NEW YORK INDEPENDENT SYSTEM OPERATOR
10 Krey Boulevard ♦ Rensselaer, NY 12144

July 8, 2016

By Electronic Delivery

Hon. Kathleen H. Burgess
Secretary
New York State Public Service Commission
Three Empire State Plaza
Albany, New York 12223-1350

Re: Case 15-E-0302 – Proceeding on Motion of the Commission to Implement a Large-Scale Renewable Program and a Clean Energy Standard

Dear Secretary Burgess:

The New York Independent System Operator, Inc. ("NYISO") hereby submits the enclosed Supplemental Comments on the Clean Energy Standard. The NYISO respectfully requests that its comments be accepted into the record of this proceeding pursuant to the Commission's public statement inviting comments during its pendency:

Comments from the public will be accepted at any point while this proceeding is pending, but are requested by June 6, 2016 to ensure full consideration. All public comments will become part of the record considered by the Commission.[1]

Respectfully submitted,

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[1] *See* New York State Public Service Commission, Spotlight on: Clean Energy Standard, Fact Sheet for Utility Consumers, available at http://www3.dps.ny.gov/W/PSCWeb.nsf/96f0fec0b45a3c6485257688006a701a/1008ed2f934294ae85257687006f38bd/$FILE/22678344.pdf/15-E-0302%20CES%20factsheet%204-19-16.pdf.

CERTIFICATE OF SERVICE

I hereby certify that I have this day served the foregoing document upon each person designated on the official service list compiled by the Secretary in this proceeding.

Dated at Rensselaer, NY this 8th day of July 2016.

/s/ John C. Cutting

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STATE OF NEW YORK
PUBLIC SERVICE COMMISSION

Proceeding on Motion of the Commission to Implement a Large-Scale Renewable Program and a Clean Energy Standard **Case 15-E-0302**

SUPPLEMENTAL COMMENTS OF THE NEW YORK INDEPENDENT SYSTEM OPERATOR, INC.

The New York Independent System Operator, Inc. ("NYISO") supports Governor Cuomo's public policy objectives associated with serving 50% of the State's energy with renewable resources by the year 2030 ("50% by 30").[1] The Clean Energy Standard (or "CES") will play a significant role in shaping the bulk power system in New York State ("State") over the next 15 years. The NYISO has concerns over how the New York State Public Service Commission ("Commission") is developing and planning to implement the CES to achieve the 50% by 30 objectives.[2] The NYISO strives to continue collaboration with the Commission to work toward this goal in a manner that will produce the desired salutary effects of reducing

[1] In December 2015, New York State Governor Cuomo directed the Department of Public Service to develop a Clean Energy Standard and to present the Commission a framework for implementing the CES in June 2016. *See* https://www.governor.ny.gov/sites/governor.ny.gov/files/atoms/files/Renewable_Energy_Letter.pdf.

[2] The NYISO's prior comments in this proceeding, submitted on April 22, 2016, expressed concerns regarding the compliance and procurement mechanisms described in the DPS Staff White Paper on CES and potential impacts on wholesale competitive electricity markets and maintaining system reliability.

carbon emissions. However, for the CES initiative to be successful, new renewable resources must be reliably and efficiently integrated into the bulk power system and NYISO's wholesale electric market structure.

The NYISO respectfully submits these comments to assist the Commission as it addresses the complex issues in this proceeding. The NYISO believes that the Commission's record would be incomplete without a fuller discussion of the CES impacts on the State's bulk power system and wholesale electricity markets. As the entity responsible for operating the bulk power transmission system and administering wholesale energy markets in New York, the NYISO's perspectives may help the Commission avoid adverse, unintended, economic and operational consequences in the future. The following comments focus on bulk power system needs, particularly new transmission, and certain wholesale market ramifications associated with the CES initiative as described in the Department of Public Service ("DPS") Staff White Paper on Clean Energy Standard ("DPS Staff White Paper").[3]

I. COMMENTS

A. Electric System Reliability

The NYISO's comments address three principal issues related to system reliability: (i) additional transmission capability necessary to reliably transport energy from renewable resources developed in remote areas, mainly western and northern New York, to New York's southeast load centers, (ii) additional energy and ancillary service requirements necessary to maintain system reliability with the level of intermittent resource penetration required by the CES, and (iii) the State's resource adequacy requirements resulting from the significant additional intermittent resource penetration required by the CES.

[3] The NYISO's prior comments in this proceeding expressed concerns regarding the compliance and procurement mechanisms described in the DPS Staff White Paper.

