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# Draft ICAP Manual Attachment J – UCAP for Aggregations (DER & Single Resource Type)

## 3.9 Calculation of UCAP for Aggregations

This Section describes the procedure for calculating Unforced Capacity values for Aggregations. Aggregations can either be 1) 'DER' Aggregations, which may be comprised of a heterogenous combination of technology types, or one or more Demand Side Resources, or 2) 'Single Resource Type' Aggregations ("SRT," henceforth referred to using the applicable technology-type classification, e.g., 'Solar Aggregation' or 'ESR Aggregation').

Aggregation Unforced Capacity adheres to the following formula:

$$AggregationUCAPMW_{a,m} = (Aggregation\ ICAP\ MW_{a,m} * Duration\ Adjustment\ Factor_{am}\ \sout{Duration\ Adjustment\ Factor}) * (100\% - AggregationDeratingFactor_{a,m})$$

As illustrated in the following sections, the inputs considered in an Aggregation's Unforced Capacity value calculation may vary depending on Aggregation Type, whether the Aggregation elects an Energy Duration Limitation ("EDL"), and whether the Aggregator chooses to 'time-stack' individual DER within an Aggregation to satisfy a minimum duration of 2,4, 6, or 8 hours for the Aggregation. Key concepts as applied throughout this section 3.9 include:

- Adjusted ICAP = Aggregation ICAP * DAF
- Duration Adjustment Factor (DAF) is the Duration Adjustment Factor expressed as a percentage, for an Aggregation *a* which is applicable for the month *m*, pursuant to Section 4.1.1 of this *ICAP Manual* and Section 5.12.14 of the *ISO Services Tariff.*
- An Aggregation's ICAP MW is the sum of all individual DER ICAP MWs for a given auction month. Importantly, the ICAP MW for each individual DER is a function of several variables, including:
    - Type of Aggregation in which the DER participates.
    - Demand Side Resource participation within the DER.
    - Time-stacking, dependent on the presence of an EDL.
    - DMNC MW
    - CRIS MW
    - Total Supply Declared Value MW
        - *This is not a tariff-defined term, it is used in the NYISO's Aggregation System to inform the total MW capability of an individual DER and ultimately the Aggregation – this value reflects the Demand Reduction, Injection, and Withdrawal capabilities of the individual DER, and may be less than or equal to the CRIS or DMNC for a given Capability Period.*
- Derating Factor – the Derating Factor for a given Aggregation is calculated consistent with the type of Aggregation. For Generator Aggregation types, the Derating Factor calculation uses GADS data based on EFORd– such information is derived from the individual, GADS-

reporting 'assets' within each individual DER comprising an Aggregation that is classified as a 'Single Resource Type' Generator Aggregation. For Availability-based Aggregation types (DER; ESR) and Production-based Aggregation types (Wind, Solar, Landfill Gas), the Derating Factor calculation employs an Aggregation-level average of historic production data. 'Single Resource Type' LESR Aggregations are not permitted to participate in the ISO-administered Capacity market.

- Please refer to the ICAP Manual and Services Tariff Section 5.12 for more information regarding the requirements applicable to DER when switching from one Aggregation to another. DER historic data is carried over when switching to a new Aggregation of the same 'type' as its previous Aggregation. DER availability data is replaced with the default class average for the given 'type' when the DER moves to an Aggregation of a new 'type.'

The following subsections outline the procedure for calculating the Unforced Capacity values for:

1. DER Aggregations without Demand Reduction capability and without an EDL (3.9.1)
2. DER Aggregations without Demand Reduction capability and with an EDL (3.9.2)
3. DER Aggregations with Demand Reduction capability without an EDL (3.9.3)
4. DER Aggregations with Demand Reduction capability with an EDL (3.9.4)
5. ESR Aggregations without an EDL (3.9.5)
6. ESR Aggregations with an EDL (3.9.6)
7. Generator Aggregations (EFORd based on GADS data)
8. Energy Limited Resource (ELR) Aggregations (EFORd based on GADS data)
9. Generator Aggregations (AOF based on GADS-equivalent data)
10. Energy Limited Resource (ELR) Aggregations (AOF based on GADS-equivalent data)
11. Intermittent Power Resource (IPR) Aggregations (3.9.11)

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## 3.9.1 Procedure for calculating Unforced Capacity values for DER Aggregations without Demand Reduction and without an EDL

### (a) Determining the Amount of UCAP an Aggregation Qualifies to Supply

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

***Where:***

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

$ICAP_{am}$ *is* the total ICAP MW for Aggregation *a* in month *m,* which is calculated by summing the ICAP MW values for all individual DER comprising the Aggregation.

$Duration\ Adjustment\ Factor_{am}$ is the Duration Adjustment Factor for Aggregation *a* in month *m*, pursuant to Section 4.1.1 of this *ICAP Manual*.

$AUF_{am}$ *(Average Unavailability Factor*$_{am}$) is the Derating 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:***

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

The Average Unavailability Factor applied to the Aggregation-level reflects the ratio of total available MWs and the total ICAP MWs each based on the composite of all DER comprising the Aggregation.

$ICAP\ MW_{am}$ is the summation of each $ICAP\ MW_{dm}$ contribution in Aggregation *a* for month *m,*

Aggregation DER Contributions~~$_{am}$~~ is the sum of MW contributions from each individual DER *d* in Aggregation *a* for month *m*; and is calculated as follows:

***Where:***

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

***Where:***

$ICAP\ MW_{\sout{der}\ dm}$ is the ICAP MW for each individual DER *d~~er~~* which is applicable for month *m,* and is calculated as follows:

$$ICAP_{d\sout{er}m} = min(DMNC_{d\sout{er}m,}, CRIS_{d\sout{er}m}, Total\ Supply\ Declared\ Value_{d\sout{er}\ m})$$

$DMNC_{\ d\sout{er}\ m}$ is the Demonstrated Maximum Net Capability for the individual DER *d~~er~~* for month *m*;

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*CRIS* $_{der\ m}$ is the Capacity Resource Interconnection Service Value for the individual DER *der* for month *m;*

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

***And:***

$AUF_{der\ ms}$ is the Average Unavailability Factor value for the individual DER *der* in a given month *m*. If month *m* is in the Winter Capability Period, then $AUF_{der\ sm}$ will be equal to the average of the two previous Winter Capability Period Unavailability Factor values calculated for the DER *der*. If month *m* is in the Summer Capability Period, then $AUF_{dersm}$ will be equal to the average of the two previous Summer Capability Period Unavailability Factor values calculated for the DER *der*. $AUF_{dersm}$ is calculated as follows:

$$AUF_{der ms} = \frac{\sum_{n\ m \in s} Unavailability\ Factor_{a\ mn}}{126}$$

***Where:***

$Unavailability\ Factor_{anm}$ is the monthly *m* Unavailability Factor for Aggregation *a* that contains the DER *der* in month *n.* *m* in the capability period *s*

*n* represents each of the historical 12 months included in the two Winter Capability Periods preceding month *m*, if *m* is a month in the Winter Capability Period, and the two Summer Capability Periods preceding month *m*, if *m* is a month in the Summer Capability Period.

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

***Where:***

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

*Total Available ICAP Seconds*$_{amn}$ is the sum of Total Available ICAP Seconds$_{amn}$ for months *nm*;

*Total Expected ICAP Seconds*$_{amn}$ is the sum of seconds in all real-time in months *nm* in which Aggregation *a* was not on a planned or scheduled outage;

***Where:***

Total Available ICAP Seconds$_{amn}$ and Total Expected ICAP Seconds$_{amn}$ are further defined below:

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$$Total\ Available\ ICAP\ Seconds_{a\sout{m}n} = \sum_{h=b}^{e} Total\ Available\ ICAP\ Seconds_{ah}$$

$$Total\ Expected\ ICAP\ Seconds_{a\sout{m}n} = \sum_{h=b}^{e} Total\ Expected\ ICAP\ Seconds_{ah}$$

***Where:***

*Total Available ICAP Seconds*$_{ah}$ is the sum of the Available ICAP Seconds for each hour h in the month~~s~~ ~~*m*~~*n*;

*Total Expected* ~~*Monthly*~~ *ICAP Seconds*$_{ah}$ is the sum of seconds in all real-time intervals for each hour h in the month~~s~~ ~~*m*~~*n* in which Aggregation *a* was not on a planned or scheduled outage;

*b* is the beginning hour of month~~s~~ ~~*m*~~*n*; and

*e* is the last hour month~~s~~ ~~*m*~~*n*.

***Where:*** Total Available ICAP Seconds$_{ah}$ and Total Expected ~~Monthly~~ ICAP Seconds$_{ah}$ are further defined below:

$$Total\ Available\ ICAP\ Seconds_{ah} = \sum_{i=x}^{y} (min(1, UOL\ Availability_{ai}) \times Interval\ Seconds_{ai})$$

$$Total\ Expected\ \sout{Month}ICAP\ Seconds_{ai} = \sum_{i=x}^{y} Interval\ Seconds_{ai}$$

***Where:***

UOL Availability$_{ai}$ measures the ratio of Aggregation *a*'s UOL$_N$ that is available for a given interval *i* to the ICAP equivalent of UCAP sold;

Interval Seconds$_{ai}$ is the number of seconds in each real-time interval *i* for Aggregation *a* in month~~s~~ *n*~~*m*~~, except for real-time intervals *i* when Aggregation *a* is fully unavailable due to a planned or maintenance outage, Interval Seconds$_{ai}$ will be set to zero (0);

x is the first real-time interval in month~~s~~ ~~*m*~~*n*; and
y is the last real-time interval in month~~s~~ *n*~~*m*~~.

