2022 Capacity Auction Enhancements -DRAFT

October 2021

ieso
Connecting Today.
Powering Tomorrow.

Table of Contents

Introduction

Over the next several years, as the IESO enters a period of increasing capacity needs, the annual Capacity Auction will be the main mechanism in the Resource Adequacy Framework to secure short-term resource adequacy needs and the primary acquisition mechanism to meet needs prior to 2026, when the commitment period for the first medium-term RFP begins. The Capacity Auction enables the IESO to acquire capacity in a transparent and cost-effective manner and acts as an enduring mechanism that can balance fluctuations in capacity needs from one year to the next. Having a flexible and competitive mechanism that can respond to changing system needs each year delivers significant value to ratepayers and ensures cost-effective reliability.

In an important milestone for Ontario's electricity sector, the IESO secured 992.1 MW of capacity from a broad range of resources in the December 2020 Capacity Auction.

The experience with the most recent auction has reinforced the value of this mechanism in meeting short-term needs, and demonstrates why it will be increasingly relied upon in the years ahead as our system needs grow. In order to achieve greater competition and improve the performance of participating resources, several enhancements to the existing Capacity Auction have been proposed and developed through discussions with stakeholders throughout 2021 in the Resource Adequacy stakeholder engagement.

The first Annual Acquisition Report, issued in July 2021, provided increased business and investment certainty for the market by publishing minimum annual targets and forward guidance on expected overall targets for upcoming annual Capacity Auctions.

This document describes enhancements designed to expand participation and competition in the auction to generator-backed capacity imports and improve availability and delivery performance of participating resources for the December 2022 auction.

Purpose of Design Document

This document describes the design enhancements that will be implemented in the Capacity Auction to be held in December 2022. The purpose of this document is to provide stakeholders and the IESO with a common understanding of the design features that will be introduced, including key design decisions and the rationale. The design enhancements described in this document reflect feedback provided by stakeholders through Resource Adequacy engagement sessions held throughout 2021.

The IESO intends to make regular, incremental improvements to the Capacity Auction in future years in response to both internal IESO drivers, lessons learned and stakeholder priorities while accounting for time and resource constraints. Any future enhancements will be discussed with stakeholders in a transparent manner.

Not included in the scope of this document is the more detailed implementation of the design, in terms of specific Market Manual changes and tool/system changes. The IESO will address the implementation aspects of the changes through future stakeholder engagements.

This document assumes that the reader is familiar with relevant terminology and design features of the existing Capacity Auction, the rules and mechanisms of which will be used as a foundation for the enhancements outlined in the following sections. For more information on the existing Capacity Auction and the current guiding documents, please refer to the Capacity Auction webpage.

Background

The IESO's first Capacity Auction was held in December 2020, in which approximately 992 MW of capacity, from a diverse range of suppliers, was procured. This inaugural Capacity Auction was developed by expanding the Demand Response Auction, which acquired capacity from demand response resources over five auctions from 2015 to 2019. The annual Capacity Auction will be the main mechanism in the Resource Adequacy Framework to secure short-term resource adequacy needs outlined in the Annual Planning Outlook and Annual Acquisition Report and the primary acquisition mechanism to meet needs prior to 2026.

The Capacity Auction is broken down into four major auction periods, as presented with the associated timelines in the figure below.

Figure 1: Capacity Auction Timeline

These auction periods will be referenced throughout this document as the design enhancements are outlined.

Design Principles

The design enhancements for the December 2022 Capacity Auction were developed in accordance with the same guiding principles used for the Market Renewal Program:

- **Efficiency** - focus on efficient outcomes to reduce system costs
- **Competition** - provide open, fair, non-discriminatory competitive opportunities for participants to help meet evolving system needs
- **Implementability** - work together with our stakeholders to evolve the market in a feasible and practical manner

- **Certainty** - establish stable, enduring mechanisms that send clear, efficient price signals
- **Transparency** - accurate, timely and relevant information is available and accessible to participants to enable their effective participation to meet system needs

Summary of Enhancements

The following major design enhancements will be implemented ahead of the December 2022 Capacity Auction:

Capacity Qualification

The IESO plans to adopt a capacity qualification process to derive an Unforced Capacity, or UCAP, value for all resources. Qualifying resources on a UCAP basis is a well-established approach to fairly and uniformly evaluate how much a resource can reliably be expected to provide towards meeting capacity needs during peak periods by accounting for historic availability and performance. A qualified capacity approach also supports the transition to more technology-agnostic procurements. By introducing an IESO-administered Capacity Qualification process, both the IESO and participants in the auction will have the confidence that the capacity contribution from each resource is being accounted for appropriately using fair and transparent methodologies.

Enhanced Performance Assessment Framework

Updates to the performance assessment framework will incent improved reliable performance from participants in the auction, reduce the risk of underperformance from cleared resources during hours of system need and will work in conjunction with the capacity qualification process to improve confidence and address concerns related to the value provided by resources secured in the auction.

Expanding Participation to Generator-Backed Capacity Imports

The IESO aims to increase competition and cost effectiveness by facilitating the participation of generator-backed capacity imports. The IESO anticipates being able to facilitate participation from generator-backed capacity imports located in Quebec and New York, while participation from generator-backed capacity imports located in the Midcontinent Independent System Operator (MISO) is still under consideration.

Enhancement #1: Capacity Qualification

Key objectives of the Capacity Auction include:

- Procuring capacity in a transparent, open and fair manner; and
- Ensuring that the capacity secured through the auction contributes equally towards meeting resource adequacy needs while considering the unique characteristics of the underlying technology.

To meet these objectives, a capacity qualification process will be used in the pre-auction period of the December 2022 Capacity Auction (and similarly for future auctions) to derive the UCAP value that a resource can offer into the Capacity Auction.

During the pre-auction period, resources that intend to participate in an upcoming Capacity Auction will be required to submit an ICAP value for each resource (described further in the next section). The IESO will apply the resource-specific capacity qualification methodologies to derive a UCAP value which will represent the maximum megawatt quantity that the resource may offer into the auction.

Capacity Qualification Methodology Overview

The approach to qualifying capacity for all resources is generalized as follows:

UCAP (MW) = ICAP (MW) x Availability De-Rating Factor x (1 – PAF)

Where:

- UCAP (Unforced capacity) is the maximum amount, in MW, that a resource is qualified to offer into the Capacity Auction as an output of the Capacity Qualification process.
- ICAP (Installed capacity, in the context of the Capacity Auction) is the capability, in MW, as specified by the Capacity Auction Participant for a Capacity Auction Resource, reflecting the seasonal generation or load-reduction that a resource is able to provide.
- Availability De-Rating Factor is based on a resource's historical data.
- PAF is the Performance Adjustment Factor, applicable to an individual resource, as based on assessed performance during historical seasonal capacity test activations.

