APRIL, 2020

Update on the 2020 DRWG Work Plan Initiatives

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Purpose of the presentation

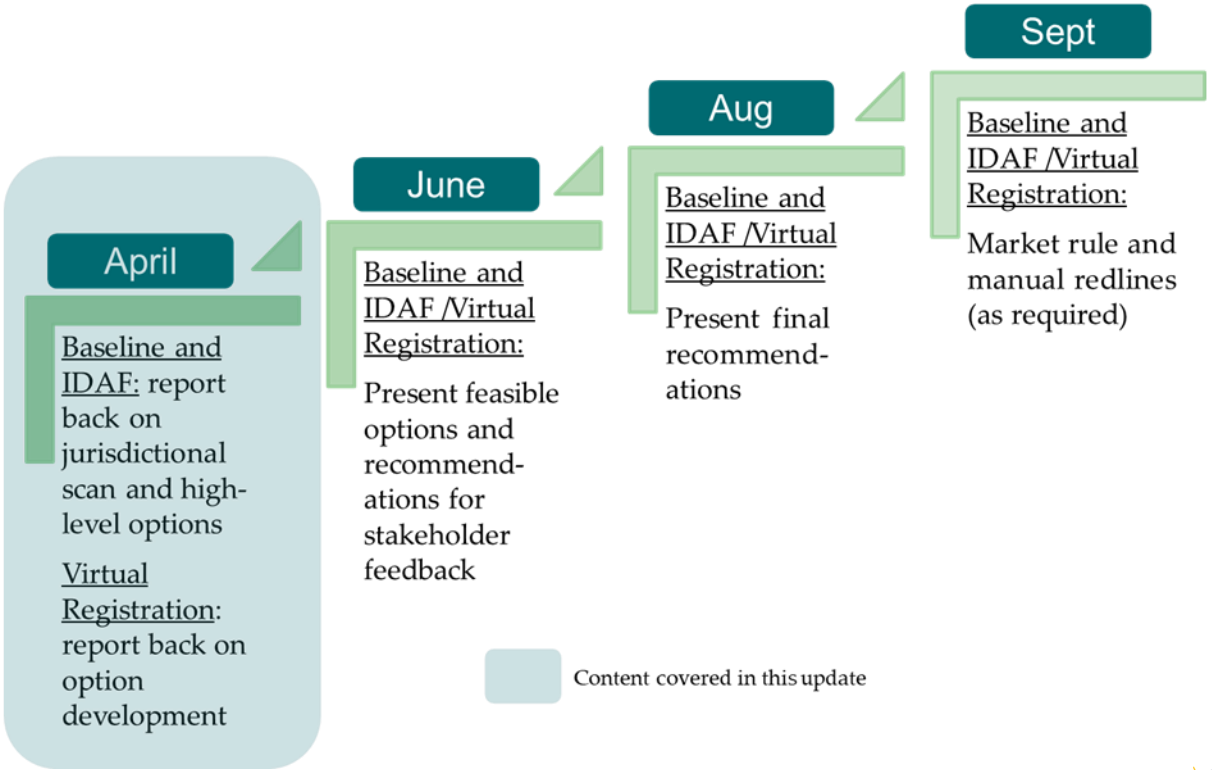
The following slides provide an update on the priority DRWG 2020 work plan initiatives, including:

- Baseline methodology
- In-day adjustment methodology
- Registering virtual hourly demand response (HDR) resources

Purpose of the presentation - Continued

The purpose of this presentation is to update stakeholders on how the work is progressing in absence of an April webinar, which has been cancelled as a result of the additional demands facing stakeholders during COVID-19

Re-Cap: Timelines of 2020 Work Plan Initiatives



UPDATE ON BASELINE AND IN-DAY ADJUSTMENT FACTOR (IDAF) INITIATIVES

Baseline and IDAF Initiatives - Objectives

The objectives of these initiatives are to:

- Determine whether the in-day adjustment methodology, as part of the baseline determination, should be revised to better reflect consumption patterns for non-weather sensitive loads (Phase 1).
- Explore the need for different baseline methodologies for different load types, including options for such methodologies (Phase 2).

