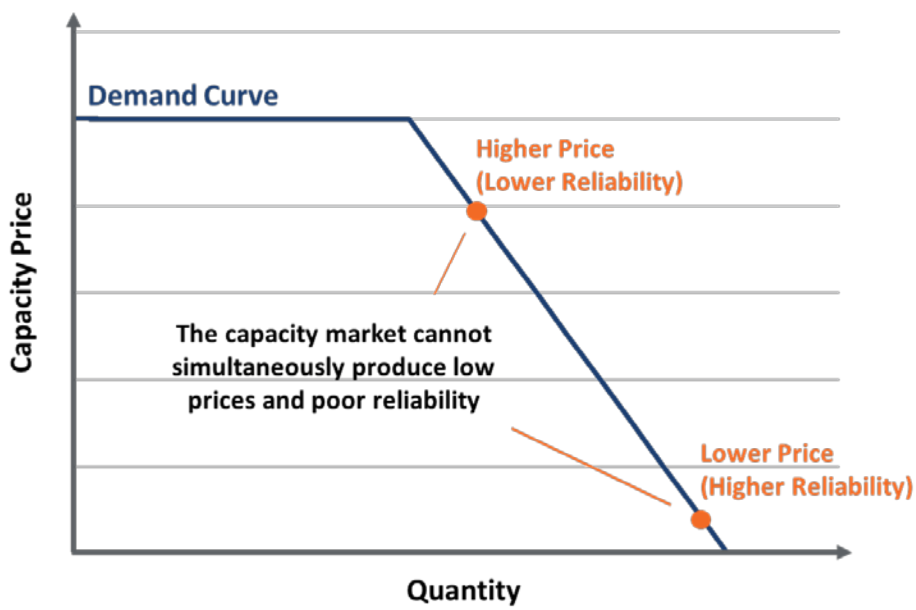
B.3. Capacity Markets with Sloping Demand Curves Cannot Simultaneously Produce Low Prices and Poor Resource Adequacy

The Complainants and other BSM advocates have expressed a misguided concern that the low prices that may prevail due to growth in policy resources will threaten reliability by discouraging investment.

As shown in Figure 3, this concern is illogical in the context of a capacity market with a downward-sloping demand curve that reflects the required reserve margin and the incremental value of additional supply beyond that reserve margin. By its nature, the downward sloping demand curve simply cannot produce market outcomes with low prices and low reliability at the same time. If prices are low due to the entry of policy resources, this means that there is ample supply of capacity on the system. In this long market condition the low capacity prices signal that high-cost resources should retire and new entry is not needed. If the supply-demand balance tightens, prices will rise and signal the need to attract and retain scarce capacity. Thus the Complainants' concern that low prices will produce low reliability is unfounded (and a mathematical impossibility).

This is not to say that reliability is not a concern in the clean energy transition. As noted above, intermittent resources whose unavailability may be correlated across the fleet (*e.g.*, low wind days, or low solar insolation periods such as nighttime) provide less and less incremental resource adequacy value as their penetration increases. Capacity markets must recognize that fact through resource accreditation that accurately reflects resources' contribution to system reliability. Beyond the context of capacity markets discussed in this testimony, other aspects of the wholesale electricity markets including energy, ancillary service, and transmission planning rules may be needed to ensure robust pricing and operations in the context of different resource patterns and capabilities throughout the clean energy transition.

FIGURE 3: CAPACITY MARKETS WITH DOWNWARD-SLOPING DEMAND CURVES CANNOT SIMULTANEOUSLY PRODUCE LOW PRICES AND POOR RESOURCE ADEQUACY



B.4. Broad Application of Buyer-Side Mitigation to Policy Resources will Amplify (Not Mitigate) Regulatory Risks

BSM advocates have argued BSM is necessary to mitigate regulatory risk surrounding capacity investments. We acknowledge that capacity investments do face more regulatory risk in a world with environmental policies than one in which policies never change; and that imposition of increasingly-stringent policies will more usually disadvantage higher-emitting resources. The application of BSM to clean energy policy resources undoes some of that effect, by elevating capacity prices to the level that would prevail absent the policy resources. It would also retain the same capacity as in world without the policy-supported clean energy resources. As long as BSM is maintained, it will benefit incumbent fossil resources and might even attract investment in new gas-fired resources (in both cases, securing more capacity than is needed for reliability).

However, elevated prices should not be conflated with less-risky prices. We do not believe the BSM reduces regulatory risk or provides an efficient basis for attracting new investment. On the contrary, a market whose price is artificially inflated by a rule as controversial and economically inefficient as BSM is unsustainable. Investors will not count on the price premiums produced by such a rule to be sustainable over the long term. They would have to realize that, over time, the pressure to eliminate BSM would only increase as mounting quantities of policy resources are excluded from the market and the BSM-supported price and capacity deviate further from reflecting actual supply and demand conditions. Customers will ask why they are paying so much to support excess capacity, as if it were needed to meet the (already conservative) resource adequacy objectives underlying the capacity market. They will notice that the excess capacity they are supporting is primarily fossil fuel generation that contravenes state clean energy policy goals with wide popular support, and they will demand change. For these reasons, capacity markets that fail to accommodate policies that states are committed to pursuing cannot form the basis for a sustainable market design that supports investment.

Capacity markets can better support merchant investment when needed, with lower regulatory risk, if they do not apply BSM to clean energy policy resources. Such a market reflecting actual supply and demand conditions will send just the right price signals to maintain resource adequacy at least cost. Merchant investors will still face market and regulatory risks, including risks from environmental policies changing in the future. States can mitigate these risks by setting environmental policies on a long-term stable basis, as New York has done through its CLCPA that specifies goals through 2050. Investors can then view these policies as part of the fundamentals against which they can plan their business strategies.[24]

[24] For example, the Grid Evolution study we performed for NYISO did not incorporate BSM, and it showed how merchant investment in capacity could complement a future with large quantities of policy-supported clean energy resources added. The simulated market retained enough existing capacity and attract enough storage investment to maintain resource adequacy through 2040. It showed that, as vast amounts of wind and solar generation are added to meet clean energy goals, they will continue to contribute capacity value but at a declining marginal rate reflecting their correlated intermittency. Other non-intermittent resources will still needed to support system reliability, and market prices should adjust to signal dispatchable capacity to stay online or enter the market. In our central scenario where policy-driven electrification of transportation and heating sectors increases demand, the simulated market even attracted investment in new dispatchable "gas-fired" generation capacity, assuming it could generate using "renewable natural gas" that counts as non-emitting. *See* R. Lueken, et al., "New York's Evolution to a Zero Emission Power System," prepared for NYISO and presented to the NYISO stakeholders, June 22, 2020.

B.5. Merchant Investors Operate Amidst Wide-Ranging Energy and Environmental Policies from which They Never Should have Expected to be Indemnified

The Complainants express concern that certain merchant investments are not earning the return on investment that they anticipated. They assert that "state subsidy issues" are producing "lower than expected capacity prices caused by uneconomic retention of state subsidized generation facilities."[25]

While poor investment returns are certainly a concern for the particular investors referenced here, this is not a concern from a market design perspective. Merchant generation investors operate in a market and regulatory context that has always included environmental regulations from which they should not expect to be indemnified any more than they should be charged when regulations work in their favor. Favorable policy developments for merchant investors in gas-fired generation such as the Complainants have enjoyed in New York include the finalization of the State's arrangement with Entergy to shut down the Indian Point Energy Center, agreements to retire the state's remaining coal plants, rules to eliminate high-NO_X-emitting peaking plants from Downstate New York, and possible future expansion of electricity demand from policy-driven electrification of the heating and transportation sectors. Natural gas-fired generators also benefit from various tax policies and ratepayer-funded gas transportation infrastructure that have lowered the delivered costs of their fuels.[26]

New York's decarbonization policies underlying the complaint mostly do not help natural gas-fired plants that are major emitters of carbon dioxide. But the state has long discussed its environmental priorities, particularly the need to address climate change. Investors in new power plants should have anticipated policies to effectuate a transition in the generation fleet. It is misleading to suggest, as the Complainants have, that investors in Empire and CVEC could not or should not have foreseen the development of public policies that are unfavorable to the interests of large carbon-emitting power plants. Consider the following record of New York's steady long-term march toward the policies it has now:

- As early as 2002, the New York state government expressed concern in its State Energy Plan regarding the reliance of the state on gas-fired electricity and established a goal to increase renewable energy by 50% as a percentage of total load served by 2020, aiming to move from 10% of demand met by renewable energy to 15% by 2020.[27] In 2004, the New York PSC had adopted the more aggressive RPS goal of 25% renewable energy by the end of 2013.[28] Investment in Empire Energy was made against this backdrop, wherein New York had clearly displayed its commitment to promoting renewable energy.
- In 2010 the RPS goal was amended to 30% by 2015.[29]

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25 Complaint at p. 33.

26 For example, s*ee* Doug Koplow, "Testimony on behalf of Sierra Club in Protest on Behalf of Clean Energy Advocates", in FERC Docket No. ER18-1314, May 7, 2018.

27 New York State, "2002 New York State Energy Plan," at Section 1–3.

28 NYPSC, Case 03-E-0188, *Proceeding on Motion of the Commission Regarding a Retail Renewable Portfolio Standard,* "Order Regarding Retail Renewable Portfolio Standard," September 24, 2004.

29 NYPSC, Case 03-E-0188, *Proceeding on Motion of the Commission Regarding a Retail Renewable Portfolio Standard,* "Order Establishing New RPS Goal and Resolving Main Tier," January 8, 2010.

- In December 2015, Through Reforming the Energy Vision (REV), New York State Government called for 80% GHG emissions reduction by 2050 and 50% of electricity demand to be met by renewables by 2030.[30]
- On January 25, 2016 the NYSDPS staff published a white paper regarding what was to become the Clean Energy Standard, which aimed to meet the goals set forth by Governor Cuomo in 2015. In this white paper they discussed the plan to institute a ZEC in order to support "a smooth emission-free transition from nuclear to non-nuclear resources in the event that energy prices are not able to support the continued financial viability of the plants during their license lives."[31] The ZEC program was established formally on August 1, 2016, when the New York PSC adopted the Clean Energy Standard.[32] It was not until January 24, 2017, nearly one year after NYSDPS staff published the white paper regarding the ZEC program that CVEC closed on financing for developing its generating facility.[33]

But even if the Complainants could not have anticipated the full extent or particulars of the CLCPA, these policies are within the State's mandate to protect public health and are part of the context in which the Complainants chose to invest. They chose to bear the risks and rewards associated with changing market conditions and regulations, and there is no reason to indemnify them through BSM. Doing so would distort the market, as explained above, and impose unnecessary costs on consumers.

