Memorandum

TO: Richard J. Dewey

FROM: David B. Patton, Pallas LeeVanSchaick, and Joseph Coscia

DATE: November 4, 2021

RE: MMU Comments on the NYISO's 2021-2030 Comprehensive Reliability Plan

As the Market Monitoring Unit ("MMU") for the NYISO, we are required to provide comments on the Comprehensive Reliability Plan ("CRP") regarding the results of the analysis and the extent to which the current market design fails to provide appropriate incentives for the markets to satisfy Reliability Needs.[1] This memo discusses the results of the 2021-2030 CRP and the implications for the NYISO's market design.

A. Executive Summary

The CRP finds that under base case assumptions, the system meets all applicable reliability criteria for the entire study period. Reliability violations that were identified in the 2020 RNA have been resolved by post-RNA updates to assumptions. However, reliability issues could still arise under alternative scenarios of generation retirements and load growth. The results of the CRP demonstrate ways in which current market design does not provide efficient incentives to satisfy reliability needs. In this memo, we focus on three such shortcomings and recommend improvements to address each of them:

- **The NYISO capacity market does not provide sufficiently granular signals to invest in locations where capacity is needed**. Results of the CRP indicate that generators at different locations within an existing capacity zone do not provide the same resource adequacy benefit. As a result, generators at some locations are over- or under-compensated under the current framework, which has four capacity zones and pays the same price to all generators within a zone. This could lead to premature retirement at locations where reliability is needed, overinvestment at locations where resources provide little reliability value, and barriers to efficient new entry in the interconnection process. We have recommended the NYISO implement C-LMP so that locational variations in the value of capacity can be priced appropriately.

[1] See NYISO MST Section 30.4.6.8.3. "Following the Management Committee vote," the MMU evaluates "whether market rules changes are necessary to address an identified failure, if any, in one of the ISO's competitive markets."

- **The NYISO capacity market does not incentivize an efficient mix of resources to secure reliability as state policies take effect**. The CRP indicates that in the long term, changes driven by state policy will create challenges for maintaining reliability. These include rapid load growth, a shift to a winter-peaking system, and challenges associated with integration of intermittent renewables such as securing available capacity during periods of sustained low intermittent output and meeting afternoon ramp needs. Current methods to establish resources' capacity credit are too simplistic to account for interactions between resources' availability profiles and changing load patterns. We have recommended that the NYISO implement improved capacity accreditation based on each resource's marginal contribution.

- **The NYISO capacity market assumptions are not well-aligned with its transmission security requirements**. The CRP finds that the margin of resources above the minimum needed to comply with steady state transmission security requirements in Zone J is expected to be small in the next decade. However, assumptions about resource availability in transmission security analysis are misaligned from how the same resources participate in the capacity market. This may result in overstated capacity requirements (leading to inflated consumer costs) and poor incentives for some resources to take actions that would contribute to meeting transmission security needs. We recommend that the NYISO consider ways to better align resource availability assumptions in transmission security and the capacity market.

The NYISO is currently evaluating ways to address the second and third issues, which we discuss in Section C of this memo.

B. Overview of 2021-2030 CRP

The CRP is the second step in the NYISO's Reliability Planning Process ("RPP"). In the first step, the Reliability Needs Assessment ("RNA") identifies the Reliability Needs of the system over a 10-year study period based on a set of assumed (i.e., Base Case) conditions and solicits proposals for market-based and regulated solutions. Then, the CRP identifies the solutions that could be used to satisfy the Reliability Needs of the system over the study period. Furthermore, the CRP indicates whether any regulated solution(s) must begin to move forward in order to satisfy the Reliability Needs of the system in any year of the study period. The CRP includes additional analysis related to system reliability, including long-term reliability implications of state energy policies.

The CRP finds that under base case assumptions, the system meets all applicable reliability criteria for the entire study period. The 2020 RNA identified future reliability needs, primarily driven by the impending retirement of peaking capacity in New York City. The NYISO also identified a near-term reliability need in New York City in its Q3 2020 Short Term Assessment of Reliability (Q3 STAR), for which it solicited solutions in 2020.[2] The CRP finds that the previously identified needs have been addressed through a combination of a reduced load forecast (reflecting the impacts of COVID-19), three new 138 kV PAR-controlled feeder

[2] See October 25, 2021 Draft CRP at p. 13

facilities in NYC included in Con Edison's Local Transmission Plan, and a change in the operation of seven 345 kV series reactors proposed by Con Edison.[3] As a result, the NYISO concludes that there are no remaining reliability needs throughout the study period.