A resource-specific UCAP value will be determined during the capacity qualification process for each seasonal obligation period (summer and winter). The Capacity Auction Participant can then choose to offer the resource's summer and winter UCAP value (or less) into the Capacity Auction. Any resources assessed to have a cleared UCAP below 1 MW will be unable to participate in the auction as the minimum offer quantity a resource may offer into the auction is 1 MW.

Further detail on each component of the capacity qualification process, as well as a chart summarizing the input sources by resource type are in the following sections.

ICAP Values

Seasonal ICAP values for individual Capacity Auction Resources will be submitted to the IESO by the Capacity Auction Participant through Online IESO during the capacity qualification process. It is the responsibility of the resource representative to determine the most appropriate value based on the following guidance:

- Seasonal ICAP values should reflect the maximum expected offer/bid capability of a resource given ambient temperature and operating conditions. However, when submitting the ICAP for a Capacity Auction Resource, the Capacity Auction Participant should account for some uncertainty of these conditions, or generally the ability to achieve this maximum capability, during a capacity test activation.
- Seasonal ICAP values are expected to be consistent with other data submitted to the IESO through Form 1230 or market registration (if this data set exists).
- It is important to consider that during a capacity test activation, a resource will be tested to its cleared ICAP. Applicable charges and Performance Adjustment Factors (as further described below) will be calculated based on a resource's performance as compared to its cleared ICAP.
- For storage resources, ICAP should account for a four-hour energy duration requirement as detailed in the dispatchable storage UCAP methodology, outlined below.

Availability De-Rating Factor

The basis of the Availability De-Rating Factor in the UCAP calculation takes into account the unique operating and participating methods of the resource type. The Availability De-Rating Factor for an individual resource, will be calculated per the methodology for the resource type, using either, equivalent forced outage rate on demand ($EFOR_d$), the resource's production and scheduled operating reserve data from the top 200 hours of Ontario demand (per season) or the resource's bid data from the top 200 hours of Ontario demand (per season). Five years of this historical data will be used to calculate the Availability De-Rating Factor.

Exceptions to this approach will be provided for dispatchable loads and HDR resources. The Availability De-Rating Factor for dispatchable loads will be based on bid data from the most recent comparable season. The Availability De-Rating Factor for HDR resources will not be applicable. This is due to the fact that under the HDR participation framework, resources only maintain bids through to real-time when on standby. This means there is an insufficient amount of real-time bid and production data from which to derive an Availability De-Rating Factor.

Equivalent Forced Outage Rate on Demand ($EFOR_d$)

The Availability De-Rating Factor may be based on $EFOR_d$, which represents the probability that a resource will not be available (completely or in part) during hours the unit is called upon to generate (i.e., during on-demand hours) due to forced outages or forced de-rates. If known, a resource-specific $EFOR_d$ will be used, otherwise a fleet-wide $EFOR_d$ will be applied.

Top 200 Hours of Ontario Demand

The top 200 hours of Ontario Demand per season approach will be used to assess performance (availability or production) during the roughly 5% of peak hours per year. This sample size represents a good reflection of resource contributions and availability during hours of system peak.

Performance Adjustment Factor

The last variable in calculating a resource's UCAP is the Performance Adjustment Factor (PAF). A resource's PAF will be calculated in the pre-auction period for each season, prior to the annual Capacity Auction. The PAF will be based on the most recent test activation that occurred prior to the pre-auction period, for which data is available. PAFs will always be calculated pursuant to the performance assessment pass/fail settlement criteria that were in place at the time that the capacity test activation occurred.

For the December 2022 Capacity Auction, and subsequent auctions, summer and winter PAFs will be calculated for HDR resources based on the resource's historical performance in the most recent season for which data are available. For the December 2022 Capacity Auction, HDR resources will be qualified using:

- Capacity test activation data from the summer 2021 obligation period for PAF_{summer}, and;
- A weighted "class average" of the capacity test activation data from the winter obligations of years 2018/19 and 2019/20 (November 2018 to April 2019 and November 2019 to April 2020) for PAF_{winter}. A class average was required because there is no winter 2021/22 Capacity Auction obligation period and no testing was performed during the 2020/21 obligation period due to the COVID-19 pandemic. Separate class averages will be derived for 1) Physical HDRs, 2) Virtual C&I HDRs, and 3) Residential HDRs.

For the December 2023 Capacity Auction, **all resources** will be qualified using capacity test activation data from the summer obligation period of May to October 2022 and the winter obligation period of November 2022 to April 2023.

For more details on the data that will be used for PAF calculations and the obligation periods from which that data will be sourced, consult Appendix A.

The table below summarizes the factors to be used in qualifying capacity.

Table 1: Summary of Qualification Inputs

	ICAP	Availability De-Rating Factor	PAF
Dispatchable Thermal Generation	Seasonal ICAP values provided by Capacity Auction Participant during capacity qualification process	$EFOR_d$ value based on five years of historical $EFOR_d$ data	For qualification in the December 2023 Auction, PAF will be based on capacity test activation results from summer 2022 and winter 2022/23
Dispatchable Hydro		Production data and scheduled operating reserve data that coincides with the top 200 hours of highest Ontario demand per season, over the most recent five years	
Dispatchable Storage		$EFOR_d$ of 5%	
Dispatchable Load		One year of historical bid data that coincides with the top 200 hours of highest Ontario demand per season	
System Backed Imports		N/A	
Generator Backed Imports		Accredited UCAP value in source jurisdiction (if available) or same methodology as used for equivalent resource type in Ontario	
HDR		N/A	For qualification in the December 2022 Auction, PAF will be based on capacity test activation results from summer 2021 and a weighted class average of results from winter 2018/19 and 2019/20.