***Where:*** UOL Availability$_{ai}$, is further defined below:

$$UOL\ Availability_{ai} = \frac{min(UOL_{Nai}, ICE_{a\sout{h}i})}{min(ICE_{ai\sout{h}}, Adjusted\ ICE_{ai})}$$

***Where:***

UOL$_{Nai}$ is the Normal Upper Operating Limit for Aggregation *a* that is available to the Real-Time Market system, measured in MW. For real-time intervals *i* when Aggregation *a* is adjusted down due to a NYISO or TO reliability need, the UOL$_{Nai}$ will be set equal to the Aggregation's Bid UOL;

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$ICE_{ai}$ is the Installed Capacity Equivalent of the amount of Unforced Capacity that Aggregation *a* supplies in the month ~~*m*~~containing interval *i*, measured in MW;

Adjusted $ICE_{ai}$ is the Installed Capacity Equivalent of the amount of Unforced Capacity that Aggregation *a* supplies for real-time interval *i*, accounting for any derates that result from planned and maintenance outages while Aggregation *a* remains available for operation, measured in MW;

**(b) Determining the ICE of the Amount of UCAP Supplied**

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

***Where:***

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

$UCAP^{P~~Q~~}_{am}$ 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*;

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

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## 3.9.2 Procedure for calculating Unforced Capacity values for DER Aggregations without Demand Reduction and with an EDL

### (a) Determining the Amount of UCAP an Aggregation Qualifies to Supply

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

***Where:***

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

$ICAP_{am}$ 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 DER 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 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:***

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

$ICAP\ MWh_{am}$ 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 *d* in Aggregation *a* for month *m*; and is calculated as follows:

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

***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 *d* will contribute to the Aggregation time-stacking.

***Where:***

*$ICAP\ MWh_{dm}$ is further defined below:*

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

$DMNC_{dm}$ 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.

$AUF_{dm}$ 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*. $AUF_{dm}$ is calculated as follows:

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

***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.*

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:***

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

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

*Total Expected ICAP Seconds*$_{an}$ is the sum of seconds in all real-time intervals in month *n* in which Aggregation *a* was not on a planned or scheduled outage;

***Where:***

Total Available ICAP Seconds$_{an}$ and Total Expected ICAP Seconds$_{an}$ are further defined below:

$$Total\ Available\ ICAP\ Seconds_{an} = \sum_{h=b}^{e} Total\ Available\ ICAP\ Seconds_{ah}$$

$$Total\ Expected\ ICAP\ Seconds_{an} = \sum_{h=b}^{e} Total\ Expected\ ICAP\ Seconds_{ah}$$

***Where:***

*Total Available ICAP Seconds*$_{ah}$ is the sum of the Available ICAP Seconds for each hour *h* in the month *n*;

*Total Expected ICAP Seconds*$_{ah}$ is the sum of seconds in all real-time intervals for each hour *h* in the month *n* in which Aggregation *a* was not on a planned or scheduled outage;

*b* is the beginning hour of month *n*; and

*e* is the last hour of month *n*.

***Where:*** Total Available ICAP Seconds$_{ah}$ and Total Expected ICAP Seconds$_{ah}$ are further defined below:

$$Total\ Available\ ICAP\ Seconds_{ah} = \sum_{i=x}^{y} (min(1, UOL\ Availability_{ai}) \times Interval\ Seconds_{ai})$$

$$Total\ Expected\ ICAP\ Seconds_{ai} = \sum_{i=x}^{y} Interval\ Seconds_{ai}$$

***Where:***

UOL Availability$_{ai}$ measures the ratio of Aggregation *a*'s UOL$_N$ that is available for a given interval *i* to the ICAP equivalent of UCAP sold;

Interval Seconds$_{ai}$ is the number of seconds in each real-time interval *i* for Aggregation *a* in month *n*, except for real-time intervals *i* when Aggregation *a* is fully unavailable due to a planned or maintenance outage, Interval Seconds$_{ai}$ will be set to zero (0);

*x* is the first real-time interval in month *n*; and
*y* is the last real-time interval in month *n*.

***Where:*** UOL Availability$_{ai}$, is further defined below:

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$$UOL\ Availability_{ai} = \frac{min(UOL_{Nai}, ICE_{ai})}{min(ICE_{ai}, Adjusted\ ICE_{ai})}$$

***Where:***

$UOL_{Nai}$ is the Normal Upper Operating Limit for Aggregation *a* that is available to the Real-Time Market system, measured in MW. For real-time intervals *i* when Aggregation *a* is adjusted down due to a NYISO or TO reliability need, the $UOL_{Nai}$ will be set equal to the Aggregation's Bid UOL;

$ICE_{ai}$ is the Installed Capacity Equivalent of the amount of Unforced Capacity that Aggregation *a* supplies in the month containing interval *i*, measured in MW;

Adjusted $ICE_{ai}$ is the Installed Capacity Equivalent of the amount of Unforced Capacity that Aggregation *a* supplies for real-time interval *i*, accounting for any derates that result from planned and maintenance outages while Aggregation *a* remains available for operation, measured in MW;

**(b) 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*;

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

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## 3.9.3 Procedure for calculating Unforced Capacity values for DER Aggregations with Demand Reduction without an EDL

### (a) Determining the Amount of UCAP an Aggregation Qualifies to Supply

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

***Where:***

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

$ICAP_{am}$ *is* the total ICAP MW for Aggregation *a* in month *m,* which is calculated by summing the ICAP MW values for all individual DER comprising the Aggregation.

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

$AUF_{am}$ *(Average Unavailability Factor*$_{am}$) is the Derating 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:***

$$AUF_{am} = \left(1 - \left(\frac{Aggregation\ \ DER\ Contributions_{am}}{ICAPMW_{am}}\right)\right)$$

The Average Unavailability Factor applied to the Aggregation-level reflects the ratio of total available MWs and the total ICAP MWs each based on the composite of all DER comprising the Aggregation.

$ICAP\ MW_{am}$ is the summation of each $ICAP\ MW_{dm}$ contribution in Aggregation *a* for month *m,*

Aggregation DER Contributions$_{am}$ is the sum of MW contributions from each individual DER in Aggregation *a* for month *m*; and is calculated as follows:

***Where:***

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

***Where:***

$ICAP\ MW_{dm}$ is 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:

*1)* If the DER is capable of only injection:

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

*2)* If the DER is capable of only demand reduction:

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

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

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

***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;*

***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*. $AUF_{dm}$ is calculated as follows:

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

***Where:***

*Unavailability Factor*$_{an}$ 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.*

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:***

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

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

*Total Expected ICAP Seconds*$_{an}$ is the sum of seconds in all real-time intervals in month *n* in which Aggregation *a* was not on a planned or scheduled outage;

***Where:***

*Total Available ICAP Seconds*$_{an}$ and *Total Expected ICAP Seconds*$_{an}$ are further defined below:

$$Total\ Available\ ICAP\ Seconds_{an} = \sum_{h=b}^{e} Total\ Available\ ICAP\ Seconds_{ah}$$

$$Total\ Expected\ ICAP\ Seconds_{an} = \sum_{h=b}^{e} Total\ Expected\ ICAP\ Seconds_{ah}$$

***Where:***

*Total Available ICAP Seconds*$_{ah}$ is the sum of the Available ICAP Seconds for each hour *h* in the month *n*;

*Total Expected ICAP Seconds*$_{ah}$ is the sum of seconds in all real-time intervals for each hour *h* in the month *n* in which Aggregation *a* was not on a planned or scheduled outage;

*b* is the beginning hour of month *n*; and

*e* is the last hour of month *n*.

***Where:*** *Total Available ICAP Seconds*$_{ah}$ and *Total Expected ICAP Seconds*$_{ah}$ are further defined below:

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$$Total\ Available\ ICAP\ Seconds_{ah} = \sum_{i=x}^{y} (min(1, UOL\ Availability_{ai}) \times Interval\ Seconds_{ai})$$

$$Total\ Expected\ ICAP\ Seconds_{ai} = \sum_{i=x}^{y} Interval\ Seconds_{ai}$$

***Where:***

*UOL Availability*$_{ai}$ measures the ratio of Aggregation *a*'s $UOL_N$ that is available for a given interval *i* to the ICAP equivalent of UCAP sold;

*Interval Seconds*$_{ai}$ is the number of seconds in each real-time interval *i* for Aggregation *a* in month *n*, except for real-time intervals *i* when Aggregation *a* is fully unavailable due to a planned or maintenance outage, *Interval Seconds*$_{ai}$ will be set to zero (0);

*x* is the first real-time interval in month *n*; and
*y* is the last real-time interval in month *n*.