Developed in response to:

These initiatives were developed in response to:

- Stakeholder feedback on the challenges associated with the impact of the IDAF on non-weather sensitive loads that curtail in advance to prepare for an event (refer to Appendix for additional details); and,
- Stakeholder feedback regarding the need for different baselines methodologies to better reflect different load types as are commonly available in other jurisdictions.

Baseline and IDAF Initiatives – Baseline methodologies

A scan of baseline methodologies used in other electricity markets has been conducted to inform this work and to inform what may be possible in Ontario to address stakeholder concerns. This includes:

- What in-day adjustment methods are employed? Are there opt-out provisions? What tests and audits are performed to assess accuracy of a baseline?
- What is the timing of the adjustment window as part of the in-day adjustment methods in other markets and how does this align with the timing of activation?

Baseline and IDAF Initiatives – Jurisdictional scan

The "jurisdictional scan" will be used to inform the IESO's draft recommendations, which will be shared for stakeholder feedback in June

JURISDICTIONAL SCAN - BASELINE METHODOLOGIES

Jurisdictional Scan Outline

The jurisdictional scan includes:

- A re-cap of the purpose of a baseline
- An overview of industry best practices for DR performance measurement

Jurisdictional Scan Outline - Continued

A review of baseline methodologies available in PJM, MISO, NYISO, ERCOT and ISO-NE

- With a focus on the methodologies used to assess the performance of DR resources that participate in similar ways to those in Ontario
- Includes review of the in-day adjustment methods as part of the baseline methodologies

Summary of key learnings

Purpose of a Baseline

The baseline is an approximation of a resource's consumption profile that is used to estimate what the resource would have been consuming had a DR activation not taken place.

Accurate Baseline Challenge

Deriving an accurate baseline is challenging due to the inherent volatility of a customer's load.

- Load variance can occur due to planned or unplanned daily business activities, business cycles, weather, seasonal product demand, etc.

Effective Baseline Goal

An effective baseline should neither reward nor penalize participants for normal load variance .

This should help ensure observed curtailments and associated settlements are reflective of the actual demand reduction value provided to the grid.

Industry Measures and Best Practices

The North American Energy Standards Board (NAESB) was tasked with developing Business Practice Standards for DR M and V as part of FERC Order 745.

- The purpose of FERC Order 745 was to enable increased DR participation in wholesale energy markets.

M and V Goals

Goals of the M and V standards are:

- Transparency – requirements should be accessible and understandable
- Accountability – promote accurate performance measurement in dispatch, operations, and market settlement
- Consistency – methods should be applicable across all wholesale markets

Performance Evaluation Methodologies

5 broad Performance Evaluation Methodologies were developed by NAESB.

The type of baseline methodology used to measure DR resource performance is largely dependent on the type of service the resource is providing.

Scope of the Jurisdictional Scan

The scan reviews the methodologies that other jurisdictions use to assess the performance of DR resources with participation characteristics that most closely align with how C&I HDR resources participate in Ontario.

Scan focus

This includes resources with a capacity obligation and “must offer” requirement in the energy market or DR that chooses to participate as both a capacity (emergency) resource and an energy resource

Based on this scope, the scan focuses on the NAESB Baseline Type-I methodology which uses historical interval meter data to estimate a profile baseline

The scan covers Baseline Type-I methodologies in PJM, MISO, NYISO, ERCOT, and ISO-NE per stakeholder feedback

Elements of the Type-I Baseline – Data Selection

There are three main components to a Type-I Baseline.

Data Selection:

- Establishes what data to include in baseline calculation
- Includes exclusion rules (i.e. defines a Suitable Business Day), for example “High 15 of 20”

Estimation Method

- Method used to calculate the provisional baseline (i.e. baseline with no adjustments)
- E.g., Averaging, regression

Adjustment Method – Key Terms 1 and 2

1. Weather-Sensitive Adjustment: determined by a relationship derived through a regression analysis that considers the DR load and historical hourly temperature data.
2. Additive Adjustment: A fixed kW adjustment to the provisional baseline that is applied across all event time intervals.

Key Terms

1. Scalar/Multiplicative Adjustment: A percentage multiplier adjustment to the provisional baseline that is applied across all event time intervals.
2. Symmetric Adjustment: allows for adjustment upward and downward (asymmetric allows for only upward or downward).
3. Adjustment Cap: A limit to the magnitude of an adjustment to the provisional baseline; can be limited upward, downward, or both.