B.6. BSM Should Be Applied for Its Narrow Original Purpose of Mitigating Market Power Abuses (Not Repurposed to Undo the Effects of State Policies)

BSM is an appropriate mechanism for its original purpose of preventing manipulative price suppression.[34] In that context BSM has a valid economic rationale: to prevent net-short entities and their representatives from sponsoring uneconomic investments to suppress prices, benefit themselves in the short run (at the expense of other market participants), and induce economic deadweight losses.[35] Applied for that original purpose, BSM rules work together with many other elements of a comprehensive monitoring and mitigation framework that assures market participants that market outcomes will be competitive, reflecting supply-demand fundamentals.[36]

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30 REV, "What You Need to Know," December, 2015.

31 NYSPSC, Case 15-E-0302, *Proceeding on Motion of the Commission to Implement a Large-Scale Renewable Program and a Clean Energy Standard*, "Staff White Paper on Clean Energy Standard," at p. 30, January 25, 2016.

32 NYPSC, Case 15-E-0302, *Proceeding on Motion of the Commission to Implement a Large-Scale Renewable Program and a Clean Energy Standard*, "Order Adopting a Clean Energy Standard," August 1, 2016.

33 *See* "Advanced Power AG Closes Financing of $1.584 Billion Energy Center in Dover, New York" *Business Wire*, January 24, 2017.

34 *See:* FERC, Docket No. EL07-39-000, "Order Conditionally Approving Proposal" at PP 100–P100106, March 7, 2008.

35 This deadweight loss is the cost of the uneconomic resources in excess of the value they provide. The costs of the resources developed in order to suppress prices exceeds the cost of the resources displaced that would otherwise have cleared the market.

36 *See* Affidavit of Dr. Samuel A. Newell on Behalf of the Competitive Markets Coalition: FERC, (supporting PJM's proposed tariff revisions to change certain terms regarding the Minimum Offer Price Rule in the Reliability Pricing Model).

This valid economic rationale for BSM does not apply in the context of policy-supported clean energy investments:

- Clean energy policy investments are pursued to address climate change, not as a means to suppress capacity prices.
- State-supported investments in clean energy are not uneconomic just because they need payments beyond what they would earn through wholesale electricity markets alone. These policy incentives correct for the market failure to reflect the costs of environmental externalities associated with climate change and public health.
- Applying BSM to clean energy policy resources does not prevent uneconomic behavior (as it does when applied to mitigate manipulative price suppression schemes); rather, it actually *causes* uneconomic behavior by incentivizing the retention of uneconomic, unneeded resources. And as we show later the greatest impact would be to retain exactly those aging fossil plants that the clean energy investments are intended to displace.

Clean energy policies will have a number of effects in the electricity sector and broader economy. Capacity markets, like all other markets, may inevitably be affected by these policies. The overall outcome of an effective policy to mitigate climate change will be to reduce the amount of greenhouse gas emissions produced and to guide the resource mix away from fossil and toward a mix that meets energy and reliability needs with cleaner resources

C. Applying Buyer Side Mitigation to Policy Resources Will Interfere with New York's Statutory Mandate to Transition to a 100% Clean Electricity Grid by 2040

To evaluate the impacts of applying BSM to policy resources, we conducted a simulation analysis of the New York capacity market in a 2030 study year with three scenarios with "No BSM," "Status Quo BSM," and "Expanded BSM" rules.[37] In the No BSM case, we estimated the prices, clearing outcomes, and resulting customer costs under a capacity market design in which BSM is eliminated from application to policy resources. In the Status Quo BSM case, we simulated current BSM rules that are applied only to new policy resources in the downstate G-J region of the NYISO capacity market with an offer floor at the minimum of 0.75 × mitigation Net CONE and a technology-specific value. In the Expanded BSM case, we examined rules consistent with Complainants' proposal to expand BSM to existing and new policy resources throughout New York, and increasing the applicable offer floor to technology-specific MOPR values.

Our analysis shows that the overall effect of applying BSM to state policy resources is to exclude policy resources from clearing the capacity market and induce the uneconomic retention of fossil plants. Both of these outcomes pose barriers to achieving the State's mandate to eliminate carbon emissions from electricity generation by 2040, and interim mandates before then.

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[37] We conducted this analysis on behalf the New York State Energy Research and Development Authority, and the New York Department of Public Service. The assumptions and methodology used to develop the analytical results reported here are described in more detail in Exhibit B. *See* Spees, *et al.*, "Quantitative Analysis of Resource Adequacy Structures," Prepared for NYSERDA and NYSDPS, July 1, 2020.

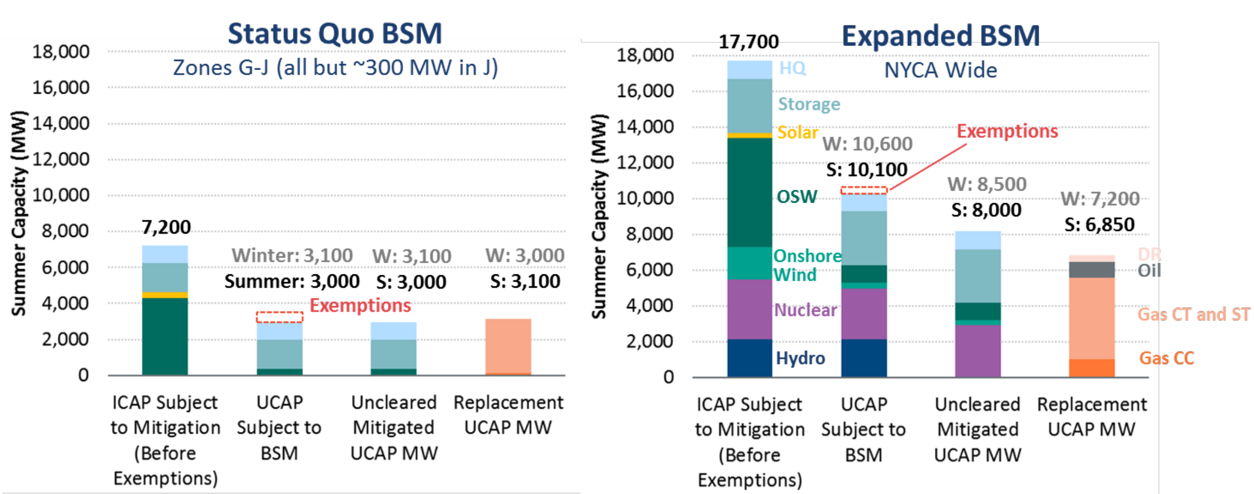
C.1. Approximately 8,250 MW of Clean Resources Would be Excluded from Clearing the Capacity Market by 2030

Figure 4 summarizes our estimates of the quantity of policy resources that could be subject to BSM rules in the New York capacity market by 2030 under Status Quo and Expanded BSM rules. We further report the shares of these resources that we estimate would be likely to clear the capacity market and those that would not. Specifically, we estimate that:

- Under the Status Quo BSM rules, approximately 7,200 ICAP MW (3,050 UCAP MW, reported as the annual average of summer and winter capacity ratings) of policy resources will be subject to BSM by 2030. We project that none of that capacity will clear the capacity market because their BSM offer floors would price them out of the market.
- Under an Expanded BSM rule similar to the one proposed by the Complainants, approximately 17,700 ICAP MW (10,350 UCAP MW annual average) of policy resources would be subject to BSM by 2030. Approximately 8,250 UCAP MW annual average would fail to clear the capacity market.

Failing to clear such a large quantity of existing capacity resources will limit progress in the transition to a clean energy grid by reducing the formal role of policy resources to contribute to resource adequacy and reliability needs.

FIGURE 4: PROJECTED IMPACTS OF BSM ON CAPACITY MARKET CLEARING BY 2030



Sources and Notes: *See* p. 14, Exhibit B.

C.2. Approximately 7,025 MW of Fossil Resources Would be Uneconomically Maintained by an Expanded BSM

As also shown in Figure 4 above, policy resources excluded from clearing the capacity market would likely be replaced primarily by uneconomic fossil plants that would otherwise retire. Under Status Quo BSM assumptions, we estimate that 3,050 UCAP MW annual average of aging, high-emitting gas-fired steam turbine plants would be retained that would otherwise retire. Under Expanded BSM, a full 7,025 UCAP MW annual average of unneeded and uneconomic capacity resources would be retained, including primarily gas- and oil-fired plants, as well as a small amount of demand response.

C.3. In a Region with Significant Clean Electricity Goals, Any Sensible Market Must Recognize Clean Supply While Enabling the Orderly Retirement of Fossil Plants

In a region with significant clean electricity goals, a sensible and sustainable market design would be one that supports and enables the clean energy transition. That means increasing reliance on clean energy resources to provide energy, ancillary, and capacity needs; while enabling the orderly retirement of fossil plants.

Applying BSM to policy resources will impede the State's ability to effectively transition away from carbon-emitting supply and toward a 100% clean electricity grid. It will retain existing fossil plants that would otherwise retire and defer the ability to gain operational experience in relying more heavily on clean energy resources, including non-traditional and intermittent clean energy supply.

D. Applying Buyer Side Mitigation to Policy Resources Imposes Uneconomic Excess Costs on Customers and on Society as a Whole

Applying BSM to policy resources would prevent them from clearing the market and, by removing supply, raise prices in the market. This higher price would induce more non-policy-supported resources to clear and thus support more continued investment in maintaining existing plants (and possibly developing new ones) than needed to maintain reliability. That is, the total amount of capacity available and operating would exceed the amount needed to meet the reliability objectives that the capacity market was designed to meet.

This translates into two types of adverse consequences:

- Higher prices would effectuate a wealth transfer from customers to suppliers on the entire volume of capacity transacted in the market, not just the excess resources; and
- Supporting excess capacity results in excess societal costs or deadweight loss that benefits neither customers nor suppliers (who bear the costs of maintaining the uneconomic excess supply).

The scale of these problems would grow with the scope of BSM application and will grow over time as the State proceeds toward achieving its 100% by 2040 clean electricity mandate.

