



APRIL 18, 2023

Technical Panel Education Capacity Auction Enhancements

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Today's Discussion

- Discussion on key activities regarding the 2023 Capacity Auction Enhancements and provide the opportunity for an open dialogue around the enhancements that will be reflected in the Market Rules for May.
- Goal: To gain an understanding of the design intentions behind the proposed Market Rule and Market Manual Amendments that will be provided next month.

Objectives of Proposed 2023 Enhancements (1 of 2)

- The Capacity Auction will be an increasingly important component of the Resource Adequacy Framework as we prepare to meet emerging capacity needs
- Enhancements are needed to drive competition, improve resource performance and contribute to ratepayer value as auction targets increase

Objectives of Proposed 2023 Enhancements (2 of 2)

- The enhancements have been designed to:
 - **Ensure Reliability:** contribute to a more accurate assessment of the reliability contributions resources can provide during times of need
 - **Deliver Value:** better align compensation with resource's capability
 - **Promote Fairness and Transparency:** procure capacity transparently, openly, and fairly
 - **Procure Sufficient Capacity in the Future:** provide appropriate investment signals, and drive competition and ratepayer value

Agenda

- Engagement Process
- Enhancement Implementation Timelines (Stream 1 and 2)
- Stream 1 Technical Proposals
- Wrap-up

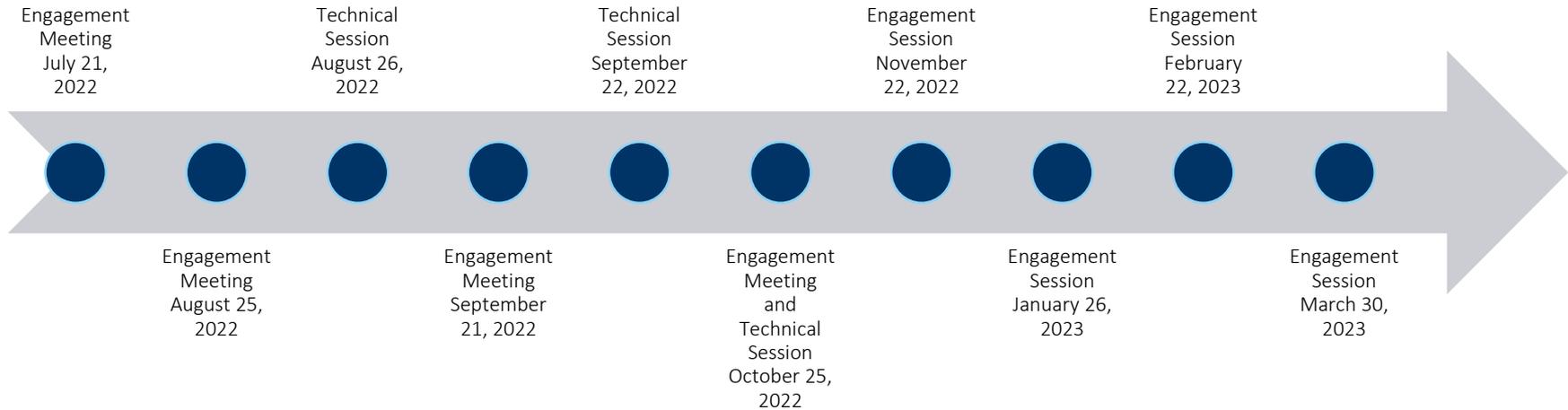


Engagement Process

Stakeholder Input Process

- The IESO's approach to the Capacity Auction Enhancements engagement has aimed to provide a timely, transparent, and inclusive process for participants:
- IESO initiated engagement process in "listening mode" to ensure stakeholder feedback and insights were understood. Monthly meetings increased opportunities for discussion and feedback
- Multiple revisions to engagement timelines, process and designs based on stakeholder feedback
- Introduced new documentation format with design memos and discussion briefs as part of the technical sessions for more effective stakeholder understanding
- Facilitated meetings with individuals or smaller groups for detailed discussion on design topics – this includes technical sessions with the HDR community and others

Engagement Timelines



Stakeholder Input - Results

- The following are some of the design components that have been incorporated as a result of feedback received:
 - HDR capacity qualification methodology including in-period adjustment
 - Revisions to new capacity testing framework
 - Solution for HDR resources to manage impact of contributor outages in baselines
 - Performance thresholds for capacity tests
 - Revised HDR standby price trigger for the 2022 Capacity Auction

Stakeholder Input - Pending Items

- Stakeholders requested the IESO to include additional provisions in the Capacity Auction Enhancements, such as the following:
 - Multiple HDR Resources per Zone
 - Monthly Buy-Outs
 - Including loss factors in the HDR capacity qualification methodology
- Specific enhancement requests such as these require additional time and consideration to properly address.
- The IESO intends to continue discussion with stakeholders to enhance and grow the auction.