***Where:*** UOL Availability$_{ai}$, is further defined below:

$$UOL\ Availability_{ai} = \frac{min(UOL_{Nai}, ICE_{ai})}{min(ICE_{ai}, Adjusted\ ICE_{ai})}$$

***Where:***

*UOL*$_{Nai}$ is the Normal Upper Operating Limit for Aggregation *a* that is available to the Real-Time Market system, measured in MW. For real-time intervals *i* when Aggregation *a* is adjusted down due to a NYISO or TO reliability need, the *UOL*$_{Nai}$ will be set equal to the Aggregation's Bid UOL;

*ICE*$_{ai}$ is the Installed Capacity Equivalent of the amount of Unforced Capacity that Aggregation *a* supplies in the month containing interval *i*, measured in MW;

*Adjusted ICE*$_{ai}$ is the Installed Capacity Equivalent of the amount of Unforced Capacity that Aggregation *a* supplies for real-time interval *i*, accounting for any derates that result from planned and maintenance outages while Aggregation *a* remains available for operation, measured in MW;

**(b) Determining the ICE of the Amount of UCAP Supplied**

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

***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*;

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

Redlines reflect updates since April 27 ICAPWG to existing formulae – green highlighted section headings reflect new Aggregation types not included at the April 27 ICAPWG

## 3.9.4 Procedure for calculating Unforced Capacity values for DER Aggregations with Demand Reduction and with an EDL

### (a) Determining the Amount of UCAP an Aggregation Qualifies to Supply

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

***Where:***

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

$ICAP_{am}$ 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 DER 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 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:***

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

$ICAP\ MWh_{am}$ 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:

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

***Where:***

$ICAP\ MWh_{dm}$ is 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 *d* depending on the capabilities of the DER:

*1)* If the DER is capable of only injection:

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

*2)* If the DER is capable of only demand reduction:

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

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

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

**To inform the following:**

$$ICAP\ MW_{dm}\ x\ (Elected\ Timestacking\ hour(s))$$

***Where:***

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

*Demand Reduction DMNC MW*$_{dm}$ is the demonstrated amount of Demand Reduction only during a DMNC test by DER *d* based on the rules detailed in ICAP Manual Sections 4.2.2.1 and 4.2.2.2.

*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* based on the rules detailed in ICAP Manual Sections 4.2.2.1 and 4.2.2.2.

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

*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.

$AUF_{dm}$ 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*. $AUF_{dm}$ is calculated as follows:

Redlines reflect updates since April 27 ICAPWG to existing formulae – green highlighted section headings reflect new Aggregation types not included at the April 27 ICAPWG

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

***Where:***

*Unavailability Factor*$_{an}$ 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.*

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:***

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

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

*Total Expected ICAP Seconds*$_{an}$ is the sum of seconds in all real-time intervals in month *n* in which Aggregation *a* was not on a planned or scheduled outage;

***Where:***

*Total Available ICAP Seconds*$_{an}$ and *Total Expected ICAP Seconds*$_{an}$ are further defined below:

$$Total\ Available\ ICAP\ Seconds_{an} = \sum_{h=b}^{e} Total\ Available\ ICAP\ Seconds_{ah}$$

$$Total\ Expected\ ICAP\ Seconds_{an} = \sum_{h=b}^{e} Total\ Expected\ ICAP\ Seconds_{ah}$$

***Where:***

*Total Available ICAP Seconds*$_{ah}$ is the sum of the Available ICAP Seconds for each hour *h* in the month *n*;

*Total Expected ICAP Seconds*$_{ah}$ is the sum of seconds in all real-time intervals for each hour *h* in the month *n* in which Aggregation *a* was not on a planned or scheduled outage;

*b* is the beginning hour of month *n*; and

*e* is the last hour of month *n*.

***Where:*** *Total Available ICAP Seconds*$_{ah}$ and *Total Expected ICAP Seconds*$_{ah}$ are further defined below:

Redlines reflect updates since April 27 ICAPWG to existing formulae – green highlighted section headings reflect new Aggregation types not included at the April 27 ICAPWG

$$Total\ Available\ ICAP\ Seconds_{ah} = \sum_{i=x}^{y} (min(1, UOL\ Availability_{ai}) \times Interval\ Seconds_{ai})$$

$$Total\ Expected\ ICAP\ Seconds_{ai} = \sum_{i=x}^{y} Interval\ Seconds_{ai}$$

***Where:***

*UOL Availability*$_{ai}$ measures the ratio of Aggregation *a*'s $UOL_N$ that is available for a given interval *i* to the ICAP equivalent of UCAP sold;

*Interval Seconds*$_{ai}$ is the number of seconds in each real-time interval *i* for Aggregation *a* in month *n*, except for real-time intervals *i* when Aggregation *a* is fully unavailable due to a planned or maintenance outage, *Interval Seconds*$_{ai}$ will be set to zero (0);

*x* is the first real-time interval in month *n*; and
*y* is the last real-time interval in month *n*.

***Where:*** UOL Availability$_{ai}$, is further defined below:

$$UOL\ Availability_{ai} = \frac{min(UOL_{Nai}, ICE_{ai})}{min(ICE_{ai}, Adjusted\ ICE_{ai})}$$

***Where:***

$UOL_{Nai}$ is the Normal Upper Operating Limit for Aggregation *a* that is available to the Real-Time Market system, measured in MW. For real-time intervals *i* when Aggregation *a* is adjusted down due to a NYISO or TO reliability need, the $UOL_{Nai}$ will be set equal to the Aggregation's Bid UOL;

$ICE_{ai}$ is the Installed Capacity Equivalent of the amount of Unforced Capacity that Aggregation *a* supplies in the month containing interval *i*, measured in MW;

*Adjusted* $ICE_{ai}$ is the Installed Capacity Equivalent of the amount of Unforced Capacity that Aggregation *a* supplies for real-time interval *i,* accounting for any derates that result from planned and maintenance outages while Aggregation *a* remains available for operation, measured in MW;

**(b) Determining the ICE of the Amount of UCAP Supplied**

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

***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*;

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

Redlines reflect updates since April 27 ICAPWG to existing formulae – green highlighted section headings reflect new Aggregation types not included at the April 27 ICAPWG

## 3.9.5 Procedure for calculating Unforced Capacity values for ESR Aggregations without an EDL

### (a) Determining the Amount of UCAP an Aggregation Qualifies to Supply

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

***Where:***

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

$ICAP_{am}$ is the total ICAP MW for Aggregation $a$ which is calculated on a monthly basis by summing the ICAP MW values for all individual ESR comprising the Aggregation $a$;

$Duration\ Adjustment\ Factor_{am}$ 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 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:***

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

The Average Unavailability Factor applied to the Aggregation-level reflects the ratio of total available MWs and the total ICAP MWs each based on the composite of all ESR comprising the Aggregation.

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

$Aggregation\ ESR\ Contributions_{am}$ is the MW contribution from all ESR $d$ in Aggregation $a$ for month $m$; and is calculated as follows:

***Where:***

$$Aggregation\ ESR\ Contributions_{am} = \sum_{\text{~~esr~~}d \in a_m} ICAP MW_{\text{~~esr~~}d\text{-}m} \times (1 - AUF_{\text{~~esr~~}d\text{-}\text{~~s~~}m})$$

***Where:***

$ICAP\ MW_{\text{~~esr~~}d\text{-}m}$ is the ICAP MW for each individual ESR ~~*esr-*~~$d$ which is applicable for month $m$; and is calculated as follows:

$$ICAP_{d\text{~~esr~~}m} = min\left(DMNC_{d\text{~~esr~~}m}, CRIS_{d\text{~~esr~~}m}, Total\ Supply\ Declared\ Value_{d\text{~~esr~~}m}\right)$$

$DMNC\text{-}_{d\text{~~esr~~}m}$ is the Demonstrated Maximum Net Capability for the individual ESR $d$~~*esr*~~ for month $m$;

Redlines reflect updates since April 27 ICAPWG to existing formulae – green highlighted section headings reflect new Aggregation types not included at the April 27 ICAPWG

*CRIS*~~-esr~~*d*~~-m~~ is the Capacity Resource Interconnection Service Value for the individual ESR ~~*esr*~~*d* ~~-~~for month *m;*

*Total Supply Declared Value* ~~-esr~~*d*~~-m~~ is the MW amount reflecting the Injection capability of the ESR ~~*esr*~~*d*, and may be equal to or less than the *ESR CRIS* or *ESR DMNC* for the month *m;*

***And:***

$AUF_{~~esr~~d~~-s~~m}$ is the Average Unavailability Factor value for the individual ESR ~~*esr*~~*d* in a given month *m*. If month *m* is in the Winter Capability Period, then $AUF_{~~esr~~d~~-s~~m}$ will be equal to the average of the two previous Winter Capability Period Unavailability Factor values calculated for the ESR ~~*esr*~~*d*. If month *m* is in the Summer Capability Period, then $AUF_{~~esr~~d ~~s~~m}$ will be equal to the average of the two previous Summer Capability Period Unavailability Factor values calculated for the ESR ~~*esr -*~~*d* $AUF_{d~~esrs~~m}$ is calculated as follows:~~:~~

$$AUF_{~~esr~~d~~-m s~~} = \frac{\sum_{n~~m \in s~~} Unavailability\ Factor_{\ a~~m~~n}}{12~~6~~}$$

***Where:***

$Unavailability\ Factor_{a~~m~~n}$ is the ~~monthly *m*~~ Unavailability Factor for Aggregation *a* that contains the ESR ~~*esr -*~~*d* in month~~s~~ *n.~~m~~* ~~in the capability period *s*~~

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

The Unavailability Factor value for each individual ESR ~~*esr -*~~*d* for each month in the calculation of $AUF_{d~~esr~~~~-m s~~}$, will be calculated based on historic unavailability of the Aggregation:

***Where:***

$$Unavailability\ Factor_{a~~m~~n} = 1 - \left(\frac{Total\ Available\ ICAP\ Seconds_{a~~m~~n}}{Total\ Expected\ ICAP\ Seconds_{a~~m~~n}}\right)$$

$Total\ Available\ ICAP\ Seconds_{a~~m~~n}$ is the sum of $Total\ Available\ ICAP\ Seconds_{a~~m~~n}$ for each month *m*;

$Total\ Expected\ ICAP\ Seconds_{a~~m~~n}$ is the sum of seconds in all real-time in month~~s~~ *n~~m~~* in which Aggregation *a* was not on a planned or scheduled outage;

***Where:*** $Total\ Available\ ICAP\ Seconds_{a~~m~~n}$ and $Total\ Expected\ ICAP\ Seconds_{a~~m~~n}$ are further defined below:

$$Total\ Available\ ICAP\ Seconds_{a~~m~~n} = \sum_{h=b}^{e} Total\ Available\ ICAP\ Seconds_{ah}$$

Redlines reflect updates since April 27 ICAPWG to existing formulae – green highlighted section headings reflect new Aggregation types not included at the April 27 ICAPWG

$$Total\ Expected\ ICAP\ Seconds_{a\sout{m}n} = \sum_{h=b}^{e} Total\ Expected\ ICAP\ Seconds_{ah}$$

***Where:***

*Total Available ICAP Seconds*$_{ah}$ is the sum of the Available ICAP Seconds for each hour ~~*h*~~ *i* in the month~~s~~ *n*~~m~~;

*Total Expected* ~~*Monthly*~~ *ICAP Seconds*$_{ah}$ is the sum of seconds in all real-time intervals for each hour *h* in the month~~s~~ *n*~~m~~ in which Aggregation *a* was not on a planned or scheduled outage;

*b* is the beginning hour of month~~s~~ *n*~~m~~; and

*e* is the last hour month~~s~~ *n*~~m~~.

***Where:*** *Total Available ICAP Seconds*$_{ah}$ and *Total Expected* ~~*Monthly*~~ *ICAP Seconds*$_{ah}$ are further defined below:

$$Total\ Available\ ICAP\ Seconds_{ah} = \sum_{i=x}^{y} (min(1, UOL\ Availability_{ai}, LOL\ Availability_{ai}, Storage\ Availability_{ai}, Energy\ Level\ Availability_{ai}) \times Interval\ Seconds_{ai})$$

$$Total\ Expected\ \sout{Month}ICAP\ Seconds_{ai} = \sum_{i=x}^{y} Interval\ Seconds_{ai}$$

***Where:***

*UOL Availability*$_{ai}$ measures the ratio of Aggregation *a*'s UOL$_N$ that is available for a given interval *i* to the ICAP equivalent of UCAP sold;

*LOL Availability*$_{ai}$ measures the ratio of Aggregation *a*'s LOL$_N$ that is available for a given interval *i* to the negative ICAP equivalent of UCAP sold;

*Storage Availability*$_{ai}$ measures the ratio of Aggregation *a*'s real-time storage limits to the ICAP equivalent of storage sold for a given interval *i*;

*Energy Level Availability*$_{ai}$ measures the ratio of Aggregation *a*'s real-time Energy Level at the first interval *i* of hour *r* to the sum of its *DAM Energy*$_{ar}$ and *DAM Reserves*$_{ar}$ schedule for hour *r*. *Energy Level Availability*$_{ai}$ will be applicable to all real-time intervals *i* occurring within hour *r*. If Aggregation *a* is adjusted due to a NYISO or TO reliability need, *Energy Level Availability*$_{ai}$ will be 100% for all remaining real-time intervals *i* of the applicable day;

*Interval Seconds*$_{ai}$ is the number of seconds in each real-time interval *i* for Aggregation *a* in month~~s~~ *n*~~m~~, except for real-time intervals *i* when Aggregation *a* is fully unavailable due to a planned or maintenance outage, *Interval Seconds*$_{ai}$ will be set to zero (0);

*x* is the first real-time interval in month~~s~~ *n*~~m~~; and
*y* is the last real-time interval in month~~s~~ *n*~~m~~.

Redlines reflect updates since April 27 ICAPWG to existing formulae – green highlighted section headings reflect new Aggregation types not included at the April 27 ICAPWG

***Where:*** *UOL Availability*$_{ai}$, *LOL Availability*$_{ai}$, *Storage Availability*$_{ai}$, and *Energy Level Availability*$_{ai}$ are further defined below:

$$UOL\ Availability_{ai} = \frac{min(UOL_{Nai}, ICE_{ai\sout{h}})}{min(ICE_{ai\sout{h}}, Adjusted\ ICE_{ai})}$$

$$\text{LOL Availability}_{ai} = \frac{\max(\text{LOL}_{\text{N}ai}, -\text{ICE}_{ah}, \text{NWL}_{ai\sout{h}})}{\max(-\text{ICE}_{ai\sout{h}}, -\text{Adjusted ICE}_{\text{ai}}, \text{NWL}_{ai\sout{h}})}$$

$$Storage\ Availability_{ai} = \frac{min((USL_{ai} - LSL_{ai}), (24\ hours\ \times ICE_{ai\sout{h}})}{min((24\ hours\ \times ICE_{ai\sout{h}}), Adjusted\ Storage_{ai})}$$

$$\text{Energy Level Availability}_{ai} = \begin{cases} 100\% \text{ if Committed Energy Level}_{a\sout{r}i} = 0 \\ \dfrac{\text{Energy Level}_{ai\sout{r}}}{\text{Committed Energy Level}_{\boldsymbol{ai\sout{r}}}}, \text{otherwise,} \end{cases}$$

***Where:***

$$Committed\ Energy\ Level_{\boldsymbol{ai\sout{r}}} = DAM\ Energy_{ar} + DAM\ Reserves_{ar}$$

***And:***

*UOL*$_{Nai}$ is the Normal Upper Operating Limit for Aggregation *a* that is available to the Real-Time Market system, measured in MW. For real-time intervals *i* when Aggregation *a* is adjusted down due to a NYISO or TO reliability need, the *UOL*$_{Nai}$ will be set equal to the Aggregation's Bid UOL;

*ICE*$_{ai\sout{h}}$ is the Installed Capacity Equivalent of the amount of Unforced Capacity that Aggregation *a* supplies in the month ~~*m*,~~ containing interval *i,* measured in MW;

*Adjusted ICE*$_{ai}$ is the Installed Capacity Equivalent of the amount of Unforced Capacity that Aggregation *a* supplies for real-time interval *i*, accounting for any derates that result from planned and maintenance outages while Aggregation *a* remains available for operation, measured in MW;

*LOL*$_{Nai}$ is the Normal Lower Operating Limit for Aggregation *a* that is available to the Real-Time Market system, measured in MW. For real-time intervals *i* when Aggregation *a* is adjusted up due to a NYISO or TO reliability need, the *LOL*$_{Nai}$ will be set equal to the Aggregation's Bid LOL;

*NWL*$_{ai\sout{h}}$ is the Normal Withdrawal Limit that Aggregation *a* supplies in month containing interval *i* ~~*m*~~ based on its withdrawal capabilities, accounting for any derates that result from planned and maintenance outages while Aggregation *a* remains available for operation, measured in MW;

*USL*$_{ai}$ is the Upper Storage Limit of Aggregation *a* for each real-time interval *i*, measured in MWh;

*LSL*$_{ai}$ is the Lower Storage Limit of Aggregation *a* for each real-time interval *i*, measured in MWh;

Redlines reflect updates since April 27 ICAPWG to existing formulae – green highlighted section headings reflect new Aggregation types not included at the April 27 ICAPWG

*Adjusted Storage*$_{ai}$ is the storage capability of Aggregation *a* for real-time interval *i*, accounting for any derates that result from planned and maintenance outages while Aggregation *a* remains available for operation, measured in MWh;

*Committed Energy Level*$_{ai}$ is the sum of Aggregation *a*'s *DAM Energy* and *DAM Reserves* schedule for the hour ~~*r*~~containing interval *i*, measured in MWh. *Committed Energy Level*$_{ar}$ will be evaluated for each hour containing interval *i*~~-r~~ and applicable to all real-time intervals *i* within that hour;

*Energy Level*$_{ai}$ is the Energy Level for Aggregation *a* that is available to the Real-Time Market system at the start of the hour containing interval *i*~~-r~~, measured in MWh. *Energy Level*$_{ar}$ will be evaluated for each hour containing interval *i*~~-r~~ and applicable to all real-time intervals *i* within that hour;

*DAM Energy*$_{ar}$ is Aggregation *a*'s Day Ahead Market (DAM) Energy schedule for the hour *r* that contains real-time interval *i*, measured in MW; and

*DAM Reserves*$_{ar}$ is Aggregation *a*'s total Day Ahead Market (DAM) Reserves schedule, excluding regulation, for the hour *r* that contains real-time interval *i*, measured in MW.

