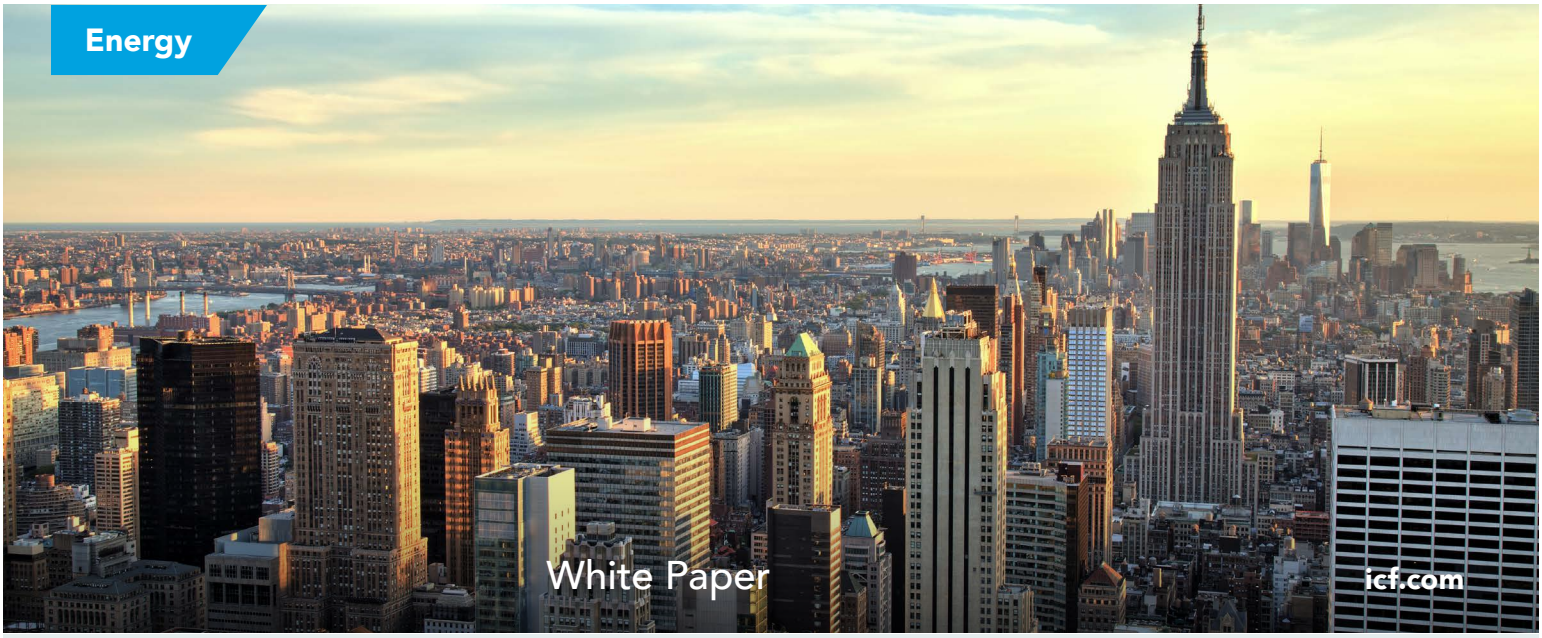



# Will FERC's BSM orders inhibit renewable and battery development in New York?

*By Ananya Chaurey, ICF and George Katsigiannakis, ICF*

## Executive summary

On February 20, 2020, the Federal Energy Regulatory Commission (FERC) issued four orders concerning buyer-side market power mitigation in the New York Independent System Operator's (NYISO) wholesale capacity market (ICAP market). The orders, which aimed to address market participants' concerns about the price-suppressive effects of subsidized generators' participation in the ICAP market, affect all subsidized resources with out-of-market payments (for example, renewable energy credit [REC] payments to wind and solar facilities, and reliability-must-run [RMR] contracts for generators deemed essential to maintain local reliability). Overall, the orders require new renewable resources beyond a predetermined cumulative MW limit, some demand response, and all new energy storage resources in the NYISO's mitigated capacity zones (Lower Hudson Valley [LHV] and New York City [NYC]) to bid at an "offer floor" in the ICAP market. However, they allow generators with RMR contracts to bid at de minimis levels. Importantly, the orders will not affect existing resources.