Timelines

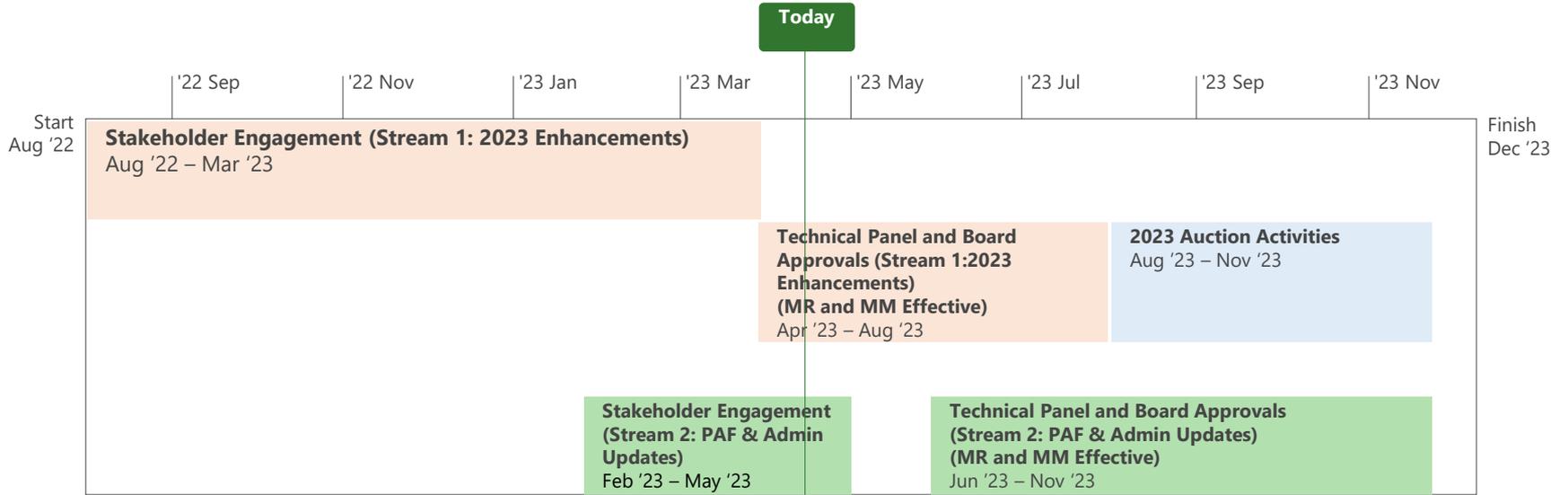
Enhancement Implementation Timeline

2023 Capacity Auction enhancements are divided into two independent streams. Today's session is focused on Stream 1

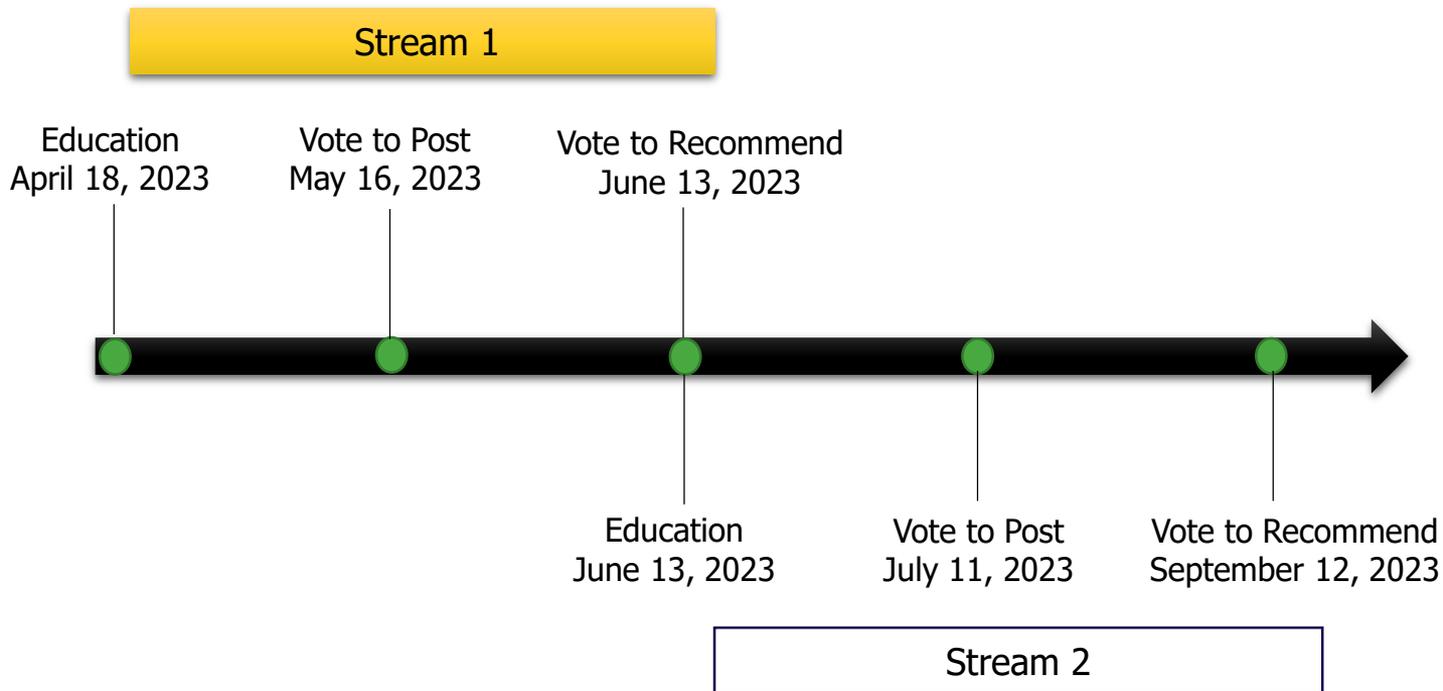
Stream 1	Stream 2
<ul style="list-style-type: none">• Capacity Qualification Framework• Performance Assessment Framework• Demand Curve Updates• Contributor Outage Management	<ul style="list-style-type: none">• Performance Adjustment Factor• Administrative updates to Ch. 9• Generator-Backed Import updates (updates only affect Market Manuals)

- Allows for continued stakeholder engagement on performance adjustment factor.
- Stream 2 enhancements will not impact the market rules and manuals for Stream 1 - nor are they necessary for the pre-qualification period.

High-Level Timeline – Stream 1 and 2



Proposed Technical Panel Timeline – Stream 1 and 2





Objectives of 2023 Capacity Auction Enhancements

2023 Enhancements: Stream 1

Capacity Qualification

- Adopt transparent methodologies to derive an Unforced Capacity (UCAP) value while accounting for unique resource participation frameworks and characteristics

Performance Assessment Modifications

- Changes to performance assessment obligation and assessment framework to ensure alignment with qualification methodology and to incent availability and reliable performance from acquired capacity resources

Other Enhancements

- Updated demand curve parameters ensure the auction continues to procure sufficient capacity, provide an appropriate investment signal and drive competition and ratepayer value
- Update the standby trigger price to promote more efficient market outcomes