Comparison of Type-I Baselines - Description

PJM: Highest 4 of 5 days over a 45-day look back

MISO: 10-day rolling average over a 45-day look back

NYISO: Highest 5 of 10 days over a 30-day look back

ERCOT: Middle 8-of-10 over a 10 day look back/forward

ISO-NE: 10-day rolling average over a 30-day look back

Comparison of Calculation Method

PJM: Hourly average of highest 4 event period use days

MISO: Hourly average of the 10, but not less than 5, most recent eligible weekdays

NYISO: Hourly average of highest 5 event period use days

ERCOT: Average 24-hour energy use over 10 eligible days, eliminating days with the highest and lowest consumption

ISO-NE: Average 24-hour energy use over last 10 eligible days

Comparison of Baseline Adjustment

PJM: WSA or SAA

MISO: WSA or SSA with a +/- 20 percent cap

NYISO: SSA with a +/- 20 percent cap

ERCOT: SSA with no cap

ISO-NE: SSA with no cap

WSA = weather-sensitive adjustment

SSA = symmetric scalar adjustment

SAA = symmetric additive adjustment

Comparison of Adjustment Window

PJM: 3 hours ending one hour prior to dispatch

MISO: 3 hours ending 4 hours prior to dispatch

NYISO: 2 hours ending 2 hours prior event (aligns with activation notice window)

ERCOT: 2 hours ending 3 hours prior to dispatch

ISO-NE: 3 most recently completed 5-minute intervals prior to issuance of activation notice

Comparison of Applicability

PJM: Energy resources; default if also an emergency/capacity resource.

MISO: Energy resources; default if also registered as a capacity resource w/ “must offer” energy requirement.

NYISO: Energy resources; emergency resources settled for performance above and beyond energy performance.

Comparison of Applicability continued

ERCOT: Energy resources, emergency resources.

ISO-NE: Energy resources; default if also registered as a capacity resource w/ “must offer” energy requirement.

PJM, MISO, NYISO, and ISO-NE also have baseline calculations to capture weekend DR events, calculated the same as above, but with weekends/holidays as eligible days.

Adjustment Method: Opt-In/Out Mechanism In-day adjustment method

PJM: WSA or SAA; 3 hours ending one hour prior to dispatch

MISO: WSA or SSA with a +/- 20% cap; 3 hours ending 4 hours prior to dispatch

NYISO: SSA with a +/- 20% cap; 2 hours ending 2 hours prior dispatch

ERCOT: SSA with no cap; 2 hours ending 3 hours prior to dispatch (adjustment window can be moved to improve accuracy)

ISO-NE: SSA with no cap; 3 most recently completed 5-minute intervals prior to issuance of start-up instruction

Adjustment Method: Opt-In/Opt-Out Mechanism

PJM: Adjustment is default unless participants fail the relative root mean squared error (RRMSE) test at registration.

MISO: Participants must bring forward documentation at the time of registration if they choose to opt for an adjusted baseline.

NYISO: Participants elect whether or not to have an adjustment at the time of registration.

Opt-In/Opt-Out Mechanism, continued

ERCOT: Applied at ERCOTs discretion if it improves the accuracy of the baseline calculation.

ISO-NE: Applied universally to all DR assets*.

Note in ISO-NE, the baseline calculation and in-day adjustment are conducted at the asset level (i.e. contributor level) rather than the resource level.

Summary of Key Learnings 1

There are at least three jurisdictions that allow for an unadjusted baseline.

NYISO offers one NAESB Type-I baseline with an adjustment that is most similar to Ontario:

- Optional
- symmetric scalar with a +/- 20% cap

Participants elect whether or not to have an adjustment at the time of registration

Summary of Key Learnings 2

MISO offers one NAESB Type-I baseline and customers can choose between:

- the unadjusted baseline,
- a weather-adjusted baseline, or
- a symmetric scalar adjustment with a +/- 20% cap (like Ontario)

In MISO, participants must bring forward documentation at the time of registration if they choose to opt for an adjusted baseline

Summary of Key Learnings 3

It is common for the adjustment window to be aligned with the activation notice timeframe.

