Calculation of Demand Curve Parameters

Rationale

4.1 Resource adequacy standard

4.1.1 The resource adequacy standard announced by the Government of Alberta prescribes the minimum level of reliability to be achieved. The standard will be a normalized expected unserved energy metric set at a maximum of 0.0011%. The Minister of Energy may make regulations establishing the resource adequacy standard, and AESO's duties now include procuring enough capacity to meet the established resource adequacy standard. The demand curve will be developed to meet this minimum standard.

4.2 Resource adequacy model

4.2.1 A probabilistic approach is expected to provide greater information on the relationship between capacity and supply adequacy, as well as better capture the correlations between supply and demand variability. This results in a more informed and accurate estimation of the procurement volume.

(a) Gross demand is currently the best measure of total provincial demand in Alberta, for which the AESO will need to procure capacity. Gross demand, as opposed to net-to-grid demand, is best suited to capture the overall behaviour between economic activity and load. Forecasting gross demand also aligns with the AESO's current planning and reliability mandate.

The intent of the AESO's load forecast model is to minimize model error. Using multiple hourly weather and economic profiles introduces load-related uncertainty to the RAM, which provides a better reflection of the range of potential future conditions through which the reliability performance of differing capacity volumes can be tested.[1] Specifically, the RAM will consider probabilities of economic growth scenarios to capture uncertainty in the economic outlook underpinning the load forecast. These scenarios also capture uncertainty related to new sources of load growth and energy efficiency impacts. Each scenario is assigned an associated normal-curve-based probability totaling to 100%.

(b) Currently, the AESO has visibility of generating units with a capabilities of 5 MW and greater and is able to reasonably determine outage rates and other key characteristics for these units. The AESO does not have sufficient visibility of assets with a maximum capability of less than 5 MW to include data in the RAM. In the future, the RAM will consider capacity assets less than 5 MW as data becomes available from their participation in the capacity, energy and ancillary services markets.

Demand response capacity assets must be prequalified by the AESO in order to participate in the capacity market. Once these resources have been determined, they will be modelled in the RAM in subsequent auctions.

[1] Additional details on the proposed capacity market load forecast model can be found here: www.aeso.ca/assets/Uploads/Capacity-market-load-forecast-model-description-and-process.pdf.

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(c) The objective of the planned outage algorithm is to add maintenance events such that each event added impacts the lowest load days possible.

(d) Sites with load served by onsite generation exhibit a wide range of generation, load and availability patterns. By aggregating the data across these sites, the AESO is able to capture the correlation between onsite generation and load. The individual unique characteristics of each site create assumption and modelling challenges which prevent the AESO from being able to model them like other generators. Daily gross peak loads of such sites are generally higher in the winter than in the summer. While it has been observed that, at times, these sites do have similar values in the different seasons, their facility daily peak availability does vary from winter to summer. Defining seasonal distributions takes these observed variations into account to better capture the variability in supply from cogeneration.

(e) The RAM is set up to align with current system controller procedure for supply shortfall (EEA) events. The activation and utilization of contingency reserves is consistent with current EEA procedure and operating reserves will be used to meet energy requirements. As contingency reserves are used in real time for other reasons, those types of events are not captured in the RAM estimation of unserved energy unless the event leads to an overall supply shortfall.

(f) It is necessary to develop renewable profiles to take into account the diversity of production from intermittent sources in Alberta. When evaluating resource adequacy it is important to use multiple hourly weather correlated profiles to represent uncertainty in renewable generation. There is insufficient historical data to cover 30 years of weather uncertainty for all sites. Simulated wind shapes were developed incorporating historical metered output from existing sites. Shapes were aggregated by geographic locations and correlations between wind output sites were maintained. Simulated solar shapes were developed using NREL National Solar Radiation Data.[2] Multiple profiles were created to represent diversity in location and technology (fixed and tracking solar PV).

(g) The RAM considers weather correlated historic profiles to accurately assess the contribution of hydro to the system. Hourly, daily and monthly constraints need to be considered while allowing for flexibility inherent in the hydro system to meet load.

(h) As part of the data review, transmission availability was identified as the binding import constraint rather than generation availability within adjacent jurisdictions during tight supply conditions. Therefore, imports within the RAM are a function of transmission availability with other jurisdictions.