D.1. Expanded BSM Would Cost Customers Approximately $1,780 Million per Year by 2030

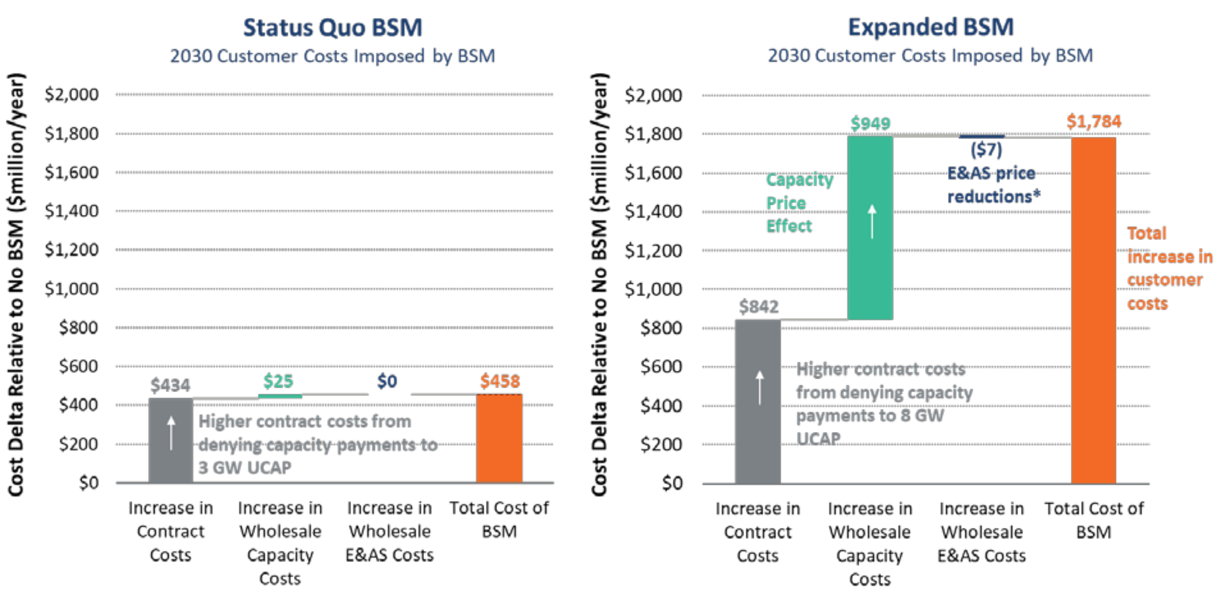
Imposing BSM on policy resources would impose a significant cost on New York customers. We calculated the extent of this cost for several alternative cases with Status Quo and Expanded BSM rules. The detailed assumptions and results from this analysis are included in Exhibit B. These excess costs appear in two ways: (1) as an increase in capacity prices affecting all transactions; and (2) as an increase in contract payments to policy resources because they are deprived of capacity market revenues that go instead to unnecessary substitute resources.

As summarized in Figure 5 below, we estimate costs as an increase in contract payments, plus an increase in capacity market payments, minus a small offset due to reduced energy and ancillary service (E&AS) prices. We estimate that:

- Under the Status Quo BSM rules, costs imposed on customers are currently low but will grow rapidly with the increase in policy resources, with a total cost rising to approximately $460 million per year by 2030. We estimate a relatively modest price impact over the long term, primarily due to the offsetting impact of supply elasticity that could keep prices consistent with the costs of retaining aging fossil plants over the long term.
- An Expanded BSM would have a much more immediate effect due primarily to the application of BSM to approximately 3,100 UCAP MW of nuclear plants that earn ZECs. The customer cost of the Expanded BSM would grow over time to approximately $1,780 million per year by 2030 as the quantity of resources subject to BSM grows. Of this total customer cost, approximately $950 million is caused by higher capacity prices, $840 million is caused by higher contract payments, and approximately $10 million is offset by somewhat lower energy and ancillary service prices.

Our cost estimates account for the offsetting effects of supply elasticity that could reduce price impacts from BSM over the long term. This price mitigation would occur to the extent that excluding policy resources could cause the retention of an almost equivalent amount of replacement capacity and thus results in relatively small net price impact. (Absent supply elasticity, BSM would cause the market to clear at a much higher price along the capacity demand curve and result in much higher customer costs.) We also account for offsetting effects of reductions in the prices of energy and ancillary services due to the excess capacity on the system.

FIGURE 5: CUSTOMER COSTS FROM IMPOSING BSM ON POLICY RESOURCES BY 2030



Sources and Notes: Costs reported in 2030$. *See* p. 7, Exhibit B.

Like any forward-looking estimate of costs, ours are subject to some uncertainty and would differ with alternative assumptions, but we view the overall magnitude to be robust and likely, conservative. Under alternative assumptions, we estimate that Status Quo BSM could cost $400 to $850 million per year by 2030; while expanded BSM could cost $1,300 to $2,750 million per year by 2030.

The robustness of our analysis is further supported by the findings of an entirely independent analysis of the same question that was previously conducted by NorthBridge Group on behalf of

Exelon. In that separate analysis, NorthBridge estimated customer costs of Status Quo BSM would begin at zero in 2021 and rise to $950 million per year by 2025, and that customer costs from an Expanded MOPR would range over $1,200 million to $1,650 million per year over 2021 to 2025.[38] Though the assumptions, methodology, and study years in this Northbridge study differ significantly from our own, the results are relatively consistent. The customer costs of BSM are very high.

D.2. Expanded BSM Would Induce Economic Inefficiencies of Approximately $790 Million per Year by 2030

BSM's costs to customers do not only reflect a wealth transfer to suppliers. The costs also reflect the fact that BSM induces economic waste by inducing capacity owners to make investments to attract or retain capacity resources that are not needed. As we estimated in our analysis, the vast majority of these investments are associated with retaining existing fossil plants that require substantial ongoing investments to stay in operation. For example, the gas-fired steam turbines require significant ongoing reinvestments each year to keep them in operation. In total, keeping an excess 3,050 UCAP MW of these resources online induces excess societal costs on the order of $450 million per year by 2030 under the Status Quo BSM.[39]

With an Expanded BSM, the economic waste is greater, growing to about $790 million per year by 2030.[40] This cost is driven by the same effect of inducing investments to retain resources that are not needed for resource adequacy, though the effect is greater given the larger 7,025 UCAP MW scale of the uneconomic resources.

D.3. Expanded BSM Would Impose Harms to Customers that Significantly Exceed the Benefits to Capacity Sellers

Incumbent capacity sellers are the primary beneficiaries of BSM. However, the approximately $10 million per year in net benefits that these incumbent players would enjoy from Status Quo BSM are far below the $460 million per year increases in costs imposed on customers. In

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[38] Aaron T. Patterson, "Impact of Carbon Pricing on Potential Expanded Buyer-Side Mitigation in the NYISO Markets," The NorthBridge Group, at pp. 6–7, November, 2019.

[39] This calculation of $451 million per year in excess resource costs is based on the observation on p. 14 of Exhibit B that approximately 3,050 UCAP MW of Gas ST is retained under status quo BSM in the summer and winter capacity auctions that would economically retire with no BSM. We assume that the entirety of this retained capacity is in Zone J. The average capacity market price in Zone J is unchanged between the cases with status quo BSM and no BSM, indicating that Gas ST is the marginal resource; hence the clearing price corresponds with the going-forward cost of these resources.

[40] This calculation of $793 million per year in excess resource costs is based on the finding shown on p. 14 of Exhibit B that an average of 7,025 UCAP MW of supply is uneconomically retained between the summer and winter capacity auctions in the case with expanded BSM relative to the case with no BSM. We have assumed that 3,050 UCAP MW of Gas ST is retained in Zone J, as in the case with Status Quo BSM; we have further assumed that all the mitigated capacity that does not clear in the summer in Zone K with expanded BSM is replaced by incumbent supply that is uneconomically retained and that the remaining retained supply is upstate (Zones A-F). Uncleared mitigated capacity in Zone K is estimated as 480 UCAP MW of mitigated storage plus about 186 UCAP MW of mitigated offshore wind, based on the total uncleared quantity of offshore wind in the summer (approximately 900 UCAP MW) times the ratio of mitigated offshore wind in Zone K to total mitigated offshore wind. The average going-forward costs of the retained supply in each zone are estimated as the average of the clearing price with no BSM and the clearing price with Expanded BSM.

Expanded BSM, the benefits to incumbent players are larger at around $1,000 million per year, but still far below the $1,780 million per year in costs to customers.

The reason for this discrepancy is associated with the economic waste induced by BSM as outlined in the following table. As discussed above, customer costs are increased according to the quantity effect (higher contract payments) and price effect (higher capacity market costs). The higher contract payments are earned by policy resources, making up for lost revenues from the capacity market (resulting in overall no net cost or benefit to policy resources that are subject to BSM).

Other incumbent capacity sellers enjoy significant increases in capacity revenue as driven by higher capacity prices and by gaining a greater market share. This causes approximately $460 and $1,790 million per year in increased capacity revenues to incumbent capacity sellers in the Status Quo and Expanded BSM cases, respectively, by 2030. This increase in revenues, however, is offset in large part by a large increase in costs that are incurred to keep uneconomic resources online. Thus, the net benefits to capacity sellers is much lower at approximately $10 or $1,000 million per year in the Status Quo and Expanded BSM cases, respectively.

Overall, the net benefits to incumbent capacity sellers from BSM are significantly lower than the net costs to customers. This is because a portion of the customer costs from BSM fund a wealth transfer from customers to capacity sellers (benefitting fossil generators at the expense of customers), while the remainder of customer cost increases are used to fund uneconomic investments to maintain aging fossil plants that would otherwise retire (benefitting neither customers nor generators).

TABLE 1: APPLYING BSM TO POLICY RESOURCES PRODUCES NET BENEFITS TO INCUMBENT CAPACITY SELLERS AND NET COSTS TO CONSUMERS

		Change from No BSM	
		Status Quo BSM 2030 $ millions Per Year	**Expanded BSM** 2030 $ millions Per Year
Customer Costs			
Increased Capacity Market Costs	[1]	$25	$949
Increased Contract Payments	[2]	$434	$842
Total Customer Cost Increase	[3]	**$458**	**$1,784**
Revenues Earned by Policy Resources			
Decrease in Capacity Payments	[4]	$434	$842
Increase in Contract Payments	[5]	$434	$842
Net Benefits to Policy Resources	[6]	**$0**	**$0**
Revenues and Costs Earned by Other Resources			
Increase in Capacity Revenues	[7]	$459	$1,791
Increase in Investment and Fixed Costs	[8]	$451	$793
Net Benefits to Capacity Sellers	[9]	**$8**	**$998**

Sources and Notes:

[1] – [3]: From Exhibit B, p 15. Note that [3] is slightly less than the sum of [1] and [2] due to small offsets in customer costs due to lower energy and ancillary service prices.

