ICAP Manual – DER Updates

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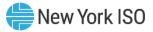
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ICAPWG/MIWG

May 23, 2023

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Agenda

- **Background & Overview**

- **Draft Manual Language for Discussion**
  - ICAP Manual
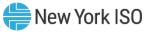 - Attachment J

- **Next Steps**

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Background & Overview

- To support the deployment of the DER Participation Model, NYISO seeks stakeholder feedback on draft language that will be included in NYISO Manuals, Guides, & Technical Bulletins.

- Before NYISO seeks approval of draft manual language, stakeholder input on the concepts must be solicited and captured in the documents by staff.

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Background & Overview

- Today's discussion will review updates to the ICAP Manual and Attachment J of the ICAP Manual.

  - An initial partial draft of Attachment J was reviewed at the April 27 ICAPWG

- Updates include 1) responses to feedback received at, or shortly after, the April 27 ICAPWG and 2) new content added to Attachment J.

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Draft Manual Language for Discussion

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ICAP Manual

Updates based on feedback and new content

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ICAP Manual Updates
(<mark>green</mark> highlights in posted draft)

- ## 4.1.3 DER and Aggregations
  - Included a reference to the provisional DMNC language in the Aggregation Manual – provisional DMNC enables uninterrupted capacity market participation for resources switching from SCR or standalone capacity market participation into the DER participation model.

- ## 4.5 Calculation of the Amount of Unforced Capacity each Resource may Supply to the NYCA
  - Included reference to the Duration Adjustment Factor/Capacity Accreditation Factor to be used in calculating DER unavailability.
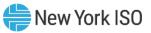
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Attachment J

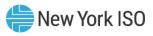New York ISO

ICAP Manual – Appendix Attachment J

- **Draft Attachment J section 3.9 includes UCAP equations for all viable types of Aggregations:**
  - Discussed at the April 27, 2023, ICAPWG:
    - DER Aggregation with no Demand Reduction and without an EDL
    - ESR Aggregation without an EDL
    - ESR Aggregation with an EDL
  - Included in today's revised draft (<u>Section Headings of NEW Aggregation Types are <mark>highlighted green)</mark></u>:
    - Three previous Aggregation types
      - Includes some clarifying revisions based on feedback (refer to slide 10)
    - New Aggregation Types:
      - DER Aggregation with no Demand Reduction and with an EDL
      - DER Aggregation with Demand Reduction and without an EDL
      - DER Aggregation with Demand Reduction and with an EDL
      - Generator Aggregation without an EDL (AEFORd)
      - Generator Aggregation with an EDL (Energy Limited Resource) (AEFORd)
      - Generator Aggregation without an EDL (AOF)
      - Generator Aggregation with an EDL (Energy Limited Resource) (AOF)
      - Intermittent Power Resource (IPR) Aggregation

- **There will be a corresponding Section to address changes taking effect with the 2024 Capability Year, including replacement of DAF with CAF, for example.**

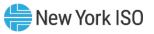New York ISO

Feedback from April 27th ICAPWG

- **Adjustments to equations/terms/index variables used throughout:**
  - '*der*' updated to '*d*'
    - Resource type-specific index variables applied when appropriate
  - Re-definition of certain terms (*e.g.,* ICAP MW$_{am}$) to improve clarity
  - Introduction of '*n*' to define historical months applied in *Average Unavailability Factor* calculation
  - Removal of DMNC language – replaced with reference to ICAP Manual Sections containing details on DMNC test requirements if Aggregation is time-stacking

- **Various additional ministerial corrections (*e.g.,* spelling errors)**

- **ESR Unavailability Factor redlines included in Section 3.9.5 only – Section 3.9.6 contains copy/pasted language from 3.9.5**

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ICAP Manual – Appendix: Attachment J
UCAP for DER Aggregations without Demand Reduction and with an EDL

$UCAP^{Q}_{am}$ is the amount of Unforced Capacity that Aggregation *a* is qualified to provide in month *m:*

$$UCAP^{Q}_{am} = (1 - AUF_{am}) * (ICAP_{am} * Duration\ Adjustment\ Factor_{am})$$

Where:

- *ICAP$_{am}$* is the total ICAP MW for Aggregation *a* which is calculated on a monthly basis by taking the minimum of consecutive sustained output from all individual DERs comprising the Aggregation;

- *Duration Adjustment Factor$_{am}$* is the Duration Adjustment Factor for Aggregation *a* which is applicable for month *m*, pursuant to Section 4.1.1 of this *ICAP Manual*.