4.2.2 There are two key principles underpinning the ICAP to UCAP translation:

(a) The measure of capacity in the demand curve and supply curve need to align so the capacity that the AESO is buying aligns with what the capacity market is selling (i.e., UCAP).

(b) The AESO is indifferent to the type of UCAP it procures. A MW of UCAP should deliver the same amount of reliability regardless of the underlying technology (e.g., 1 MW UCAP from wind equals 1 MW UCAP from simple cycle).

[2] https://nsrdb.nrel.gov/nsrdb-viewer.

4.3 Calculation of gross-CONE and net-CONE

Reference technology

4.3.1- 4.3.2

Selection of a reference technology is meant to ensure the Alberta capacity market provides adequate revenue for required generation additions. The reference technology should represent a technology that can be developed to meet the capacity needs during the capacity auction timeframe at a low cost and, philosophically, be the unit most likely to be developed under predicted future market conditions.

In all capacity market jurisdictions, the reference technology is based on a gas-fired power station. Some capacity markets refer to a combined-cycle plant, while other markets prefer a simple-cycle reference technology. The AESO will consider combined cycle and simple cycle capital and operating characteristics to determine the appropriate reference technology. Based on the AESO's assessment to date, simple-cycle technology may be the best fit to the criteria listed above. Additional details on the reference technology will be developed by the AESO and subject to further consultation.

Gas-fired technologies including LM6000's, frame turbines, reciprocating internal combustion engines, and LMS100 turbines all represent simple-cycle technologies with recent developments in the province. Fuel efficiency tends to favor LMS100 turbines and reciprocating internal combustion engines, while availability and maintenance costs may favour LM6000 or frame turbine power plants.[3]

Approach to gross-CONE estimate

4.3.3 Gross-CONE and net-CONE are significant inputs into the demand curve and are necessary for a functioning capacity market. Reasonable estimation ensures that new assets are attracted to enter the market when appropriate price signals are present. Working with experienced independent financing and engineering services firms to determine appropriate detailed cost estimates for the gross-CONE will increase the objectivity and accuracy of estimates.

4.3.4 Using an approach that considers Alberta-specific conditions for financing generation projects will most accurately characterize on-the-ground conditions for developing supply to meet adequacy needs. The AESO will work with the external consultant to provide realistic financing assumptions in the gross-CONE calculation, based on observable cost, and leverage data applicable to Alberta-based power projects.

The ATWACC for individual firms is expected to vary greatly as different participants and projects will have asymmetric credit ratings, costs of debt and debt/equity ratios.

4.3.5 Since CONE values are not subject to significant changes over a several year timespan, CONE studies are updated in other capacity market jurisdictions every 3 to 5 years to reduce administrative burden.[4] Similarly, the gross-CONE study will be updated with the demand curve review cycle to ensure that the reference technology is reflective of long term changes in the market and generation costs. In between review cycles, the gross-CONE estimate will be indexed from year-to-year to reflect changes in the capital cost of the reference technology. The indices will reflect changes in labour, materials, and turbines (e.g., machinery and equipment) in order to track changes in the development cost of the reference technology. A composite index will be developed by weighting component indices by their relative contribution to installed costs initially.

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[4] See Charles River Associates Paper, Governance Institutions and Processes for Electric Capacity Markets: A Jurisdictional Review at PDF pp. 134-135: http://www.energy.alberta.ca/AU/electricity/AboutElec/Documents/CMGovernanceJurisdictionalReview.pdf.

The specific indices used to index gross-CONE will be developed by the AESO and subject to further consultation.

Approach to energy and ancillary services offset

4.3.6 To develop the energy and ancillary services offset (offset) approach to construct the net-CONE, the AESO took into consideration that numerous historic and future market fundamentals will lead to significant challenges and uncertainty when modelling potential earnings derived from the offset. Some of the many examples of changes to market fundamentals that challenge analysis of the future power market include natural gas prices, the cost of carbon, renewables penetration, magnitude of coal to gas conversions, and energy and ancillary services market offer share ownership. To manage the uncertainty and to develop a transparent replicable methodology for creating the offset, the AESO is proposing a forward market methodology, which incorporates forward power and natural gas prices. To achieve certainty of revenues, the offset will not include revenues from ancillary services given that forward markets do not price ancillary service products.