1. Additional Transmission Capability will be Required to Transfer Energy from Renewable Resources to New York's Load Centers

The DPS Staff White Paper states "the CES program will be required to add an additional 33,700 GWh of renewable energy to meet the 50% by 2030 mandate."[4] The CES Draft Supplemental Environmental Impact Statement prepared for the DPS Staff ("DPS SEIS"), reiterated that approximately 34,000 GWh of new renewable energy supply in 2030 will be required to achieve 50% by 30.[5] The DPS SEIS further assumed that approximately 5,000 GWh of that new supply will be met with "behind-the-meter" generation (such as customer-sited solar PV). Therefore, approximately 29,000 GWh/year of additional energy will have to come from new wholesale renewable generators. The DPS SEIS projects that a mix of approximately 12,000 MW of renewable resources will be developed in response to the CES, bringing New York's total renewable generation capability to over 19,000 MW (including generators in New York State and imports from Ontario and Quebec).[6] The DPS SEIS's projected resource mix for the Base Case Fixed-REC category includes additional resources of approximately 6,800 MW of utility-scale solar, 3,500 MW of land-based wind, 600 MW of conventional hydroelectric, 450 MW of renewable imports, 360 MW of biomass and anaerobic digestion, 200 MW of off-shore wind generation, and 3,000 MW of behind-the-meter solar.[7] Approximately 90%, or 17,000 MW, of New York's total renewable generation is anticipated to locate in Upstate New York

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[4] DPS Staff White Paper at 7.

[5] *See* DPS Draft Supplemental Environmental Impact Statement at http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={5BCF1E9C-3251-441B-8BF0-B17AEBADD2BD}.

[6] *See* DPS SEIS and 2016 NYISO Load and Capacity Data, http://www.nyiso.com/public/webdocs/markets_operations/services/planning/Documents_and_Resources/Planning_Data_and_Reference_Docs/Data_and_Reference_Docs/2016_Load__Capacity_Data_Report.pdf.

[7] *See* DPS SEIS Exhibit 4-1. The DPS SEIS projects this scenario as one possible resource mix.

(*i.e.*, NYISO Zones A-F).[8] The NYISO uses the DPS's projected renewable resource build-out and associated energy production figures (*e.g.*, capacity factors) to facilitate analysis and discussion without endorsing the assumptions of the DPS SEIS.

The DPS SEIS correctly assumes that a large percentage of the new renewable resources will be intermittent, located away from the State's load centers, and distributed over a large geographic area. Such a significant build-out of renewable resources will require new or upgraded transmission facilities on both the bulk power system and the sub-transmission systems to deliver the output of these new resources to the southern and eastern portions of New York State, where demand for electricity is greatest**.** Significant additional transmission system investment will be required to deliver energy from anticipated new renewable resources beyond the AC Transmission and Western New York public policy initiatives now underway, which are important steps to improving operation of the bulk power system that were not included in the DPS SEIS.[9]

i. Additional Bulk Power Transmission System Upgrades are Required

Much of New York's renewable energy capability is located in upstate New York, with additional potential in the Canadian provinces of Ontario and Quebec, requiring upgrades to the bulk power transmission system to deliver the renewable energy to load. The resource mix and geographic distribution of the new renewable resources will dramatically change power flows across the New York State bulk transmission system. Significant additional volumes of renewable energy will have to move east and south across the State to serve load. In order to

[8] *See* DPS SEIS and 2016 NYISO Load and Capacity Data.

[9] The NYISO's prior comments in this proceeding, submitted on April 22, 2016, advised that additional transmission studies were necessary and the results of these studies were likely to indicate the need for additional transmission. As discussed above, the NYISO's review of the DPS SEIS projected resource mix and locational build-out indicates that additional transmission will be needed to deliver the output of new renewable resources across the State to serve load centers.

achieve 50% by 30, the bulk power transmission system must have the capability to deliver all renewable resources' energy production simultaneously. The bulk power transmission system's transfer capability is limited by engineering principles based on the physical capability of the system designed to maintain safe, reliable operations and protect equipment. If the system is undersized at any point between the renewable generator locations and the load centers, renewable generation may likely be curtailed, jeopardizing achievement of 50% by 30 based on the projected build-out in the DPS SEIS.

In order to maximize the yearly average load served by renewable generation, cross-state energy transfers will actually increase as load decreases due to the fact that more renewable generation is available to serve the downstate load. As renewable penetration in the upstate regions outweighs the load in those same regions, additional energy transfers from upstate renewable resources to downstate load centers are necessary, subject to the transmission system capability. A lower total system load allows a higher percentage of load to be served by renewable resources. Curtailment of renewable generation to maintain transmission system reliability, consistent with the NYISO's 2010 Wind Study finding, would quickly jeopardize achievement of 50% by 30 because energy will not be deliverable from renewable resources to downstate load centers.