In response to the FERC order concerning the mitigation of renewable resources, on April 7, 2020, the NYISO proposed a new methodology to calculate the MW limit of renewables that would be exempt from mitigation. If approved by FERC, it would calculate the exemption cap by evaluating incremental capacity needs arising from load growth and regulatory retirements. Based on current prospects for regulatory

 ©Copyright 2020 ICF 

retirements and demand growth, ICF expects the proposed methodology to accommodate New York's renewable energy targets. However, the storage order that denied the request to exempt storage from mitigation will be detrimental to storage development. While some battery projects in NYC may still clear mitigation, not all battery projects in LHV will do so under normal conditions.

There are four key points in this paper.

1. To minimize the price suppressive effects of subsidized resources (such as renewables and battery storage) in the ICAP market, the NYISO employs buyer-side mitigation (BSM) measures in the NYC and LHV localities.
2. Some participants contend that the measures unfairly prevent clean-energy and demand-response resources from participating in the markets, and demanded that such resources be exempt from BSM measures.
3. In February 2020, the FERC ruled that new renewables beyond a certain limit, all new energy storage, and some new demand response should not be exempt from BSM. It also ordered the NYISO to propose a new methodology to calculate the exemption limit for new renewables.
4. The NYISO has proposed to calculate the renewable exemption limit using dynamic factors such as load growth and regulatory retirements. ICF's analysis finds that the proposed exemption will not be detrimental to renewable development in LHV and NYC. However, since all new storage resources will be subject to BSM, ICF expects battery storage development outside NYC to be affected.

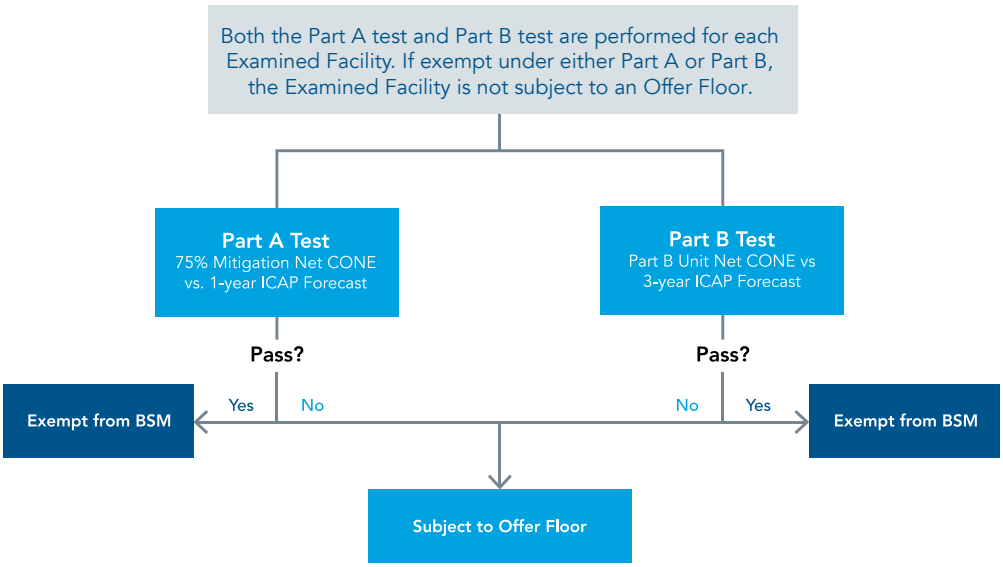
## Background

The NYISO employs "mitigation" measures, including buyer-side mitigation (BSM), in the ICAP markets to deter large incumbents, such as load-serving entities (LSE), from exercising market power through the suppression of capacity prices. These measures apply in the LHV locality (Zones G–J), which includes NYC locality. Under BSM rules, new generating facilities are subjected to an "offer floor" in the ICAP market equal to the lesser of 75% of the NYISO's Net Cost-of-New-Entry (CONE), called the Default Net CONE (DNC), or the unit's individual CONE.