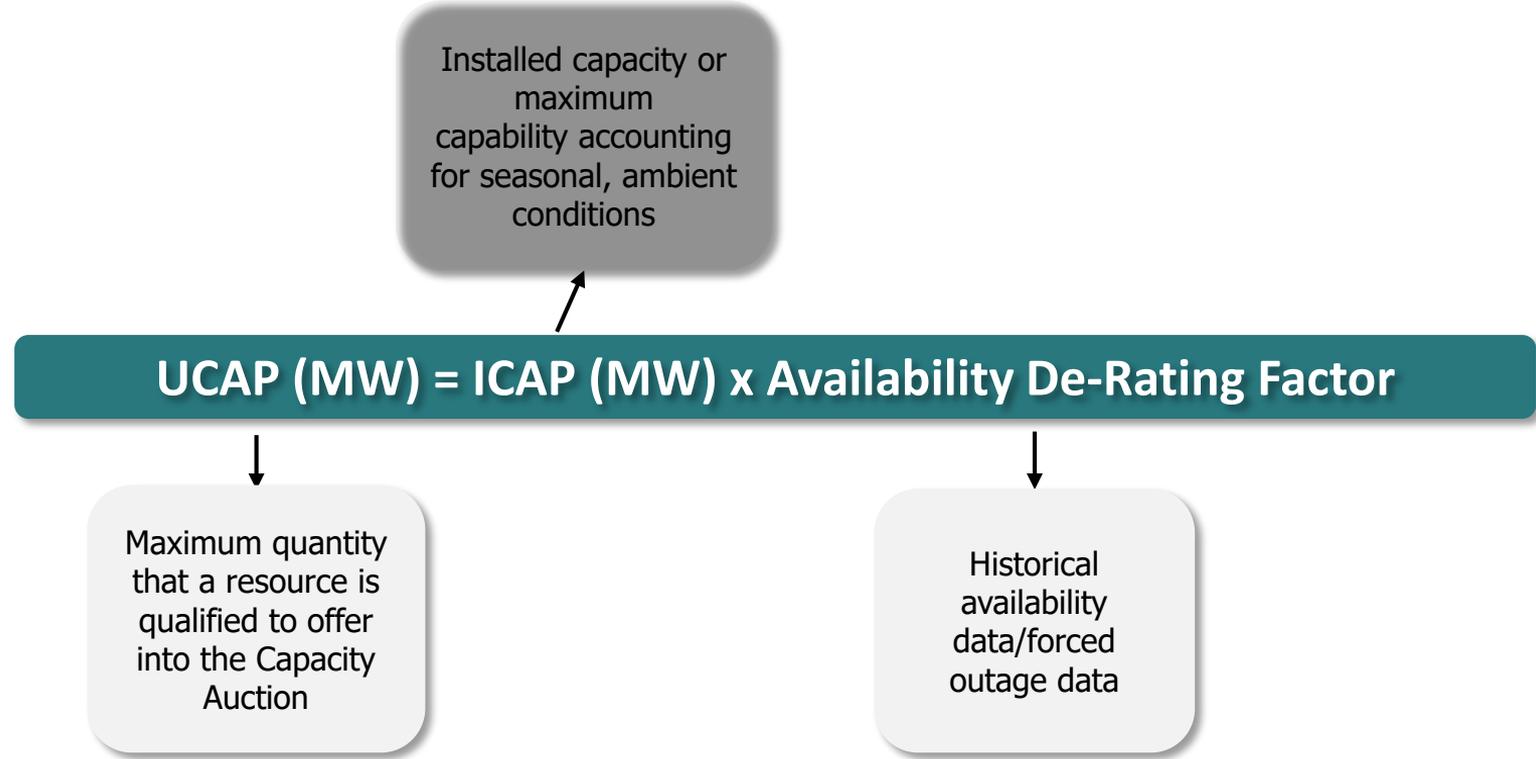


Capacity Qualification Design

Capacity Qualification

- Unforced capacity (UCAP) reflects the amount of capacity a resource can be expected to provide, on average, during peak hours by accounting for historic availability and/or forced outages
 - Aims to equalize the contribution of each MW across all resource types towards satisfying resource adequacy needs
 - Methodologies account for the unique characteristics of different resource types in an equitable manner.
 - Developed with consideration of industry best practices from other jurisdictions

Generalized UCAP Formula



Qualification: Availability De-Rating Factors

Equivalent
Forced
Outage Rate
on Demand
(**EFOR_d**)

- 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.

Production
data from
the top 200
hours of
Ontario
Demand

- Used to assess performance (availability or production) during the roughly 5% of peak hours per year. This is a good reflection of resource contributions and availability during hours of system peak.