The anticipated renewable generation development and cross-state energy transfer increases are significant compared to the existing system flows. Transmission system constraints already materialize at a number of interfaces in the west to east and north to south directions across the State during certain system conditions. Additional renewable resources built in the western and northern portions of the State will exacerbate the transmission constraints that limit energy transfers across the State. The NYISO has begun analyzing potential new transmission

facilities to help accommodate additional renewable resource build-out throughout western and northern New York. Based on the volume of new renewable generation resources and the locations for build-out projected in the DPS SEIS, the NYISO estimates that one likely transmission development scenario could require nearly 1,000 miles of new bulk power transmission, in addition to the AC Transmission and Western New York public policy initiatives now underway, to avoid frequent west to east transmission constraints in the future.

ii. Additional Sub-Transmission System Upgrades are Required

Sub-transmission systems (*i.e.*, 69 to 138 kV transmission facilities) will also require significant investment to bring the renewable energy from renewable resource sites to the bulk power transmission system. The sub-transmission system must have the capability to transfer intermittent renewable resources' full energy output to the bulk power system in order to fully utilize qualifying energy production from these resources. Undersized sub-transmission systems may result in renewable energy generation being curtailed to maintain local electric system reliability.

As the CES progresses, and the asset mix and locations become clearer, the NYISO will conduct further analyses of both the bulk and sub-transmission upgrades necessary for the CES to be accomplished.

iii. Transmission Planning

The NYISO recommends that the Commission consider future transmission system needs as soon as possible in order to meet the timeline envisioned in the CES. The Commission should be planning for a broad range of plausible generation development scenarios. For example, new lines should be built on double circuit towers to provide space for additional transmission lines to

be built on existing towers in the future.[10] The Commission must consider next steps now for transmission development to align with the CES timeframes.

The question of how much additional transmission is required to implement the CES is technically complex and likely to carry material additional costs beyond the upgrades now under consideration in the AC Transmission and Western New York proceedings. The DPS Staff and New York Transmission Owners are currently engaged in a State Resource Planning ("SRP") study to identify the system impacts of additional renewable resource build-out.[11] The SRP study will be examining transmission facilities that may be needed in 2030 to meet various public policies, but there are, as of this date, no findings for the Commission, the NYISO, and the other affected stakeholders to consider and critique. Given the potential gravity and magnitude of the CES-related transmission additions, the NYISO believes it would be prudent for the Commission to study this question in depth before taking any final action to implement the 50% by 30 initiative.

2. Operational Tools and Market Products may need to Evolve for Reliable New York Control Area System Operations

The NYISO also reviewed the potential impact of intermittent resource build-out, as required by the CES, from an operational perspective. Power systems are dynamic, and are affected by factors that change in real-time by the second, minute, and hour. It is essential that

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[10] *See also Well-Planned Electric Transmission Save Customer Costs: Improved Transmission Planning is Key to the Transition to a Carbon Constrained Future*, The Brattle Group, A WIRES Report (Pfeifenberger, Chang) (June 2016) ("Brattle Report") available at **http://www.brattle.com/system/publications/pdfs/000/005/295/original/Well-Planned_Electric_Transmission_Saves_Customer_Costs_-_Improved_Transmission_Planning_is_Key_to_the_Transition_to_a_Carbon_Constrained_Future.pdf?1465246946**. "Constructing a single circuit line on double circuit towers (as was done for the CREZ buildout in Texas) or constructing a higher voltage line but operating it at lower voltage levels are examples of ways to create low-cost options that are valuable in the presence of uncertainty." *See* Brattle Report at 13.

[11] *See* the New York State Department of Public Service's presentation to the NYISO Management Committee, December 17, 2015, available at http://www.nyiso.com/public/webdocs/markets_operations/committees/mc/meeting_materials/2015-12-17/Agenda%2004_NYSDPS%20SRP%20Presentation_revised.pdf.

throughout each of these time horizons balance be maintained between the load on the system and the available supply of generation. In New York, a significant investment has been made in competitive markets and market systems to help meet system reliability needs with the optimal set of resources. Naturally, as the system evolves to include more variable resources, operational tools and market products will also need to evolve. The NYISO is committed to continuing its efforts to meet these challenges.

