New York ISO
Independent System Operator

ICAP Manual Attachment J

Issued: Month Year

WG/SUBCOMMITTEE DRAFT – NOT FOR COMMITTEE ACTION

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:

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

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 and without an EDL**
2. DER Aggregations without Demand Reduction and with an EDL
3. DER Aggregations with Demand Reduction capability without an EDL
4. DER Aggregations with Demand Reduction capability with an EDL
5. **ESR Aggregations without an EDL**
6. **ESR Aggregations with an EDL**
7. Generator Aggregations without an EDL
8. Energy Limited Resource Aggregations with an EDL
9. Intermittent Power Resource Aggregations

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:

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

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.

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:

$$Aggregation\ DER\ Contributions_{am} = \sum_{der \in a_m} ICAP_{der\ m} \times AUF_{der\ s}$$

Where:

$ICAP_{der\ m}$ is the ICAP MW for each individual DER *der* which is applicable for month *m,* and is calculated as follows:

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

DMNC $_{der\ m}$ is the Demonstrated Maximum Net Capability for the individual DER *der* for month *m*;

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

Total Supply Declared Value $_{der\ m}$ 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:

$AUF_{der\ s}$ 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 $AUF_{der\ s}$ 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 $AUF_{der\ s}$ will be equal to the average of the two previous Summer Capability Period Unavailability Factor values calculated for the DER *der*. AUF_{ders} is calculated as follows:

$$AUF_{der\ s} = \frac{\sum_{m \in s} Unavailability\ Factor\ _{am}}{6}$$

Where:

Unavailability Factor$_{am}$ is the monthly *m* Unavailability Factor for Aggregation *a* that contains the DER *der* in month *m* in the capability period *s*

The Unavailability Factor value for each individual DER *der* for each month in the calculation of AUF*der s*, will be calculated based on historic unavailability of the Aggregation:

Where:

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

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

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

Where:

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

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

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

Where:

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

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

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

e is the last hour month *m*.

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

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

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

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 *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 *m*; and
y is the last real-time interval in month *m*.

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

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

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

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

Where:

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

UCAP$^{Q}_{am}$ 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*.

3.9.2 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:

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

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.

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

Where:

$$Aggregation\ ESR\ Contributions_{am} = \sum_{esr \in a_m} ICAP_{esr\ m} \times AUF_{esr\ s}$$

Where:

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

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

$DMNC_{esr\ m}$ is the Demonstrated Maximum Net Capability for the individual ESR *esr* for month *m*;

CRIS esr $_m$ is the Capacity Resource Interconnection Service Value for the individual ESR *esr* for month *m;*

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

And:

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

$$AUF_{esr\,s} = \frac{\sum_{m \in s} Unavailability\ Factor_{\ am}}{6}$$

Where:

Unavailability Factor$_{am}$ is the monthly *m* Unavailability Factor for Aggregation *a* that contains the ESR *esr* in month *m* in the capability period *s*

The Unavailability Factor value for each individual ESR *esr* for each month in the calculation of AUF*esr s*, will be calculated based on historic unavailability of the Aggregation:

Where:

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

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

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

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

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

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

Where:

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

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

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

e is the last hour month *m*.

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

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

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

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 *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 *m*; and
y is the last real-time interval in month *m*.

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

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

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

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

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

Where:

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

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$_{ah}$ is the Installed Capacity Equivalent of the amount of Unforced Capacity that Aggregation a supplies in month *m*, 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$_{ah}$ is the Normal Withdrawal Limit that Aggregation a supplies in month *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;

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

Energy $Level_{ar}$ is the Energy Level for Aggregation a that is available to the Real-Time Market system at the start of hour r, measured in MWh. Energy $Level_{ar}$ will be evaluated for each hour 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

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

Where:

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

$UCAP^{Q}_{am}$ 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*.

3.9.4 Procedure for calculating Unforced Capacity values for ESR Aggregations 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 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:

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

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

$$Aggregation\ ESR\ Contributions_{am} = \sum_{esr \in a_m} ICAP_{esr\ m} \times AUF_{esr\ s}$$

Where:

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

Where:

$ICAP\ MWh_{esr\ m}$ is further defined below:

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

DMNC $_{esr\ m}$ is the Demonstrated Maximum Net Capability for the individual ESR *esr* for month *m*; for an Aggregation that has an EDL and is 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 MW 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 $_{esr\ m}$ is the Capacity Resource Interconnection Service Value for the individual ESR *esr* for month *m;*

Total Supply Declared Value $_{esr\ m}$ is the MW amount reflecting the Injection capability of the ESR *esr*, 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.

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.

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

$$AUF_{esr\ s} = \frac{\sum_{m \in s} Unavailability\ Factor_{\ am}}{6}$$

Where:

Unavailability Factor$_{am}$ is the monthly *m* Unavailability Factor for Aggregation *a* that contains the ESR *esr* in month *m* in the capability period *s*

The Unavailability Factor value for each individual ESR *esr* for each month in the calculation of AUF*esr* s, will be calculated based on historic unavailability of the Aggregation:

Where:

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

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

Total Expected ICAP Seconds$_{am}$ is the sum of seconds in all real-time intervals in month *m* in which Aggregation *a* was not on a planned or scheduled outage;***Where:*** Total Available ICAP Seconds$_{am}$ and Total Expected ICAP Seconds$_{am}$ are further defined below:

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

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

Where:

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

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

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

e is the last hour month *m*.

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

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

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

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 *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 *m*; and
y is the last real-time interval in month *m*.

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

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

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

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

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

Where:

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

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_{ah} is the Installed Capacity Equivalent of the amount of Unforced Capacity that Aggregation a supplies in month *m*, 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_{ah} is the Normal Withdrawal Limit that Aggregation a supplies in month *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;

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

Energy $Level_{ar}$ is the Energy Level for Aggregation a that is available to the Real-Time Market system at the start of hour r, measured in MWh. Energy $Level_{ar}$ will be evaluated for each hour 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

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

Where:

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

$UCAP^{Q}_{am}$ 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 *g* which is applicable for month *m*, pursuant to Section 4.1.1 of this *ICAP Manual*.