- *AUF$_{am}$ (Average Unavailability Factor$_{am}$)* is the Derating Factor calculated for DER Aggregation *a* that will be used to determine the amount of Unforced Capacity that an Aggregation will be permitted to provide in month *m*; and it is further defined on next slide.

ICAP Manual – Appendix: Attachment J
UCAP for DER Aggregations without Demand Reduction and with an EDL

$$AUF_{am} = 1 - \frac{(Aggregation\ DER\ Contributions_{am})}{ICAP\ MWh_{am}}$$

Where:

- $ICAP\ MWh_{am}$ is the summation of each $ICAP\ MWh_{dm}$ contribution in Aggregation a for month m;

- $Aggregation\ DER\ Contributions_{am}$ is the MWh contribution from all DERs in Aggregation a for month m; and is calculated as follows:

$$Aggregation\ DER\ Contributions_{am} = \sum_{d \in a_m} ICAP\ MWh_{dm} \times (1 - AUF_{dm})$$

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ICAP Manual – Appendix: Attachment J

UCAP for DER Aggregations without Demand Reduction and with an EDL

Where:

- $ICAP\ MWh_{dm}$ is the contribution of each DER's ICAP MW in Aggregation *a* for month *m,* multiplied by the number of hours that the DER will contribute to the Aggregation time-stacking.

$$ICAP\ MWh_{dm} = \left(min\left(DMNC_{dm,}, CRIS_{dm}, Total\ Supply\ Declared\ Value_{dm}\right)\right) x (Elected\ Timestacking\ hour(s))$$

Where:

- $DMNC_{dm}$ is the Demonstrated Maximum Net Capability for the individual DER *d* for month *m*; for an Aggregation that has an EDL and is time-stacking, the DMNC is based on the rules detailed in ICAP Manual Sections 4.2.2.1 and 4.2.2.2.

- $CRIS_{dm}$ is the Capacity Resource Interconnection Service Value for the individual DER *d* for month *m;*

- *Total Supply Declared Value $_{dm}$* is the MW amount reflecting the Total capability of the DER *d*, and may be equal to or less than the *DER CRIS* or *DER DMNC* for the month *m;*

- *Elected Timestacking hour(s)* is the declared number of hours that a DER will contribute to the Aggregation's total time stacked duration. – value must be a whole number greater than or equal to 1.

When an Aggregation is time-stacking, the Average Unavailability Factor applied to the Aggregation-level reflects the ratio of total available MWhs and the total nameplate MWhs each based on the composite of DERs comprising the Aggregation.

ICAP Manual – Appendix: Attachment J

UCAP for DER Aggregations without Demand Reduction and with an EDL

And:

- AUF_{dm} is the Average Unavailability Factor value for the individual DER d in a given month m. If month m is in the Winter Capability Period, then AUF_{dm} will be equal to the average of the two previous Winter Capability Period Unavailability Factor values calculated for the DER d. If month m is in the Summer Capability Period, then AUF_{dm} will be equal to the average of the two previous Summer Capability Period Unavailability Factor values calculated for the DER d.

$$AUF_{dm} = \frac{\sum_n Unavailability\ Factor\ _{an}}{12}$$

Where:

- *Unavailability Factor$_{am}$* is the Unavailability Factor for Aggregation a that contains the DER d in month n.

- n represents each of the 12 months included in the previous two Capability Periods (summer or winter) depending on the value of m.