[4] – [6]: Increase in policy resources' contract payments is equal to the decrease in capacity revenues earned by policy resources, given that contract payments are structured to capacity market payments thus keeping policy resources whole with or without BSM. Increase in contract costs in [4] can be found on p. 15 of Exhibit B.

[7]: Increase in capacity payments to non-policy resources is equal to the decrease in capacity payments to policy resources that are excluded from the capacity market (item [4]) plus the total increase in capacity market costs (item [1]).

[8]: Estimated based on Exhibit B, at 12, 14-15, as explained in footnotes 39 and 40.

[9]: Calculated as the increase in capacity revenues to non-policy resources (item [7]) minus the increase in investment and fixed costs of non-policy resources (item [8]).

E. To Continue Offering Broad Benefits to Consumers, Competitive Markets Must Align with and Support Environmental Policy Goals

Competitive wholesale electricity markets, including the NYISO capacity market, have a long history of offering significant benefits to consumers by maintaining reliability at low costs. To continue offering these benefits in the future, the markets will increasingly need to adapt to facilitate and accommodate States' clean energy mandates.

E.1. Expansion of BSM Threatens to Undermine the Future of Competitive Wholesale Electricity Markets

Far from "protecting" capacity markets from the threat of price suppression and policy resources, the application of BSM to policy resources threatens to undermine the benefits and eventually the very existence of competitive capacity markets. The application of BSM to state policy resources erodes the benefits that a competitive capacity market can offer. It imposes unnecessary excess costs on customers and society, interferes with the ability to achieve State policy goals, and effects a wealth transfer from customers to incumbent capacity sellers. These adverse economic outcomes are amplified in any region with a significant environmental policy and will rise quickly as New York proceeds toward achieving its 100% clean energy mandate.

Eventually, the scope and scale of an Expanded BSM would become so great that it would exclude the large majority of all resources from participating. At the same time, the capacity market would continue to produce the high prices that would be necessary to retain excess fossil plants consistent with a fictional scenario as though the State's 100% clean electricity policy did not exist. This outcome is nonsensical and unsustainable. Rather than force customers to endure persistent, growing, and unnecessary excess costs, state policymakers would be forced to exit the capacity market entirely. In fact, state policymakers in New York have initiated a proceeding on the future of resource adequacy in the state for this very reason.[41]

The solution to this problem is simple: eliminate the application of BSM on policy resources and allow prices to reflect the intersection of supply with demand.

E.2. Wholesale Electricity Markets Should Offer States and Customers Competitive Solutions for Aligning with and Achieving Environmental Policy Goals

More generally, well-designed competitive markets will greatly aid the cost-effective, reliable transition to a clean electricity grid. To preserve and expand the role of competitive markets in offering broad consumer benefits, they will increasingly need to align with and support states' environmental goals. The FERC has already acknowledged the benefits of supporting state goals through the reflection of enhanced carbon pricing within wholesale electricity markets.[42] States, ISOs, and stakeholders will increasingly identify opportunities to enhance the markets for a decarbonized grid, such as through enhanced carbon pricing, enhanced energy and ancillary service market designs, and solutions for aligning the capacity market with state policy.[43] These reforms may take some time but will ultimately support the evolution of toward a fit-for-purpose wholesale market for the decarbonized grid.

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[41] *See*: NYPSC, Case Number 19-E-0530, "Proceeding on Motion of the Commission to Consider Resource Adequacy Matters."

[42] FERC, Docket No. AD20-14-000, "Carbon Pricing in Organized Wholesale Electricity Markets," October 15, 2020.

[43] *See* Samuel A. Newell, Roger Lueken, Jürgen Weiss, Kathleen Spees, Pearl Donohoo-Vallet, Tony Lee, The Brattle Group, "Pricing Carbon into NYISO's Wholesale Energy Market to Support New York's Decarbonization Goals," August 10, 2017; Kathleen Spees, Samuel A. Newell, Walter Graf, Emily Shorin, "How States, Cities, and Customers Can Harness Competitive Markets to Meet Ambitious Carbon Goals: Through a Forward Market For Clean Energy Attributes Expanded Report Including A Detailed Market design Proposal," September 2019; and New York Independent System Operator (NYISO), "Reliability and Market Considerations For A Grid in Transition," December 20, 2019.

F. Certification

We hereby certify that we have read the filing signed and know its contents are true as stated to the best of our knowledge and belief. We possess full power and authority to sign this filing.

Respectfully Submitted,

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November 18, 2020

EXHIBIT B

Spees, *et al.*, "Quantitative Analysis of Resource Adequacy Structures," Prepared for NYSERDA and NYSDPS, July 1, 2020

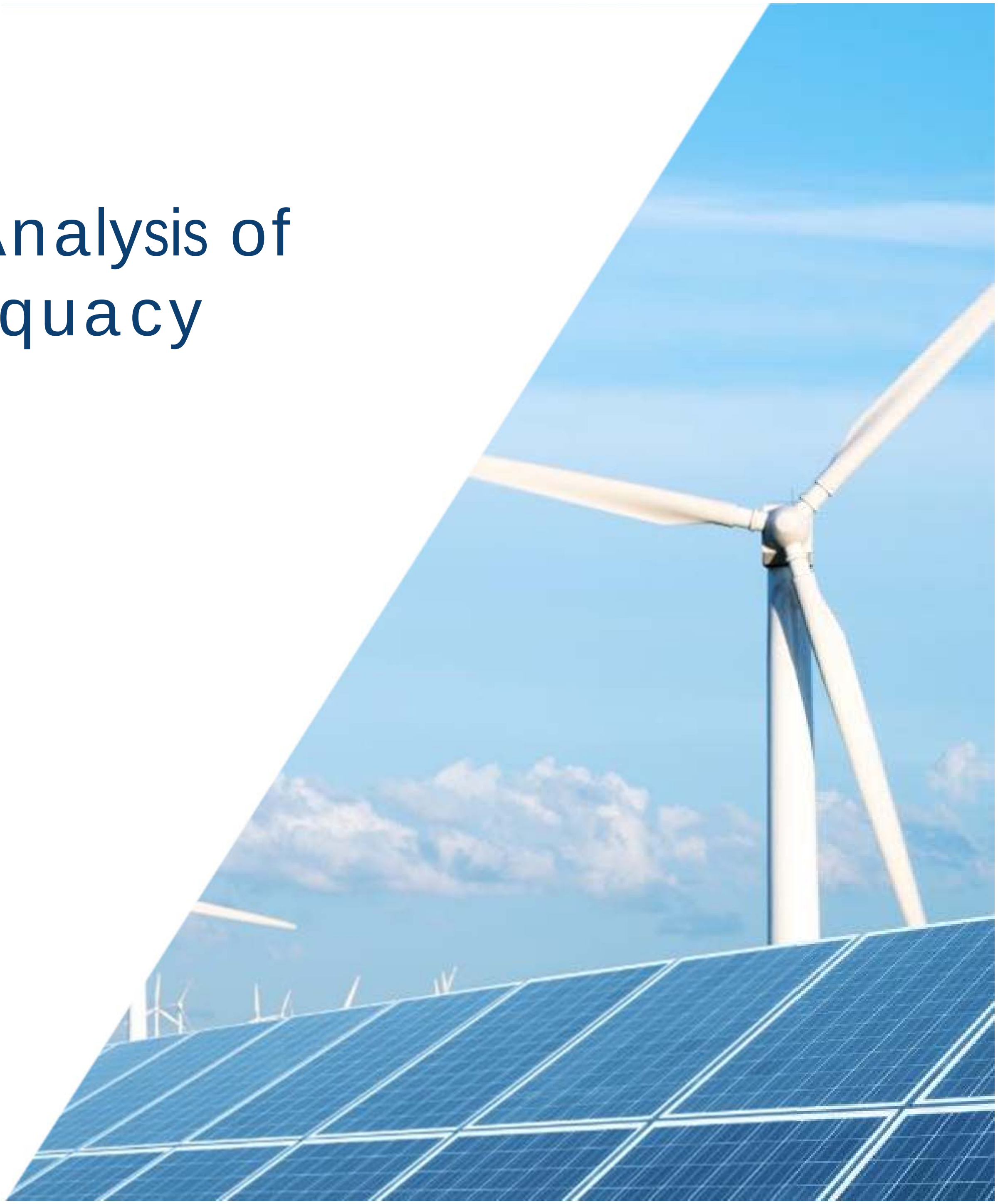
Quantitative Analysis of Resource Adequacy Structures

PREPARED FOR
NYSERDA and NYSDPS

PREPARED BY
Kathleen Spees
Sam Newell
John Imon Pedtke
Mark Tracy

July 1, 2020

THE Brattle GROUP



Study Scope

NYSERDA and NYDPS retained Brattle to evaluate several alternative resource adequacy constructs that differ primarily in who administers them and how Buyer-Side Mitigation (BSM) is applied; this deck presents estimates of the differences in customer costs.