Cleared UCAP and Cleared ICAP

The UCAP calculation determines the maximum amount (in MW) that a resource will be qualified to offer into the Capacity Auction. Once the Capacity Auction has been completed, the resource will then have a Cleared UCAP, which may or may not be equal to the initial UCAP. The Cleared UCAP will then be used to calculate a corresponding Cleared ICAP as follows:

Cleared ICAP (MW) = Cleared UCAP (MW) / (1 – PAF)

The concepts of a Cleared ICAP and a Cleared UCAP are essential for resources to be aware of since:

- The resource will be paid based on its Cleared UCAP value

- Capacity test activations will be assessed against the resource's Cleared ICAP value

This concept is illustrated below:

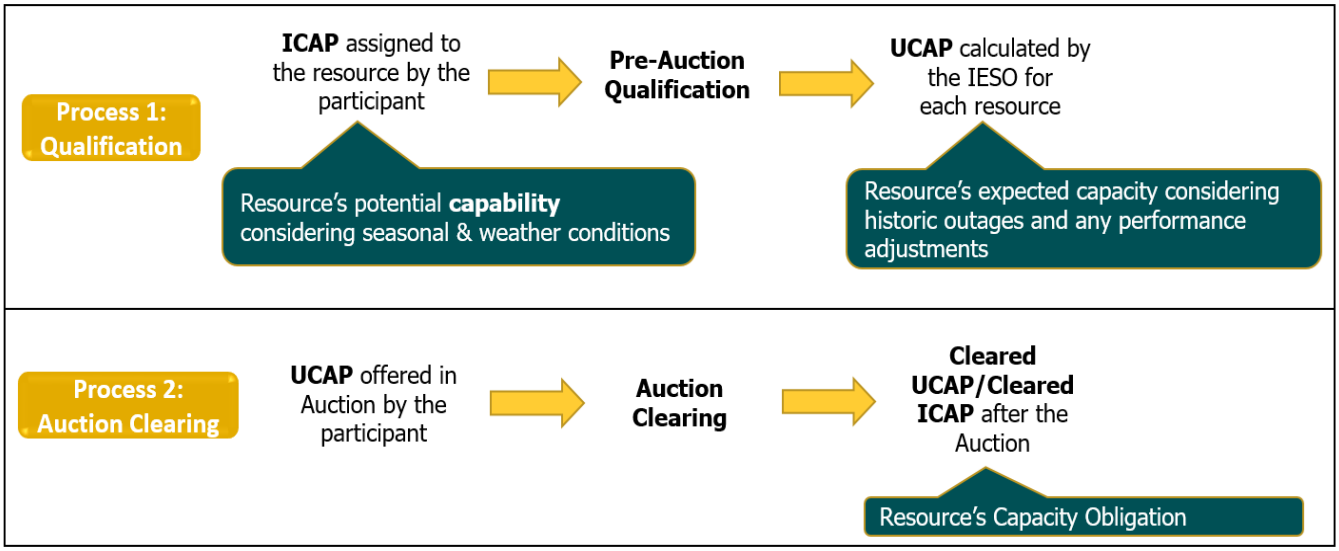

Figure 2: Process Flow for Cleared ICAP & UCAP

The capacity qualification methodology (UCAP calculation) specific to each resource type is explained in more detail in the following subsections.

Dispatchable Thermal Generation

The UCAP formula for dispatchable thermal generation is:

UCAP (MW) = ICAP (MW) x Availability De-Rating Factor x (1 – PAF)

= ICAP (MW) x (1 – $EFOR_d$) x (1 – PAF)

Where:

- UCAP is the unforced capacity amount, in MW, that a resource is qualified to offer into the Capacity Auction
- ICAP is the resource's seasonal capability, in MW, as submitted by the Capacity Auction Participant
- $EFOR_d$ is the equivalent forced outage rate on demand, and
- PAF is the Performance Adjustment Factor

$EFOR_d$ for dispatchable thermal generation will be an annual $EFOR_d$ value based on five years of historical $EFOR_d$ data established using the existing IESO process. For resources with less than five years of historical data, a proxy value will be used based on the average $EFOR_d$ of the resource fleet.

Example

A dispatchable thermal generator resource registers for the auction with the following attributes:

ICAP: 100MW

$EFOR_d$: 8%

PAF (in December 2022 Auction): Not applicable, PAF will begin with the 2023 Auction

UCAP would be calculated as follows:

UCAP = ICAP x (1 – $EFOR_d$) x (1 – PAF)

= 100MW x (1 – 8%) x (1 – 0)

= 100MW x 0.92 x 1

= 92MW

Therefore, the resource would be eligible to offer 92 MW into the Capacity Auction.

Dispatchable Hydro

The UCAP formula for dispatchable hydro is:

UCAP (MW) = ICAP (MW) x Availability De-Rating Factor x (1 – PAF)

= ICAP (MW) x Average of [(AQEI (MWh)+Scheduled Operating Reserve (MWh))/ICAP (MW)] in Top 200 hours of Ontario demand for the last 5 years x (1 – PAF)

Where:

- UCAP is the unforced capacity amount, in MW, that a resource is qualified to offer into the Capacity Auction
- ICAP is the resource's seasonal capability, in MW, as submitted by the Capacity Auction Participant
- AQEI is the Allocated Quantity of Energy Injected, in MWh
- Scheduled Operating Reserve in MWh, and
- PAF is the Performance Adjustment Factor

A seasonal UCAP will be determined using a combination of energy production and scheduled Operating Reserve data from the top 200 hours of highest Ontario demand from each relevant season over the most recent five years of historical data. The historical data, gathered from the IESO's records of hourly energy injected to the grid and scheduled operating reserve in the dispatch schedule, incorporates the impacts of energy limitations, weather limitations and forced outage rates. Therefore, it is expected that the production and scheduled Operating Reserve data of dispatchable hydro facilities will be an accurate reflection of their historical capability.

Example

A dispatchable hydro generator registers for the auction with the following attributes:

ICAP: 100MW

Average [(AQEI + Scheduled Operating Reserve)/ICAP] in top 200 hours, for the last 5 years: 96MW

PAF (in December 2022 Auction): Not applicable, PAF will begin with the 2023 Auction

Its UCAP would be calculated as follows:

UCAP = ICAP (MW) x Average of [(AQEI (MWh)+Scheduled Operating Reserve (MWh))/ICAP (MW)] in Top 200 hours of Ontario demand for the last 5 years x (1 – PAF)

= 100MW x (96MW/100MW) x (1 – 0)

= 100MW x 0.96

= 96MW

Therefore, the resource has qualified to offer 96 MW into the Capacity Auction.

Dispatchable Storage

The UCAP formula for dispatchable storage is:

UCAP (MW) = ICAP (MW) x Availability De-Rating Factor x (1 – PAF)

= [min(Full Power Operating Mode, Energy Rating/4 hours)] x (1 – $EFOR_d$) x (1 – PAF)

Where:

- UCAP is the unforced capacity amount, in MW, that a resource is qualified to offer into the Capacity Auction
- Full Power Operating Mode is the temperature-sensitive maximum power rating that can be sustained for 1 hour
- Energy Rating is the temperature-adjusted maximum amount of energy in MWh, that the resource is capable of delivering, when it is fully charged
- $EFOR_d$ is the equivalent forced outage rate on demand
- PAF is the Performance Adjustment Factor

In determining qualified capacity, the IESO must consider a resource's sustained capability over a specified time period, in order to level the contribution of different resources towards meeting resource adequacy needs.