Approach to net-CONE estimate

4.3.7 - 4.3.8

The net-CONE will not be a negative number because at a minimum, a plant operator could avoid generating to avoid any negative margin. Net-CONE reflects the missing money, that the capacity market is designed to compensate generators for. Thus, net-CONE is the best index to reflect price parameters at points on the demand curve corresponding to the capacity price cap and the inflection point.

4.4 Shape of the Demand Curve

4.4.1 The AESO's development of the demand curve was guided by the following principles:

(a) Demand curve parameters should be set to ensure procurement of a sufficient amount of capacity for reliable operation of the electricity grid and to achieve the resource adequacy objectives, while avoiding significant over-procurement or under-procurement.

(b) Demand curve parameters should be set to send an efficient price signal in the capacity market, avoid excessive capacity price volatility and reduce the opportunity for the exercise of market power.

(c) Demand curve parameters should be set to balance between achieving resource adequacy and lowest possible long-term cost to consumers, and to sustain resource adequacy over time through a market-based outcome.

(d) Demand curve parameters, including the relationship between these parameters and net-CONE, should be set to ensure that Alberta's market attracts investment in new capacity and maintains existing capacity in order to achieve the resource adequacy objectives.

(e) Demand curve parameters should be compatible with, and robust to, reasonably foreseeable changes in supply, demand, energy prices and other factors in the electricity market.

(f) To the extent applicable to the Alberta context, the demand curve analysis should incorporate experience and lessons learned from other jurisdictions.

(g) Unique aspects of Alberta's electricity system (e.g., small size of the market, market transition) should be considered.

Demand curve shape refined to meet the Government's resource adequacy objective

The primary purpose of the demand curve is to express the Government's resource adequacy objectives as a quantity of capacity to be procured in the market, at prices high enough to attract entry as the Alberta system becomes short (and low enough to defer entry when the system is long). In 2017 and early 2018, preliminary demand curve analysis was conducted under the assumption that the Government would adopt a target resource adequacy level to be achieved on average across many years. The AESO and stakeholders used a 400 MWh per year average expected unserved energy (EUE) target as a working assumption in developing its original candidate demand curves. Under that assumed reliability objective, candidate curves were designed to achieve 400 MWh EUE on average across many years, though reliability could drop to a lower level in any individual year.

In March 2018, the Government of Alberta announced a *minimum* resource adequacy standard by specifying a *minimum acceptable* reliability of 0.0011% EUE, which equates to approximately 964 MWh of EUE at the load level expected by 2022. Defining the reliability objective as a minimum acceptable (rather than a target average) introduces different implications for how the demand curve should be defined. Average reliability must now be, on average, greater than or equal to the 0.0011% / 964 MWh EUE minimum. The minimum acceptable reliability level will also define the capacity level at which the AESO may need to intervene in the market to procure backstop capacity to avoid unacceptable reliability levels. The minimum acceptable reliability and the backstop intervention level are similar to the EUE intervention level in the energy only market in Section 202.6 of the ISO rules, *Adequacy of Supply.*

To represent this reliability standard as a demand curve for capacity, the AESO will aim to limit the frequency of a capacity auction clearing below the minimum acceptable level to no more than 5% of years. This will be achieved by developing a demand curve where the parameters are set such that procurement levels in the base auction are expected to exceed the minimum level 95% of the time. The demand curve necessary to achieve this objective is fairly wide and achieves *average* reliability considerably higher than the *minimum*. This reflects the reality that reliability deteriorates rapidly as the market becomes short, consistent with the exponential shape of the EUE versus a total UCAP curve.

If the demand curve performs as expected, the demand curve would procure sufficient capacity to meet reliability needs with reliance on rebalancing auctions or backstop reliability interventions triggered only once every 20 years. The simulation performed by the Brattle Group, described in further detail below, showed that this 5% level will minimize the impact of out-of-market interventions on capacity and energy market performance. The AESO will not attempt to entirely eliminate the possibility of infrequent reliability interventions however, because doing so would require maintaining large excess quantities of capacity and imposing the associated costs. Given the ability to take action in the three years leading up to the obligation period to meet the resource adequacy standard, the AESO is of the view that this is a reasonable risk to take to prudently manage capacity costs.