Summary of RA Structures Corresponding to Brattle Qualitative Analysis Memo

Structure		Description	Cost Evaluation
1	**ICAP Market with Status Quo BSM**	Current ICAP market with current rules	Compared to #3 to indicate costs of Status Quo BSM
2	**ICAP Market with Expanded BSM**	Same as above but with potential expansion to BSM rules corresponding to FERC's December 2019 order for PJM	Compared to #3 to indicate costs of potential Expanded BSM
3	**Centralized Market for Resource Adequacy Credits (RACs), without BSM**	Functionally similar to current ICAP market, but with rule-setting by State No BSM, except as applied by PSC to prevent the intentional introduction of uneconomic capacity to profitably suppress capacity prices	Evaluated as "No BSM"
4	**LSE Contracting for RACs**	Same as #3, but with no centralized market LSEs must procure sufficient RACs bilaterally	Similar to #3 but difficult to quantify
5	**Co-optimized Capacity and Clean Energy Procurement**	Same as #3, but a State entity would procure RACs and RECs for LSEs in a joint, co-optimized auction	Not evaluated (out of scope)

Approach and Key Assumptions

To estimate customer cost impacts, we simulated future wholesale markets (including the application of BSM) in 2030, using Brattle's GridSIM model. Key Assumptions:

- Modeled fleet reflects the **Climate Leadership and Community Protection Act** (CLCPA) and **NYISO CARIS study**:
  - 70% of load is met by renewable resources by 2030 (does not include Nuclear generation)
  - Annual gross load, 6,100 MW of offshore wind (OSW), 3,000 MW of storage, and 7,500 MW of behind-the-meter (BTM) solar assumptions consistent with CLCPA targets and 2019 CARIS study assumptions
- Assumptions on BSM applicability were updated to align with NYISO's proposed exemption rule:
  - 1. "Status Quo" applies BSM to new renewables and storage in Zones G-J, except approximately 550 UCAP MW of policy exemptions
  - 2. "Expanded BSM" extends BSM to all zones, incl. nuclear and half of the existing hydro resources (assuming CapEx projects), with exemptions for 160 UCAP MW of OSW in Zone J, 173 UCAP MW of OSW in Zone K, and 41 UCAP MW of PV in Zones G-I
  - 3. Centralized RAC Market w/ "No BSM" does not exclude any resources from the capacity market
- Assumptions on UCAP ratings of intermittent resources affect the magnitude of BSM
  - UCAP value declines with penetration; analyzed output vs. net load to estimate effective load-carrying capability (ELCC)
  - Available output data had low CF% and output diversity, making impact estimates conservative; on the other hand, analysis does not recognize that transmission constraints could make the local J/K value fall faster with penetration
- Other key assumptions: resources' fixed and variable costs contributing to capacity prices via supply elasticity
- Sensitivity analyses: explored effects of nuclear retirements; higher load; quantity of BSM policy exemptions

The 2030 system examined here leveraged CARIS 70*30 and otherwise made necessary simplifying assumptions. While the system examined in 2030 does not represent a prediction of the future system, it is a reasonable expectation for the purpose of examining alternative RA structures

Cost estimates are thus indicative; impact will ultimately depend on the year, load, supply mix, UCAP ratings, and capacity supply elasticity, and the details of any changes to BSM rules

Updates to this Quantitative Analysis

We have updated this quantitative analysis based on stakeholder input received and to better reflect NYISO's proposed BSM rules and recent developments

- The most important changes provide a more accurate representation of likely outcomes under the "Status Quo" buyer-side mitigation approach, including:
  - Higher renewables exemption (assuming that NYISO's April 20 filing is accepted)
  - Sensitivity analysis on the quantity of public policy resource exemptions
  - Offer floor at the minimum of 0.75x mitigation Net CONE or resource offer floor
  - Updated representation of resource retirements and winter only status as per the NY DEC "Peaker Rule" Part 227-3 and 2020 Gold Book
  - Updated going-forward cost assumptions for fossil resources that are at risk of retirement (identified as a key study sensitivity)
- **Overall Impact of Updates:** Estimated customer costs imposed by Status Quo BSM are somewhat lower, but the uncertainty range remains similar at approximately $0.4-$0.9 billion per year; Expanded BSM scenario costs remain similar at approximately $1.3-$2.8 billion per year

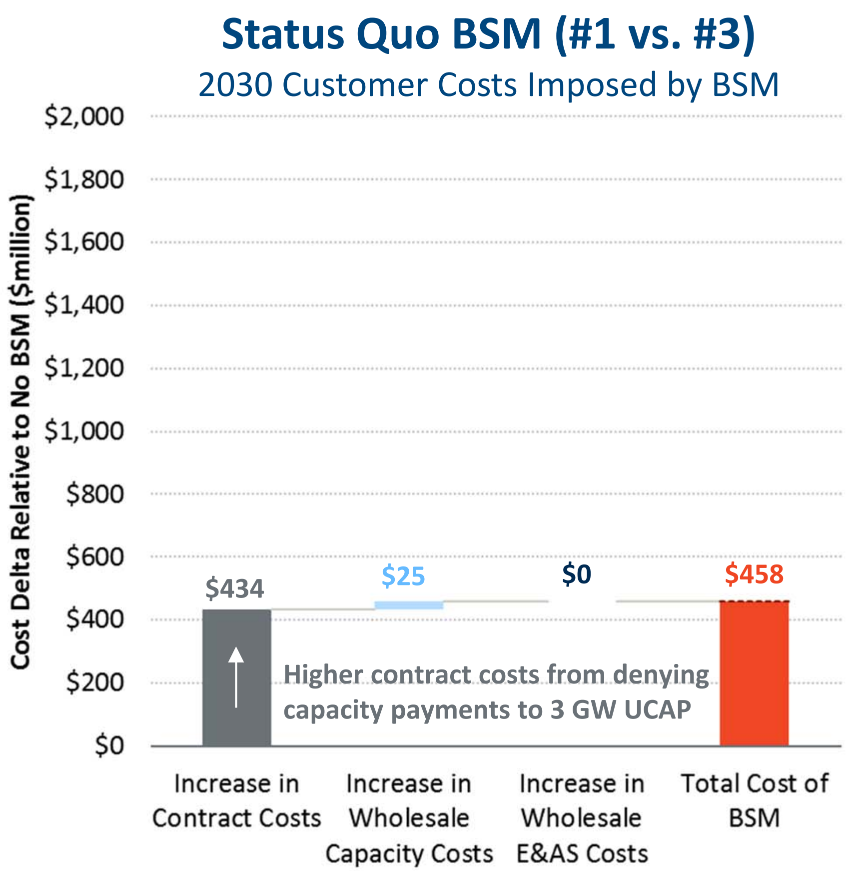
Summary of Conclusions

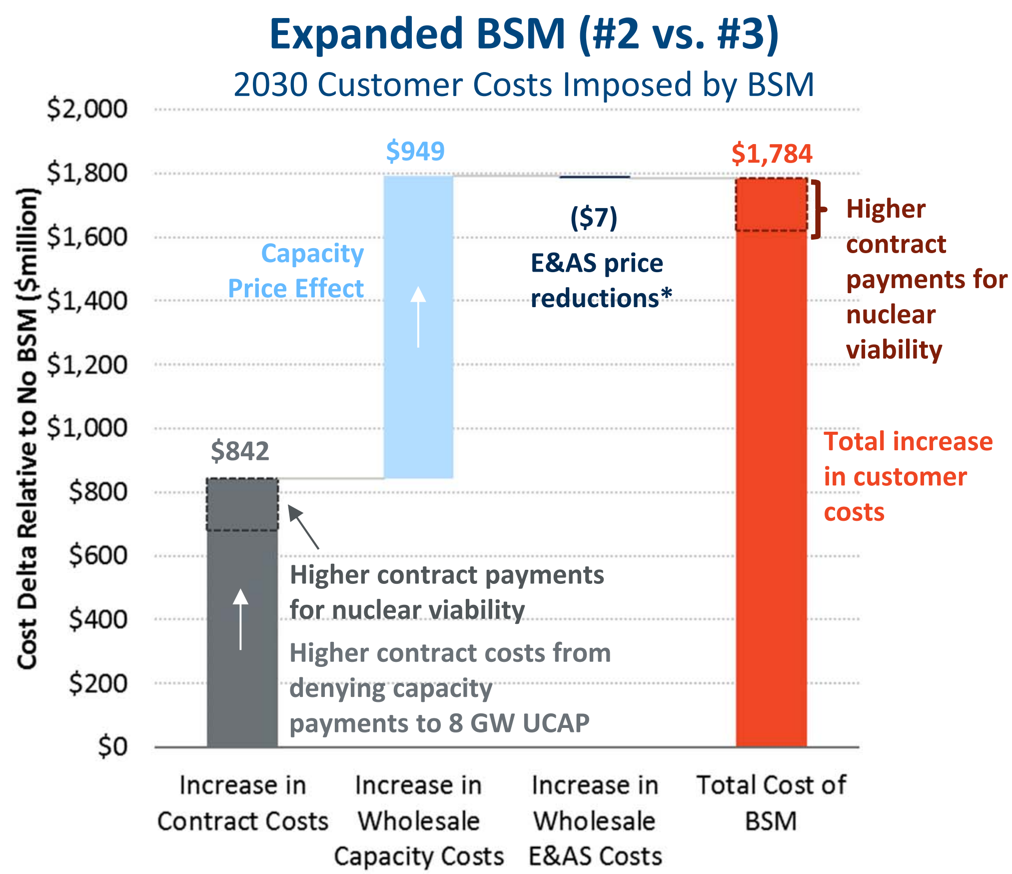
- By 2030 relative to a No-BSM scenario, estimated customer costs increase by:
  - <u>**$0.4-0.9 billion/year** under Status Quo BSM</u> (~12%-20% of statewide capacity costs or ~24%-34% of Zones G-J capacity costs), range depending on load growth and exemptions
  - <u>**$1.3-2.8 billion/year** under Expanded BSM</u> (~35%-63% of statewide capacity costs), range depending on load growth and nuclear resource retention
- This reflects costs of over-procuring capacity because mitigated policy resources would not be accounted for in the capacity market, including:
  - <u>Contract costs increase</u> for policy resources, since they are denied capacity payments
  - <u>Capacity market clearing prices rise</u>
- These estimates account for moderating long-term factors:
  - <u>Long-term supply elasticity</u> mitigates capacity price impacts so it is smaller than the "double-payment" quantity effect (showing up as higher contract costs)
  - <u>Lower resource UCAP values at higher penetration of mitigated renewable resources</u> limit the impact of BSM
  - <u>Offsetting E&AS impacts</u>, but these are relatively small
  - <u>Policy resource exemptions</u> can somewhat mitigate costs

Analytical Results

Estimated Customer Costs of BSM in 2030

Net impact of BSM on customers is $0.5 billion/yr under Status Quo; $1.8 billion/yr under Expanded BSM.