New resources can qualify for an exemption from BSM rules if they are purely merchant (a Competitive Entry Exemption) or pass one of two exemption tests conducted by the NYISO. The Part A exemption test compares the DNC with the forecasted annual ICAP Spot Market clearing price. If the forecasted price exceeds the DNC, then the examined facility passes the Part A test. The Part B exemption test analyzes the economics of the examined facility itself. A unit's Net CONE[1] is compared against a three-year average of forecasted capacity prices in the Mitigation Study Period (MSP)[2]. If the three-year average ICAP price exceeds the unit's Net CONE, then it is deemed economic and passes the Part B test. Further, once online, a resource can be exempt from the BSM rules if it clears the ICAP market in any 12 (not necessarily consecutive) monthly spot ICAP auctions.

 ©Copyright 2020 ICF 

Exhibit 1: NYISO BSM Part A and Part B exemption tests




*Source: NYISO*

Before the latest FERC orders, the NYISO allowed up to 1,000 MW ICAP of qualifying renewable resources per Class Year to be exempt from BSM. Further, it had filed tariffs with FERC that proposed to exempt all Special Case Resources (SCR), mostly demand response, from BSM. Stand-alone and renewable-paired energy storage resources were not afforded any exemptions, and were thus subject to the BSM offer floor.

With New York State aggressively pursuing decarbonization, the BSM mechanism has become increasingly controversial as it would potentially result in the exclusion of state-subsidized resources (such as battery storage, renewables, and demand response) from the ICAP markets. In August 2019, the New York Public Services Commission (PSC) initiated proceedings to examine how to reconcile existing resource adequacy mechanisms (the capacity market) with the state's renewable and decarbonization targets. Among other concerns, the PSC stated that the BSM rules interfered with the ability of state-supported resources to sell capacity. Separately, it filed a complaint with FERC requesting that energy storage resources be made exempt from the BSM rules[3].

## The FERC orders

The FERC orders issued on February 20, 2020, all aim to address concerns regarding the artificial suppression of ICAP market prices by generators that receive "out-of-market" payments. The orders dictate how resources receiving state subsidies—such as new renewables, Energy Storage Resources (ESR), SCRs (i.e. demand-response resources that participate in capacity markets), and resources receiving reliability must-run (RMR) payments—participate in the ICAP market.

Exhibit 2: Overview of FERC orders

| Docket no. | Involved parties | Overview | Outcome |
|---|---|---|---|
| EL13-62: The RMR order | IPPNY v. NYISO | In 2015, FERC denied a complaint from IPPNY that alleged that generators receiving "out-of-market" payments from RMR service agreements were suppressing ICAP prices because they were required to bid at de minimis levels. IPPNY requested a rehearing of the order. | FERC denied IPPNY's rehearing request and found that generators receiving payments from RMR agreements should not be subject to an offer floor. |
| EL19-86-000: The storage order | NYPSC & NYSERDA v. NYISO | NYPSC and NYSERDA argued that the application of BSM rules for ESR in LHV and NYC was unjust and unreasonable because the rules prevent storage from participating in the ICAP market and interfere with state policy objectives. They sought a blanket exemption for ESR—or at least a 300 MW per Class Year exemption cap. | FERC denied the complaint, arguing that unmitigated ESR have the potential to suppress capacity prices. All new ESR will be subjected to BSM rules in LHV and NYC. |
| EL16-92-001: The SCR order | NYPSC & others v. NYISO | FERC, in a 2017 order, allowed new SCR to be exempt from BSM rules and required NYISO to make a compliance filing. IPPNY requested a rehearing and sought to have the SCR exemption removed. | FERC granted IPPNY's request for a rehearing and found that new SCRs should be subjected to BSM rules. However, to the extent that SCRs are receiving payments for local reliability services, they should be exempt. |
| ER16-1404-000: The renewables order | NYPSC & NYSERDA v. NYISO | In a 2015 order, FERC required the NYISO to make a compliance filing after finding that renewable resources had little incentive to artificially suppress prices. The NYISO revised its tariff to exempt 1000 MW ICAP of renewables per Class Year from its BSM rules; however, FERC had so far not ruled on the tariff filing. State entities had also requested that the BSM exemption eligibility be extended to storage paired with eligible renewables.<br><br>NYISO's tariff filing also exempted self-supply LSEs from the BSM rules. | FERC accepted the NYISO proposal to allow BSM exemption to some capped amount of renewable resources, but rejected its 1000 MW cap. FERC required the NYISO to revise its calculation of the MW cap and make a revised filing. Further, FERC denied state entities' request to extend eligibility to storage resources paired with eligible renewables.<br><br>FERC also ruled that state entities have the ability to suppress ICAP prices; hence, they should not be eligible for self-supply exemption. |