The most appropriate availability de-rating factor to use depends on the resource type, the quality of its historic data, its characteristics and participation framework (see appendix for specific methodology by resource type)

Qualified Capacity and HDR (1 of 2)

- The HDR participation framework is unique in some respects from other resources in the energy market
 - Requirement to maintain day at hand energy market bids is contingent on receiving a standby notice (triggered by prices)
 - Limited historical availability and consumption data (only required to provide consumption data when activated)
- This unique framework needs to be accounted for in the design enhancements

Qualified Capacity and HDR (2 of 2)

- The lack of historical availability data of HDR resources means that the IESO is unable to apply availability de-rates as part of the pre-auction qualification.
- Without an availability de-rate applied, the methodology for HDR capacity qualification will be:

$$\mathbf{UCAP = ICAP}$$

- To account for this, and to ensure fair treatment between different resource types, the IESO has worked with HDR stakeholders to design an In-period Cleared UCAP Adjustment as an alternative to an availability de-rate

Capacity Qualification – HDR Resources

In-Period Cleared UCAP Adjustment (HDR)

- If an HDR resource fails to deliver at least 90% of obligation during a capacity test its UCAP value (synonymous with obligation) will be adjusted for the entire obligation period based on the capacity delivered in the capacity test.
- Payments going forward will be made based on the adjusted obligation amount
- In addition, an in-period cleared UCAP adjustment settlement charge will claw back payments already disbursed for the capacity not delivered.
- The settlement charge will be net of any availability charges incurred during the affected time-period.



Performance Assessment Framework Design

Performance Assessment Framework Modifications

- Modifications will incent improved performance, accurate representations of availability and align compensation with the qualification methodologies.
- Modifications include:
 - Revised Testing Framework
 - Revised performance thresholds for capacity tests
 - Availability True-up Payment
 - Capacity Charges True-up Payment
 - HDR Contributor Outage Solution

Revised Testing Framework

- The revised capacity testing framework provides greater flexibility to participants to conduct a capacity test and manage the risk of being unsuccessful.
- Updates to testing protocols and performance assessment for the capacity test allow for more consistency across resource types.

Key Design Points:

- Participants will be given one week to schedule and conduct their own test
- Participants will be given 10 business days' notice of capacity test week
- Test will assess to capability (ICAP)
- Allowable exceptions to the capacity test provide for opportunity for re-test (e.g., third party outage, force majeure)
- IESO has discretion to dispatch test resources by scheduling in the energy market to verify ability to comply with dispatch based on submitted bids and offers.

Revised Performance Thresholds

- HDR resources are currently afforded a 20% performance threshold on the amount they are required to deliver during a capacity test.
- In the interest of greater fairness and equity, the HDR resource performance threshold will be reduced to 10%, while all other resources will be afforded a 5% threshold.

Key Design Points:

- The capacity test will now require resources to deliver to their cleared ICAP, within the applicable performance threshold amount
- Based on stakeholder feedback, IESO has also included a 10% performance threshold in the design of the in-period cleared UCAP adjustment

Availability True-up Payment

- The availability true-up payment is intended to allow resources to recover availability charges incurred if that resource bids/offers in excess of its capacity obligation, over the duration of the obligation period.
- The new true-up ensures fairness by aligning the average assessment in the pre-auction UCAP qualification with an average assessment for availability during the obligation period.
- It incents continued offering of a resource's full capability (i.e., their ICAP) to the market.
- The payment can only recover availability charges incurred throughout the obligation period. No extra payments can be earned for over-availability.

Capacity Charges True-up Payment

- Non-performance charges incurred in an obligation period could inflict a financial risk to resources.
- This true-up payment will ensure that the total charges incurred in an obligation period do not exceed availability payments in the same obligation period.

Key Design Points:

- Calculated at the end of an obligation period
- Includes all charges except the buy-out charge and dispatch charge

HDR Contributor Outage Solution

- Stakeholders raised concerns that a contributor on a forced outage may negatively affect the Hourly Demand Response (HDR) baseline calculation and subsequent HDR performance assessment.
- As a result, a mechanism to declare an outage of a virtual HDR contributor, and subsequently remove that contributor from the baseline calculation, has been developed.