- In PJM, the notification timeline for activation is 30 minutes, with an adjustment window of 3 hours starting one hour prior to dispatch.
- In NYISO and ISO-NE, the adjustment window is aligned with the activation notice (2 hours in NYISO, service-dependent in ISO-NE).

Summary of Key Learnings 4

Where the standard baselines do not appropriately reflect a participant's load profile, PJM and MISO have an option for the participant to bring forward a Custom Baseline which must be approved by the ISO/RTO.

Next Steps on IDAF Initiative

The IESO will use the findings from the jurisdictional scan to inform draft recommendations for Phase 1 of the baseline methodology initiative.

Current assessment is focused on an opt-out of the IDAF as well as the timing of the adjustment window.

Draft recommendations will be presented to stakeholders for feedback in June.

UPDATE ON REGISTERING VIRTUAL HDR RESOURCES INITIATIVE

Overview of the Registering Virtual HDR Resources Initiative

The objective of this initiative is to develop and assess options for allowing a DRMP to register virtual HDR contributors into separate aggregates within a zone.

These slides provide an update on the IESO's development of options under consideration.

Option Development - enrollment

To align with Capacity Auction design, the primary option under development is to allow an aggregator to enroll two C&I virtual demand response resources per zone in the pre-auction period.

- Aggregator submits offers for each C&I virtual demand response resource in the auction.
- Aggregator can transfer obligations between the two resources in the forward period following the auction and prior to the obligation period.

Option Development – Aggregations limits

Allowing more than two virtual aggregations per market participant per zone is not being considered due to concerns related to potential impact on tool computation.

2020 DRWG Work Plan - Next Steps

The IESO will present the draft recommendations with respect to the priority DRWG 2020 work plan initiatives in June.

The IESO welcomes questions and feedback from stakeholders on this update by email to engagement@ieso.ca.

Please provide feedback on the information contained in this update by May 22 to engagement@ieso.ca. Feedback provided by this date will be considered in the development of the draft recommendations.

APPENDIX: BASELINE CALCULATIONS IN CURRENT DESIGN

Standard Baseline for C&I HDRs

Uses an average of the highest 15 consumption values during the same hours as those of the Activation, in the last 20 Suitable Business Days prior to the Activation.

Suitable Business Days

Any business days where a C&I HDR resource:

- Has placed at least one demand response energy bid (as defined in Chapter 11 of Market Rules) for at least one hour within the availability window for the day; and,
- Was not activated to provide demand response

Calculation may go back to a maximum of 35 Business Days prior to establishing the 20 Suitable Business Days

In-Day Adjustment Factor for C&I HDRs

Captures changes in typical load consumption during the activation day.

- Capturing changes in HDR participant's baseline during the activation day helps to provide accurate performance calculations.

In-Day Adjustment Factor calculation

In-Day Adjustment Factor (IDAF) = A ÷ B

Where:

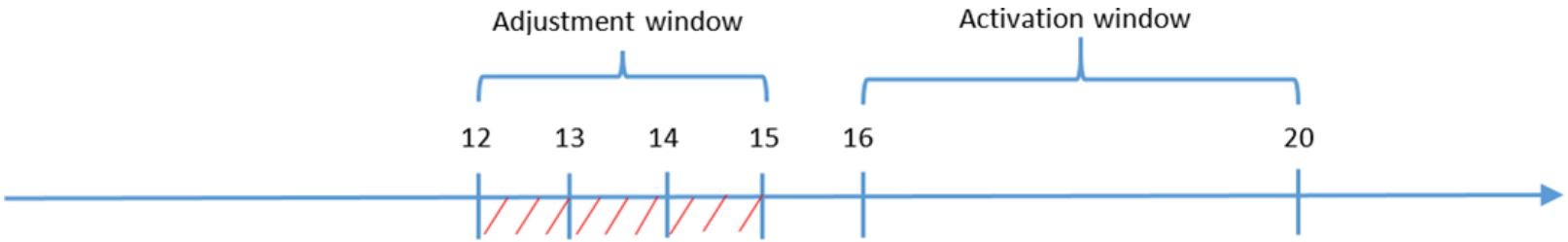
"A" is the average actual consumption during the adjustment window* hours on the actual DR activation day.

