3 Calculation of Unforced Capacity (UCAP)

This section addresses the methodologies for calculating unforced capacity (UCAP) of capacity assets.

3.1 Calculation of UCAP

3.1.1 Before every base auction and rebalancing auction, the AESO will calculate and assign a UCAP to each prequalified capacity asset.

3.1.2 The AESO will not calculate UCAP for those assets identified in subsections 2.1.4 and 2.1.5 of Section 2, *Supply Participation* (i.e., Renewable Electricity Program Round 1, 2 and 3 resources, and energy efficiency).

3.1.3 The legal owner of a prequalified capacity asset may elect a UCAP within a narrow range of the AESO calculated UCAP.[1]

3.1.4 The AESO will qualify all prequalified capacity assets that have a UCAP greater than or equal to 1 MW to participate in a capacity auction.

UCAP for capacity assets with five year historical generation or consumption data in Alberta

3.1.5 A UCAP for a capacity asset with historical generation or consumption data in Alberta will be based on one of two methodologies:

(a) ***Availability factor.*** Generally, a straight average availability factor approach will be used to calculate UCAP for capacity assets whose generation or load metered volumes align with the dispatch levels in the energy market.

An hourly availability factor will be calculated using a duration-weighted available capability as observed in the Energy Trading System divided by maximum capability for each of the 100[2] tightest supply cushion hours per year for the past five years. Availability factors will incorporate historical derates, forced outages, planned outages and force majeure outages. Reductions to available capability due to Alberta bulk electric system constraints will be excluded from the availability factor calculation.

$$\text{Hourly Availability Factor} = \frac{\text{Weighted Available Capability}}{\text{Maximum Capability}}$$

The hourly availability factors for each of the past five obligation periods will be averaged to create a straight average availability factor for the capacity asset:

$$\text{Straight Average Availability Factor} = \frac{\text{Hourly Availability Factors}}{\text{\# observed hours}}$$

[1] The AESO is currently evaluating acceptable ranges and will update future versions of the CMD accordingly. Ranges will be narrowed over the course of the initial few auctions. The range will not be applicable to external or demand response assets. In no event should the range allow the legal owner to select a UCAP above the maximum capability of the asset.

[2] The AESO is currently evaluating alternatives to this number, ranging from 100 to 500 tight supply cushion hours per year. This applies to all instances where 100 tightest supply cushion hours is referenced in this Section 3.

The straight average availability factor multiplied by the capacity asset's maximum capability anticipated for the obligation period will yield the UCAP:

$$\text{UCAP} = \text{Straight Average Availability Factor} * \text{Maximum Capability}$$

(b) ***Capacity factor.*** In the majority of cases, a capacity factor approach will be used to calculate UCAP for a capacity asset whose generation or load metered volumes do not align with the dispatch levels in the energy market. Capacity factors will incorporate historical derates, forced outages, planned outages and force majeure outages. Reductions to available capability due to Alberta bulk electric system constraints will be excluded from the availability factor calculation.

An hourly capacity factor will be calculated using historical metered volumes, plus any applicable ancillary services volumes of the capacity asset, divided by maximum capability for each of the 100 tightest supply cushion hours per year for the past five years:

$$\text{Hourly Capacity Factor} = \frac{(\text{Metered Volumes} + \text{applicable AS Volumes})}{\text{Maximum Capability}}$$

The hourly capacity factor for each of the past five years will be averaged to create a straight average capacity factor for the capacity asset:

$$\text{Straight Average Capacity Factor} = \frac{\text{Hourly Capacity Factors}}{\text{\# observed hours}}$$

The straight average capacity factor, when multiplied by the capacity asset's maximum capability anticipated for the obligation period, will yield the UCAP of the capacity asset:

$$\text{UCAP} = \text{Straight Average Capacity Factor} * \text{Maximum Capability}$$

3.1.6 The AESO has identified the following outstanding transitional matters with respect to calculating UCAP for assets that currently operate in the energy and ancillary services markets:

(a) Based on the guidance in subsection 4.1 of Information Document # 2012-007R, *Long Lead Time Energy,* a long lead time asset is expected to restate its available capability in the Energy Trading System during economic shutdown to better reflect physical capability. As a result, observed available capability may not be an accurate representation of the asset's ability to deliver capacity in tight supply cushion hours and the use of availability factor may discount the true capacity contribution of the asset, especially if the tight supply cushion hour occurred in a relatively weaker economic period when the asset was offline. This issue affects approximately three to five generating units in Alberta. The AESO is currently evaluating approaches to remedy this issue. An approach similar to the treatment of mothballed or temporarily delisted assets where the hours impacted by long lead time configuration will be excluded from the availability factor calculation may be adopted. Alternatively, the AESO may obtain more appropriate availability data from the asset owner.

(b) Some generating units in Alberta reduce their available capability in the Energy Trading System to provide operating reserves. As a result, observed availability capability may not be an accurate representation of the asset's ability to deliver capacity in tight supply

cushion hours. This issue affects a small number of generating units in Alberta. The AESO is currently evaluating approaches to remedy this matter. One approach which may be adopted would include an evaluation of the volumes sold in the operation reserves market and adding them back to the reduced available capability.

(c) There are five assets in Alberta that do not meet the criteria for using an availability factor or a capacity factor approach. The AESO is continuing to evaluate options for calculating UCAP for these unique assets.

UCAP for capacity assets without five year historical generation or load consumption data in Alberta

3.1.7 A UCAP for a capacity asset without five years of operating history in Alberta will also be based on an availability factor or a capacity factor calculation, as outlined in subsection 3.1.4 above.[3] Until operating history becomes available, the AESO will use one of the following approaches to supplement data for the UCAP calculation:

(a) ***Class-averages***. Class-averages are based on operating data for similarly-designed or geographically-located assets. The class-average will be based on average energy production or available capacity declarations as observed during the 100 tightest supply cushion hours per year. The AESO will calculate class-average capacity factors for each of the previous five years.

(b) ***Production or load estimates***. In the absence of comparable assets to form a class-average, the AESO will review production or load estimates based on engineering data and historical meteorological studies submitted by the legal owner of the capacity asset to determine a capacity factor.

3.1.8 As operating history becomes available, the AESO will calculate UCAP using a combination of class-average data and the capacity asset's observed capability until the point in time the asset has achieved a five year history of operations.

Asset-specific UCAP methodologies

3.1.9 Table 1 below contains the asset-specific UCAP methodologies and considerations for the calculation of UCAP.

Table 1 – Asset-specific UCAP Methodologies[4]

Asset Type	Asset-specific UCAP Methodology
Wind & solar	• A capacity factor will be established for existing wind and existing solar assets. • A capacity factor using class averages will be established for new wind and new solar assets.
Thermal (including coal-to-gas conversions and net-dispatched cogeneration)	• An availability factor will be established for existing thermal assets. • An availability factor using class averages will be established for new thermal assets, including new net-dispatched cogeneration, and coal-to-gas conversions.

[3] Excluding demand response and external capacity assets. Please refer to Table 1.
[4] References to "existing" and "new" in Table 1 mean capacity assets with and without five-year historical generation or consumption data in Alberta, respectively.