Key Design Points:

- A participant may declare a contributor outage if that outage meets certain eligibility criteria
- Contributor is removed from the measurement data submission and not included in the baseline calculation
- Is applicable to all activations



Other Design Enhancements

Demand Curve

- The demand curve parameters, originally set in 2015, were reviewed and updated to reflect the evolved role of the capacity auction.
- This evolution includes procuring a broader set of resource types, qualifying capacity on a UCAP basis and preparing to send the appropriate market signals in advance of a period of emerging capacity needs.

Key Design Points:

- Update Reference Price from \$413/MW-day ICAP to \$644/MW-day UCAP
- Update the Maximum Auction Clearing Price to 1.5x the Reference Price
- * Updates to the demand curve only affect Market Manuals

Standby Trigger

- Higher pre-dispatch shadow prices were triggering the \$100/MWh HDR standby notification more frequently, prompting HDR resources to take preemptive actions to prepare for a potential activation.
- An IESO review concluded that HDR community concerns can be addressed without negative impacts on reliability. The standby trigger price was updated effective for the 2022 capacity auction.

Key Design Points:

- Trigger price updated to \$200/MWh
- Effective for the upcoming 2023/24 commitment period



Summary

2023 Capacity Auction Enhancements

- The Capacity Auction will be an increasingly important component of the Resource Adequacy Framework as we prepare to meet emerging capacity needs
- Enhancements are needed to drive competition and ratepayer value as auction targets increase
- A collaborative engagement process has resulted in more robust designs informed by stakeholder feedback

Next Steps

- **Stream 1:**
 - Proposed amendments to the Market Rules and Manuals posted for review/feedback on March 16 (2 weeks prior to March 30 engagement)
 - Stakeholder feedback was requested by April 13
 - Technical Panel Vote to Post May 16
- **Stream 2:**
 - Stakeholder engagement continues until May
 - Technical Panel Education on June 13



Appendix

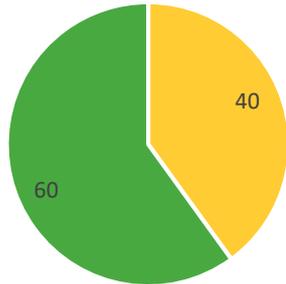
Reference Links

Design Enhancement	Supporting Design Documents
Capacity Qualification (Non-HDR)	Memo 1.1: Capacity Qualification (Non-HDR)
Capacity Qualification (HDR)	Memo 5.2: Capacity Qualification (HDR) HDR In-Period Cleared UCAP Adjustment Example
Availability True-up	Memo 3.1: Charges and True-ups HDR Availability True-up Example
Testing Framework & Performance Assessment Thresholds	Memo 2.1: Testing Framework Memo 6.3: Performance Thresholds
HDR Contributor Outages	Memo 6.2: HDR Contributor Outages
Demand Curve Review	Memo 7.0: Demand Curve Review
Standby Trigger	Memo 4.0: Standby Trigger

Overall June 2022 Capacity Auction Test Results

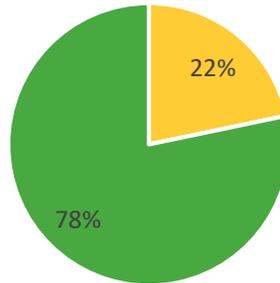
- **Only 66% of the expected energy was actually delivered**
- 40% of participants reduced their bids/offers resulting
- There was a 22% reduction in available megawatts
- 38% of resources the IESO was able to test failed

Market Participant Behaviour



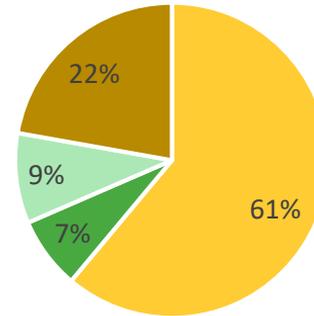
- % of MPs who reduced their bids/offers
- % of MPs who didn't reduce their bids/offers

Overall % of Obligation made available in Real Time



- Unavailable MWs
- Available MWs

Test Breakdown by % of Resources



- PASSED
- MODERATE FAIL (>50% EED)
- MINOR FAIL (>75% EED)
- MAJOR FAIL (<50% EED)

Qualification Example: Dispatchable Thermal Generation Resource

$$\text{UCAP (MW)} = \text{ICAP (MW)} \times \text{Availability De-Rating Factor}$$