**(b) Determining the ICE of the Amount of UCAP Supplied**

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

***Where:***

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

$UCAP^{PQ}_{am}$ 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*;

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

## 3.9.6 Procedure for calculating Unforced Capacity values for ESR Aggregations with an EDL

**(a) Determining the Amount of UCAP an Aggregation Qualifies to Supply**

Redlines reflect updates since April 27 ICAPWG to existing formulae – green highlighted section headings reflect new Aggregation types not included at the April 27 ICAPWG

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

***Where:***

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

$ICAP_{am}$ 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 ESR 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 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:***

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

*ICAP MWh*$_{am}$ is the summation of each *ICAP MWh*$_{dm}$ contribution in Aggregation *a* for month *m;*

*Aggregation ESR Contributions*$_{am}$ is the MWh contribution from all ESRs in Aggregation *a* for month *m*; and is calculated as follows:

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

***Where:***

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

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

$DMNC_{dm}$ is the Demonstrated Maximum Net Capability for the individual ESR *d* for month *m*; 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.~~time-stacking, the DMNC is the minimum of either~~:

~~*1)* Minimum DMNC – the minimum of all post-test rating MWs for all time-stacked hours included in the duration of the DMNC test for the applicable Capability Period.~~

~~2) Average EDL DMNC – If applicable, the sum of the DMNC MWh based on a previous EDL DMNC test, for all DER comprising the Aggregation, divided by the minimum of either 1) the Aggregation-level EDL or 2) the time-stacking hours contributed by the ESR~~

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

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

*Elected Timestacking hour(s)* is the declared number of hours that an ESR 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 all ESRs comprising the Aggregation.

$AUF_{d\sout{s}m}$ is the Average Unavailability Factor value for the individual ESR *d* in a given month *m*. If month *m* is in the Winter Capability Period, then $AUF_{d\sout{s}m}$ will be equal to the average of the two previous Winter Capability Period Unavailability Factor values calculated for the ESR *d*. If month *m* is in the Summer Capability Period, then $AUF_{d\sout{s}m}$ will be equal to the average of the two previous Summer Capability Period Unavailability Factor values calculated for the ESR *d*. $AUF_{d\sout{s}m}$ is calculated as follows:

$$AUF_{d\sout{s}m} = \frac{\sum_{n \in \sout{s}} Unavailability\ Factor_{an}}{12}$$

***Where:***

*Unavailability Factor*$_{an}$ is the Unavailability Factor for Aggregation *a* that contains the ESR *d* in months *n.*

~~*s* represents the two Winter Capability Periods preceding month *m*, if *m* is a month in the Winter Capability Period, and the two Summer Capability Periods preceding month *m*, if *m* is a month in the Summer Capability Period~~

The Unavailability Factor value for each individual ESR *d* for each month in the calculation of $AUF_{d\sout{s}m}$, will be calculated based on historic unavailability of the Aggregation:

***Where:***

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

*Total Available ICAP Seconds*$_{an}$ is the sum of *Total Available ICAP Seconds*$_{an}$ for each month *m*;

Redlines reflect updates since April 27 ICAPWG to existing formulae – green highlighted section headings reflect new Aggregation types not included at the April 27 ICAPWG

*Total Expected ICAP Seconds*$_{an}$ is the sum of seconds in all real-time in month~~s~~ *n* in which Aggregation *a* was not on a planned or scheduled outage;

***Where:*** *Total Available ICAP Seconds*$_{an}$ and *Total Expected ICAP Seconds*$_{an}$ are further defined below:

$$Total\ Available\ ICAP\ Seconds_{an} = \sum_{h=b}^{e} Total\ Available\ ICAP\ Seconds_{ah}$$

$$Total\ Expected\ ICAP\ Seconds_{an} = \sum_{h=b}^{e} Total\ Expected\ ICAP\ Seconds_{ah}$$

***Where:***

*Total Available ICAP Seconds*$_{ah}$ is the sum of the Available ICAP Seconds for each hour *h* in the month~~s~~ *n*;

*Total Expected ICAP Seconds*$_{ah}$ is the sum of seconds in all real-time intervals for each hour *h* in the month~~s~~ *n* in which Aggregation *a* was not on a planned or scheduled outage;

*b* is the beginning hour of month~~s~~ *n*; and

*e* is the last hour month~~s~~ *n*.

***Where:*** *Total Available ICAP Seconds*$_{ah}$ and *Total Expected ICAP Seconds*$_{ah}$ are further defined below:

$$Total\ Available\ ICAP\ Seconds_{ah} = \sum_{i=x}^{y} (min(1, UOL\ Availability_{ai}, LOL\ Availability_{ai}, Storage\ Availability_{ai}, Energy\ Level\ Availability_{ai}) \times Interval\ Seconds_{ai})$$

$$Total\ Expected\ ICAP\ Seconds_{ai} = \sum_{i=x}^{y} Interval\ Seconds_{ai}$$

***Where:***

*UOL Availability*$_{ai}$ measures the ratio of Aggregation *a*'s UOL$_N$ that is available for a given interval *i* to the ICAP equivalent of UCAP sold;

LOL Availability$_{ai}$ measures the ratio of Aggregation *a*'s LOL$_N$ that is available for a given interval *i* to the negative ICAP equivalent of UCAP sold;

*Storage Availability*$_{ai}$ measures the ratio of Aggregation *a*'s real-time storage limits to the ICAP equivalent of storage sold for a given interval *i*;

*Energy Level Availability*$_{ai}$ measures the ratio of Aggregation *a*'s real-time Energy Level at the first interval *i* of hour *r* to the sum of its *DAM Energy*$_{ar}$ and *DAM Reserves*$_{ar}$ schedule for hour *r*. *Energy Level Availability*$_{ai}$ will be applicable to all real-time intervals *i* occurring within hour *r*. If Aggregation *a* is adjusted due to a NYISO or TO

reliability need, *Energy Level Availability*$_{ai}$ will be 100% for all remaining real-time intervals *i* of the applicable day;

*Interval Seconds*$_{ai}$ is the number of seconds in each real-time interval *i* for Aggregation *a* in month~~s~~ *n*, except for real-time intervals *i* when Aggregation *a* is fully unavailable due to a planned or maintenance outage, *Interval Seconds*$_{ai}$ will be set to zero (0);

*x* is the first real-time interval in month~~s~~ *n*; and
*y* is the last real-time interval in month~~s~~ *n*.

***Where:*** *UOL Availability*$_{ai}$, *LOL Availability*$_{ai}$, *Storage Availability*$_{ai}$, and *Energy Level Availability*$_{ai}$ are further defined below:

$$UOL\ Availability_{ai} = \frac{min(UOL_{Nai}, ICE_{ai})}{min(ICE_{ai}, Adjusted\ ICE_{ai})}$$

$$\text{LOL Availability}_{ai} = \frac{\max(\text{LOL}_{Nai}, -\text{ICE}_{ah}, \text{NWL}_{ai})}{\max(-\text{ICE}_{ai}, -\text{Adjusted ICE}_{ai}, \text{NWL}_{ai})}$$

$$Storage\ Availability_{ai} = \frac{min((USL_{ai} - LSL_{ai}), (24\ hours\ \times ICE_{ai})}{min((24\ hours\ \times ICE_{ai}), Adjusted\ Storage_{ai})}$$

$$\text{Energy Level Availability}_{ai} = \begin{cases} 100\% \text{ if Committed Energy Level}_{\text{ai}} = 0 \\ \dfrac{\text{Energy Level}_{ai}}{\text{Committed Energy Level}_{\boldsymbol{ai}}}, \text{otherwise,} \end{cases}$$

***Where:***

$$Committed\ Energy\ Level_{\boldsymbol{ai}} = DAM\ Energy_{ar} + DAM\ Reserves_{ar}$$

***And:***

*UOL*$_{Nai}$ is the Normal Upper Operating Limit for Aggregation *a* that is available to the Real-Time Market system, measured in MW. For real-time intervals *i* when Aggregation *a* is adjusted down due to a NYISO or TO reliability need, the UOL$_{Nai}$ will be set equal to the Aggregation's Bid UOL;

*ICE*$_{ai}$ is the Installed Capacity Equivalent of the amount of Unforced Capacity that Aggregation *a* supplies in the month containing interval *i,* measured in MW;

*Adjusted ICE*$_{ai}$ is the Installed Capacity Equivalent of the amount of Unforced Capacity that Aggregation *a* supplies for real-time interval *i*, accounting for any derates that result from planned and maintenance outages while Aggregation *a* remains available for operation, measured in MW;

*LOL*$_{Nai}$ is the Normal Lower Operating Limit for Aggregation *a* that is available to the Real-Time Market system, measured in MW. For real-time intervals *i* when Aggregation *a* is adjusted up due to a NYISO or TO reliability need, the *LOL*$_{Nai}$ will be set equal to the Aggregation's Bid LOL;

*NWL*$_{ai}$ is the Normal Withdrawal Limit that Aggregation *a* supplies in month containing interval *i* based on its withdrawal capabilities, accounting for any derates that result

from planned and maintenance outages while Aggregation *a* remains available for operation, measured in MW;

$USL_{ai}$ is the Upper Storage Limit of Aggregation *a* for each real-time interval *i*, measured in MWh;

$LSL_{ai}$ is the Lower Storage Limit of Aggregation *a* for each real-time interval *i*, measured in MWh;

$Adjusted\ Storage_{ai}$ is the storage capability of Aggregation *a* for real-time interval *i*, accounting for any derates that result from planned and maintenance outages while Aggregation *a* remains available for operation, measured in MWh;

$Committed\ Energy\ Level_{ai}$ is the sum of Aggregation *a*'s *DAM Energy* and *DAM Reserves* schedule for the hour containing interval *i*, measured in MWh. $Committed\ Energy\ Level_{ar}$ will be evaluated for each hour containing interval *i* and applicable to all real-time intervals *i* within that hour;

$Energy\ Level_{ai}$ is the Energy Level for Aggregation *a* that is available to the Real-Time Market system at the start of the hour containing interval *i*, measured in MWh. $Energy\ Level_{ar}$ will be evaluated for each hour containing interval *i* and applicable to all real-time intervals *i* within that hour;

$DAM\ Energy_{ar}$ is Aggregation *a*'s Day Ahead Market (DAM) Energy schedule for the hour *r* that contains real-time interval *i*, measured in MW; and

$DAM\ Reserves_{ar}$ is Aggregation *a*'s total Day Ahead Market (DAM) Reserves schedule, excluding regulation, for the hour *r* that contains real-time interval *i*, measured in MW.