C. Comments on the 2021-2030 CRP Results

Although the CRP finds that the system is expected to satisfy reliability criteria under base case assumptions, its findings highlight areas where market design improvements are needed.

1. Locational Value of Capacity

The NYISO capacity market does not provide sufficiently granular signals to invest in locations where capacity is needed. It produces prices for four capacity zones: the rest-of-state region and the NYC, Long Island, and Lower Hudson Valley localities. However, analyses presented in the CRP demonstrate that the value of capacity differs at sub-locations within these capacity zones.

Findings from the CRP

The analyses contained in the CRP indicates that there are differences in the resource adequacy value of resources at different locations within the same capacity zone. For example:

- Capacity in zones A and B provides more resource adequacy benefit than capacity located in zones C-F. Under base case assumptions, approximately 900 MW more perfect capacity could be removed from Zones C-F than from Zone A before violating LOLE criteria in 2024, with this difference narrowing to 100 MW by 2030. This suggests that transmission bottlenecks between zones A/B and C are binding under some conditions and that upstate retirements are more likely to result in reliability issues if they are concentrated in western New York.[4]
- Transmission constraints between Staten Island and the rest of Zone J limit the amount of capacity that can be delivered from Staten Island resources to the rest of the zone. New 138 kV transmission facilities included in Con Edison's Local Transmission Plan (LTP) are anticipated to allow approximately 225 MW of additional capacity in Staten Island to be deliverable beginning in 2025. However, NYISO's MARS topology indicates that capacity in Staten Island will remain bottlenecked even after the ConEdison LTP projects enter service. As a result, a unit of capacity in Staten Island provides less resource adequacy benefit than a unit located elsewhere in Zone J.[5]
- Within the G-J Locality, capacity located in zones H and I could provide more resource adequacy benefit than capacity located in Zone G. The CRP base case finds that, by the

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[3] Con Edison's proposed change in the operation of seven 345 kV series reactors was selected as the solution to the short-term need identified in the Q3 STAR.

[4] See assessment of Zonal Resource Adequacy Margin in the October 25, 2021 Draft CRP at p. 24.

[5] See Figure 8, Appendix C of the CRP (p. 34-35). For example, when all Arthur Kill and Linden Cogen units are available, the J3 to J transfer limit increases by 225 MW to 425 MW with the ConEd LTP projects in service.

late 2020s, improving transmission capability between zones G and H and between zones I and J provides more benefit than improving capability between only zones I and J. This indicates that, although the primary downstate transmission bottleneck is expected to be between zones I and J, constraints affecting reliability between zones G and H/I could also emerge. By contrast, the CRP results indicate that following completion of the AC Transmission Projects, there is no bottleneck between zones F and G (the current capacity zone boundary).[6]

There are many other transmission constraints that are modeled in the resource adequacy model and do not bind in a particular RNA or CRP study, but that could bind if conditions change from the base case assumptions. The CRP illustrates that differences in resource adequacy value between areas are dynamic and fluctuate in magnitude from year to year as the system changes. The findings cited above are derived from the CRP base case, which incorporated only limited changes to the future generation mix and generally does not reflect the impacts of state policy. Hence, the reliability value of capacity at each location is likely to change as the resource mix evolves, but this will not be properly reflected in the NYISO's static four-zone configuration.

Market Design Implications

The capacity market does not adequately signal the reliability benefit (measured by reduction of LOLE) that resources at alternative locations provide. All resources within a capacity zone are paid the same price, even if their impact on LOLE varies by location within that zone. As a result, the market may over- or under-compensate certain resources, provide inefficient locational incentives for entry and exit, and potentially result in a need for future regulated procurements.

Resources in import-constrained areas within a capacity zone are under-compensated relative to the reliability benefit they provide. These resources may face incentives to retire prematurely, and new resources lack adequate incentives to locate in these areas. The recently approved ConEdison LTP projects were necessary in part because of the lack of incentives for new resources to interconnect in import-constrained areas.

Resources in export-constrained areas within a capacity zone (such as Staten Island) are over-compensated relative to the reliability benefit they provide. Consequently, the interconnection process imposes barriers to new efficient investment in such areas. This protects incumbent generators from competition by potential new entrants.