Storage	• An availability factor will be established for existing storage assets. • Given the uniqueness of storage and lack of comparator assets in Alberta, an availability factor using production estimates will be initially used to calculate UCAP for new storage assets. • The UCAP of a storage asset will be capped at its maximum sustainable four hour discharge capability.
Self-supply with net supply	• A capacity factor will be established for self-supply configurations where metered volumes do not match energy market dispatches since these configurations are usually dispatched on a gross output basis. The capacity factor will be based on observed historical net-generation data. • An availability factor will be established for self-supply configurations where metered volumes match energy market dispatches since these configurations are usually dispatched on a net-to-grid basis. The availability factor will be based on historical declarations of available capability. • New self-supply will be required to indicate future load expectations to the AESO.
Hydro	• An availability factor will be established for existing hydro assets in Alberta (Bow River system, Brazeau and Big Horn, run of river hydro). The availability factor will be based on historical declarations of available capability. • An availability factor using production estimates will be used for any new hydro in Alberta.
Demand response **Firm consumption level**	• The capacity contribution (CC) of new firm consumption level asset will be measured as the difference between the qualified baseline (QB)[5] and the firm consumption level (FCL) of the demand response capacity asset: CC = QB – FCL The capacity contribution is multiplied by a derating factor to yield the UCAP of the demand response capacity asset: UCAP = CC * derate factor The derating factor will be based on observed asset performance over the most recent 100 tight supply cushion hours. If the asset is a new asset the class-average derating factor for other Alberta firm consumption level assets will be used. In the initial auction the derating factor will be 90%. • As operating data becomes available, an availability factor using historical consumption data will be established for existing firm consumption load demand response.

[5] As described in subparagraph 2.1.7(c) of Section 2, *Supply Participation*, new loads with no consumption history in Alberta will declare their qualified baseline to the AESO during the prequalification period. The qualified baseline for load sites with consumption history in Alberta will be determined based on the historical consumption of the site.

Demand response Guaranteed load reduction	• The capacity contribution (CC) for new guaranteed load reduction demand response is the guaranteed load reduction (GLR) declared by the legal owner during the prequalification period: CC = GLR The derating factor will be based on observed asset performance over the most recent 100 tight supply cushion hours. If the asset is a new asset the class-average derating factor for other Alberta guaranteed load drop assets will be used. In the initial auction the derating factor will be 90%. UCAP = CC * derate factor • As operating data becomes available, an availability factor will be established using historical consumption data for existing guaranteed load reduction demand response.
Aggregated assets	• Depending on the fuel-type of the aggregated capacity asset, an availability factor or a capacity factor may be established. • The UCAP for an existing aggregated capacity asset will be based on the combined historical performance of the individual component resources during the 100 tightest supply cushion hours during the previous five years. • The UCAP for an aggregated capacity asset that is combining two or more new assets will be based on the individual assets combined asset class-average production during the 100 tightest supply cushion hours during the previous five years.
External assets	*Determination of capacity limit of each Alberta intertie* During a capacity auction, the capacity procured from external capacity assets will not exceed the capacity limits of the BC intertie, MATL intertie, the combined BC/MATL path, and the Saskatchewan intertie. The capacity limits are determined as follows: (a) The hourly capacity limits of the BC intertie will be determined using the minimum of the hourly BC to Alberta import ATC and the total firm transmission service on the BC intertie for each of the 100 tightest supply cushion hours per year for the past five years. The capacity limit of the BC intertie will then be calculated by averaging the hourly capacity limits for the BC intertie. (b) The hourly capacity limits of the MATL intertie will be determined using the minimum of the hourly MATL to Alberta import ATC and the total firm transmission service on the MATL intertie for each of the 100 tightest supply cushion hours per year for the past five years. The capacity limit of the MATL intertie will then be calculated by averaging the hourly capacity limits for the MATL intertie. (c) The hourly capacity limits of the combined BC/MATL interties will be determined using the minimum of combined firm transmission for the BC and MATL interties, and the combined BC/MATL ATC prior to LSSi arming for each of the 100 tightest supply cushion hours per year for the past five years. The capacity limit of the BC/MATL interties will then be calculated by averaging the hourly capacity limits for the BC/MATL intertie.