**(b) 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*;

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

Redlines reflect updates since April 27 ICAPWG to existing formulae – green highlighted section headings reflect new Aggregation types not included at the April 27 ICAPWG

## 3.9.7 Procedure for calculating Unforced Capacity values for Generator Aggregations (EFORd based on GADS data)

### (a) Determining the Amount of UCAP an Aggregation Qualifies to Supply

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

***Where:***

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

$ICAP_{am}$ 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 Generators 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*.

*AEFORd*$_{am}$ *(Average Equivalent Demand Forced Outage Rate*$_{am}$) is the Derating 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*; 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.

***Where:***

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

*ICAP MW*$_{am}$ is the summation of each *ICAP MW*$_{dm}$ contribution in Aggregation *a* for month *m;*

*AggregationFacility Contributions*$_{am}$ is the MW contribution from all facilities *f* in Aggregation *a* for month *m*; and is calculated as follows:

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

***Where:***

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

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

$DMNC_{fm}$ is the Demonstrated Maximum Net Capability for the individual facility *f* for month *m*;

$CRIS_{fm}$ is the Capacity Resource Interconnection Service Value for the individual facility *f* for month *m;*

*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;*

***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:

$$AEFORd_{fm} = \frac{\sum_{z \in f}(AEFORd_{zm} * NC_{zm})}{\sum_{z \in f}(NC_{zm})}$$

***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.*

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

***Where:***

$$EFORd_{zn} = \frac{IST_{ze}}{6} \times \frac{f_{fzbe}FOH_{zbe} + f_{pzbe}(EFOH_{zbe} - FOH_{zbe})}{(SH_{zbe} + f_{fzbe}FOH_{zbe})} + \left(1 - \frac{IST_{ze}}{6}\right) CEFORd_{z}$$

***$f_{fzbe}$ and $f_{pzbe}$ are further defined below and:***

$IST_{ze}$ is the number of months that asset *z* was in service during the 6-month Capability Period ending as of time *e* ($IST_{ze}$ = 0 if asset *z* was not in service as of time *e*; $IST_{ze}$ = 6 if asset *z* was in service for all months of the Capability Period;

$FOH_{zbe}$ is the sum of all Full Forced Outage Hours reported for asset *z* for the period beginning at time *b* and ending at time *e*. The data is the GADS Data submitted in accordance with Attachment K, Performance Record 02, columns 40-43 and Event Record 01, NERC Event Types U1, U2, U3, and SF;

$EFOH_{zbe}$ is the sum of all Equivalent Full Forced Outage Hours reported for asset *z* for the period beginning at time *b* and ending at time *e*. The data is the GADS Data submitted in accordance with Attachment K for NERC Event Types U1, U2, U3, D1, D2, D3 and SF, such that:

$$EFOH_{\text{zbe}} = \left\{ \begin{array}{l} \text{0, if there were no outages for asset z during the} \\ \text{period beginning at time b and ending at time e; and} \\ \sum_{i \in \text{OUTzbe}} \frac{(NDC_{zi} - NAC_{zi})H_{zi}}{NDC_{zi}}\text{, otherwise;} \end{array} \right\}$$

$OUT_{zbe}$ is the set of outages for asset *z* during the period beginning at time *b* and ending at time *e*;

$NDC_{zi}$ is the Net Dependable Capacity for asset z during the applicable Peak Load Window applicable for outage *i*, submitted in accordance with Attachment K, Performance Record 01, columns 35-38;

$NAC_{zi}$ is the Net Available Capacity for asset *z* during the applicable for outage *i*, submitted in accordance with Attachment K, Event Record 01, columns 60-63;

***And:***

$H_{zi}$ is the time accumulated for asset *z* during the applicable for outage *i* submitted in accordance with Attachment K, columns 20-27 and columns 48-55, (*i.e.*, the positive difference between the start and end of the event);

$SH_{zbe}$ is the sum of all Service Hours reported for asset *z* for the period beginning at time *b* and ending at time *e* in accordance with the GADS Data submitted in accordance with Attachment K, Performance Record 02, columns 16-19;

*e* is the end of the last month of the Capability Period;

*b* is the beginning of the first month of the Capability Period, unless the asset had not gone into service at that time, in which case *b* is the time at which that asset went into service;

$CEFORd_z$ is the class-equivalent EFORd calculated by the ISO for resources of the same class as asset *z* based on NERC class averages for similar resources. Where no similar resource exists, the NYISO will estimate a value based on its best judgment, if a mutually acceptable value cannot be agreed on.

***Then:***

$$f_{\text{fzbe}} = \frac{\frac{1}{\text{r}} + \frac{1}{\text{T}}}{\frac{1}{\text{r}} + \frac{1}{\text{T}} + \frac{1}{\text{D}}}$$

*r* is $\text{FOH}_{\text{zbe}}$ divided by the total number of GADS Data Forced Outages reported for the period beginning at time *b* and ending at time *e* in accordance with Attachment K;

*T* is the number of Reserve Shutdown Hours ($\text{RSH}_{\text{gbe}}$) divided by the number of attempted starts reported for the period beginning at time *b* and ending at time *e* for asset *z*. $\text{RSH}_{\text{zbe}}$ is the sum of all Reserve Shutdown Hours reported for asset *z* for the period beginning at time *b* and ending at time *e* in accordance with the GADS Data submitted in accordance with Attachment K, Performance Record 02, columns 20-23;

*D* is the number of Service Hours ($\text{SH}_{\text{zbe}}$) divided by the number of successful starts reported for the period beginning at time b and ending at time *e* for asset z; and

$$f_{\text{pzbe}} = \frac{SH_{zbe}}{AH_{zbe}}$$

$\text{AH}_{\text{zbe}}$ is the sum of all Available Hours reported for asset *z* for the period beginning at time *b* and ending at time *e* in accordance with GADS Data submitted under Attachment K, Performance Record 02, Columns 32-35.

These equations shall be modified when necessary as follows in order to avoid dividing by zero:

- If RSH < 1 then $f_f$ =1;
- If SH = 0 then $f_f$ = 1;
- If FOH = 0, set 1/r = 0 and calculate $f_f$ per its equation; and
- If AH = 0 then $f_p$ = 0

**(b) Determining the ICE of the Amount of UCAP Supplied**

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

***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*;

$AEFORd_{am}$ *(Average Equivalent Demand Forced Outage Rate*$_{am}$) 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*;

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

## 3.9.8 Procedure for calculating Unforced Capacity values for Energy Limited Resource (ELR) Aggregations (EFORd based on GADS data)

**(a) Determining the Amount of UCAP an Aggregation Qualifies to Supply**

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

***Where:***

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

*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 Generators 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*.

*AEFORd*$_{am}$ *(Average Equivalent Demand Forced Outage Rate*$_{am}$) is the Derating 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:***

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

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 Energy Limited Resources (ELR) comprising the Aggregation.

*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 as follows:

***Where:***

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

***Where:***

Redlines reflect updates since April 27 ICAPWG to existing formulae – green highlighted section headings reflect new Aggregation types not included at the April 27 ICAPWG

*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 $_{dm}$* is the Demonstrated Maximum Net Capability for the individual ELR d for month *m*; 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$_{dm}$* is the Capacity Resource Interconnection Service Value for the individual ELR d for month *m;*

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

*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.

When an Aggregation is time-stacking, the Average Equivalent Demand Forced Outage Rate applied to the Aggregation-level reflects the ratio of total available MWhs and the total nameplate MWhs each based on all ELRs comprising the Aggregation.