## NYISO's proposed renewable exemption cap and implications for New York's clean energy targets

FERC's renewables order directed the NYISO to revise its renewable exemption cap by making it more narrowly tailored to LHV and representing it in UCAP terms. In response, on April 7, 2020, the NYISO filed its new exemption cap that calculates MW UCAP of exemption by evaluating incremental capacity needs arising from demand growth, state-mandated retirements, and increasing reliability needs as a result of entry of renewable resources. If there are no incremental capacity needs, or if these needs are relatively small, new renewable resources can still clear mitigation at an amount that does not depress the ICAP market clearing price by more than $0.5/kW-month (Insignificant Market Price Impact). The NYISO also proposes to carry over any unused exemption MWs to subsequent class year studies, thus allowing the cap to amplify over time in the absence of sufficient new renewable builds. Exhibit 3 illustrates NYISO's proposed methodology.

Exhibit 3: Equations demonstrating NYISO's proposed renewable exemption cap

$$\textit{First BSM Study Renewable Exemption Cap (MW UCAP)} = \textit{Greater of (Load Growth + Regulatory UCAP Requirements + URM Impact) Or Market Price Impact}$$

$$\textit{Subsequent BSM Study Renewable Exemption Cap (MW UCAP)} = \textit{Greater of (Bank + Load Growth + Regulatory UCAP Retirements + URM Impact) or Market Price Impact}$$

*Source: NYISO, "BSM Renewable Exemption Cap Proposal" March 18, 2020*

In the equations above, URM (Unforced Reliability Margin) refers to an increase in a locality's reliability needs due to the entry of renewables. For example, NYISO's proposal uses a URM factor of 0.4 for offshore wind and 0.25 for onshore wind and solar. Thus, for every 1 MW UCAP entry of offshore wind, the increase in UCAP requirement would be 0.4 MW. Next, MPI (Market Price Impact) is the maximum amount of UCAP MW entry that would suppress capacity price by no more than $0.5/kW-mo. Finally, Bank refers to the cumulative amount of unused exemptions from prior class year studies.

The NYISO proposes to calculate exemption caps separately for LHV and NYC localities to account for differences in load growth, regulatory retirements, and URM impact. However, these caps will not be additive to each other. Since NYC is a nested locality within the LHV parent locality, any exemptions awarded in NYC will deplete both the NYC and LHV exemption caps. Exemptions will be first awarded to resources in NYC up to the NYC cap, or until all NYC resources have received exemption. These NYC exemptions will be subtracted from the LHV cap down to zero to avoid double counting. Remaining available exemptions in LHV, if any, will then be awarded to resources interconnecting in LHV (including

resources in NYC that did not receive exemption through the NYC cap). For subsequent class year studies, unused exemptions will roll over to each locality's bank. The LHV Bank will be offset by the NYC Bank down to zero.

ICF analyzed the impacts of NYISO's proposed renewable exemption cap on New York's clean energy targets and the LHV and NYC locality capacity prices. So far, the NYISO has allowed a static exemption cap of 1,000 MW ICAP per class year (Status Quo). ICF expected the Status Quo to be sufficient to allow at least half of the 9 GW ICAP offshore wind target in NYC[4], as well as 1 GW ICAP of solar builds in LHV to clear mitigation rules by 2035 (Class Year 2031).

However, with the new exemption cap based on several dynamic factors, such as load growth and regulation-driven retirements (New Exemption), ICF was interested in understanding how it would affect the amount of renewable development in LHV and NYC. Further, ICF wanted to estimate the impact, if any, of the new methodology on NYC and LHV capacity prices.