Two key metrics that impact power system operations are the amount of expected load and its variability. System load profiles will be significantly impacted as the penetration of wind and solar facilities grows (particularly at the levels required to comply with the CES), as experienced in California and other states. As higher magnitude ramping events occur on the bulk power system and as variable generation increases, it will be necessary to commit proportionately more flexible resources on dispatch. The expected load profiles will lead to more pronounced up-ramp and down-ramp patterns that have not historically been experienced and managed by system operators. The current energy market design provides real-time price signal incentives and cost guarantee incentives for resources that are able to ramp quickly. However, more significant up-ramp and down-ramp patterns may require the development of new market products to procure sufficient flexible resources necessary to maintain system reliability.

The NYISO will continue to evaluate how to evolve existing market products and operational tools to maintain system reliability. For example, the NYISO expects an increase in the average regulation requirement across all hours of the year, in order to manage second-to-second variability across the system, as a result of the renewable resource development necessary to comply with the CES. The NYISO will also need to enhance its operator decision support

tools to increase operator situational awareness and enable the operation of the future bulk power systems with significant penetration of variable generation.

As the CES progresses, the NYISO will further evaluate the ramifications of significant additional intermittent resources on electric system operations in New York through more specific analyses of New York Control Area-wide needs. The NYISO will work with its stakeholders to develop the tools and products needed to maintain reliability of New York's bulk power system.

3. Installed Capacity Requirement ("ICR") and Installed Reserve Margin ("IRM") Impacts

The New York State Reliability Council ("NYSRC") conducts an annual probabilistic assessment to determine the amount of capacity required to maintain a 1 day-in-10 year loss of load expectation ("LOLE"). The resulting Installed Capacity Requirement ("ICR") is then converted into an Installed Reserve Margin ("IRM"). The IRM has generally ranged between 15% and 18% in recent years. The primary driver of the ICR and IRM is expected generation resource performance (*i.e.*, resource availability) during periods when system loads are highest (*e.g.*, on-peak summer hours). Given the State's existing generation mix, the weighted average performance of capacity resources across peak hours is in the 90% range. As a general rule, new entry of resources that perform below the system average places upward pressure on the IRM, while new entry of resources that perform above the system average places downward pressure on the IRM. Significant levels of new entry of intermittent renewable resources, *e.g.*, wind and solar, are expected to decrease the average system performance.

The NYISO estimated the impact that the 50% by 30 renewable energy requirement is likely to have on the IRM, as that resource mix is described in Exhibit 4-1 of the DPS SEIS and

shown in Table 1 below ("DPS SEIS resource mix").[12] Exhibit 4-1 of the DPS SEIS identifies specific resource types for the Base Case Fixed-REC scenario, which includes expected renewable resource levels for land-based wind, utility-scale solar, hydro, biomass, offshore wind, and renewable imports. The NYISO also included behind-the-meter solar in its analysis because penetration is forecasted to be significant by 2030.

The NYISO estimates that the DPS SEIS resource mix will increase the IRM from 17.5% to between 40% and 45%. The estimated increase in the IRM resulting from the DPS SEIS resource mix will require the State to maintain an additional amount of nameplate capacity (*i.e.*, Installed Capacity) significantly greater than required today.

It is important to understand that the increase in the IRM is necessary to maintain reliability. With the increased IRM requirement, the NYISO markets need to retain and attract resources to support the proposed renewable resource build-out. The increased capacity requirement will be largely met by the additional capacity contribution of the proposed renewable resources. The NYISO will be required to ensure that the installed capacity revenues will be sufficient to maintain resource adequacy in conformance with NYSRC rules.

The NYISO's analysis began with the 2016 IRM base case and assessed the incremental impact of the DPS SEIS resource mix. Table 1 identifies the expected new entry for each resource type in the DPS SEIS resource mix or, in the case of behind-the-meter solar, the new entry that is expected to be online by 2030.[13] The NYISO then estimated the incremental ICR and IRM impact for each resource type of the expected 14,910 MW of additional renewable resources.

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[12] *See* DPS SEIS at http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={5BCF1E9C-3251-441B-8BF0-B17AEBADD2BD}.

[13] The NYISO has also included behind-the-meter solar as penetration is expected to be significant by 2030.