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ICAP Manual – Appendix: Attachment J
UCAP for DER Aggregations without Demand Reduction and with an EDL

The Unavailability Factor value for each individual DER d for each month in the calculation of AUF_{dm}, will be calculated based on historic unavailability of the Aggregation:

Where:

$$Unavailability\ Factor_{an} = 1 - \left(\frac{Total\ Available\ ICAP\ Seconds_{an}}{Total\ Expected\ ICAP\ Seconds_{an}}\right)$$

Where:

- *Total Available ICAP Seconds$_{an}$* is the sum of Total Available ICAP Seconds of Aggregation *a* in months *n*;

- *Total Expected ICAP Seconds$_{an}$* is the sum of seconds in all real-time intervals in months *n* in which Aggregation *a* was not on a planned or scheduled outage;
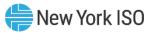
Total Available ICAP Seconds$_{an}$ and *Total Expected ICAP Seconds$_{an}$* are further defined in Attachment J of the ICAP Manual.

ICAP Manual – Appendix: Attachment J

UCAP for DER Aggregations without Demand Reduction and with an EDL

Determining the ICE of the Amount of UCAP Supplied:

$$ICE_{am} = \left(\frac{UCAP^{P}_{am}}{(1 - AUF_{am}) * (Duration\ Adjustment\ Factor_{am})} \right)$$

Where:

- ICE_{am} is the Installed Capacity Equivalent of the amount of Unforced Capacity that Aggregation *a* supplies in month *m*;

- *UCAP*$^{P}_{am}$ as above, is the amount of Unforced Capacity that Aggregation *a* supplies in month *m*;

- *AUF*$_{am}$ *(Average Unavailability Factor$_{am}$)* as above, is the Derating Factor calculated for Aggregation *a* that will be used to determine the amount of Unforced Capacity that resource will be permitted to provide in month *m*;

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ICAP Manual – Appendix: Attachment J

UCAP for DER Aggregations with Demand Reduction and without an EDL

The calculation of UCAP for this Aggregation type follows the same steps as the calculation in Section 3.9.2 with the following exceptions:

- Average Unavailability Factor and ICAP MW do not reflect time stacking

- Demand Reduction is included in calculation of ICAP MW.

$$Aggregation\ DER\ Contributions_{am} = \sum_{d \in a_m} ICAPMW_{dm} \times (1 - AUF_{dm})$$

ICAP Manual – Appendix: Attachment J

UCAP for DER Aggregations with Demand Reduction and without an EDL

Where:

- $ICAP\ MW_{dm}$ the summation of ICAP MW for each individual injection capable and demand reduction capable DER d which is applicable for month m, and is calculated uniquely for each DER depending on the capabilities of the DER.

If the DER is capable of only injection:

$$ICAP_{dm} = min\left(DMNC_{dm,}\ CRIS_{dm}, Total\ Supply\ Declared\ Value_{dm}\right)$$

If the DER is capable of only demand reduction:

$$ICAP_{dm} = min\left(DMNC_{dm,} Total\ Supply\ Declared\ Value_{dm}\right)$$

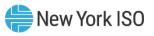If the DER is capable of both injection and demand reduction:

$$
\begin{aligned}
ICAP_{dm} \\
= min\left(Demand\ Reduction\ DMNC_{dm,}, Demand\ Reduction\ MW\ Declared\ Value_{dm}\right) \\
+ min\left(Injection\ DMNC_{dm,}, CRIS_{dm}, Injection\ MW\ Declared\ Value_{dm}\right)
\end{aligned}
$$

ICAP Manual – Appendix: Attachment J

UCAP for DER Aggregations with Demand Reduction and without an EDL

Where:

- *$DMNC_{dm}$* is the Demonstrated Maximum Net Capability for the individual DER *d* for month *m*;

- *$CRIS_{dm}$* is the Capacity Resource Interconnection Service Value for the individual DER *d* for month *m*;

- *Total Supply Declared Value$_{dm}$* is the MW amount reflecting the total capability of the DER *d*, and may be equal to or less than the *DER CRIS* or *DER DMNC* for the month *m*;