To understand the implications of the New Exemption, ICF first estimated the total amount of renewable exemption available in each of the localities. **Exhibit 5** compares the amount of renewable exemption available in Status Quo and New Exemption, while **Exhibit 6** breaks down the New Exemption cap into its various components: load growth, regulatory requirements, and URM impact due to the entry of new renewable resources. ICF does not expect MPI (see **Exhibit 3**) to exceed these components in any class year. In LHV, a $0.5/kW-mo price impact corresponds to 50 MW UCAP, while in NYC, it corresponds to 35 MW UCAP—much less than the other components.

Exhibit 4: Summary of key ICF assumptions

| Modeling component | ICF assumption |
|---|---|
| Load growth | Sourced from 2019 Gold Book, which forecasts a slight fall in peak load until 2030, before starting to rise sharply due to electrification[5]. |
| Regulatory retirements | By 2025, up to 1.5 GW of peaking CT capacity in LHV will be non-compliant with NY DEC's NOx regulations. Analysis by ConEd and NYISO indicates that 660 MW would be required for reliability. Thus, ICF assumes that the remaining capacity would retire and be considered "regulatory retirements." These retirements are accounted for in the 2019 and 2021 Class Years. |
| Amount of renewable builds | 4.5 GW ICAP of offshore wind builds in NYC by Class Year 2031 (calendar year 2035) 800 MW ICAP of solar builds in the rest of LHV by Class Year 2031 (calendar year 2035). |
| Renewable UCAP derating factors | Offshore wind: 38%<br>Solar: 46% in summer, 2% in winter (by Class Year 2031, derating factor reduces to 35% in summer) |
| Frequency of class year studies | Exemptions are granted every 2 years, since typically, the NYISO takes two calendar years to complete a class year study. |

Exhibit 5: Comparison of renewable exemption available in status quo and new exemption

| Class year | Status quo | | New exemption | | |
|---|---|---|---|---|---|
| | Total cap, MW ICAP | Total cap, MW UCAP[6] | Total cap, MW UCAP[7] | Cap available for NYC, MW UCAP | Cap available for LHV, MW UCAP[8] |
| **2019** | 1,000 | 395 | 192 | 192 | 189 |
| **2021** | 1,000 | 395 | 866 | 866 | 430 |
| **2023** | 1,000 | 395 | 653 | 653 | 0 |
| **2025** | 1,000 | 395 | 455 | 455 | 0 |
| **2027** | 1,000 | 395 | 355 | 355 | 0 |
| **2029** | 1,000 | 395 | 362 | 362 | 263 |
| **2031** | 1,000 | 395 | 455 | 390 | 455 |
| **Total** | 7,000 | **2,765** | **3,338** | NA | NA |

Exhibit 6: ICF's Estimate of Renewable Exemption Available in NYC and LHV

| Class year | NYC exemption summary (MW, UCAP) | | | | | |
|---|---|---|---|---|---|---|
| | Bank (a) | Load growth (b) | Regulatory retirements (c) | UGM impact (d) | Exemption cap (e) = (a) + (b) + (c) + (d) | Exemption granted (f) |
| 2019 | 0 | -49 | 241 | 0 | 192 | 0 |
| 2021 | 192 | 17 | 533 | 124 | 866 | 310 |
| 2023 | 556 | -25 | 0 | 122 | 653 | 304 |
| 2025 | 349 | -16 | 0 | 122 | 455 | 304 |
| 2027 | 151 | 82 | 0 | 122 | 355 | 304 |
| 2029 | 51 | 189 | 0 | 122 | 362 | 304 |
| 2031 | 58 | 271 | 0 | 61 | 390 | 152 |

| Class year | LHV exemption summary (MW, UCAP) | | | | | |
|---|---|---|---|---|---|---|
| | Bank (g) | Load growth (h) | Regulatory retirements (i) | UGM impact (j) | Exemption available (k) = (g) + (h) + (i) + (j) - (f) | Exemption granted (l) |
| 2019 | 0 | -79 | 241 | 27 | 189 | 115 |
| 2021 | 0 | 8 | 597 | 135 | 430 | 42 |
| 2023 | 142 | -48 | 0 | 130 | 0 | 0 |
| 2025 | 0 | -30 | 0 | 138 | 0 | 0 |
| 2027 | 0 | 89 | 0 | 145 | 0 | 0 |
| 2029 | 183 | 233 | 0 | 151 | 263 | 116 |
| 2031 | 211 | 331 | 0 | 65 | 455 | 10 |

ICF modeling suggests that, in the long run, the new exemption is just as accommodating as the status quo (**Exhibit 5**). In fact, ICF found that, by 2035 (Class Year 2031), the new exemption may even allow for 500 MW UCAP more of renewables to enter the market relative to the status quo.