Table 1

	New Resource Type (MW)	Estimated Resource Unavailability (%)	Additional ICR Impact (MW)	Estimated IRM Impact (%)
Existing Fleet	*N/A*	*N/A*	*N/A*	*17.5%*
Land-based Wind	3,500	86%	3,010	9%
Utility-scale Solar	6,800	55%	3,740	11%
Hydro[14]	600	47%	283	<1%
Biomass/ADG	360	21%	77	<1%
Offshore Wind	200	53%	107	<1%
Imports	450	61%	N/A	N/A
BTM Solar	3,000	55%	1,650	5%
Total	14,910		8,867	~ 40-45%

The NYISO used historic performance data to estimate the incremental IRM impact for additional land-based wind and solar resources while using the implicit capacity factors defined from the DPS SEIS Base Case Fixed-REC scenario for hydroelectric, biomass, offshore wind and imports. Historically, the NYISO's land-based wind performance data indicates a performance of about 14% during on-peak hours (*e.g.*, estimated wind resource unavailability of 86%).[15] While the impact of solar facilities on the IRM has not been as widely studied as wind facilities, the NYISO assumed that utility-scale solar facilities have a value of 45% performance during on-peak hours.[16] The overall system-average performance is much better than the wind and solar performance; therefore, the NYISO estimates that each additional installed MW of

[14] The NYISO's analysis assumed the hydroelectric capacity shown in DPS SEIS Table 4-1. If the NYISO were to assume long-term committed Canadian hydroelectric imports with historically high performance factors, those resources would put downward pressure on the IRM percentage.

[15] *See* New York Control Area Installed Capacity Requirement Technical Study report at http://nysrc.org/pdf/Reports/2016%20IRM%20Tech%20Study%20Report%20Final%2012-15-15.pdf.

[16] *Id*.

wind and solar will put upward pressure on the IRM.[17] The NYISO estimated the IRM impact from behind-the-meter solar to be similar to utility-scale solar.[18] Based on the implicit capacity factors defined in the DPS SEIS base case, hydroelectric, biomass and offshore wind also perform below the system average and, therefore, will put further upward pressure on the IRM. Import capacity did not impact the NYISO's estimate of the IRM in Table 1, as only imports with longer-term capacity market commitments are considered in the IRM determination.

In summary, the renewable intermittent penetration assumed in the DPS SEIS suggests that the State's capacity requirements will need to increase materially to satisfy the NYSRC's present LOLE requirements. The exact capacity requirement increase will depend on the specific mix of new renewable resources; but, the increase will be largely met by the additional capacity contribution of the proposed renewable resources. The cost associated with this change will be affected by a number of factors which cannot be determined at this time. It would be premature to speculate on whether the increased IRM will translate into increased consumer costs. The NYISO is committed to work with all affected parties to best reflect the impact that the additional intermittent, renewable resources needed to achieve the CES will have on the State's resource adequacy needs.

B. Nuclear Generators are a Critical Bridge to New York's Clean Energy Goals

Retaining all existing nuclear generators is critical to the State's carbon emission reduction requirements as well as maintaining electric system reliability. Quick implementation of a short-term program is necessary to retain the State's nuclear generation resources for the near future. In 2015, the existing nuclear generators produced 44,620 GWh of energy or 31% of

[17] Solar may also be located downstate which will have an effect on the Location Capacity Requirement (LCR).

[18] Behind-the-meter solar would impact the IRM differently, through modeling of load forecast uncertainty, but for the sake of this analysis it was assumed to have a similar magnitude impact as that of the utility-scale solar.

the energy generated within New York State. The NYISO believes a short-term nuclear retention program is a necessary bridge to retain existing, zero-emission nuclear generators until a market-based solution can be implemented. The NYISO agrees with the DPS Staff White Paper's assertion that "forward progress in reducing carbon also requires steps to ensure that existing, safe emission-free sources of electricity remain operational."[19] The NYISO will continue to collaborate with the DPS Staff to develop an approach that is consistent with the existing wholesale market structure to achieve this important bridge.

C. Longer Term Market-Based Solutions

As noted above, the NYISO believes that the Commission should quickly proceed with a short-term solution to retain nuclear generation. At the same time, the NYISO intends to explore with its stakeholders market mechanisms to internalize the cost of carbon emissions within wholesale electricity prices. The ultimate goal of this effort is to examine potential mechanisms to retain nuclear generation and to incent renewable development so that the CES objectives can be harmonized with the wholesale markets.

II. CONCLUSION

The competitive wholesale electric markets have provided, and will continue to provide, significant benefits to the State and its electricity consumers, including fuel cost savings, improved generation efficiency, reduced reserve requirements, reduced emissions, and increased renewable generation. The NYISO respectfully requests that the Commission consider the structure and benefits of the wholesale electric markets and the bulk power system ramifications outlined above while developing its Clean Energy Standard order. The CES should be structured to enable the NYISO to maintain bulk electric system reliability after increased renewable

[19] DPS Staff White Paper at 27.

energy penetration. The NYISO supports the Commission in this matter and looks forward to future collaboration.

Dated: July 8, 2016

Respectfully submitted,

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