The AESO intends to meet the Government's minimum reliability standard by procuring all needed supply through the base auction. This approach will take advantage of the larger pool of resources available to commit on a three-year forward timeframe and the resulting higher elasticity of available supply. The AESO will leverage rebalancing auctions to correct imbalances arising after the base auction, but not to procure incremental supply on *average* through the demand curve shape. If the AESO consistently relied on the rebalancing auctions to true up its supply, it would risk entering the rebalancing auctions very short in years where net supply was under-forecasted in the base auction. The AESO would then have limited options to procure sufficient supply before the start of the delivery year, customers would be forced to pay potentially very high offer prices from the limited pool of available suppliers, and reliability could be negatively affected.

Approach to evaluating potential demand curves

In the fall of 2017, the AESO consulted on numerous candidate demand curves that would support the assumed reliability target of 400 MWh per year average EUE, perform well under a range of potential market conditions, and align with the other demand curve design principles. To examine potential performance of each of these curves, the Brattle Group developed a Monte Carlo model to simulate the likely price volatility, quantity procurement, cost, and reliability outcomes that could result from each curve. The Monte Carlo model evaluated capacity market outcomes probabilistically, given realistic variability in supply and demand under the long-run equilibrium assumption that merchant generation will enter or exit the market until average prices equal net-CONE. Results of the model include distributions of price, quantity, and reliability outcomes that might be realized over many years under AESO candidate demand curves. The AESO and the Brattle Group engaged with the Demand Curve Working Group to refine simulation assumptions and technically test a wide range of curves through an iterative process.

This analysis revealed that there is a workable range of well-performing curves. The well-performing curves met the desired outcomes of ensuring resource adequacy, providing a price signal of net-CONE on average, and mitigating against net-CONE error.[5] However, the simulation modeling identified trade-offs across these curves in terms of robustness to market conditions, price volatility, reliability outcomes and market power exposure. Curves outside the workable range of good performance parameters tended to have unacceptable performance in at least one area (such as unacceptably low reliability, high cost, or high price volatility).

From March to June 2018, the AESO assessed additional curves consistent with the Government's 0.0011% EUE minimum resource adequacy standard. In developing a new set of candidate curves, the AESO and the Brattle Group also implemented a refined simulation approach that accounted for stakeholder input.[6] All of the curves assessed in 2018 were downward-sloping and convex (i.e., the slope on the minimum-to-inflection point segment of the curve is steeper than the slope of the inflection point-to-foot segment). This downward-sloping, convex shape is generally consistent with the marginal reliability benefit of capacity. The AESO focused on curves with a price cap at 1.75x net-CONE, which balances the trade-off between sending a strong signal for investment when the market is short and increasing price volatility under all market conditions.

Rationale for selecting specific demand curve parameters

Based on a qualitative and quantitative analysis of a large number of demand curves, the AESO has identified a workable range and preferred levels for specific demand curve parameters. Based on this analysis, the AESO and the Demand Curve Working Group developed a preference for a convex demand curve (rather than straight-line or concave) with the following: (i) a width comparable to or slightly wider than demand curves in other capacity market jurisdictions; and (ii) a higher price cap than other capacity market jurisdictions in the range of 1.6 - 1.9x net-CONE.

The rationale for identifying the workable range for each demand curve parameter is as follows:

- ***Y-axis (or price) points.*** The Y-axis points for the demand curve will be set in reference to a multiple of the net-CONE parameter. This approach to setting price points is consistent with the economic theory that capacity market prices must be able to rise to the long-run marginal cost of supply on average in the capacity market (i.e., to net-CONE). Setting demand curve prices around the expected net-CONE will allow the demand curve to adjust to support higher (or lower) prices if market conditions change to increase (or decrease) the prices needed to attract new entry when needed. The price cap (zero quantity-to-minimum reliability segment) is set based on the maximum value of either a 1.75x times net-CONE or a 0.5 times gross-CONE. The 1.75x net-CONE level is expected to set prices in times when energy prices and expected energy margins for the marginal new entrant are moderate or low. This price cap is high enough to attract supply offers and avoid shortage conditions, but not so high that it exposes market participants to excess price volatility or excess potential for the exercise of market power. The 0.5x gross-CONE minimum on the price cap will prevail under conditions with high

[5] Further material on the candidate curves examined earlier in the capacity market design process, along with the rationale for their selection, can be found here: www.aeso.ca/assets/Uploads/2.1-2017-11-29-Candidate-Demand-Curves-ForPosting.pdf.