In its modeling, ICF assumed that 4.5 GW ICAP (1.7 GW UCAP) of offshore wind in NYC and approximately 1 GW ICAP (300 MW UCAP) of new solar in the rest of LHV entered the market (**Exhibit 4**). These new builds are distributed across the class years, and ICF still expects these new resources to clear mitigation by the mid-2030s (**Exhibit 7**). However, in the 2025-30 timeframe (Class Years 2023-2027), the new exemption may be marginally more restrictive to renewable development in LHV outside NYC due to a lack of regulatory retirements and low load growth (**Exhibit 6**). In the long run, since the amount of renewable capacity clearing mitigation in the status quo and the new exemption is the same, the impact on capacity market clearing price is insignificant (**Exhibit 8**).

It is important to note that ICF's conclusions depend on assumptions outlined in **Exhibit 4**. Load growth and regulatory retirements are the most significant sources of uncertainty in ICF's analysis. Preliminary analysis by the NYISO on the impacts of the ongoing COVID-19 crisis suggests that peak and energy demand might be depressed for the next one or two years. However, in the case of a longer economic recession, demand could be depressed for longer. Thus, lower forecasted load growth in the near term would lead to lower renewable exemption available in Class Years 2019 and 2021. Further, lower regulatory retirements due to fewer NOx retirements would also reduce the amount of available renewable exemption. For instance, apart from the 660 MW required for reliability (**Exhibit 4**), generators affected by the DEC NOx regulations may choose to comply by installing emissions controls or by simply not running during the ozone season.

Exhibit 7: Summary of assumed renewable builds and exemptions in NYC and LHV

| Class year | Status quo (MW, UCAP) | | | |
|---|---|---|---|---|
| | NYC | | Rest of LHV | |
| | Offshore wind exemption requests | Offshore wind exemptions granted | Solar exemption requests | Solar exemptions granted |
| 2019 | - | - | 115 | 115 |
| 2021 | 310 | 310 | 42 | 42 |
| 2023 | 304 | 304 | 35 | 35 |
| 2025 | 304 | 304 | 31 | 31 |
| 2027 | 304 | 304 | 27 | 27 |
| 2029 | 304 | 304 | 23 | 23 |
| 2031 | 152 | 152 | 10 | 10 |
| **Total** | **1,678** | **1,678** | **283** | **283** |

 ©Copyright 2020 ICF 

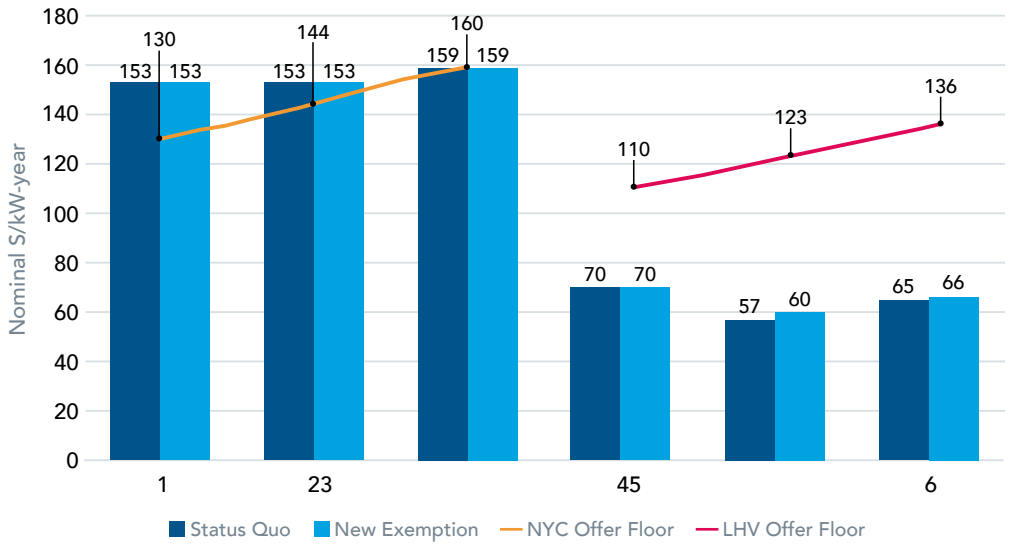
| Class year | New exemption (MW, UCAP) | | | |
|---|---|---|---|---|
| | NYC | | Rest of LHV | |
| | Offshore wind exemption requests | Offshore wind exemptions granted | Solar exemption requests | Solar exemptions granted |
| 2019 | - | - | 115 | 115 |
| 2021 | 310 | 310 | 42 | 42 |
| 2023 | 304 | 304 | 35 | 0 |
| 2025 | 304 | 304 | 31 | 0 |
| 2027 | 304 | 304 | 27 | 0 |
| 2029 | 304 | 304 | 23 | 116 |
| 2031 | 152 | 152 | 10 | 10 |
| **Total** | **1,678** | **1,678** | **283** | **283** |