The four-hour energy duration requirement used in the Capacity Auction is meant to find a balance between system needs, operational flexibility and cost. A duration shorter than four hours may increase supply but could be insufficient to meet operational needs during peak times while a duration longer than four hours would increase costs and limit participation. Additionally, the four-hour duration has been a feature of the previous Capacity Auction and Demand Response Auction.

To align with these considerations, the qualification process for dispatchable storage will consider the resource output that can be sustained for four hours. This means that qualification will be determined by the lower of maximum power rating or the energy rating divided over four hours. This duration adjusted value will then be de-rated using an $EFOR_d$. As there is a limited data set available on historical performance for storage resources that have been operating in Ontario, a 5% $EFOR_d$ will be used for all dispatchable storage resources in the 2022 Auction.

Example

A storage resource registers for the auction with the following attributes:

Full Power Operating Mode: 8MW

Energy Rating: 16MWh

PAF (in December 2022 Auction): Not applicable, PAF will begin with the 2023 Auction

$EFOR_d$: assumed to be 5%

UCAP would be calculated as follows:

UCAP = [min(Full Power Operating Mode, Energy Rating/4 hours)] x (1 – $EFOR_d$) x (1 – PAF)

= [min(8MW, 16MWh/4h)] x (1-5%) x (1 – 0)

= [min(8MW, 4MW)] x 0.95 x 1

= 4MW x 0.95 x 1

= 3.8MW

Therefore, the resource would be eligible to offer up to 3.8 MW into the Capacity Auction.

Dispatchable Load

The UCAP formula for dispatchable load is:

UCAP (MW) = ICAP (MW) x Availability De-Rating Factor x (1 – PAF)

= ICAP (MW) x (Average hourly bids in Top 200 hours of Ontario demand/ICAP) x (1 – PAF)

Where:

- UCAP is the unforced capacity amount, in MW, that a resource is eligible to offer into the Capacity Auction
- ICAP is the resource's seasonal capability, in MW, as submitted by the Capacity Auction Participant
- PAF is the Performance Adjustment Factor

In this calculation, one year of historical bid data that coincides with the top 200 hours of highest Ontario demand per season will be used. Using a longer period of historical bid data may create distortions due to changing business operations and associated consumption. Historical bids indicate the availability of the resource, and are suitable for calculating future availability. For new resources, a fleet-specific class average will be utilized for the availability de-rating factor. This will be based on the average availability de-rating factor applied to all existing dispatchable loads qualified in the Capacity Auction in each season.

Example

A dispatchable load registers for the auction with the following attributes:

ICAP: 100MW

Average of one year of historical hourly bid data coinciding with the top 200 hours of Ontario demand: 98MW

PAF (in the December 2022 Auction): Not applicable, PAF will begin with the 2023 Auction

UCAP would be calculated as follows:

UCAP = ICAP x [(Average hourly bids in top 200 hours of Ontario demand)/ICAP] x (1 – PAF)

= 100MW x (98MW/100MW) x (1 – 0)

= 100MW x 0.98 x 1

= 98MW

Therefore, the resource would be eligible to offer 98 MW into the Capacity Auction.

System Backed Capacity Imports

The UCAP formula for system-backed imports is:

UCAP (MW) = ICAP (MW)

Imports from System-Backed Capacity Imports are anticipated to be fully reliable as these are guaranteed by the host system operator and not tied to a specific resource. IESO has established global import limits that, over the next few years, are well below the tie line capabilities and internal transmission constraints. Therefore, although the initial UCAP calculation considered and presented to stakeholders included tie line outage rates, they were deemed to be not applicable. Similarly, because of the guarantee from the host system operator, no de-rating is required.

Example

A system backed import registers for the auction with the following attributes:

ICAP: 100MW

Its UCAP would be calculated as follows:

UCAP = ICAP

= 100MW

Therefore, the system-backed import would be eligible to offer 100 MW into the Capacity Auction.

Generator-Backed Capacity Imports

Imports from generator-backed capacity imports are supported or 'backed' by a specific generator in an external jurisdiction. Under this participation model, the specific generating resource that is backing the imports will be assessed during the capacity qualification process to determine a UCAP value.

Since capacity provided by generator-backed imports may come from a host jurisdiction which already calculates UCAP values for resources located in its system, the IESO may choose to accept the accredited UCAP value of a generator backing a capacity import if one has been determined in

the host jurisdiction. If no UCAP value is available, the IESO will calculate one in accordance with the corresponding resource-specific UCAP methodology outlined in this document. As such, separate UCAP formulas will be used for generator-backed capacity imports depending on whether the generator is located within a host jurisdiction that has an accredited UCAP product or not, as outlined below.

The UCAP formula for generator-backed capacity imports that are located in a system with an accredited UCAP product is:

UCAP (MW) = Host System UCAP accreditation (MW) x (1 – PAF)

Where:

- PAF is the Performance Adjustment Factor

The UCAP formula for generator-backed capacity imports that are located in a system without an accredited UCAP product is:

UCAP (MW) = UCAP as calculated under the IESO qualified capacity process (MW) x (1 – PAF)

Where:

- PAF is the Performance Adjustment Factor

Example – Generator-backed capacity import in a system with an accredited UCAP product

A generator-backed capacity import located in a system with an accredited UCAP product, registers for the auction with the following attributes:

Host System UCAP: 15MW

PAF (for December 2022 Auction): Not applicable, PAF will begin with the 2023 Auction

Its UCAP would be calculated as follows:

UCAP = Host System UCAP (MW) x (1 – PAF)

= 15MW x (1 – 0)

= 15MW

Therefore, the resource would be eligible to offer 15 MW into the Capacity Auction.

Example – Generator-backed capacity import in a system without an accredited UCAP product

In this example, the generator backing the import will be assumed to be a dispatchable thermal generator. A dispatchable thermal generator-backed capacity import located in a system without an accredited UCAP product, registers for the auction with the following attributes:

ICAP: 100MW

$EFOR_d$: 8%

PAF (for December 2022 Auction): Not applicable, PAF will begin with the 2023 Auction

The dispatchable thermal generator-backed capacity import's UCAP would be calculated as follows:

UCAP = ICAP x (1 – $EFOR_d$) x (1 – PAF)

= 100MW x (1 – 8%) x (1 – 0)

= 100MW x 0.92 x 1

= 92MW

Therefore, the resource would be eligible to offer 92 MW into the Capacity Auction.