[6] Further material can be found here: https://www.aeso.ca/assets/Uploads/DemandCurveTWG4-June14-slide28-Updated-rev2.pdf.

energy margins and associated low net-CONE. This minimum on the price cap will prevent reliability erosion, in cases of low net-CONE or underestimation of net-CONE.

- ***Inflection point.*** The inflection point is set at a level of 0.875x net-CONE, which is within the workable range of at least 0.8 to 1.0x net-CONE identified by the AESO. The exact placement of this point has a modest effect on demand curve performance in that placing it lower and to the left would make the curve more convex, while placing it higher and to the right would make it less convex. The more important performance issue related to the inflection point is that the inflection point (and the entire demand curve) needs to be right-shifted compared to the minimum acceptable reliability level. To avoid falling below the minimum acceptable level, the quantity points on the demand curve must be right-shifted sufficiently to mitigate year-to-year fluctuations in the supply-demand balance (caused by factors such as entry and exit from the market and load forecast changes).
- ***X-axis of demand curve*.** The X-axis points for the demand curve will be set in reference to quantity of UCAP MW of capacity, RAM metrics, and demand curve performance simulations. The minimum point is set at a value equal to the 0.0011% EUE standard set by the Government. This minimum quantity is the point at which demand curve prices will reach the price cap. Setting the cap quantity at the minimum acceptable level will ensure that all in-market offered capacity will be procured before the AESO would potentially need to engage in backstop procurement. All other quantity points on the demand curve will be set at a higher level in order to ensure that average reliability exceeds the minimum acceptable, and that the capacity market is expected to fall below the minimum acceptable only 5% of the time.
- ***Foot of the demand curve*.** The foot of the curve is set at zero as negative pricing does not incentivize capacity additions. A price floor above zero is also not desirable because it would have the potential to attract and retain excess quantities of capacity resources, particularly if the cost of incremental supply is low. This was the experience in the early years after implementation of ISO-NE's capacity market with a price floor that attracted incremental low-cost supply into the already long market. By allowing capacity prices to drop to zero at higher quantities, the demand curve will ensure that customer costs are more aligned with reliability value and mitigate the potential for sustained periods with excess supply.

  The foot of the demand curve will be set at a quantity level such that the minimum acceptable reliability level will be violated only 5% of all years in the base auction procurement. Price outcomes can be expected to average at net-CONE levels while also balancing capacity price volatility and maintaining the desired convexity of the curve. This combination is expected to best achieve the demand curve principles.
- ***Width of the demand curve.*** The AESO considered the following trade-offs in its evaluation of the width of the demand curve:

  (a) A steeper curve is more robust to a wide range of market conditions, has less reliability risk from underestimated net-CONE, and less risk of excess capacity above the reliability requirement.

  (b) A flatter curve has lower price volatility and less exposure to exercise of market power and need for strict mitigation. However, a flatter curve presents a risk of procuring more capacity than required to meet the resource adequacy standard.

  (c) Assessments of Alberta's system indicate that a demand curve based on the marginal reliability value is too steep to achieve reliability.

  Due to Alberta's small market size, the AESO identified that the province is at greater risk than other markets of price volatility and resource adequacy concerns caused by the expected variability in supply and demand in the capacity market. To manage this volatility and variability, a relatively wider curve could be used. However, industry stakeholders raised concerns that a wider demand curve might have the undesirable effect of increasing average procurement levels and capacity market costs along with dampening price signals in the energy market due to greater supply. In response to this feedback, the AESO has opted to choose a demand curve that is relatively steep compared to other candidate curves identified within the well-performing range. The steeper curve also requires a relatively higher price cap than that used in other capacity markets, to keep quantities above the minimum acceptable level and support revenues aligned with long-run marginal cost.