## Other implications for the NYISO ICAP market

ICF's analysis found that the NYISO's new renewable exemption cap could allow up to 2 GW UCAP of renewables to be exempt from mitigation rules in LHV and NYC by 2035. This would comfortably allow the state to meet its offshore wind target of 9 GW (assuming half interconnects in NYC). The inclusion of state-mandated regulatory retirements in the calculation of the exemption enables the state to have greater influence in determining the resource mix. Potential regulations such as carbon emission limits, or an expansion of the NOx limits, may induce incremental thermal retirements in NYC and LHV, and, hence, allow more entry of renewable resources.

The NYISO's new exemption pertains to renewable resources and does not address the state's concerns with mitigation rules applicable to energy storage and demand response resources: the storage order and the SCR order (see **Exhibit 2**). Based on ICF's capacity price forecast, capacity prices in NYC are sufficient to allow up to 300 MW UCAP of storage resources to pass the Part A exemption test. However, the same does not hold true for LHV. ICF estimates that, in the absence of incremental retirements, no storage resources in LHV will be able to clear mitigation. **Exhibit 8** compares ICF's capacity price forecast with the BSM offer floors in NYC and LHV.

Exhibit 8: ICF indicative capacity price forecast for NYC and LHV




In August 2019, the NY PSC initiated Case No. 19-E-0530— "Proceeding on Motion of the Commission to Consider Resource Adequacy Matters"—to reevaluate whether the NYISO ICAP market could satisfy both resource adequacy requirements and the state's clean energy targets. In particular, the PSC inquired about the effectiveness of alternative resource adequacy mechanisms, such as the state-directed long-term bilateral contracting mechanism in use in California, or the Competitive Auctions with Sponsored Resources (CASPR) mechanism[9] in ISO-NE.

The NYISO itself has initiated a comprehensive mitigation review to determine whether the rules efficiently mitigate concerns of buyer-side market power. It may identify new BSM evaluation rules or tests that better evaluate resources that promote environmental attributes or fulfill policy goals. It also has been pushing its carbon pricing proposal as a means to satisfy both FERC concerns regarding buyer-side market power and the state's clean energy ambitions. Increased wholesale prices due to a price on carbon will make carbon-free resources more economic by boosting their energy revenues. This might allow them to clear the ICAP market and avoid mitigation. The governor of New York, however, hasn't yet supported this proposal, and without the state's support, a carbon price is unlikely. Other proposals by the NYISO include ancillary services market reform, and energy market participation models for ESR and hybrid (renewable and storage) resources.

It is uncertain how the PSC (and the state) will move forward in the resource adequacy proceeding. However, it is clear that the state will continue to aggressively pursue its clean energy and carbon reduction goals. The wholesale markets, consequently, will see transformative change in the near future.

**Ananya Chaurey** is a consultant in ICF's power markets practice area. He performs research, quantitative analysis, and power system modeling in support of ICF's advisory services. His recent experience has focused on the NYISO and PJM markets, with projects involving a diverse set of technologies ranging from offshore wind and energy storage to conventional natural gas-fired thermal power plants.