- For a thermal generation resource, the availability de-rating factor is its forced outage or EFOR_d
- For a resource with a 100 MW ICAP and an EFOR_d of 8%, the UCAP will be calculated as follows:
- $\text{UCAP} = 100 \text{ MW} \times (1 - 8\%) = 100 \text{ MW} \times 0.92$
- $\text{UCAP} = 92 \text{ MW}$

UCAP Methodologies

MAPC = Maximum Active Power Capability
 AQEI = Allocated Quantity of Energy Injected
 SQROR = Scheduled Quantity of Class r Operating Reserve

Resource Type	UCAP Methodology
Dispatchable Thermal Generation	$ICAP (MW) \times (1 - EFOR_d)$
Dispatchable Hydro	$ICAP (MW) \times \text{Median} [(AQEI (MWh) + SQROR (MWh)) / MAPC (MW)]$ in Top 200 hours of Ontario Demand per <i>obligation</i> period for the last 5 years
Dispatchable Storage	$[\min(\text{Full Power Operating Mode, Energy Rating}) / 4 \text{ hours}] \times (1 - EFOR_d)$
Dispatchable Load	$ICAP (MW) \times \text{Median} (\text{Hourly bids quantity} / \text{maximum seasonal energy bid quantity})$ in top 200 hours of Ontario Demand per <i>obligation period</i> from the most recent complete <i>obligation period</i>
System Backed Capacity Imports	$UCAP (MW) = ICAP (MW)$
Generator Backed Imports	$UCAP (MW) = \text{External System UCAP accreditation (MW)}$
Hourly Demand Response (HDR)	$UCAP (MW) = ICAP (MW)$

Qualification Example: In-Period Cleared UCAP Adjustment

Clearing Price (2021) = 264.99\$/MW-day

Testing Month: June

Business days per month: 22

Obligation: 10 MW

Performance in capacity test: 8 MW

Revised cleared UCAP: 8 MW

Obligation Month	Availability Payment	Obligation (cleared UCAP) Amount (MW)	In-Period Adjustment Charge	Capacity Charge	Net Payment
May	\$58,297.80	10	-	-	\$58,297.80
June	\$46,638.24	8	-\$11,659.56*	-\$58,297.80	-\$23,319.12
July	\$46,638.24	8	-	-	\$46,638.24
August	\$46,638.24	8	-	-	\$46,638.24
September	\$46,638.24	8	-	-	\$46,638.24
October	\$46,638.24	8	-	-	\$46,638.24
TOTAL	\$291,489.00	-	-\$11,659.56*	-\$58,297.80	\$221,531,64

*Due to HDR resource data submission processes and associated performance assessment and settlement timelines, the in-period adjustment charge and revised obligation may not appear in the settlement statement for the month in which the test is conducted. Additionally, the in-period adjustment charge will correct any availability payments that were based on a 10MW obligation. All payments for the entire obligation period will not exceed what can be earned based on an 8 MW obligation.

Availability True-up Payment Calculation Details

- The availability true-up payment is assessed at the end of an obligation period.
- The availability charges included in the assessment will be net any availability charges already recovered through the calculation of the in-period cleared UCAP adjustment charge (only applicable to an HDR resource).
- The excess offer or bid amount considered in the true-up assessment will be capped at the following:
 - 15% above the resource's capacity obligation,
 - the resource's cleared ICAP, or;
 - the resource's registered capability (total capability of registered contributors, applicable only to virtual HDRs)
- An example of the application of an availability true-up is provided in the appendices.

Availability True-Up & In-period Adjustment (1 of 3)

In this example, let's assume there is an HDR resource with:

Cleared ICAP = 100 MW, Cleared UCAP = 100 MW

Before Test (first two months of obligation)

For the first two months, based on a 100 MW obligation, the resource receives:

$$\begin{aligned}\text{Total Availability Payments Received} &= \text{Obligation} \times \text{Availability Rate} \times \# \text{ of Days} \\ &= 100 \text{ MW} \times 314 \text{ \$/MW-day} \times 42 \text{ days} \\ &= \$1,318,000\end{aligned}$$

Additionally, in the first two months of the obligation, the resource reduces its availability through its bids such that Total Availability Charges Incurred in First Two Months of Obligation Period = \$18,840