Comparison of selected and alternative curves

Figure 1 below illustrates two candidate curves based on the 5 % at the cap reliability objective and compares them with the curve that was previously proposed in CMD 1.0. Table 1 provides the performance result of each candidate curve displayed in Figure 1. The "Less Convex" curve (displayed in navy blue) has a price cap at 1.75x net-CONE and a quantity at the cap corresponding to the minimum acceptable reliability (currently 964 MWh EUE). The kink is located at 0.875x net-CONE and is a quantity corresponding to 40% of the overall curve width. The position of the foot is selected in order to ensure no more than 5% of draws occur at the price cap in the Brattle Group's sample Monte Carlo simulation.

The "More Convex" curve (displayed in purple) has a slightly different shape, with the kink located at the intersection of net-CONE and the quantity corresponding to 100 MWh EUE. The foot quantity is selected using the same approach as for the Less Convex curve in order to ensure no more than 5% of draws occur at the price cap. The horizontal portion of this curve is higher, which results in a steeper portion of the curve left of the kink, and a much wider foot compared to the Less Convex curve.

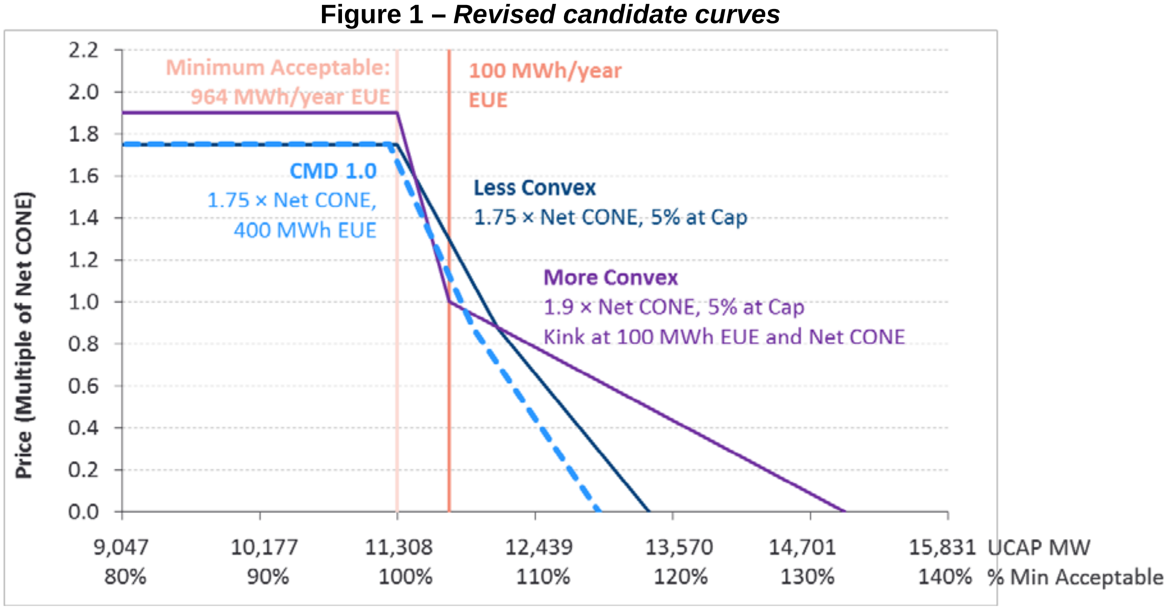
The Less Convex curve is similar in shape to the proposed curve from CMD 2 and CMD 3, but slightly wider. The increase in width is the result of updated information and analysis since CMD 1, including:

(a) updating RAM analysis resulted in a slightly steeper EUE curve (slightly widens the demand curve);

(b) reducing the estimate of shocks to demand (slightly narrows the demand curve), and

(c) revising the objective from a 400 MWh per year average EUE target to hitting the price cap no more than 5% of the time (slightly widens the demand curve).