Hourly Demand Response (HDR)

The UCAP formula for HDR resources is:

UCAP (MW) = ICAP (MW) x (1 - PAF)

Where:

- ICAP is the capacity in MW, as submitted by the MP for each HDR resource
- PAF is based on:
    - Capacity test activation results from the most recent summer and winter obligation period for which data is available (see Appendix A for more detail)
    - Or, where this data is not available, the weighted class average performance based on the obligation type (physical HDR, virtual HDR commercial and industrial, or virtual HDR residential) in the most recent obligation period for which this data is available

The IESO will always derive a PAF based on the performance assessment pass/fail settlement criteria in place at the time of the test activation. So, for qualification in the December 2022 Auction, the IESO will use the 20% threshold that is currently in place to assess the value of a PAF using historical data. If a resource is able to deliver up to its energy bid within the 20% threshold, a PAF of zero will be applied. If the resource is unable to deliver within 20% of its energy bid, the PAF will be determined based on the delivered MWs against the bid MWs. For new resources a fleet-specific class average will be utilized for the PAF.

Example

A physical Commercial and Industrial (C&I) HDR resource registers for the December 2022 auction with the following attributes:

ICAP = 100MW

During the summer obligation period of the December 2020 Auction (May 1, 2021 to October 31, 2021), the resource was tested to its bid of 100MW and delivered 70MW. The PAF_{summer} would be calculated as:

PAF_{summer} = 1 – (70MW / 100MW) = 1 – 0.7 = 0.3 (30%)

During the winter obligation period of auction years 2017 and 2018, (November 1, 2018 to April 30, 2019 and November 1, 2019 to April 30, 2020), the weighted class average PAF for physical C&I was

calculated by the IESO to be zero based on the weighted average of the performance data which accounted for over and under delivery. Therefore,

$PAF_{Winter} = 0$

Its UCAP values would be calculated as follows:

$UCAP_{Summer} = ICAP \times (1 - PAF_{Summer})$

$= 100MW \times (1 - 0.3)$

$= 100MW \times 0.7$

$=70MW$

And,

$UCAP_{Winter} = ICAP \times (1 - PAF_{Winter})$

$=100MW \times (1 - 0)$

$= 100MW \times 1$

$= 100MW$

Therefore, the resource would be eligible to offer 70 MW into the summer obligation period and 100 MW into the winter obligation period of the Capacity Auction.

Enhancement #2: Performance Assessment Modifications

The current performance obligation and assessment framework is a critical aspect in properly incenting performance of resources secured in the auction. In order to enhance the reliability and market performance of acquired capacity resources, the IESO conducted a review of current performance obligation and assessment criteria to identify improvements. Improvements to the performance obligation and assessment framework identified through this review will be implemented for resources which secure an obligation in the December 2022 auction and will take effect at the beginning of the May 2023 Obligation Period.

The modifications to the performance obligation assessment framework described in the following subsections seek to achieve the objectives of:

- Incenting proper behaviour from acquired resources during the obligation period, including a resource's availability during hours of system need, and their bid and offer obligations in the energy market;
- Reducing the risk of underperformance, especially during hours of system need; and
- Improving confidence in and addressing concerns related to the reliability value provided by resources secured in the auction.

Below is a summary of the modifications to the performance assessment framework:

Table 2: Summary of Performance Assessment Framework Improvements

Consistent Capacity Tests	• Assess to Capability (ICAP): All resources will be assessed to their actual capability (or cleared ICAP) when tested • Better Alignment of Performance Thresholds: For HDR, reduce the performance threshold from 20% to 10% for 2022 Auction[1]; allow a 5% threshold for all other resources • Common Testing Notification: Issue a test notice to the participants a day ahead of the scheduled test for all resources; test details will continue to be provided closer to scheduling timeframe
Improve Performance	• Future De-Rates Based on Performance: If a resource fails a capacity test below the requisite threshold, in addition to current charges, their UCAP value in the subsequent auction will be de-rated through the PAF • Higher Charges at Times of Need: Levy of 2x Capacity Charge (2 month's availability payments) for failure to deliver on cleared ICAP within the requisite threshold during Emergency Operating State Control Action (EOSCA) activations
Fair Assessments	• Availability Charge True-Up: Allow resources to receive a credit for hours when availability over the duration of the obligation period exceeded their UCAP value. This assessment will true-up a Capacity Auction Resource's hourly availability charges incurred over the Obligation Period, based on its performance across the season. The availability of the resource for each hour is capped at the minimum of either 15% above a resource's capacity obligation or its cleared ICAP • The true-up payment is capped to the total availability charges incurred; i.e., no extra payment for over availability

The following subsections will provide more detail on each enhancement.

Consistent Capacity Tests

Starting with resources that clear the December 2022 Capacity Auction, the following performance obligation and assessment criteria will be applied to capacity testing.

Improvement #1: Testing to ICAP for all Resources

Under the current framework, some resources are assessed on their ability to deliver to their full capacity obligation when tested, whereas others, including HDR resources, are only assessed against their submitted bids. This creates misalignment in how the IESO assesses whether different resources can provide their full capability.

Under the new framework, the IESO will be testing all resources on their ability to deliver their ICAP value (or cleared ICAP value, if a resource clears only a portion of its capacity), within the performance assessment thresholds outlined below. This will help the IESO better assess whether a

[1] Future revisions to HDR thresholds after 2022 are pending the results of the IESO's HDR Baseline Review.

resource can deliver to their cleared ICAP capability in the energy market and will help to ensure a more level playing-field when assessing different resource types. Refer to Table 3: Summary of Changes to Charges for information on how this new assessment criteria will result in changes to how settlement charges are assessed.

Improvement #2: More Similar Performance Assessment Thresholds

Under the current framework, HDR resources are afforded a 20% threshold when capacity is tested, whereas other resources have no allowance during the test. This creates an imbalance in how capacity performance is assessed across resource types.

Under the new framework, the IESO will reduce the capacity test activation threshold for HDR resources from 20% to 10% and will introduce a 5% threshold for all other capacity resources. The different threshold for HDR is to account for the potential variance in the baseline process, which does not apply to directly metered resources. The new 5% threshold for all other capacity resources is meant to bring performance assessment thresholds in closer alignment across resource types.

Performance assessment thresholds will be considered in determining resource-specific PAFs during capacity qualification in future years. If a resource delivers a capacity amount within the thresholds indicated above during a capacity test, the resource will be deemed to have passed and no PAF will be applied. If a resource delivers a capacity amount below the thresholds indicated above during a capacity test, the actual amount of capacity delivered will be used in the PAF calculation. These thresholds will also be considered when determining whether capacity charges apply (see Table 3: Summary of Changes to Charges).