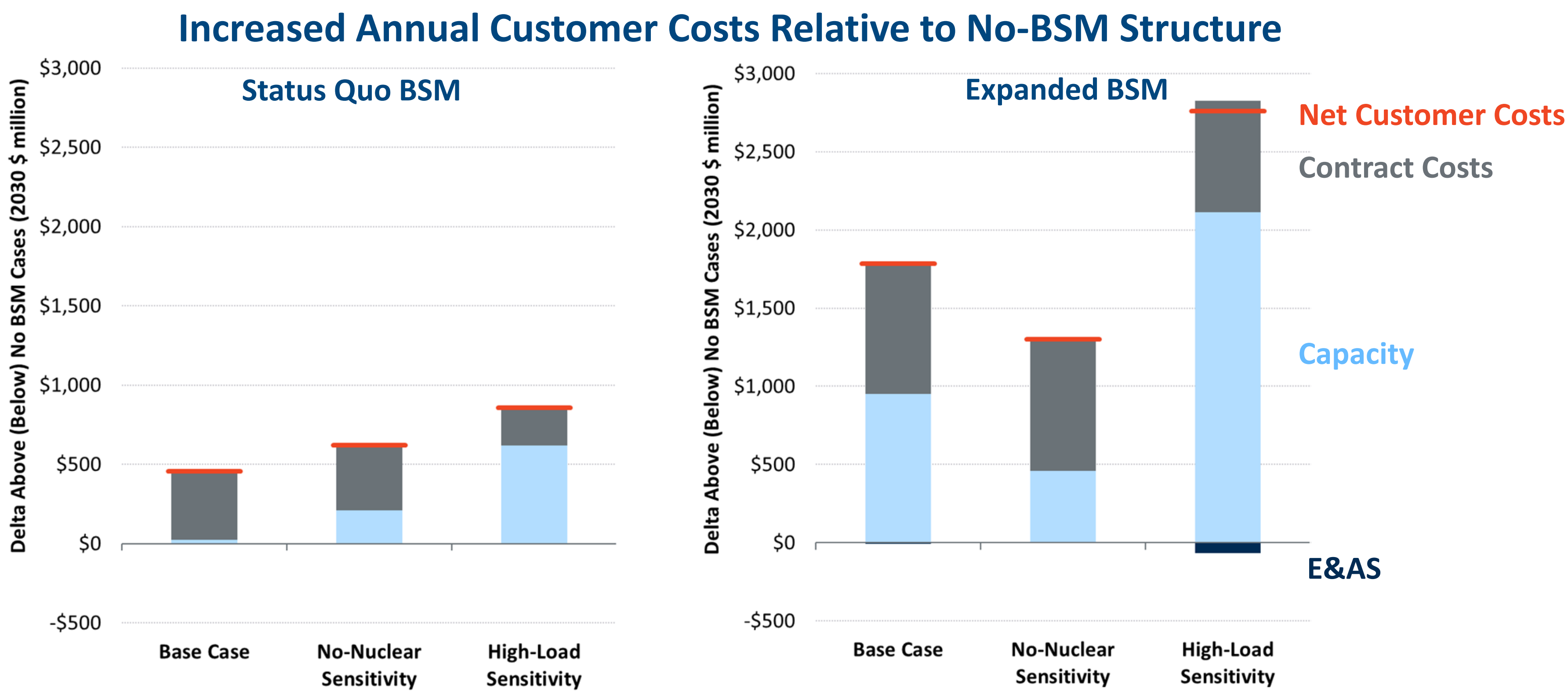




* Energy and AS prices decrease in some cases because excess capacity depresses prices in tight hours; and because higher contract payments (due to lack of capacity payments) cause energy prices to be more negative in over-generation hours.

Sensitivity of BSM Costs to Supply-Demand Balance

Customer costs of BSM are sensitive to peak load (higher load driving higher costs)



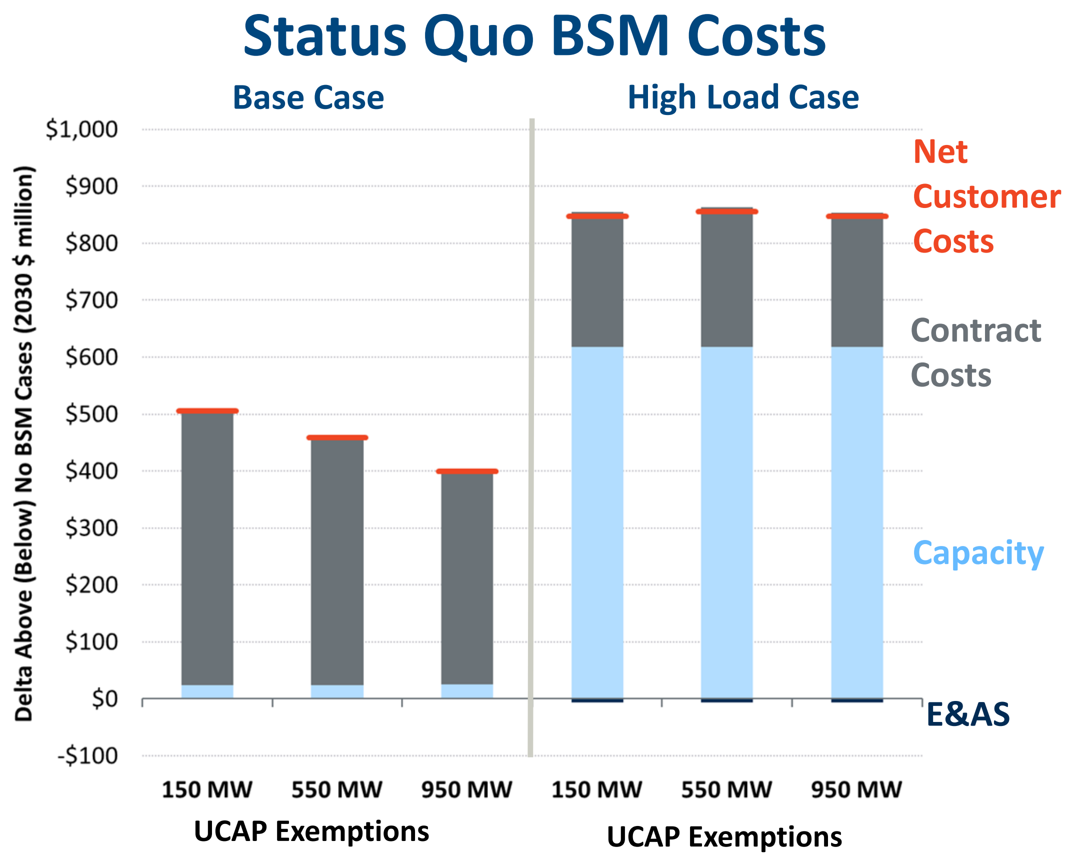
Notes: "**No-Nuclear Sensitivity**" loses all >3 GW of upstate nuclear, largely replaced by retaining gas CCs, so fewer resources to mitigate.
"**High-Load Sensitivity**" results in additions of onshore wind to meet 70% target.

Sensitivity of Status Quo BSM Costs to Policy Resource Exemptions

We evaluated the sensitivity of Status Quo costs to +/- 400 MW of policy resource exemptions

Costs remain similar because:

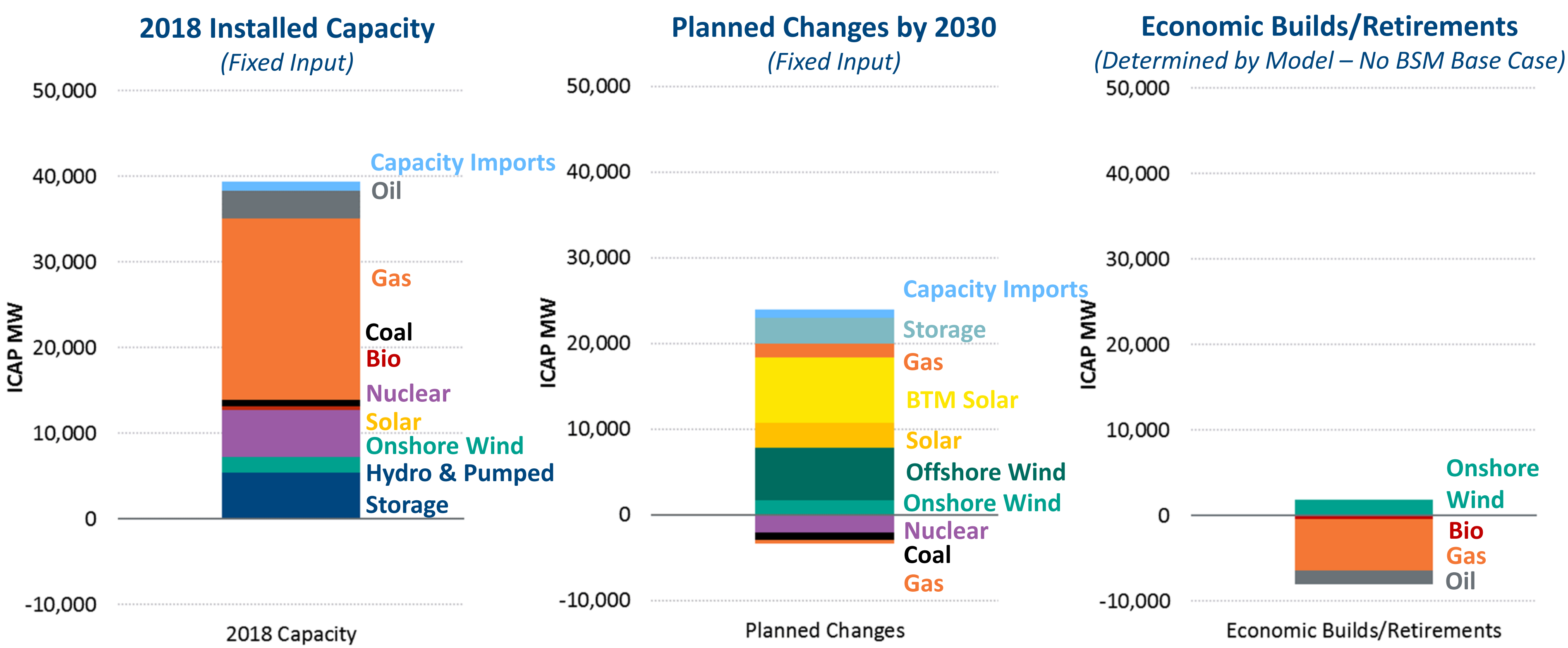
- **Base Case:** Gas ST is marginal, so 400 MW policy exemptions displaces 400 MW of gas ST retention
- **High Load Case:** Generic offer floor is marginal in all cases, so 400 MW exemptions results in +400 MW generic offer floor resources (and vice versa)



Base Case Detailed Results

Base Case Supply Mix

Existing generation is consistent with the 2019 Gold Book, and planned capacity changes are based on signed CES contracts and CARIS study assumptions. The model economically retires old plants and builds new clean ones to meet any remaining gap to reach CLCPA 70% target



Note: Model determines if 2018 existing supply resources will retire by 2030.

Note: Model determines economic resource builds needed to reach CLCPA targets (incremental to planned changes).