- *Demand Reduction DMNC MW$_{dm}$* is the demonstrated amount of Demand Reduction only during a DMNC test by DER *d*

- *Demand Reduction MW Declared Value$_{dm}$* is the declared MW amount reflecting only the demand reduction capability of a DER *d*

- *Injection DMNC$_{dm}$* is the demonstrated amount of injection only during a DMNC test by DER *d*

- *Injection MW Declared Value$_{dm}$* is the declared MW amount reflecting only the injection capability of a DER *d*

ICAP Manual – Appendix: Attachment J
UCAP for DER Aggregations with Demand Reduction and with an EDL

- **The calculation of UCAP for this Aggregation type follows the same steps as the calculation in Section 3.9.2 with the following exceptions:**
  - Demand Reduction is included in calculation of ICAP MW.
- **Please refer to slides 18 and 19 for ICAP MW calculation details as applied in Section 3.9.4**

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ICAP Manual – Appendix: Attachment J
UCAP for Generator Aggregations (EFORd based on GADS data)

$$UCAP_{am}^{Q} = (1 - AEFORd_{am}) * (ICAP_{am} * Duration\ Adjustment\ Factor_{am})$$

- *$AEFORd_{am}$ (Average Equivalent Demand Forced Outage Rate$_{am}$) is the Derating Factor calculated for Generator Aggregation a that will be used to determine the amount of Unforced Capacity that an Aggregation will be permitted to provide in month m; The Average Equivalent Demand Forced Outage Rate applied to the Aggregation-level reflects the ratio of total available MWs and the total ICAP MWs each based on the composite of all facilities comprising the Aggregation.*

$$AEFORd_{am} = 1 - \left(\frac{Aggregation\ Facility\ Contributions_{am}}{ICAP\ MW_{am}} \right)$$

Where:

- *$ICAP\ MW_{am}$ is the summation of each $ICAP\ MW_{dm}$ contribution in Aggregation a for month m;*
- *$Aggregation\ Facility\ Contributions_{am}$ is the MW contribution from all facilities in Aggregation a for month m; and is calculated in next slide:*

ICAP Manual – Appendix: Attachment J
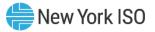## UCAP for Generator Aggregations without an EDL

$$Aggregation\ Facility\ Contributions_{am} = \sum_{f \in a_m} ICAPMW_{fm} \times (1 - AEFORdf_m)$$

Where:

ICAP MW$_{fm}$ is the ICAP MW for each individual facility f which is applicable for month m; and is calculated as follows:

$$ICAP_{fm} = min\big(DMNC_{fm,}, CRIS_{fm}, Total\ Supply\ Declared\ Value_{fm}\big)$$

- $DMNC_{fm}$ and $CRIS_{fm}$ are consistent with current definitions for this type of technology in Attachment J of the ICAP Manual.
- $Total\ Supply\ Declared\ Value_{fm}$ is the MW amount reflecting the Injection capability of the facility f, and may be equal to or less than the facility CRIS or facility DMNC for the month m;.

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ICAP Manual – Appendix: Attachment J
UCAP for Generator Aggregations without an EDL

And:

AEFORd$_{fm}$ is the Average Equivalent Demand Forced Outage Rate for the individual facility *f*. The *AEFORd$_{fm}$* value for each individual facility *f* for month *m*, will be calculated based on historic unavailability of the assets *z* comprising the facility *f*, weighted based on the nameplate MW values of each asset:
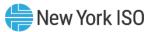
$$AEFORdf_m = \frac{\sum_{z \in f}(AEFORd_{zm} * NC_{zm})}{\sum_{z \in f}(NC_{zm})}$$

Where:

- *NC$_{zm}$* is the nameplate capacity MW rating of asset *z* in month *m*

- *AEFORd$_{zm}$* is the Average Equivalent Demand Forced Outage Rate for asset z in for month *m*, calculated as follows:

$$AEFORd_{zm} = \frac{\sum_n EFORd_{zn}}{2}$$

Where:

- *EFORd$_{zn}$* is the Equivalent Demand Forced Outage Rate for asset *z* within facility *f* for the 6-month period ending in any given month *n*. This term is further defined in currently effective Attachment J, in alignment with UCAP calculations for individual Generators (section 3.1 UCAP based on EFORd*)*

- *n* represents each of the 6 months included in the previous two Capability Periods (Summer or Winter) depending on the value of *m*.