Applying more uniform thresholds contributes to a more uniform assessment across different resources while accounting for different characteristics in the participation models.

Improvement #3: Common Day Ahead Capacity Test Notification

Currently, the timeline for notifying a resource of a capacity test varies across resource types. Quick start generators, storage and dispatchable load resources can be notified up to one hour in advance of the test, and capacity imports can be notified two hours in advance. HDR resources and non-quick start generators on the other hand are informed one day in advance of the test.

Under the new framework, all resources will be provided with a day ahead capacity test activation notification, however, the exact test instructions will continue to be specified closer to real-time. This will provide greater consistency and fairness in capacity test activation notification for all resources.

Improve Performance

The following two modifications have been designed to improve performance of acquired Capacity Auction Resources.

Improvement #4: Application of Future Capability De-rates

Under the current market design, if a resource fails the capacity test activation, there is no impact on that resource's qualified capacity in a future auction. However, starting with the December 2022 Capacity Auction, the result of the capacity test activation will impact a resource's capacity value for

the following auction through application of a PAF that will apply to future UCAP calculations. The PAF will reflect performance during capacity test activations occurring in the applicable obligation period outlined in Appendix A.

It will continue to be at the IESO's discretion as to whether a second test in the same obligation period will be conducted. The IESO has the ability to test a resource up to two times per obligation period but may be unable to do so given the data submission and settlement timelines for some resources. The IESO will use the most recent available test results in determining a PAF.

The application of past-performance results provides a fair and proportional adjustment for future auctions based on a resource's demonstrated capability and a strong incentive for resources to submit offers that reflect actual capability.

Improvement #5: Incenting Performance at Times of System Need

Capacity Auction resources provide significant value to the IESO by delivering their capacity during times of system need to help maintain reliability. If the IESO is unable to rely on Capacity Auction resources during these times, additional measures may need to be taken to ensure reliability. Under the current assessment framework, the IESO does have the ability to activate/dispatch resources for an Emergency Operating State Control Action (EOSCA) event but there are no specific performance charges if a resource fails to deliver on its obligation during this event.

To incent performance during these critical times of system need, the IESO is implementing a new capacity charge equal to two months' availability payments when a resource fails to deliver on its cleared ICAP when it is activated/dispatched in an out-of-market control action leading up to or during an Emergency Operating State. The potential application of this charge will help to ensure resources are available and reliable at times of system need.

Fair Assessments

The purpose of the Availability Performance Assessment is to assess whether and how well a resource was able to submit and maintain bids and offers relative to their capacity obligation for each hour of the availability window and for each day of the obligation period. An availability charge is applied to the resource in any hour if its bid/offer MW amount is less than its obligation amount.

Currently, the Availability Charge assessment only applies charges related to under-availability. Using an hourly availability assessment alone, a resource would receive a charge when it is *below* its obligation, but no credit when it is *above* its obligation.

With the introduction of a capacity qualification process, a number of resource types will be qualified based on an average (e.g., average historical production and/or forced outage rate) to derive a UCAP but are required under the market rules to submit, maintain and adjust bids/offers to reflect their full capability (ICAP). The introduction of an averaging process necessitates a review of the current availability assessment to ensure they are aligned.

Improvement #6: Availability Charge True-Up

All resources will be eligible to be assessed for a "true-up" credit at the end of the obligation period. The true-up would compensate for some availability charges if, on average, the availability of the resource is determined to be greater than or equal to it obligation amount over the duration of the obligation period.

The Availability Charge True-up calculated for each hour will be capped at the minimum of either 15% above a resource's UCAP obligation or the resource's cleared ICAP.

The true-up ensures fairness by aligning the average assessment in qualification with an average assessment for availability, and incents resources to offer their full capability to the market.

Availability Charge True-Up Example

Resource X has a 10 MW ICAP and an outage rate of 10%; its UCAP is 9 MW, which is the maximum amount it can offer into the auction. If the resource clears all 9 MW, its availability performance will be assessed against the 9 MW obligation. If during any hour, the resource offers a quantity less than 9MW (due to outages, etc.), it will incur availability charges.

For the Availability Charge True-up, calculated at the end of the obligation period, the availability charges can be reduced, potentially down to zero, by recognizing and crediting hours where the offered quantity exceeded the Capacity Obligation. The True-up payment/credit calculation will average the availability of a resource throughout the entire obligation period considering the following:

- The availability of the resource for each hour is capped at the minimum of either 15% above a resource's capacity obligation or its cleared ICAP
- The true-up payment is capped to the total availability charges incurred; i.e., no extra payment for over availability.

Table 3: Summary of Changes to Charges

Settlement Charge	Description of Changes to Current Charges and how they will be applied
Availability Charge	• No changes to current availability charge. • A true-up will be introduced that compensates for availability charges if, on average, the availability of the resource is determined to be greater than or equal to its obligation amount. The true-up is capped to the total availability charges incurred over the obligation period. The availability of a resource for each hour is capped at the minimum of either 15% above a resource's capacity obligation or its cleared ICAP. The true-up payment is capped to the total availability charges incurred; i.e., no extra payment for over availability.
Capacity Charge	• Resources will be expected to provide their full capability (cleared ICAP) during capacity test activations. Reduced thresholds (10% for HDR resources, 5% for all other resources) will be used in performance assessment for capacity test activations. • A capacity charge equal to two months' availability payment for failure to perform during EOSCA activation. There will be no cap on capacity charges applied for EOSCA activations. • The capacity charge for failed test activations will continue to be equal to one month's availability payment and will to continue to be capped at no greater than one month's availability payment.
Administration Charge and Dispatch Charge	• No change from today but Administration Charge will be extended to Generation Backed Capacity Imports when they fail to provide timely test and activation data.

Enhancement #3: Expand Participation to Generator-Backed Capacity Imports

As indicated in the 2021 Annual Acquisition Report, the Capacity Auction will serve as a flexible mechanism to meet short-term Resource Adequacy needs over the next several years with targets that are expected to grow in future years. A major objective of the Capacity Auction enhancements described in this document is to increase competition by expanding participation in the auction and, by doing so, ensuring the auction can deliver competitive and cost-effective results.

Currently, system-backed imports are permitted to participate in the Capacity Auction. In the case of a system-backed import, the capacity is backed by the system operator's supply rather than a specific generation resource. This framework is generally applicable in jurisdictions where vertically-integrated utilities (such as Hydro Quebec) own generation and transmission assets in addition to being the system operator. Throughout 2021, the IESO engaged with stakeholders to develop a framework to enable 'generator-backed' capacity imports from neighbouring jurisdictions to participate, beginning with the 2022 Capacity Auction. Generator-backed capacity imports are imports that are tied to or 'backed' by the capacity of a specific external generation resource within a neighbouring jurisdiction.