NYISO's current construct for creating or eliminating capacity zones is overly cumbersome and will not be effective at addressing the need to distinguish between the reliability value of resources at different locations as the grid evolves. It is possible that inefficient locational capacity price signals will result in premature retirement or lack of entry in areas where capacity is needed in the coming years, resulting in a need for regulated solutions.

6 See assessment of Binding Interfaces in the CRP at Figure 10, p. 26.

Recommendation

We have recommended that NYISO adopt a locational marginal price of capacity ("C-LMP") framework in our 2020 State of the Market report (see Recommendation #2013-1c).[7] Under this approach, the NYISO would set capacity clearing prices at multiple locations based on the marginal benefit to system reliability for resources at those locations. In the resource adequacy analysis, transmission constraints are represented by the GE MARS topology, and C-LMP would set a clearing price for each location represented in the topology. Hence, the price paid to resources at each location would automatically adjust as the location of bottlenecks changes over time, without the need to create or eliminate localities or to establish separate capacity market demand curves at each location. C-LMP would also provide flexibility to model key constraints identified by transmission security analysis within the resource adequacy framework, resulting in differentiated price signals for resources upstream and downstream of those constraints.

2. Market Enhancements to Support Clean Energy Goals

The CRP considers reliability implications of changes to the NYISO system that will result from state policies. Key state policies include a 70 percent renewable generation mix by 2030, a zero-emissions electricity sector by 2040, and a large-scale reduction of economy-wide emissions through electrification of other sectors.

Findings from the CRP

Analysis performed for NYISO's Climate Change Phase I and Phase II studies, the 2020 RNA '70x30' case, and the CRP conclude the following:

- *Load*: although energy efficiency measures put downward pressure on demand growth, load is likely to grow at rapid rates in the long term due to electrification of transport, heating and other sectors. The transition to electric heating is likely to cause winter peak load to exceed summer peak load. By 2040, NYISO anticipates summer peak demand of 47 GW and winter peak demand of 56 GW.[8]
- *Intermittent generation*: Large quantities of intermittent resources are needed to comply with the state's targets. It will be necessary to ensure that there are sufficient resources available when output of intermittent resources is low. Specific challenges identified by NYISO include periods of sustained (multi-day) low wind output and large ramping needs created by the correlated profile of intermittent resources. NYISO notes that in a scenario with all CLCPA targets satisfied, one-hour ramp requirements could be over 10 GW and a six-hour ramp could exceed 25 GW.[9]

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7 See our 2020 State of the NYISO Market report and MMU presentations to ICAPWG on January 15, 2020, February 6, 2020, February 19, 2020 and March 10, 2020.

8 See October 25, 2021 Draft CRP at pg. 37.

9 See October 25, 2021 Draft CRP at p. 45 and discussion of Extended Wind Lull Analysis in Appendix E of the CRP.

- *Dispatchable generation*: NYISO anticipates that it will be necessary to retain over 24 GW of dispatchable, non-duration limited generation statewide by 2030 and over 35 GW by 2040 to ensure reliability when state goals are met. It is currently unknown what technologies will satisfy the need for dispatchable, non-duration limited resources as the requirement for a zero-emissions system in 2040 approaches.[10]

Market Design Implications

Suppliers are currently accredited to sell capacity based on simplistic rules that generally do not account for interactions between resources. Hence, the capacity market is likely to encourage over-investment in resources with diminishing reliability value and under-investment in complementary resources as the penetration of intermittent and duration-limited resources grows. For example, accreditation of wind resources based on their average output during a season will not capture the effects of correlated wind lulls analyzed in the CRP.

In addition, resource adequacy analysis in GE-MARS currently does not adequately consider correlated unavailability of gas-only and other fuel-limited units during winter periods, correlation between intermittent resources and load patterns, generator startup times, and other factors that will be critical as generation and load patterns change.[11] As a result, the capacity market will not provide signals to attract the most efficient mix of resources to secure reliability as the system changes.

The CRP also suggests that large quantities of flexible resources will be needed to address ramping needs by increasing their output over 1-hour to multi-hour timescales. In the future, improvements to real-time market scheduling and commitment could be needed to efficiently utilize system resources in addressing multi-hour ramping needs.