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ICAP Manual – Appendix: Attachment J
UCAP for Generator Aggregations without an EDL

Determining the ICE of the Amount of UCAP Supplied:

$$ICE_{am} = \left(\frac{UCAP_{am}^{P}}{(1 - AEFORd_{am}) * (Duration\ Adjustment\ Factor_{am})} \right)$$

Please refer to the prior sections for definition of each term included in this equation.

ICAP Manual – Appendix: Attachment J

UCAP for Generator Aggregations with an EDL (Energy Limited Resource)

The calculation of UCAP for this Aggregation type follows the same steps as the calculation in Section 3.9.7 with the following exception:

- Average Unavailability Factor and ICAP MW reflect time stacking

$$UCAP_{am}^{Q} = (1 - AEFORD_{am}) * (ICAP_{am} * Duration\ Adjustment\ Factor_{am})$$

Where:

$$AEFORd_{am} = 1 - \left(\frac{Aggregation\ ELR\ Contributions_{am}}{ICAP\ MWh_{am}} \right)$$

- $ICAP\ MWh_{am}$ is the summation of each ELR's ICAP MW contribution in Aggregation a for month m, multiplied by the number of hours that the ELR will contribute to the Aggregation time-stacking.

- *Aggregation ELR Contributions*$_{am}$ is the MWh contribution from all Energy Limited Resources in Aggregation a for month m; and is calculated in next slide:

ICAP Manual – Appendix: Attachment J
UCAP for Generator Aggregations with an EDL (Energy Limited Resource)

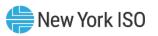$$Aggregation\ ELR\ Contributions_{am} = \sum_{d \in a_m} ICAP\ MWh_{dm} \times AEFORd_{dm}$$

- $ICAP\ MWh_{dm}$ is the summation of ICAP MW for each individual ELR d, which is applicable for month m, multiplied by the number of hours that the ELR d will contribute to the Aggregation time-stacking, and is calculated as follows:

$$ICAP\ MWh_{dm} = \left(min\left(DMNC_{dm,}, CRIS_{dm}, Total\ Supply\ Declared\ Value_{dm} \right) \right) x (Elected\ Timestacking\ hour(s))$$

- $DMNC_{dm}$ was previously defined for an Aggregation that has an EDL and is based on the rules detailed in ICAP Manual Sections 4.2.2.1 and 4.2.2.2.

- $CRIS_{dm}$ was previously defined.

- $Total\ Supply\ Declared\ Value_{fm}$ was previously defined.

- $Elected\ Timestacking\ hour(s)$ is the declared number of hours that an ELR will contribute to the Aggregation's total time stacked duration – value must be a whole number greater than or equal to 1.

And:

- $AEFORd_{dm}$ is the Average Equivalent Demand Forced Outage Rate for the individual ELR d. The $AEFORd_{dm}$ value for each individual ELR d for month m, will be calculated based on historic unavailability of the assets z comprising the ELR d, weighted based on the nameplate MW values of each asset and is calculated in the same way as for Generator Aggregations without an EDL – refer to Section 3.9.7.

ICAP Manual – Appendix: Attachment J

UCAP for Generator Aggregations with an EDL (Energy Limited Resource)

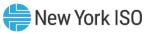Determining the ICE of the Amount of UCAP Supplied:

$$ICE_{am} = \left(\frac{UCAP_{am}^{P}}{(1 - AEFORd_{am}) * (Duration\ Adjustment\ Factor_{am})} \right)$$

Please refer to the prior sections for definition of each term included in this equation.