	(d) The hourly capacity limits of the Sasketchewan intertie will be determined using the minimum of firm transmission service on the Saskatchewan intertie, and the Saskatchewan to Alberta import ATC for each of the 100 tightest supply cushion hours per year for the past five years. The capacity limit of the Saskatchewan intertie will then be calculated by averaging the hourly capacity limits for the Saskatchewan intertie. *External asset UCAP determination* • The following methodologies apply for determining the UCAP of external capacity assets that are named resources or utility system resources. *New external assets* • New external assets must declare a volume, and demonstrate that the external asset has firm transmission in the amount of the volume declared. The external asset must also demonstrate that the declared volume is from a non-recallable source of sufficient size. The volume will then be derated to reflect the frequency of time during historical supply cushion hours that the respective hours was out of service with 0 ATC, to determine the UCAP volume of the external asset. *Existing external assets* • For existing external assets, an availability or capacity factor approach will be used to determine UCAP, in the same manner as an internal capacity asset. • For the first capacity auction, the UCAP for all external resources will be determined based on the UCAP methodology for new external assets.
Mothballed or temporary delisted assets	• The UCAP for capacity assets that have been mothballed pursuant to Section 306.7 of the ISO rules, *Mothball Outage Reporting* or temporarily delisted in accordance with the process outlined in subsection 2.3 of Section 2, *Supply Participation* will be determined using the following methodology: (a) The AESO will establish the minimum number of tight supply cushion hours required to calculate a UCAP that offers an accurate representation of the capacity asset's availability. The number of hours has to be equal to or greater than 250 hours: i. If the delisted capacity asset has data available for 250 or more tight supply cushion hours: if the performance of the asset can be observed using at least 250 tight supply cushion hours over the previous five years, the simple average of the asset's availability or capability during each hour will be used in determining the UCAP of the asset. ii. If the delisted capacity asset has data available for less than 250 tight supply cushion hours: if the performance of the asset cannot be observed using at least 250 tight supply cushion hours over the previous five years, the actual availability or capability over the observed tight supply cushion hours will be used in determining the UCAP of the asset.

	The hours that the asset's performance could not be observed will be supplemented with a class-average for similarly-designed assets during each of the unobserved hours such that a total of 250 data points is obtained. A simple average of the asset-specific and class-average availability or capability will be used to determine the UCAP of the asset.

3.2 UCAP dispute resolution process

3.2.1 The legal owner of a capacity asset may dispute the UCAP range calculated by the AESO in the following circumstances:

(a) the AESO used the incorrect methodology to calculate the UCAP of the capacity asset (e.g., capacity factor versus availability factor);

(b) the metering or Energy Trading System data used by the AESO to calculate the UCAP does not accurately reflect the available capability of the capacity asset because the capacity asset experienced:

i. distribution system impacts on availability;

ii. transmission system impacts on availability;

iii. dispatch down directives; or

iv. a force majeure;

during the tight supply cushions hours that the AESO evaluated;

(c) the AESO made a computational error in calculating a capacity asset's UCAP;

(d) the capacity asset has or will undergo physical changes before the start of the obligation period that will substantially increase or decrease the operational capability of the capacity asset compared to how it has performed historically; or

(e) the class-average data used in calculating UCAP does not create a comparable representation of the capacity asset's available capability.

3.2.2 The AESO's considerations for the resolution of UCAP disputes are as follows:

(a) The reliability contribution of a capacity asset is evaluated using a consistent set of criteria.

(b) The UCAP of a capacity asset should be representative of the capacity asset's physical reliability during tight supply market conditions.

(c) A capacity asset's stated available capability in the Energy Trading System is presumed to be accurate because it is submitted in accordance with ISO rules and the *Fair, Efficient, Open Competition Regulation*. The onus of demonstrating that performance during the hours selected by the AESO is not representative of the capacity asset's physical capability will be on the legal owner of the capacity asset.

(d) The amount of unforced capacity that can be offered into the auction shall not exceed the amount of maximum capability for the capacity asset.

(e) A materiality threshold will be established for all UCAP disputes. Disputes may not be considered if the requested volume adjustment does not exceed the maximum of:

i. one (1) MW; or

ii. 2% of the capacity asset's UCAP.