Figure 1 – *Revised candidate curves*



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As shown in Table 1, both candidate curves perform similarly in terms of average EUE and cleared quantity in the long-run Monte Carlo analysis. The only quantitative performance difference between the two curves is the approximately 15% higher price volatility associated with the Less Convex curve.

Table 1 – *Revised candidate curve results*[7]

Demand Curve	Price and Cost				Reliability			
	Average Price *($/kW-yr)*	Standard Deviation of Price *($/kW-yr)*	Frequency at Cap *(%)*	Average Cost *($mil/yr)*	Average EUE (Before Intervention) *(MWh)*	Average EUE (After Intervention) *(MWh)*	Average Cleared Quantity *(MW)*	Average Uncleared Supply *(MW)*
More Convex	$139	$46	5%	$1,666	276	128	12,047	229
Less Convex	$139	$53	5%	$1,665	266	118	12,042	247

Figure 2 below shows the two revised candidate curves compared to other capacity market demand curves. The width of the Less Convex curve is 18%, which is wider than several of the U.S. capacity markets including PJM (8%) and ISO-NE (12%). The foot quantity of the Less Convex curve is consistent with the New York City zone, which is a similarly-sized market.[8] The More Convex curve is substantially wider than other markets with a width of 32%.[9]

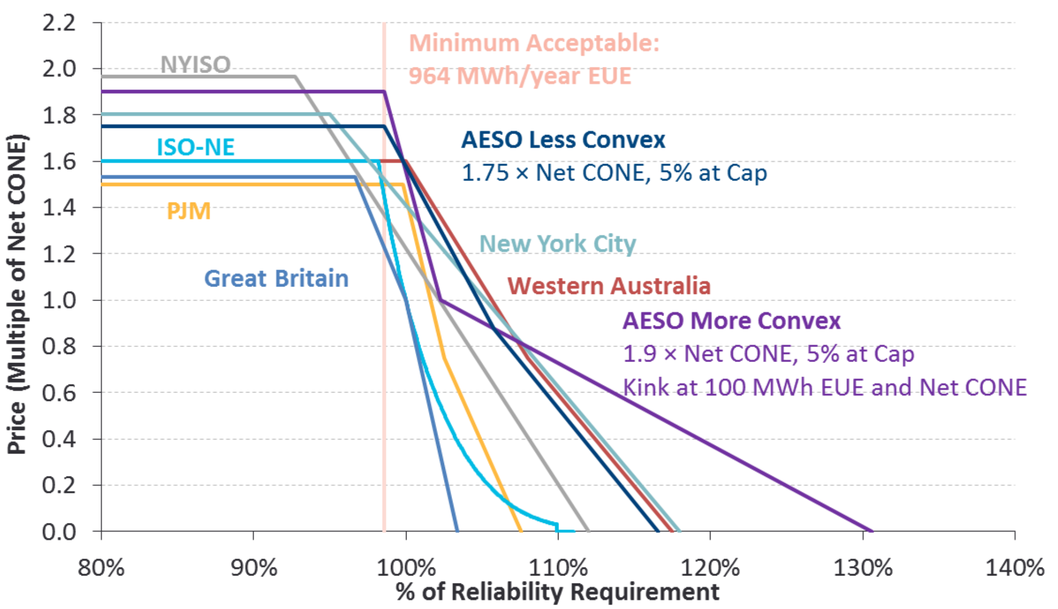
While the AESO's candidate curves are wider than curves in many other markets on a percentage basis, this is needed to manage entry and exit of lumpy supply in Alberta's smaller market. On a pure MW basis, the candidate curves are in fact steeper than in some other markets. For example, the Less Convex curve has a width of about 2,000 MW (UCAP) versus PJM's width of nearly 11,900 MW. The AESO's candidate curves also have relatively higher price caps than most other markets, which contributes to the curve's steepness. This higher price cap was chosen based on Demand Curve Working Group input and reflects a preference to avoid over-procurement in long conditions even though price volatility is somewhat higher.

[7] Average price and average cost are outputs of the Monte Carlo simulation, not an approximation of an auction outcome. The Average EUE (After Intervention) represents the EUE estimate after adjustments to reduce EUE results from any simulation seed that exceeds the minimum resource adequacy standard to the minimum level.

[8] The New York City demand curve is somewhat wider than the AESO's due to its lower quantity at the cap.