ICAP Manual – Attachment J

- Sections 3.9.9 and 3.9.10 address the calculation of UCAP for the following Aggregation types:
  - Generator Aggregations (Average Outage Factor based on GADS-equivalent data)
  - EDL Aggregations (Average Outage Factor based on GADS-equivalent data)
- Calculation of ICAP MW, ICAP MWh, ICE, and AOF adhere to the steps outlined in Sections 3.9.7 and 3.9.8, respectively.
- Calculation of Average Outage Factor adheres to the individual DER and Aggregation average and weighting logic captured in the previous sections.
  - Calculation of Outage Factor for each asset adheres to the formulae captured in the currently effective Attachment J Section 3.2

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ICAP Manual – Appendix: Attachment J
UCAP for Intermittent Power Resource (IPR) Aggregations

$$UCAP_{am}^{Q} = ProdF_{am} * (ICAP_{am} * Duration\ Adjustment\ Factor_{am})$$

Where:

- $UCAP_{am}^{Q}$ was previously defined.
- $ICAP_{am}$ was previously defined.
- *Duration Adjustment Factor$_{am}$* was previously defined.
- *ProdF$_{am}$* is the production factor calculated for Aggregation *a* that will be used to determine the amount of Unforced Capacity that an Aggregation will be permitted to provide in month *m.*

Where:

$$ProdF_{am} = \left(\frac{Aggregation\ IPR\ Contributions_{am}}{ICAP\ MW_{am}} \right)$$

ICAP Manual – Appendix: Attachment J
UCAP for Intermittent Power Resource (IPR) Aggregations
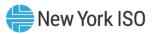
Where:

$$Aggregation\ IPR\ Contributions_{am} = \sum_{d \in a_m} ICAP_{dm} \times ProdF_{dm}$$

Where:

$ICAP_{dm}$ is the ICAP MW for each individual IPR *d* which is applicable for month *m,* and is calculated as follows:

$$ICAP_{dm} = min\left(NC_{dm,}, CRIS_{dm}, Total\ Supply\ Declared\ Value_{dm}\right)$$

- NC_{dm} is the nameplate capacity for the individual IPR *d* for month *m.*
- $CRIS_{dm}$ was previously defined.
- *Total Supply Declared Value$_{dm}$* was previously defined.

ICAP Manual – Appendix: Attachment J
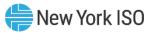## UCAP for Intermittent Power Resource (IPR) Aggregations

And:

- $ProdF_{dm}$ is the Production Factor value for the individual IPR d.

$$ProdF_{dm} = \frac{\sum_n ProdF_{an}}{3}$$

Where:

- $ProdF_{an}$ is the production factor for Aggregation a that contained the IPR d in month n;

- n represent a month included in the previous like Peak load month (Summer or Winter) depending on the value of m.
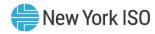
The Production Factor value for each individual IPR d for each month n in the calculation of $ProdF_{dm}$, will be calculated based on historic production of the Aggregation. This term is further defined in currently effective Attachment J, in alignment with UCAP calculations for individual IPRs (section 3.4)

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ICAP Manual – Appendix: Attachment J
UCAP for Intermittent Power Resource (IPR) Aggregations

Determining the ICE of the Amount of UCAP Supplied:

$$ICE_{a,m} = \left(\frac{UCAP_{am}^{P}}{ProdF_{am} * (Duration\ Adjustment\ Factor_{am})} \right)$$

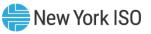Please refer to the prior sections for definition of each term included in this equation.

Next Steps

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Next Steps

- Please provide feedback to the NYISO by COB Tuesday, May 30.

- NYISO will post any subsequent revisions to redlined documents on the website.

- Please send any questions, comments, or feedback that were not addressed during this presentation
to: DER_Feedback@nyiso.com

  - Comments/feedback submitted to the NYISO may be posted publicly unless the NYISO is specifically asked not to do so.

New York ISO

Our Mission & Vision

Mission
Ensure power system reliability and competitive markets for New York in a clean energy future

Vision
Working together with stakeholders to build the cleanest, most reliable electric system in the nation

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Questions?

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