Over the course of 2021, the IESO has held discussions with neighbouring system operators in Quebec, New York Independent System Operator (NYISO) and MISO to develop operating agreements to facilitate the participation of generator-backed capacity imports in the IESO's Capacity Auction. The IESO expects to have operational agreements in place with NYISO and Hydro Quebec for the 2022 Auction and will continue discussions with MISO to enable capacity imports for future auctions. The details of the participation framework for generator-backed capacity imports are discussed below.

Eligibility

To participate in the IESO's Capacity Auction as a generator-backed capacity import, the owner of the participating resource must meet the following eligibility requirements:

- Come from an existing in-service generation facility that has been in operation for at least one year prior to the auction and located in a neighbouring jurisdiction whose Balancing Authority[2] is willing to facilitate generator-backed exports out of their jurisdiction into Ontario
- Be able to transmit energy from the generation resource to the Ontario border,
- Be a generation resource with a fuel type that is currently enabled to participate in the IESO's Capacity Auction (i.e., dispatchable/controllable, not coal),

[2] A balancing authority is defined by NERC as "the responsible entity that integrates resource plans ahead of time, maintains Demand and resource balance within a Balancing Authority Area, and supports Interconnection frequency in real time."

- Attest that no portion of the same capacity that is being offered into the IESO Capacity Auction is already committed to any other jurisdiction for the duration of the relevant obligation period.

Facilitation of generator-backed capacity imports under this participation model is premised on an agreement being in place between the IESO and the neighbouring jurisdiction where the generator-backed capacity import resource is located.

Pre-Auction Requirements

Organizations wishing to participate in the Capacity Auction as generator-backed capacity import resources located within a neighbouring jurisdiction, like all other participating organizations, will be required to be authorized as a Capacity Auction Participant (CAP) in order to qualify resources in a Capacity Auction. The owner of the generator backing the import will also be required to:

- Demonstrate deliverability of the submitted ICAP amount to the IESO:
    - This will need to be demonstrated by providing proof of ownership of firm transmission service to the Ontario border, proof of ownership of a direct transmission line to the Ontario border, or a neighbouring jurisdiction process that confirms deliverability to the border through a power flow assessment. The table below outlines the evidence that can be provided to the IESO to demonstrate the deliverability of energy from the resource to Ontario.

Table 4: Summary of Demonstration of Deliverability by Jurisdiction

Jurisdiction	Demonstration of Deliverability
NYISO (*expected for Auction 2022*)	Proof that the resource holds Capacity Resource Interconnection Service status
Hydro Quebec (*expected for Auction 2022*)	Confirmation of firm transmission service from the transmission operator
MISO (*TBD*)	Proof of ownership of firm transmission service from the OASIS market interface can be provided

- Complete an attestation that confirms the entirety of the offered MWs associated with the participating resource are not under obligation to deliver capacity to the host system or any other entity for the duration of a given obligation period. If the participating resource secures an obligation in the auction, the IESO may take further steps based on auction results to confirm that the same capacity is not committed to other jurisdictions for a period that overlaps with obligation(s) the resource may have secured through IESO's Capacity Auction.

- If a resource is found to have over-committed their offered MWs through this confirmation process, a capacity deficiency charge of 1.5 times the availability payment for the obligation period multiplied by the number of MWs over-committed will be applied.
- In addition, the MWs that are over-committed would not be included in IESO's resource adequacy assessments for the obligation periods for which they were committed and the owner of the participating resource will be required to forfeit the MWs in their obligation that are over-committed, and the full Capacity Auction deposit.

- Complete the IESO's capacity qualification process to receive a UCAP value that can be offered into the auction. See the Capacity Qualification section of this document for details on how capacity from generator-backed capacity imports will be qualified for the auction.

Forward Period Requirements and Obligations

Capacity Auction Participants who receive a Capacity Obligation for a generator-backed capacity import resource will be subject to the same forward period obligations as a resource that is already registered in the IESO Administered Market, including registering as a Capacity Market Participant (CMP). The organization must also authorize as an Energy Trader – Importer in the IESO-Administered Market in order to submit import offers at the requisite intertie. Prospective market participants that may choose to participate as a generator-backed capacity import resource are recommended to consult Market Manual 5.4 – Prudential Requirements, for the prudential requirements for energy traders.

Obligation Period Requirements and Obligations – Performance Assessment

In addition to requirements that all Capacity Market Participants who have secured a capacity obligation are required to complete in the obligation period, the owner of the resource that will be participating as a generator-backed capacity import will subject to the requirements described below.

Capacity Test Activation / Confirmation of Resource Capability

The generator-backed capacity import resource will be required to provide confirmation of the resource's cleared ICAP[3]. This confirmation can be completed in the following ways:

[3] For resources that partially clear the auction, this refers to the equivalent ICAP in proportion to the cleared UCAP.

1. A data submission to the IESO confirming the capability of the resource to generate the cleared ICAP amount for a duration of up to four hours within the availability window, on a date that falls within the first two months of the committed obligation period(s). The complete data set must be provided to the IESO in accordance with Data Submission Requirements set out below and verified as accurate by the host system operator, or an administration charge may be applied. In addition, the resource must successfully schedule an import into the IESO market for at least one hour that coincides with the duration of the above ICAP demonstration. If the IESO deems, based on the data provided, that the resource successfully delivered its cleared ICAP, it may not be subject to capacity test activations within the same obligation period.
2. If a data submission described above cannot be provided in a timely and accurate manner or is deemed by the IESO as insufficient, the resource may still be subject to up to two capacity test activations per obligation period to confirm the capability of the resource to generate the cleared ICAP amount for a duration of up to four hours at any time during the obligation period for which an obligation was secured. The IESO will notify the resource in advance of this capacity test activation and the resource will also need to successfully schedule an import to the IESO from the source jurisdiction coinciding with the time of the scheduled test. Settlement charges may apply for failure to meet the requirements of these capacity test activations.

Availability Performance Assessment

The generator-backed capacity import resource will be subject to the same availability performance assessment and charges as similar resources located within Ontario and system-backed imports. The resource will be assessed on whether it can submit and maintain import offers at the relevant interconnection point at or above the capacity obligation from day-ahead through pre-dispatch and into real-time for all hours within the availability window for each business day of the obligation period.

Capacity Call

A capacity call may be issued to the generator-backed capacity import resource if the IESO is managing capacity shortage conditions in Ontario. The generator-backed capacity import resource will need to successfully perform to any capacity calls in accordance with the general procedure outlined below. Failure to deliver on a capacity call will result in a capacity charge equal to two times the monthly availability payment being applied to the generator-backed capacity import resource.