***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:

$$AEFORd_{dm} = \frac{\sum_{z \in d}(AEFORd_{zm} * NC_{zm})}{\sum_{z \in d}(NC_{zm})}$$

***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 ELR *d* for the 6-month period ending in any given month *n.*

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

***Where:***

$$AssetEFORd_{zn} = \frac{IST_{ze}}{6} \times \frac{f_{fzbe}FOH_{zbe} + f_{pzbe}(EFOH_{zbe} - FOH_{zbe})}{(SH_{zbe} + f_{fzbe}FOH_{zbe})} + \left(1 - \frac{IST_{ze}}{6}\right) CEFORd_{z}$$

*$f_{fzbe}$ and $f_{pzbe}$ are further defined below and:*

$IST_{ze}$ is the number of months that asset *z* was in service during the 6-month Capability Period ending as of time *e* ($IST_{ze}$ = 0 if asset *z* was not in service as of time *e*; $IST_{ze}$ = 6 if asset *z* was in service for all months of the Capability Period;

$FOH_{zbe}$ is the sum of all Full Forced Outage Hours reported for asset *z* during the applicable Peak Load Window for the period beginning at time *b* and ending at time *e*. The data is the GADS Data submitted in accordance with Attachment K, Performance Record 02, columns 40-43 and Event Record 01, NERC Event Types U1, U2, U3, and SF;

$EFOH_{zbe}$ is the sum of all Equivalent Full Forced Outage Hours reported for asset *z* during the applicable Peak Load Window for the period beginning at time *b* and ending at time *e*. The data is the GADS Data submitted in accordance with Attachment K for NERC Event Types U1, U2, U3, D1, D2, D3 and SF, such that:

$$EFOH_{\text{zbe}} = \left\{ \begin{array}{l} \text{0, if there were no outages for asset z during the} \\ \text{period beginning at time b and ending at time e; and} \\ \sum_{i \in \text{OUTzbe}} \frac{(NDC_{zi} - NAC_{zi})H_{zi}}{NDC_{zi}}, \text{otherwise;} \end{array} \right\}$$

$OUT_{zbe}$ is the set of outages for asset *z* during the applicable Peak Load Window during the period beginning at time *b* and ending at time *e*;

$NDC_{zi}$ is the Net Dependable Capacity for asset z during the applicable Peak Load Window applicable for outage *i*, submitted in accordance with Attachment K, Performance Record 01, columns 35-38;

$NAC_{zi}$ is the Net Available Capacity for asset *z* during the applicable Peak Load Window, applicable for outage *i*, submitted in accordance with Attachment K, Event Record 01, columns 60-63;

***and***

$H_{zi}$ is the time accumulated for asset *z* during the applicable Peak Load Window applicable for outage *i* submitted in accordance with Attachment K, columns 20-27 and columns 48-55, (*i.e.*, the positive difference between the start and end of the event);

$SH_{zbe}$ is the sum of all Service Hours reported for asset *z* during the applicable Peak Load Window for the period beginning at time *b* and ending at time *e* in accordance

with the GADS Data submitted in accordance with Attachment K, Performance Record 02, columns 16-19;

*e* is the end of the last month of the Capability Period;

*b* is the beginning of the first month of the Capability Period, unless the asset had not gone into service at that time, in which case *b* is the time at which that asset went into service;

*Peak Load Window* is the time period during which an asset with an Energy Duration Limitation must offer Energy in the Day-Ahead Market, as specified in Section 4.1.1 of this ICAP Manual. For days in which the tariff-defined Peak Load Window has been adjusted by the ISO, pursuant to Section 4.1.1 of this ICAP Manual, the real-time intervals used in the calculation will be those that overlap between the tariff-defined and ISO-adjusted Peak Load Windows; and

$CEFORd_g$ is the class-equivalent EFORd calculated by the ISO for assets of the same class as asset *z* based on NERC class averages for similar assets. Where no similar assets exists, the NYISO will estimate a value based on its best judgment, if a mutually acceptable value cannot be agreed on.

***Then:***

$$f_{\text{fzbe}} = \frac{\frac{1}{r} + \frac{1}{T}}{\frac{1}{r} + \frac{1}{T} + \frac{1}{D}}$$

*r* is $FOH_{zbe}$ divided by the total number of GADS Data Forced Outages reported for the period during the applicable Peak Load Window beginning at time *b* and ending at time *e* in accordance with Attachment K;

*T* is the number of Reserve Shutdown Hours ($RSH_{gbe}$) divided by the number of attempted starts reported for the period during the applicable Peak Load Window beginning at time *b* and ending at time *e* for asset *z*. $RSH_{zbe}$ is the sum of all Reserve Shutdown Hours reported for asset *z* during the applicable Peak Load Window for the period beginning at time *b* and ending at time *e* in accordance with the GADS Data submitted in accordance with Attachment K, Performance Record 02, columns 20-23;

*D* is the number of Service Hours ($SH_{zbe}$) divided by the number of successful starts reported for the period during the applicable Peak Load Window beginning at time b and ending at time *e* for asset z; and

$$f_{\text{pzbe}} = \frac{SH_{zbe}}{AH_{zbe}}$$

$AH_{zbe}$ is the sum of all Available Hours reported for asset *z* during the applicable Peak Load Window for the period beginning at time *b* and ending at time *e* in accordance with GADS Data submitted under Attachment K, Performance Record 02, Columns 32-35.

These equations shall be modified when necessary as follows in order to avoid dividing by zero:

Redlines reflect updates since April 27 ICAPWG to existing formulae – green highlighted section headings reflect new Aggregation types not included at the April 27 ICAPWG

- If (RSH < 1) then $f_f$ =1;
- If (SH = 0) then $f_f$ = 1;
- If (1/r + 1/T + 1/D) = 0 then $f_f$ = 0;
- If [(# of FO occurrences = 0) or (FOH = 0)] then 1/r = 0;
- If [(RSH = 0) or (# of unit attempted starts = 0)] then 1/T = 0;
- If [(# of unit actual starts = 0) or (SH = 0)] then 1/D = 0;
- If AH = 0 then $f_p$ = 0; and
- If (SH + ($f_f$ x FOH)) = 0 then EFORd = 0.

**(b) Determining the ICE of the Amount of UCAP Supplied**

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

***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*;

$AEFORd_{am}$ *(Average Equivalent Demand Forced Outage Rate*$_{am}$) 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*;

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

## 3.9.9 Procedure for calculating Unforced Capacity values for Generator Aggregations (AOF based on GADS-equivalent data)

**(a) Determining the Amount of UCAP an Aggregation Qualifies to Supply**

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

***Where:***

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

$ICAP_{am}$ 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 Generators 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*.

$AOF_{am}$ *(Average Outage Factor*$_{am}$) is the Derating 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*; The Average Outage Factor 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.

***Where:***

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

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

*AggregationFacility Contributions*$_{am}$ is the MW contribution from all facilities *f* in Aggregation *a* for month *m*; and is calculated as follows:

***Where:***

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

***Where:***

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

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

$DMNC_{fm}$ is the Demonstrated Maximum Net Capability for the individual facility *f* for month *m*;

$CRIS_{fm}$ is the Capacity Resource Interconnection Service Value for the individual facility *f* for month *m;*

*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;*

***And:***

$AOF_{fm}$ is the Average Outage Factor for the individual facility *f.* The $AOF_{fm}$ 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:

$$AOF_{fm} = \frac{\sum_{z \in f}(AOF_{zm} * NC_{zm})}{\sum_{z \in f}(NC_{zm})}$$

***Where:***

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

$AOF_{zm}$ is the Average Outage Factor for asset z in for month *m*, calculated as follows:

$$AOF_{zm} = \frac{\sum_n OF_{zn}}{2}$$

***Where:***

$OF_{zn}$ is the Outage Factor for asset *z* within facility *f* for the 6-month period ending in any given month *n.*

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

$$OF_{zn} = \frac{IST_{ze}}{6} \times (1 - CF_{zbe}) + \left(1 - \frac{IST_{ze}}{6}\right)(1 - CCF_z)$$

$IST_{ze}$ is the number of months that asset *z* had been in service as of time *e* (0 if asset *z* was not in service as of time *e*; 6 if asset *z* was in service for the full Capability Period;

$CCF_z$ is the class-equivalent Capacity Factor for assets of the same class as asset *z* based on NERC class averages for similar assets. Where no similar asset exists, the NYISO will estimate a value based on its best judgment if a mutually acceptable value cannot be agreed on; and

$$\text{CFzbe} = \frac{\text{NAG}_{\text{zbe}}}{\sum_{i=B}^{E}(\text{NDC}_{\text{zi}}(\text{PH}_{\text{zi}} - \text{POH}_{\text{zi}} - \text{MOH}_{\text{zi}}))};$$

$CF_{zbe}$ is the Capacity Factor for asset *z* for the period beginning at time *b* and ending at time *e*;

$NAG_{zbe}$ is the Net Actual Generation for asset *a* for the period beginning at time *b* and ending at time *e*. The data is the GADS Data submitted in accordance with Attachment K, Performance Record 01, columns 39-45;

$NDC_{zi}$ is the Net Dependable Capacity for asset *z* for month *i*. The data is the GADS Data submitted in accordance with Attachment K, Performance Record 01, columns 35-38;

$PH_{zi}$ is the Period Hours reported for asset *z* for month *i*. The data is the GADS Data submitted in accordance with Attachment K, Performance Record 02, columns 56-59;

$POH_{zi}$ is the Planned Outage Hours reported for asset *z* for month *i*. The data is from the GADS Data submitted in accordance with Attachment K, Performance Record 02, columns 36-39;

$MOH_{zi}$ is the Maintenance Outage Hours reported for asset *z* for month *i*. The data is from the GADS Data submitted in accordance with Attachment K, Performance Record 02, columns 44-47;

*b* is the beginning of the first month of the Capability Period , unless the asset had not gone into service at that time, in which case *b* is the time at which that asset went into service;

*e* is the end of the last month of the Capability Period;

*B* is the month containing time *b*; and

*E* is the month containing time *e*.