[9] Note the percentage for the demand curve width refers to the percent of MW corresponding to the minimum acceptable reliability for AESO and percent of MW corresponding to the reliability requirement (1-in-10 loss of load expectation) for other capacity markets.

Figure 2 – *Cross-market demand curves comparison*



Notes:

100% of the Reliability Requirement corresponds to 400 MWh per year average EUE for the AESO and 1-in-10 loss of load expectation for the other capacity markets. NYISO and New York City curves are based on the 2018 summer period; the ISO-NE curve is the FCA11 Marginal Reliability Impact demand curve; the PJM curve is the 2021/22 BRA VRR curve; the Great Britain curve is based on the 2015/16 period; and the Western Australia curve is a proposed curve for their capacity auction.

As shown in Table 1 above, both AESO candidate curves achieve reliability objectives and have similar performance on the quantitative measures in the long-run. However, the curves will likely perform differently in the short-term. If the market is even moderately long in the short-term, then the More Convex curve would likely cause significant over-procurement compared to the Less Convex curve. This could be a concern if existing supply is retained and incremental internal supply, imports, and demand response offer into the initial capacity auctions. While it is expected that excess supply would reduce over time through auction clearing even with the More Convex curve, it is reasonable to expect periodic long supply conditions, lasting a longer period of time, if the More Convex curve were selected.

Table 2 below summarizes certain qualitative aspects of the candidate curves' short-run performance as it relates to the capacity market design objectives. These factors suggest that the Less Convex curve is more consistent with the design objectives in the short run and support the proposal to adopt this curve in Alberta.

Table 2 – *Candidate curve comparison*

Consideration	More Convex	Less Convex
Risk of Over-Procurement and Unnecessary Costs to Customers	• Has relatively lower risk when market is short and higher risk when market is long • Over-procurement when long may be a particular concern if market is expected to be long in the early years	• Has relatively lower risk when market is long and higher risk when market is short • Over-procurement may be less of a concern when market is short
Sending an Efficient Price Signal Consistent with Incremental Reliability Value	• Demand curve price substantially exceeds marginal reliability value at higher quantities	• Demand curve price may still exceed marginal reliability value at higher quantities, but by a much smaller margin
Exposure to the Exercise of Market Power	• Has relatively lower risk right of the quantity corresponding to 100 MWh EUE and higher risk to the left of that point	• Has relatively lower risk left of the quantity corresponding to 100 MWh EUE and higher risk to the right of that point
Attracting and Retaining Investment Consistent with Resource Adequacy Objectives	• Steep segment left of the kink will effectively attract supply when the market is short • Substantially flatter segment right of the kink may be slow to incentivize retirements when the market is long	• Steep segment left of the kink will effectively attract supply when the market is short • Somewhat flatter segment right of the kink will still incentivize retirements when the market is long
Consistency with Lessons Learned in Other Jurisdictions	• Curve is wider than in other jurisdictions	• Curve is somewhat wider than most full markets, but consistent with similarly-sized New York City zone

4.5 Demand curve for rebalancing auctions

4.5.1 Using the same demand curve shape in the rebalancing auctions avoids the market distortions that would occur if the rebalancing auction demand curve were systematically different than the base auction demand curve.

The AESO will update the procurement volume parameters of the demand curve using the updated resource adequacy assessment completed prior to the rebalancing auction, to reflect recent supply and demand information. These updates will allow the AESO to ensure reliability if it has under-forecasted procurement volume, reduce customer cost impacts if it has over-forecasted procurement volume, and send an accurate updated price signal to suppliers about the tightness of capacity supply and demand in the market.

The AESO proposes not to update the net-CONE parameter in the rebalancing auctions. Net-CONE will likely be the subject of an extensive stakeholder process involving public release of draft parameter values. Since draft net-CONE values may be available more than a year before they are used in a forward capacity base auction, use of an updated net-CONE parameter in a rebalancing auction would introduce an opportunity for gaming. Since market participants would know with reasonable confidence whether net-CONE is likely to increase or decrease in the rebalancing auction at the time they offer into the forward base auction, they would have incentives similar to those described above for systematic differences in demand curve shape.