A call may be issued to the generator-backed capacity import resource by the IESO beginning in the day-ahead timeframe through to pre-dispatch but will account for mandatory window requirements and start up times. The call will indicate the amount (MWs) and hours that the generator-backed capacity import resource will need to inject and successfully schedule into Ontario.

Special e-tag procedures will be used to identify the transaction.

In response to the call, the resource will need to get scheduled in the source jurisdiction and will need to successfully schedule an intertie transaction to the sink jurisdiction (Ontario) with the specified quantities and for the specified hours.

Following the call, a data must be provided to the IESO to confirm that the generator-backed capacity import resource was generating an amount (MWs) for the specified hours and an import was successfully scheduled into Ontario consistent with the instructions issued by the IESO.

Outage Submission Requirements

The generator-backed capacity import resource will be required to submit and seek approval from the IESO for any planned or forced outages in accordance with the process described in market manuals 12 and 7.3.

Data Submission Requirements

All data submissions required for participation as a generator-backed capacity import in the IESO-administered markets must be revenue-grade quality meter data with proof that the meter has been registered with and meets the market participation requirements of the host system operator. Data submissions required for capacity test activations/confirmation of resource capability and/or capacity calls must be provided to the IESO on/by the sixth (6th) business day before the end of the month following the month in which the monthly data relates. For example, if there was at least one capacity call or capacity test activation/confirmation of resource capability during the month of May, then the measurement data for the dates and hours required as outlined in the relevant sections above are due six (6) business days[4] before the end of June.

Operating Agreements

Prior to generator-backed capacity imports being able to participate in the 2022 Capacity Auction, the IESO will establish operating agreements with its neighbouring jurisdictions that outline the internal provisions required to be in place to facilitate the trade of capacity between the participating jurisdictions. These provisions may include:

- Procedures to confirm resources with a capacity obligation with the IESO will not be recalled during host-system capacity shortage conditions or relied upon to satisfy resource adequacy in the host jurisdiction;
- Procedures to outline the actions that must be taken by both the source jurisdiction and the IESO to facilitate the capacity call from the day-ahead time-frame through to real-time;
- Procedures to outline the post-auction process to confirm with neighbouring jurisdictions that a resource has not committed the same capacity to other jurisdictions for a period that overlaps with obligations the resource may have secured through the IESO's Capacity Auction;
- Procedures to outline a process for the owner of a resource that has secured an obligation through the IESO's Capacity Auction to confirm deliverability of that resource to the Ontario border, if necessary;
- Procedures to enable the transfer of data to confirm the capability of a resource to generate the ICAP amount as cleared in the IESO's Capacity Auction; and

[4] Business days as recognized by the Province of Ontario.

- Procedures to outline how outage requests and de-rates are to be coordinated between the IESO and the host jurisdiction.

Conclusion

This document has outlined the three design enhancements that will be implemented in the December 2022 Capacity Auction. These changes involve introducing a capacity qualification process, improving the performance assessment framework and increasing participation to generator-backed capacity imports. The changes will contribute to the IESO's objectives of improving performance and expanding participation, in order to increase the cost effectiveness and efficiency of the Capacity Auction.

The IESO intends to make regular, incremental improvements to the Capacity Auction to increase competition and performance. Therefore, the Capacity Auction will evolve at a measured pace, allowing the IESO to refine auctions features when appropriate – responding to changes in system need and stakeholder feedback. Any future enhancements will be proposed to stakeholders in a transparent manner.

Appendix A – PAF Inputs by Auction Year

Auction Year	December 2021	December 2022	December 2023	December 2024
Qualification Inputs	N/A	▪ ICAP for all resources ▪ PAF for HDR ▪ Historical data as required	▪ ICAP for all resources ▪ PAF for all resources ▪ Historical data as required	▪ ICAP for all resources ▪ PAF for all resources ▪ Historical data as required
Inputs for Summer PAF Calculation	N/A	**HDR:** Resource specific capacity test activation data from summer of auction year 2020 (Summer obligation period of May - October 2021) **All other eligible resources:** n/a	**All resources:** Resource specific capacity test activation data from summer of auction year 2021 (Summer obligation period of May – October 2022)	**All resources:** Resource specific capacity test activation data from summer of auction year 2022 (Summer obligation period of May – October 2023)
Inputs for Winter PAF Calculation	N/A	**HDR**: ▪ Weighted Class average of the capacity test activation data from winter of auction years 2017 and 2018, (obligation periods of November 2018 – April 2019 and November 2019 – April 2020). ▪ Class averages for physical Commercial and Industrial (C&I), virtual C&I, and virtual Residential HDR[DM1] to be calculated **All other eligible resources**: n/a	**All resources:** Resource specific capacity test activation data from winter of auction year 2021 (Winter obligation period of November 2022 to April 2023)	**All resources:** Resource specific capacity test activation data from winter of auction year 2022 (Winter obligation period of November 2023 to April 2024)
Qualification Outputs	N/A	UCAP for all resources	UCAP for all resources	UCAP for all resources
Auction Outputs	Obligation	▪ Cleared UCAP –availability performance ▪ Cleared ICAP –energy market capability	▪ Cleared UCAP –availability performance ▪ Cleared ICAP –energy market capability	▪ Cleared UCAP –availability performance ▪ Cleared ICAP –energy market capability
Testing Criteria	**HDR**: Bid values, 20% threshold **All other resources**: Obligation, no threshold	▪ Cleared ICAP for all resources ▪ 10% threshold for HDR ▪ 5% threshold for all other resources	▪ Cleared ICAP for all resources ▪ 10% threshold for HDR ▪ 5% threshold for all other resources	▪ Cleared ICAP for all resources ▪ 10% threshold for HDR ▪ 5% threshold for all other resources
Performance Outputs	Summer & Winter PAF - to be calculated for all resources and used for qualification in December 2023 Auction	Summer & Winter PAF - to be calculated for all resources and used for qualification in December 2024 Auction	Summer & Winter PAF - to be calculated for all resources and used for qualification in December 2025 Auction	Summer & Winter PAF - to be calculated for all resources and used for qualification in December 2026 Auction

Independent Electricity System Operator
1600-120 Adelaide Street West
Toronto, Ontario M5H 1T1

Phone: 905.403.6900
Toll-free: 1.888.448.7777
E-mail: customer.relations@ieso.ca

ieso.ca

@IESO_Tweets
linkedin.com/company/IESO

ieso
Connecting Today.
Powering Tomorrow.