Recommendation

In our 2020 State of the Market report, we recommended that the NYISO implement an enhanced capacity accreditation framework that values each resource based on its marginal reliability benefit (see Recommendation #2020-3). The NYISO has proposed capacity accreditation reforms as part of its Comprehensive Mitigation Review project.[12] Capacity accreditation rules based on the principle of marginal value will provide incentives to address reliability needs posed by state policies in an efficient manner. For example, marginal accreditation will incentivize development of renewable resources that complement each others' temporal availability and encourage adoption of longer-duration storage technologies and other non-emitting backstop resources when they are needed for reliability. Efficient capacity accreditation should also be applied to conventional resources such as generators that run on only natural gas without backup fuel, which will provide diminished capacity value as winter load increases.

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10 See October 25, 2021 Draft CRP at p. 44-45.

11 See MMU presentation to ICAPWG on August 9, 2021, at p. 20-21.

12 See "Comprehensive Mitigation Review", presented by NYISO to ICAPWG on September 28, 2021.

3. Misalignment between Transmission Security and the Capacity Market

The results of the CRP suggest that reliability issues related to steady state transmission security in downstate zones could arise in the coming decade. The capacity market does not provide efficient signals when zonal capacity market requirements are affected by transmission security considerations because of differences in assumptions between transmission security analysis and the capacity market.

Findings from the CRP

With the CRP base case assumptions, all dynamic stability and steady state thermal loading criteria violations previously identified in the 2020 RNA are resolved. The 2020 RNA identified BPTF steady state transmission security violations in Zone J of 1,075 MW by 2030. The CRP finds that these violations have been addressed through a combination of a reduced load forecast (reflecting the impacts of COVID-19), Con Edison's LTP projects which unbottle some capacity in Staten Island, and a change in the operation of seven 345 kV series reactors proposed by Con Edison.

While the CRP finds that previously identified violations are resolved under base case assumptions, the expected margin of transmission security in the Zone J bulk system is only 50 MW. The 'tipping point' analysis conducted in the CRP indicates that the NYC bulk system would face transmission security violations beginning in 2028 under a 1-in-10 peak load scenario, and beginning in 2025 under a 1-in-100 load forecast scenario. NYISO notes that any combination of load increase and/or generation loss of approximately 400 MW by 2025 would tip the NYC system over its transmission security margin under base case assumptions, with this margin reduced to just 42 MW by 2031. Notably, beginning in 2025 the base case transmission security margin in Zone J is projected to be smaller than the zonal resource adequacy margin in Zone J.[13]

The CRP's transmission security analysis suggests that a relatively small change in generation or load could result in transmission security violations in Zone J in the coming decade. Hence, it is important to ensure that the capacity market provides signals to provide reliability where it is needed. If the capacity market does not incentivize resource retention and/or entry in areas where transmission security violations could emerge, regulated backstop solutions could become necessary to maintain reliability.

Transmission security considerations are partially integrated into the capacity market. The NYISO establishes Transmission Security Limits (TSLs), which set a floor on the Locational Capacity Requirement (LCR) in each capacity zone. These are intended to ensure that the capacity market does not establish requirements which would lead to violations of transmission security criteria. The TSLs are calculated based on a steady state analysis similar to what is performed in the RNA, while the NYCA Installed Reserve Margin (IRM) and the LCRs (if they

[13] See assessment of Zonal Resource Adequacy Margin at p. 24 of the October 25, 2021 Draft CRP.

are not set at the TSL floors) are calculated based on probabilistic resource adequacy studies using GE-MARS. NYISO recently proposed changes to its calculation of the TSLs to better align them with the methodology that is used in planning studies.[14]

However, certain assumptions used in planning studies (and by extension, the TSLs) are inconsistent with compensation in the capacity market, including:

- Wind resources are assumed to provide 0 MW in transmission security.
- Demand response providers in the Special Case Resource (SCR) program are assumed to provide 0 MW in transmission security analysis under normal conditions and in NYISO's proposed calculation of TSLs.
- Large generators provide more value in resource adequacy analyses than transmission security analyses. This is because a single large unit may form part of a contingency which must be secured against in transmission security analysis. For example, in our comments on the 2020 RNA we noted that the transmission security margin in Zone J was reduced by 215 MW due to the presence of the 989 MW Ravenswood 3 unit, compared to the next largest generator contingency. Large generator contingencies also contribute to higher capacity requirements in resource adequacy analysis, but the impact can be much larger when the generator is included in a deterministic transmission security contingency.