Capacity Subject to Mitigation
before considering exemptions or clearing

Mitigated Non-Emitting Capacity by Zone (ICAP MW)

Blue shading subject to Status Quo BSM | Expanded BSM applies to blue and teal

	2018 Capacity	Planned/Assumed 2019-2030 Additions/Retirements (Fixed Input)					Economic Additions (Determined by Model)		Total Capacity by 2030
		Zone A-E	Zone F	Zone G-I	Zone J	Zone K	Zone A-E	Zone F-K	
Hydro & PS	5,436	0	0	0	0	0	0	0	5,436 **
Onshore Wind	1,739	1,710	0	0	0	0	1,814	0	5,263
Offshore Wind	0	0	0	0	4,320*	1,778	0	0	6,098
Solar	77	2,677	0	284*	0	0	0	0	3,038
Storage	0	660	240	270	1,350	480	0	0	3,000
Nuclear	5,399	0	0	(2,054)	0	0	0	0	3,345
Capacity Import	1,100	0	0	0	1,000	0	0	0	2,100
Total	**13,751**	**5,047**	**240**	**(1,500)**	**6,670**	**2,258**	**1,814**	**0**	**28,280**

Notes: 2018 installed capacity informed by 2019 Gold Book. Planned/assumed builds are informed by 2019 CARIS study assumptions and signed CES contracts based on 2018-2019 CES contract summary document and recent 2019 Tier 1 solicitation.

* 816 ICAP MW OSW in Zone J and 880 ICAP MW OSW in Zone K procured in 2018 solicitation and 284 MW solar in Zone GHI exempt in both Status Quo and Expanded BSM. See the following slide for assumptions regarding status quo renewable exemptions as assumed consistent with the April 20 NYISO filing.

** Half of existing hydro fleet assumed to be mitigated under Expanded BSM.

Status Quo Exemptions

The quantity of possible public policy resource exemptions under the NYISO's April 20 proposed approach is subject to considerable uncertainty. Our updated analysis assumes ~550 UCAP MW of exemptions (with a sensitivity analysis of +/-400 UCAP MW)

- Given the large uncertainties, our assumed quantity of exemptions is intentionally abstracted from specific predictions such as which resources may be deemed "policy-driven" retirements
- Overall quantity is consistent with outlook for load growth, retirements, and demand curve width
- In "high exemptions" scenario, we further assume that some storage becomes exempt through other means (such as via Part A or Part B tests)

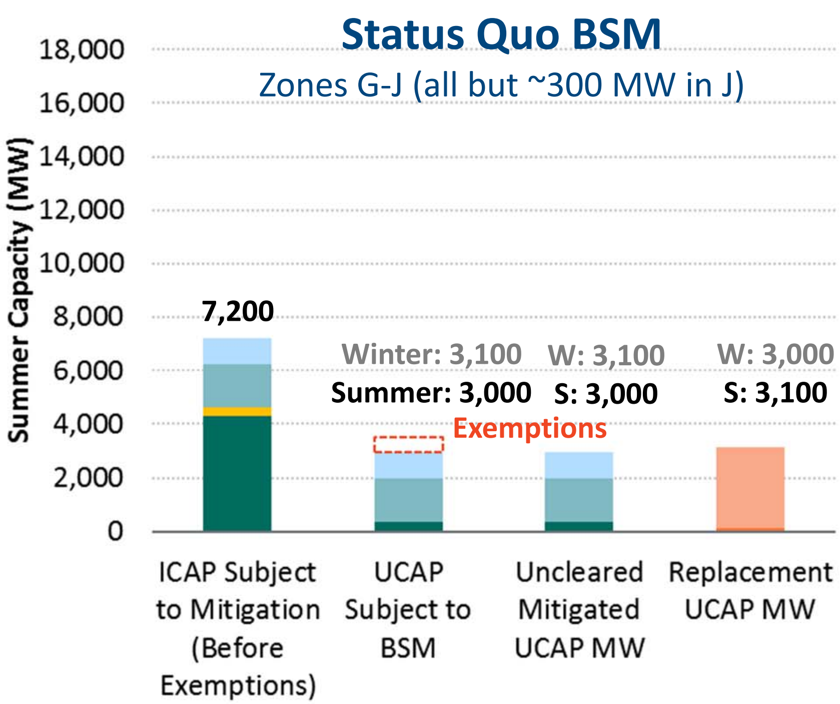
Status Quo Exemptions by Zone

	Zones G-I	Zone J	Zones G-J
Summer UCAP Supply (UCAP MW)			
Offshore Wind	0	848	848
Storage	270	1,350	1,620
Solar	41	0	41
Capacity Imports	0	1,000	1,000
Exemptions (UCAP MW)			
Public Policy Resources	41	507	548
Remaining Mitigated Resources (UCAP MW)			
Offshore Wind	0	341	341
Storage	270	1,350	1,620
Solar	0	0	0
Capacity Imports	0	1,000	1,000

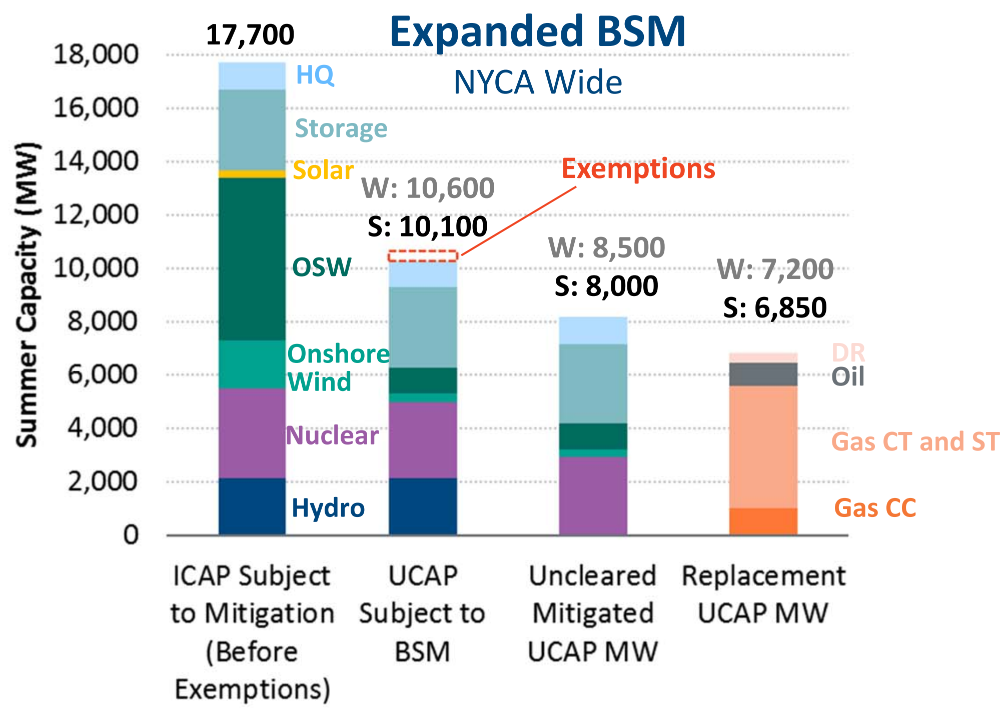
Summary of Mitigation and Market Response Quantities (NYCA-Wide)

In Status Quo BSM, essentially all of the ~3,000 summer UCAP MW uncleared mitigated capacity is replaced by retained gas ST

In Expanded BSM, ~1,150 summer UCAP MW of the 8,000 summer UCAP MW uncleared mitigated capacity is *not* replaced (mostly Upstate), resulting in a higher capacity prices and costs



Mitigated capacity in Zones G-J only under Status Quo, mostly OSW and storage in Zone J that is replaced by retained gas ST plants. UCAP values reflect average ELCC. Capacity numbers are approximate.



Mitigated capacity in all zones. Mitigated OSW and storage in Zones J and K largely offset by retained gas resources. All UCAP values shown reflect average ELCC. Capacity numbers are approximate.

Prices and Customer Costs

Zone J Capacity prices remain similar across all structures as retiring gas ST resources are marginal. Capacity prices in A-F increase significantly in Expanded BSM as more renewables and nuclear resources are mitigated, thus retaining more thermal plants that would otherwise retire

Wholesale Market Prices

	Capacity Market Prices (2030 $/kW-month)			Delta Above (Below) No BSM (2030 $/kW-month)	
Zone	1. Status Quo	2. Expanded BSM	3. No BSM	1. Status Quo	2. Expanded BSM
A-E	$3.65	$8.13	$3.69	($0.04)	$4.44
F	$3.65	$8.13	$3.69	($0.04)	$4.44
G-I	$6.05	$8.13	$6.05	($0.00)	$2.08
J (NYC)	$12.33	$12.32	$12.34	($0.01)	($0.02)
K (LI)	$13.05	$13.88	$13.05	$0.00	$0.83

	Energy Market Prices (2030 $/MWh)			Delta Above (Below) No BSM (2030 $/MWh)	
A-E	$28.02	$27.99	$28.02	$0.00	($0.03)
F	$30.28	$30.23	$30.28	$0.00	($0.05)
G-I	$30.36	$30.33	$30.36	$0.00	($0.03)
J (NYC)	$30.36	$30.33	$30.36	$0.00	($0.03)
K (LI)	$32.19	$32.19	$32.19	$0.00	($0.00)

Cost of BSM

	Customer Costs Delta Above (Below) No BSM (2030 $ million)	
Category	1. Status Quo	2. Expanded BSM
Wholesale Market Cost	**$25**	**$941**
Energy	$0	($7)
Ancillary Services	$0	($0)
Capacity	$25	$949
Contract Costs	**$434**	**$842**
Total Customer Cost	**$458**	**$1,784**
Excluding Nuclear Make-Whole	$457	$1,622

Modeling Approach and Assumptions

Brattle GridSIM Model

Inputs

Supply

Existing resources
Fuel prices
Investment/fixed costs
Variable costs

Demand

Representative day hourly demand
Capacity needs

Transmission

Zonal limits
Intertie limits

Regulations, Policies, Market Design

Capacity market
Carbon pricing
Procurement mandates

GridSIM Optimization Engine

Objective Function

Minimize NPV of Investment & Operational Costs

Constraints

- Market Design and Co-Optimized Operations
  - *Capacity*
  - *Energy*
  - *Ancillary Services*
- Regulatory & Policy Constraints
- Resource Operational Constraints
- Transmission Constraints

Outputs

Annual Investments and Retirements

Hourly Operations

System and Customer Costs

Supplier Revenues

Emissions and Clean Energy Additions

Market Prices

Demand Assumptions

- "Base Load" load assumptions align with 2019 CARIS study input assumptions for 2030
- "Base Load" assumes lower demand than 2019 (156 TWh gross load)
- Modeled "High Load" based on State Team input that assumes greater load than 2019

2030 Demand Assumptions

	Base Load	High Load
Scenarios	Base Case No-Nuclear	High-Load
Annual Gross Load	145 TWh	169 TWh
Gross Peak Load	30 GW	35 GW
Net Peak Load	28 GW	33 GW

Sources and Notes:

"Base Load" annual gross load assumptions are based on 2019 CARIS study. Used ratio of 2019 annual gross load and CARIS annual gross load to convert 2019 gross peak loads to 2030 gross peak loads on zonal level.