Availability True-Up & In-period Adjustment (2 of 3)

Test

During the capacity test, the resource delivers 75 MW:

In-period Cleared UCAP Adjustment = 25 MW

Revised Cleared UCAP = 75 MW

In-period Cleared UCAP Adjustment charge = Availability Payment x UCAP Adjustment - Incurred Availability Charges

$$= (\$1,318,000 \times 25\%) - \$18,840$$

$$= \$310,660$$

Availability True-Up & In-period Adjustment (3 of 3)

After Test

During the last four months of the obligation, the resource reduces its availability through its bids such that:

Total Availability Charges Incurred in Remaining Four Months of Obligation Period = \$6,280

In 27 hours during the remaining four months of the obligation period, the resource bids 10 MW over its revised cleared UCAP resulting in:

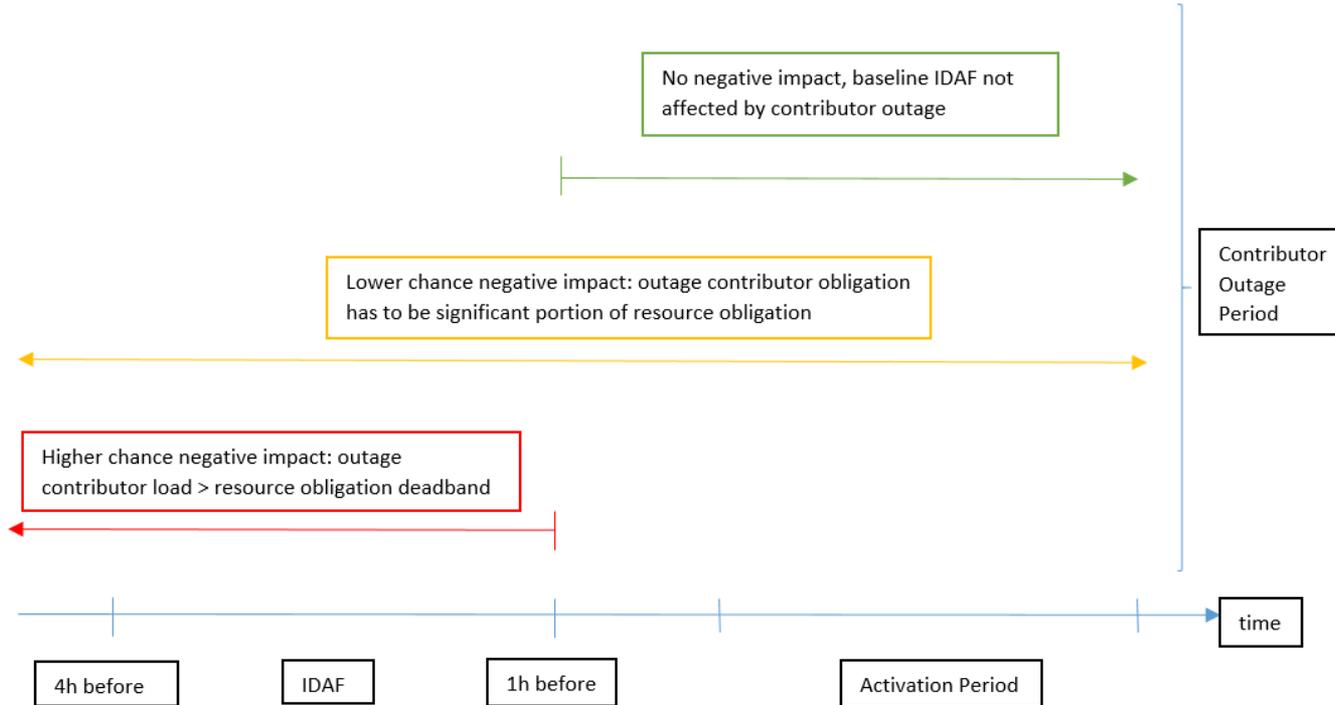
Over-availability that can be used for availability charges true-up

= 27 hours x 10 MW x \$34.89/MWh (hourly availability payment)

= \$9,420

Since this amount exceeds the availability charges incurred, all availability charges (\$6280) incurred after the test can be recovered through the availability charges true-up payment.

Impacts of HDR Contributor Outage



Thank You

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