**(b) Determining the ICE of the Amount of UCAP Supplied**

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

***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*;

$AOF_{am}$ *(Average Outage 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*;

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

Redlines reflect updates since April 27 ICAPWG to existing formulae – green highlighted section headings reflect new Aggregation types not included at the April 27 ICAPWG

## 3.9.10 Procedure for calculating Unforced Capacity values for Energy Limited Resource (ELR) Aggregations (AOF based on GADS-equivalent data)

**(a) Determining the Amount of UCAP an Aggregation Qualifies to Supply**

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

***Where:***

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

$ICAP_{am}$ 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 Generators 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*.

$AOF_{am}$ *(Average Outage Factor*$_{am}$) is the Derating 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:***

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

The Average Outage Factor applied to the Aggregation-level reflects the ratio of total available MWs and the total ICAP MWs each based on the composite of all Energy Limited Resources (ELR) comprising the Aggregation.

$ICAP\ MWh_{am}$ 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 *d* will contribute to the Aggregation time-stacking.

$Aggregation\ ELR\ Contributions_{am}$ is the MW contribution from all Energy Limited Resources *d* in Aggregation *a* for month *m*; and is calculated as follows:

***Where:***

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

***Where:***

$ICAP\ MWh_{dm}$ 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:

Redlines reflect updates since April 27 ICAPWG to existing formulae – green highlighted section headings reflect new Aggregation types not included at the April 27 ICAPWG

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

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

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

$Total\ Supply\ Declared\ Value_{dm}$ is the MW amount reflecting the Injection capability of the ELR *d*, and may be equal to or less than the *ELR CRIS* or *ELR DMNC* for the month *m;*

*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.

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

***And:***

$AOF_{dm}$ is the Average Outage Factor for the individual ELR *d.* The $AOF_{dm}$ 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:

$$AOF_{dm} = \frac{\sum_{z \in d}(AOF_{zm} * NC_{zm})}{\sum_{z \in d}(NC_{zm})}$$

***Where:***

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

$AOF_{zm}$ is the Average Outage Factor for asset z in for month *m*, calculated as follows:

$$AOF_{zm} = \frac{\sum_{n} OF_{zn}}{2}$$

***Where:***

$OF_{zn}$ is the Outage Factor for asset *z* within ELR *d* for the 6-month period ending in any given month *n.*

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

***Where:***

$$OF_{zn} = \frac{IST_{ze}}{6} \times (1 - CF_{zbe}) + \left(1 - \frac{IST_{ze}}{6}\right)(1 - CCF_z)$$

$IST_{ze}$ is the number of months that asset $z$ had been in service as of time $e$ (0 if generator $g$ was not in service as of time $e$; 6 if asset $z$ was in service for the full Capability Period;

$CCF_z$ is the class-equivalent Capacity Factor for assets of the same class as asset $z$ based on NERC class averages for similar assets. Where no similar asset exists, the NYISO will estimate a value based on its best judgment if a mutually acceptable value cannot be agreed on; and

$$\mathrm{CF_{zbe}} = \frac{\mathrm{NAG_{zbe}}}{\sum_{i=B}^{E}(\mathrm{NDC_{zi}}(\mathrm{PH_{zi}} - \mathrm{POH_{zi}} - \mathrm{MOH_{zi}}))};$$

$CF_{zbe}$ is the Capacity Factor for asset $z$ for the period beginning at time $b$ and ending at time $e$;

$NAG_{zbe}$ is the Net Actual Generation for asset $a$ for the period beginning at time $b$ and ending at time $e$. The data is the GADS Data submitted in accordance with Attachment K, Performance Record 01, columns 39-45;

$NDC_{zi}$ is the Net Dependable Capacity for asset $z$ for month $i$. The data is the GADS Data submitted in accordance with Attachment K, Performance Record 01, columns 35-38;

$PH_{zi}$ is the Period Hours reported for asset $z$ for month $i$. The data is the GADS Data submitted in accordance with Attachment K, Performance Record 02, columns 56-59;

$POH_{zi}$ is the Planned Outage Hours reported for asset $z$ for month $i$. The data is from the GADS Data submitted in accordance with Attachment K, Performance Record 02, columns 36-39;

$MOH_{zi}$ is the Maintenance Outage Hours reported for asset $z$ for month $i$. The data is from the GADS Data submitted in accordance with Attachment K, Performance Record 02, columns 44-47;

$b$ is the beginning of the first month of the Capability Period , unless the asset had not gone into service at that time, in which case $b$ is the time at which that asset went into service;

$e$ is the end of the last month of the Capability Period;

$B$ is the month containing time $b$; and

$E$ is the month containing time $e$.

**(b) Determining the ICE of the Amount of UCAP Supplied**

Redlines reflect updates since April 27 ICAPWG to existing formulae – green highlighted section headings reflect new Aggregation types not included at the April 27 ICAPWG

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

***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*;

$AOF_{am}$ *(Average Outage 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*;

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

## 3.9.11 Procedure for calculating Unforced Capacity values for Intermittent Power Resource (IPR) Aggregations

**(a) Determining the Amount of UCAP an Aggregation Qualifies to Supply**

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

***Where:***

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

$ICAP_{am}$ is the total ICAP of Aggregation *a* that is applicable when determining the amount of Unforced Capacity that Aggregation *a* is qualified to provide in month *m*;

*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*.

$ProdF_{am}$ 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:***

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

The Production Factor applied to the Aggregation-level reflects the ratio of total available MWs and the total ICAP MWs each based on the composite of all IPR comprising the Aggregation.

*ICAP MW*$_{am}$ is the summation of each *ICAP MW*$_{dm}$ contribution in Aggregation *a* for month *m,*

*Aggregation IPR Contributions*$_{am}$ is the sum of MW contributions from each individual IPR *d* in Aggregation *a* for month *m*; and is calculated as follows:

***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:

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

*NC*$_{dm}$ is the nameplate capacity for the individual IPR *d* for month *m*;

*CRIS*$_{dm}$ is the Capacity Resource Interconnection Service Value for the individual IPR *d* for month *m;*

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

***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:

$$ProdF_{an} = \sum_{h \in CPPH_{an}} \left[\left(\frac{E_{ah}}{NC_{ah}}\right) \times WF_h\right]$$

***Where:***

$CPPH_{an}$ is the set of all Summer Peak Hours during the most recent Summer Capability Period preceding the Capability Period containing month *n* (if month *m* is part of a Summer Capability Period) during which Aggregation *a* was available for commercial operation, or the set of all Winter Peak Hours during the most recent Winter Capability Period preceding the Capability Period containing month *n* (if month *m* is part of a Winter Capability Period) during which Aggregation *a* was available for commercial operation;

"Summer Peak Hours" means the hours beginning 13, 14, 15, 16, 17, and 18 for the 6-hour Peak Load Window and hours beginning 12, 13, 14,15, 16, 17, 18, and 19 for the 8-hour Peak Load Window;

"Winter Peak Hours" means the hours beginning 16, 17, 18, 19, 20, and 21 for the 6-hour Peak Load Window and hours beginning 14, 15, 16, 17, 18, 19, 20, and 21 for the 8-hour Peak Load Window;

$E_{ah}$ is the average amount of energy delivered to the NYCA transmission system by Aggregation *a* during hour *h* by all IPRs within the Aggregation;

$NC_{ah}$ is the nameplate capacity of Aggregation *a* that was applicable when determining the amount of Unforced Capacity that Aggregation *a* was qualified to provide in hour *h*; and

$WF_h$ is the hourly weighting factor according to the table in section (b).

Except that for new Intermittent Power Resource Aggregations for which less than sixty (60) days of production data are available to calculate $ProdF_{an}$ using the equation above, $ProdF_{an}$ instead will be calculated in accordance with Section 4.5 of the Installed Capacity Manual.

**(b) Determining the Production Factor for Intermittent Power Resource Aggregations**

The production factor for Intermittent Power Resources will be calculated based on the equation in the above section, and will be subject to hourly weightings within the Peak Load Window as stated in Section 5.12.6.2 of the NYISO Services Tariff,

***Where:***

Redlines reflect updates since April 27 ICAPWG to existing formulae – green highlighted section headings reflect new Aggregation types not included at the April 27 ICAPWG

| | Summer Peak Load Window | | Winter Peak Load Window | |
|---|---|---|---|---|
| Hour Beginning | 6 Hour | 8 Hour | 6 Hour | 8 Hour |
| 12 | | 5.00% | | |
| 13 | 12.50% | 10.00% | | |
| 14 | 18.75% | 17.50% | | 5.00% |
| 15 | 18.75% | 17.50% | | 5.00% |
| 16 | 18.75% | 17.50% | 18.75% | 17.50% |
| 17 | 18.75% | 17.50% | 18.75% | 17.50% |
| 18 | 12.50% | 10.00% | 18.75% | 17.50% |
| 19 | | 5.00% | 18.75% | 17.50% |
| 20 | | | 12.50% | 10.00% |
| 21 | | | 12.50% | 10.00% |

The duration of the Peak Load Window will be dependent on resources with Energy Duration Limitations. When the system reaches 1000 MW of incremental penetration of resources with Energy Duration Limitations and the Peak Load Window shifts from 6 hours to 8 hours, the Peak Load Window for Intermittent Power Resources will shift as well. The weighting percentages will be reevaluated through a study done every four years, and will be updated accordingly.

**(c) Determining the ICE of the Amount of UCAP Supplied**

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

***Where:***

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

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

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

$ProdF_{am}$ 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*;