"B" is the average actual consumption during the adjustment window* hours in the past highest fifteen (15) of twenty (20) suitable business days* prior to the DR activation day.

IDAF can only be as low as 0.8 and as high as 1.2.

In-Day Adjustment window

Three (3) hour window occurring one (1) hour before a DR activation event



In-day Adjustment: Illustrative Impact

HDR participants whose consumption is higher than typical consumption during activation day will have IDAF greater than 1.

Provides a process to adjust the baseline for weather dependent loads and thus may better reflect the amount of capacity provided by the resource.

In-day Adjustment: HDR Baseline example

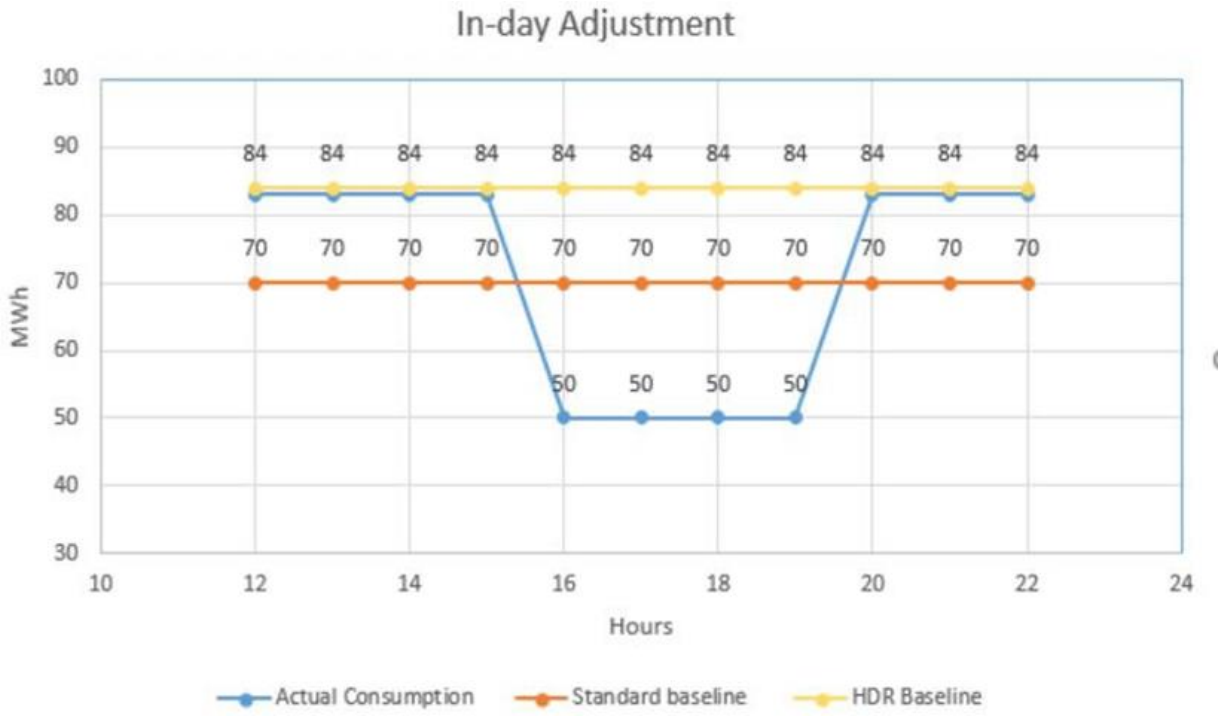
HDR Baseline = Standard Baseline x IDAF

- Example: Standard Baseline = 70 MWh, IDAF = 1.2

HDR Baseline = 70 MWh x 1.2 = 84 MWh

- Curtailment compared to Standard baseline = 20 MWh
- Curtailment compared to HDR baseline = 34 MWh

In-day Adjustment: Illustration



Illustrative Impact

HDR participants whose consumption is higher than typical consumption during activation day will have IDAF less than 1.

Provides a process to adjust the baseline for weather dependent loads and thus may better reflect the amount of capacity provided by the resource.