These inconsistencies will be partly addressed by the capacity accreditation reforms discussed earlier, which are likely to reduce the capacity credit of the resources above. However, it is unreasonable to continue to assume entire classes of resources provide no reliability benefit as the resource mix evolves. Accordingly, the NYISO recently indicated it is reassessing the transmission security analysis assumptions.[15]

Market Design Implications

An increase in the penetration of resources that are treated differently in resource adequacy and transmission security analyses may cause the LCRs to become inflated, increasing consumer costs. Under NYISO's method for determining TSLs, SCR resources directly cause the TSL to increase, to reflect the fact that they are assumed to provide 0 MW in transmission security analysis. Hence, when the LCR of a capacity zone is set at its TSL-based floor, each additional 1 MW of SCR will cause the LCR to increase by 1 MW. Future wind resources will have a similar effect if they are assumed to provide 0 MW (as is currently assumed in transmission security analysis) when determining the TSL floors. This will cause consumer costs to increase because it ignores any reliability benefit these resources are assumed to provide in the capacity market to the locality in which they are located. This situation may become increasingly common in the

14 See NYISO presentation "Proposed updates to the Transmission Security Limit method for the 2022-2023 Capability Year LCR determinations", presented to ICAPWG on September 9, 2021. See slide 8.

15 *Ibid.* See slide 11.

coming years, as (1) the CRP suggests that the transmission security margin in Zone J is expected to be small, and (2) large quantities of wind are expected to enter Zone J and Zone K.

Different treatment between transmission security and resource adequacy analysis may also cause some resources to be overcompensated. This is the case when a resource genuinely does not contribute towards securing reliability in a zone (because it cannot be relied upon to address a binding transmission security need), but is compensated equivalent to other resources based on its UCAP. As a result, the market will not appropriately incentivize behavior that would contribute to transmission security needs:

- Large resources whose loss could trigger transmission security violations cause the zonal LCR to increase when the TSL floor is binding. Hence, these units provide less effective capacity than they are compensated based on their UCAP. Market participants lack adequate incentives to retire these units and replace them with multiple smaller facilities that do not pose large single contingencies.
- Demand response resources that participate in the SCR program face insufficient incentives to enroll in alternative participation models such as Distributed Resource Aggregations, which have operational requirements that are more reliable for transmission security.

Recommendation

The NYISO has recently indicated that it intends to revisit assumptions related to generator unavailability in transmission security analyses as the resource mix changes.[16] We encourage the NYISO to pursue this effort to ensure that NYISO market signals accurately reflect the system's reliability needs. In particular, this effort should:

- Consider how non-conventional resources such as intermittent resources, demand response and energy storage should be treated in transmission security analyses underlying the TSLs and the Reliability Planning Process. Ensuring that these resources are modeled using reasonable assumptions of availability at critical hours would reduce the divergence between their treatment in the capacity market and transmission security studies.
- Consider discounting payments to capacity suppliers that cause the requirement in the zone where they are located to increase due to transmission security considerations.

D. Conclusions and Recommendations

Overall, we continue to find that the NYISO markets are well-designed and generally provide efficient investment signals. However, we have concerns regarding the current market design's ability to provide efficient incentives to satisfy reliability needs in some situations. These shortcomings could lead to inefficient market outcomes and/or the need for regulated solutions. We identify the following concerns:

16 See NYISO presentation "Proposed updates to the Transmission Security Limit method for the 2022-2023 Capability Year LCR determinations", presented to ICAPWG on September 9, 2021, at p. 11.

- The NYISO capacity market does not provide sufficiently granular signals to invest in locations where capacity is needed. To address this, we recommend that the NYISO implement C-LMP.
- The NYISO capacity market does not incentivize an efficient mix of resources to secure reliability as state policies take effect. To address this, we recommend that the NYISO continue its efforts to enhance capacity accreditation.
- The NYISO capacity market does not provide efficient compensation when requirements are set by transmission security considerations. To address this, we recommend that the NYISO (a) consider whether it is using realistic assumptions to model availability of capacity suppliers in transmission security analysis, and (b) consider discounting payments to certain resources when transmission security limits are binding in the capacity market.