Ananya started his professional career as an electrical engineer in the automotive industry after obtaining a B.S. from the University of Michigan at Ann Arbor. He then completed a master's degree in energy and environment from Duke University's Nicholas School of the Environment, and joined ICF thereafter. As a graduate student, he worked with California Energy Storage Alliance, an advocacy group, to evaluate potential greenhouse gas emission savings from replacing peaker plants in CAISO with battery storage.

**George Katsigiannakis** joined ICF in 1997 and is an expert in U.S. electricity markets, with deep understanding of all factors affecting U.S. wholesale electric markets including market design, environmental regulations, fuel markets, transmission, renewable, energy efficiency, and demand side management (DSM). He has been involved in a large number of projects including several forward price curve assessments, development support, and financial performance of generation assets. He works in the areas of energy modeling, wholesale market assessments, asset valuations, restructuring, and litigation support, as well as contract evaluation and risk assessments.

George has a bachelor's degree in Industrial Engineering from Technical University of Crete, Greece, and an M.Sc. in Operations Research from The George Washington University.

 ©Copyright 2020 ICF 

## Appendix

[1] Net CONE is defined as the unit's annual levelized capital and Fixed O&M cost less net energy and ancillary services revenue.

[2] MSP is defined as three capability years, three years after the year of the Class Year. Thus, for 2019 Class Year, MSP would be 2022–2025 capability years. The NYISO is currently in the process of reviewing the length of the MSP and may update its rules.

[3] FERC Docket No. EL19-86-000

[4] ICF assumes 4.5 GW interconnects in NYC and 4.5 GW in Long Island. While theoretically, all GW could interconnect in Long Island and avoid the LHV and NYC mitigation rules, the low voltage transmission system in Long Island would prevent the interconnection of such large amounts of offshore wind.

[5] The 2020 Gold Book was released after this analysis was completed and forecasts faster peak load growth than the 2019 Gold Book. Thus, the amount of renewable exemptions would be higher using the 2020 Gold Book forecast.

[6] This assumes that out of 1000 MW ICAP, 800 MW is offshore wind and 200 MW is solar.

[7] The total exemption available is not a sum of NYC and LHV caps. Since NYC is a nested locality, the total exemption represents the max of NYC and LHV exemptions.

[8] LHV cap represents any exempt MWs available after exemptions have been awarded to resources interconnecting in NYC.

[9] CASPR introduces a substitution auction that runs immediately after the forward capacity auction to coordinate the entry of new publicly sponsored resources in the capacity market and the exit of older existing capacity resources willing to permanently retire.

 ©Copyright 2020 ICF 

# Will FERC's BSM orders inhibit renewable and battery development in New York?

**Visit us at icf.com/energy**


For more information, contact:

**Ananya Chaurey**
Ananya.Chaurey@icf.com +1.571.459.4067

**George Katsigiannakis**
George.Katsigiannakis@icf.com +1.703.934.3223


twitter.com/ICF
linkedin.com/company/icf-international
facebook.com/ThisIsICF

**About ICF**

ICF (NASDAQ:ICFI) is a global consulting services company with over 7,000 full- and part-time employees, but we are not your typical consultants. At ICF, business analysts and policy specialists work together with digital strategists, data scientists and creatives. We combine unmatched industry expertise with cutting-edge engagement capabilities to help organizations solve their most complex challenges. Since 1969, public and private sector clients have worked with ICF to navigate change and shape the future. **Learn more at icf.com.**


Any views or opinions expressed in this white paper are solely those of the author(s) and do not necessarily represent those of ICF. This white paper is provided for informational purposes only and the contents are subject to change without notice. No contractual obligations are formed directly or indirectly by this document. ICF MAKES NO WARRANTIES, EXPRESS, IMPLIED, OR STATUTORY, AS TO THE INFORMATION IN THIS DOCUMENT.

No part of this document may be reproduced or transmitted in any form, or by any means (electronic, mechanical, or otherwise), for any purpose without prior written permission.

ICF and ICF INTERNATIONAL are registered trademarks of ICF and/or its affiliates. Other names may be trademarks of their respective owners.