HDR Baseline example

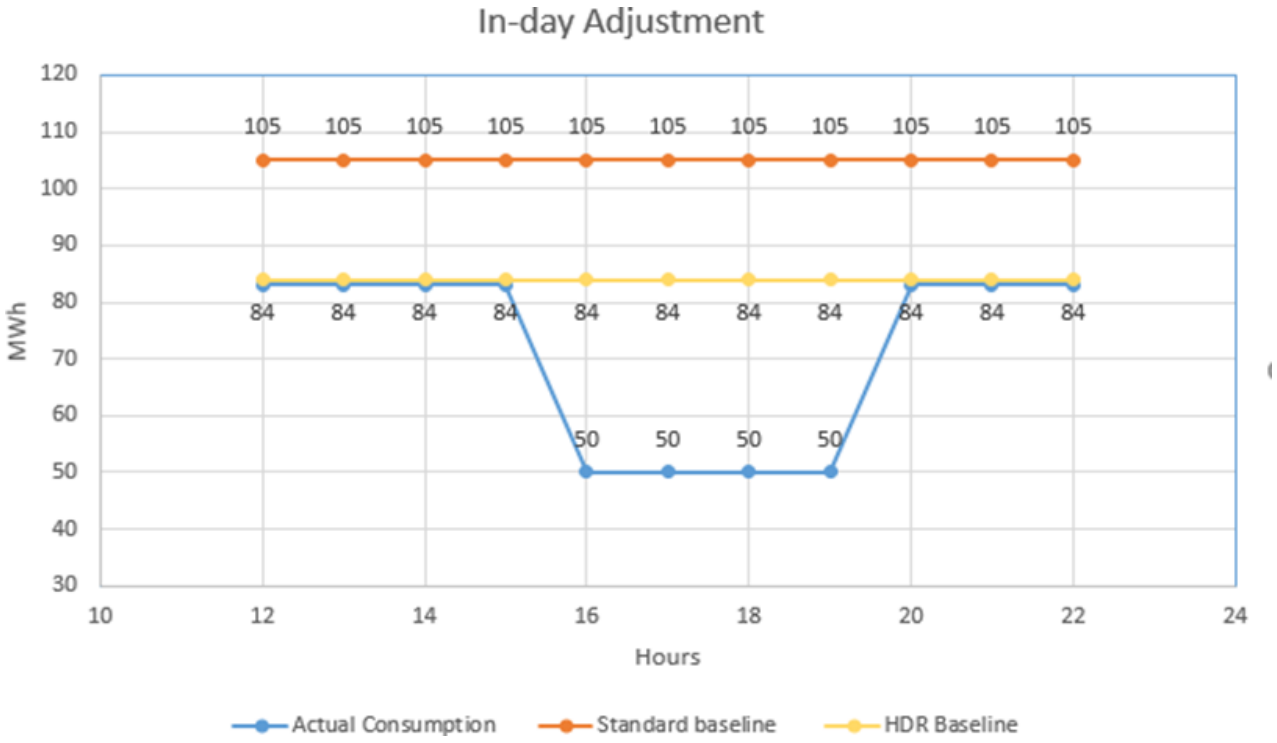
HDR Baseline = Standard Baseline x IDAF

- Example: Standard Baseline = 105 MWh, IDAF = 0.8

HDR Baseline = 105 MWh x 0.8 = 84 MWh

- Curtailment compared to Standard baseline = 55 MWh
- Curtailment compared to HDR baseline = 34 MWh

Illustration



Stakeholder Feedback: In-day Adjustment Impact

The IDAF can limit the participants operational flexibility on test/ activation day as customers can be penalized (through a lower baseline) for curtailing load in advance of the event even though these load reductions may occur outside of the availability window when the resource has no capacity obligation and be sustained for the entire activation.

In-day Adjustment Impact continued

Resources may "test" the capabilities of their contributors prior to an activation for the purposes of improving reliability during the event.

A contributor may undergo scheduled maintenance during the in-day adjustment hours on the day of an activation.

A manufacturing plant may respond to a DR notice by cancelling a shift that is scheduled to start well ahead of the activation. If the adjustment window includes part of the cancelled shift, the plant's baseline can be significantly reduced.

Stakeholder Feedback

The IDAF should be optional to allow ample time for industrial (non-weather sensitive) loads to perform shut-down processes.

The baseline adjustment window should never overlap with a ramp window as the resources is penalized when they ramp down in advance.