"High Load" annual gross load assumptions based on State Team's input. Calculated peak loads based on annual gross load ratio as described above.

Netted out assumed 7,542 MW of solar BTM (based on 2019 CARIS study) valued at ~27% summer capacity value from gross peak load to calculate net peak load (similar to Gold Book assumptions).

2019 load data taken from NYISO OASIS data.

Supply Cost Characteristics

- **Resources' fixed O&M costs** affect supply elasticity and BSM price impacts. Sources:
  - *New Gas CCs, CTs*: 2020 costs from Demand Curve Reset (DCR); 2.2% cost inflation rate
  - *New Gas STs*: 2019 costs and cost decline rate from 2019 NREL ATB (0% to -1%/year real)
  - *New wind, solar, storage*: 2019 costs and cost decline rate from 2019 NREL ATB (0% to -7% /year real)
  - *Existing Nuclear*: 2019 costs from NEI (constant real), plus assumed $280/kW-year refurbishment cost adder in 2030
  - *Existing CTs, STs*: FOM from NYISO 2018 SOM Report
  - *Other existing thermal:* FOM assumed 2x new units
  - *All other existing:* Same FOM as new resources
  - *Zone J and K*: FOM assumed 1.3 – 2.7x higher than upstate based on DCR zonal cost ratios
- **Offshore wind** tied to either zone J or K
- **Utility-scale PV and onshore wind** cannot be built in zones J or K

2030 Resource Cost Assumptions

	Upstate New Resource Capital Cost *2030$/kW*	Upstate New Resource FOM *2030$/kW-yr*	Upstate Existing Resource FOM + Refurb Costs *2030$/kW-yr*	Variable O&M *2030$/MWh*
Natural Gas				
Combined cycle	$2,300	$27	$54	$2
Combustion turbine	$1,200	$14	$25	$7
Steam turbine	$5,000	$43	$72	$11
Battery Storage				
4-hour duration	$1,100	$26	$26	$6
Solar PV				
Utility scale	$1,100	$13	$13	$0
Wind				
Offshore (downstate)	$4,600	$107	$107	$0
Onshore	$1,600	$50	$50	$0
Nuclear				
Single-unit	N/A	N/A	$602	$3
Multi-unit	N/A	N/A	$491	$3

Sources and Notes:
Includes interconnection and network upgrade costs. NREL 2019 ATB, NYISO DCR Model 2019-2020 and 2020-2021 , and NEI Nuclear Costs in Context.
VOM for storage resources reflect efficiency losses. Existing FOM for nuclear includes refurbishment costs.
FOM costs for existing STs and CTs were based on average GFC shown in Figure 16 of the 2018 State of the Market Report; FOM costs for existing Gas CTs upstate assumed to be half of those for existing Gas CTs in Zone K.
FOM costs for other existing thermal resources were assumed to be 2x that of comparable new ones, informed by EPA Integrated Planning Model document.
Nuclear refurbishment costs informed by refurbishment costs for nuclear plants in Ontario.

ELCC Modeling Approach

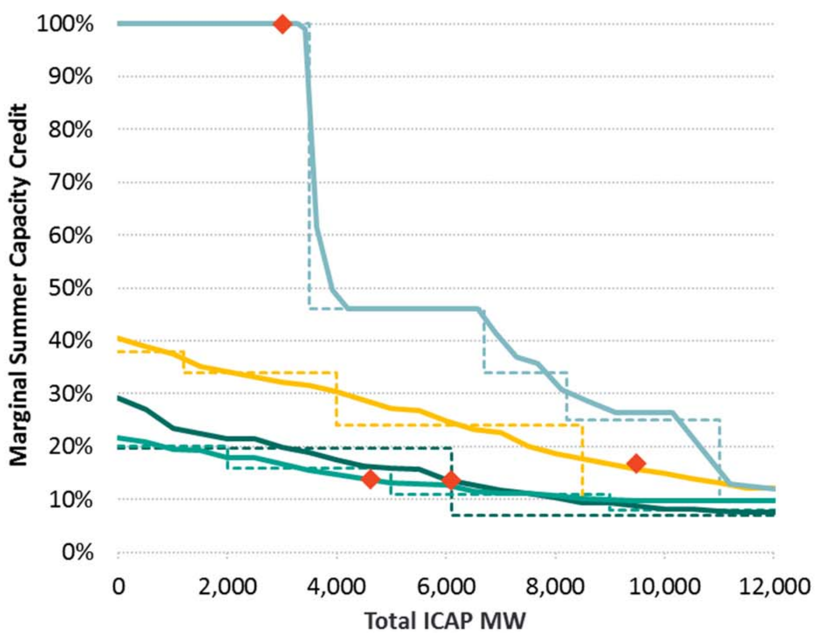
Supply Resource	Concept	Methodology
Wind and Solar Resources	Generation of new wind and solar additions is correlated with previously deployed resources. New resources therefore provide less marginal capacity value than previously added resources.	1. Across 8760 hours, identify 100 top NYCA net load hours 2. Calculate wind UCAP value as avg. output in those hours 3. Repeatedly change the MW of wind installed, all else equal 4. Each time, find top 100 net load hours and the avg. output 5. Repeat process for offshore wind and solar; for each one, hold other variable technologies at likely 2030 levels
Storage Resources	Energy storage can change the “shape” of peak net load periods, flattening and elongating peak periods. As more storage is deployed, longer discharge durations are therefore required to provide the same capacity value.	1. Across 8760 hours, analyze MW of storage required to reduce NYCA net peak load by 1 MW 2. Calculate UCAP value as 1 MW peak reduction / MW storage required 3. Increase amount of storage assumed, holding all else equal. Simulate effect of increased storage on net peak load 4. Repeat steps 1 – 3 across many storage deployment levels 5. Repeat process for storage of different durations

Base Case UCAP Value Curves
modeled based on NYCA-wide net load

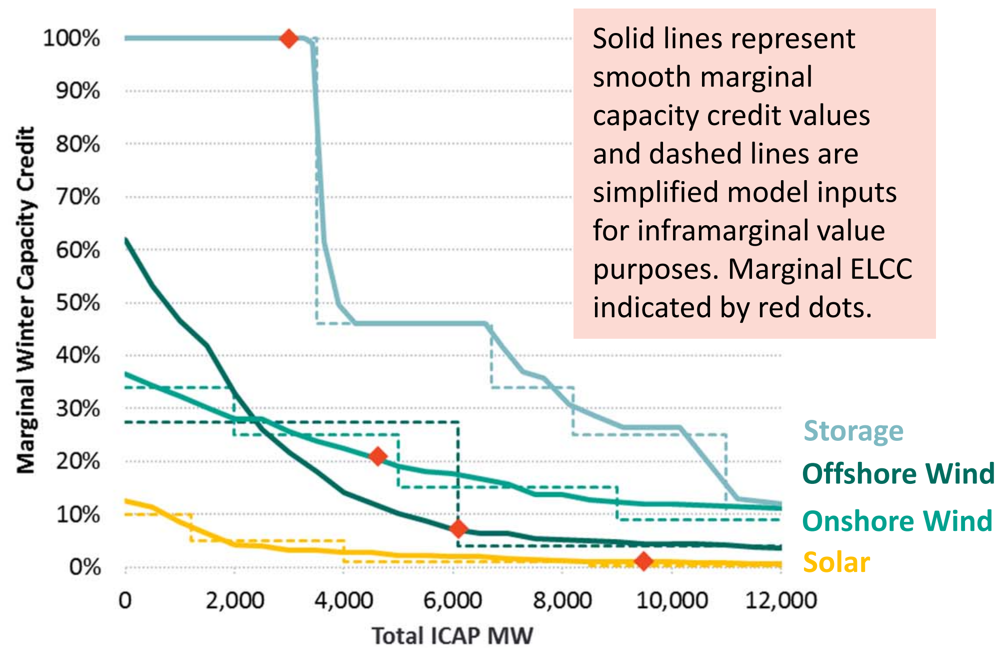
As the penetration increases, marginal effective load-carrying capability (ELCC) decreases.

Note: this analysis may have conservatively low ELCCs for renewables, based on hourly data with lower output than future installations are likely to achieve (and that does not capture diversity across sites for OSW); on the other hand, this analysis uses NYCA-wide net load without considering how transmission constraints could reduce value more quickly.

Summer UCAP Value



Winter Capacity Value



Note: solar capacity credit curves include assumed 7,542 MW of solar BTM already on the grid (based on CARIS study assumption).

Assumptions on BSM Applicability

Resource Type	BSM in Structure 1. Status Quo		BSM in Structure 2. Expanded BSM	
	Zones G-J	Rest of System	Zones G-J	Rest of System
Nuclear	N/A	N/A	N/A	3,345 ICAP MW
OSW	1,740 ICAP MW (assumed 507 UCAP MW exemption in Zone J applies to OSW)		3,504 ICAP MW (assume 816 ICAP MW of already signed contracts exempt)	898 ICAP MW (assume 880 ICAP MW of already signed contracts exempt)
Existing Solar and Onshore Wind	No		No	No
New Utility Scale Solar and Wind	Any new utility scale solar or onshore wind in Zones G-J		All new utility scale solar and onshore wind	
Bulk Storage	1,620 ICAP MW		1,620 ICAP MW	1,380 ICAP MW
Existing Hydro	No		50 ICAP MW	2,085 ICAP MW
Tier 2 Renewables	No		No	No
New HQ Imports	1,000 MW in Zone J		1,000 MW in Zone J	N/A
Demand Response	No		No	No
Fossil Resources	No		No	No

Source: Assumptions on applicability provided by NYSERDA/DPS staff.

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