Hourly Demand Response Baseline Methodology Review: Preliminary Results

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Purpose

- Present preliminary results of the Commercial & Industrial (C&I) Hourly Demand Response (HDR) baseline methodology review

- Discuss implications of key findings and seek stakeholder feedback on sensitivity analysis

Summary of Findings

1. The current baseline methodology is a more accurate predictor of load than the majority of alternative baseline methods, with only five alternative methods consistently showing marginal accuracy gains

2. Under no scenario did the unadjusted baseline methods increase accuracy compared to the adjusted methods, meaning introducing an opt-out of the IDAF will not be considered further

3. Relative baseline performance was consistent across segments (i.e. no methods performed relatively well for some segments, relatively poorly for others) meaning there does not appear to be a strong justification for introducing multiple baseline options in Ontario

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Recap: Analysis Objective

• To assess the performance of the current "High 15 of 20 with in-day adjustment" baseline method for C&I HDR resources relative to alternative methods, in order to:

1. Respond to strong stakeholder interest for a review of the effectiveness of the current C&I HDR baseline method;

2. Ensure assessment of DR resources participating in the IESO-Administered Markets (IAMs) is reflective of performance; and

3. Inform future discussions on HDR resource design and capacity market enhancements as applicable

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Key questions to be addressed

1. How well does the current baseline perform relative to a set of alternative baseline methods?

2. Is there rationale for introducing an opt-out of the in-day adjustment factor (IDAF)?

3. Is there rationale for introducing multiple C&I HDR baseline methods in Ontario?

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Analysis approach

- Historic HDR load data was used to test the relative performance of 25 baseline and in-day adjustment methods, including the current High 15 of 20 with IDAF baseline, over a 4-hour activation window[1]

- Only resources with a capacity obligation for the entire analysis period of January 1, 2018 to December 31, 2019 were included

  - 21 virtual HDR resources, 2 physical HDR resources

- 474 proxy days were identified within the analysis period, meaning each method was estimated over 10,000 times[2]

[1] See next slide for description of baselines and adjustments included in the analysis; representative activation window is from HE17 to HE20
[2] 474 proxy days x 23 resources = 10,902 estimations per baseline

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Baseline methods tested

Baseline Methods

1. <u>High 15-of-20</u>: average load on the highest 15 of the last 20 suitable business days (SBD)

2. <u>High 4-of-5</u>: average load on the highest 4 of the last 5 SBD

3. <u>High 5-of-10</u>: average load on the highest 5 of the last 10 SBD

4. <u>Middle 8-of-10</u>: average load on the middle 8 of the last 10 SBD (i.e. Day 2 through 9 of the last 10 SBD)

5. <u>Mean 10-of-10</u>: average load on the last 10 SBD

In-Day Adjustment Methods

1. <u>Unadjusted</u>: No IDAF (i.e. unadjusted)

2. <u>Current IDAF</u>: 3 hours, one hour prior to first dispatch hour; +/- 20% cap; scalar adjustment

3. <u>Shifted IDAF</u>: Current IDAF with shifted timeframe: 3 hours, 3 hours prior to first dispatch hour

4. <u>Uncapped, scalar IDAF</u>: Current IDAF (scalar adjustment) with no +/- 20% adjustment cap

5. <u>Uncapped, additive IDAF</u>: Current IDAF with no +/- 20% adjustment cap and additive adjustment rather than scalar adjustment

Additive Adjustment: A fixed kW adjustment to the 'X of Y' baseline, applied across all event time intervals
Scalar Adjustment: A percentage multiplier adjustment to the 'X of Y' baseline, applied across all event time intervals
Uncapped: No limit to the magnitude of an adjustment to the 'X of Y' baseline

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Analysis approach (cont'd)

- The 25 methods were evaluated on how well they estimated actual load with respect to three performance metrics: accuracy, bias, and variability

- Relative root mean squared error (RRMSE) measures accuracy

  - **The smaller the RRMSE, the better the baseline method performs** as a predictor of the actual hourly load

- Average relative error (ARE) measures bias, which is the systematic tendency of a baseline to over- or under- predict load

  - **The closer ARE is to zero, the closer the baseline method is to being unbiased**

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Analysis approach (cont'd)

- Relative error ratio (RER) measures variability

  - The **smaller the RER, the less variable a baseline method's error** is for a typical resource and the better it performs across a range of circumstances

- See the April 22, 2021 meeting materials posted on the Resource Adequacy engagement page for more details on performance metric selection and example calculations of each metric

Baseline method assessment and segmentation

- In order to determine which baseline methods best predict load in absence of an activation, the performance metrics were calculated for each resource, for each proxy day, and the performance of each baseline was compared using the median value of each metric[1]

- Performance metrics are reported for all resources, then further segmented by season, load variability, and resource size (based on peak summer demand)

- Weather sensitivity is also discussed

[1] Appendix A reports the 10th percentile, median, mean and 90th percentile for each metric for each baseline captured in the analysis

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Accuracy Metric: All Resources

RRMSE – All Resources	High 15-of-20	High 4-of-5	High 5-of-10	Middle 8-of-10	Mean 10-of-10
Unadjusted	8.1%	7.1%	7.4%	8.1%	8.4%
Current IDAF	4.6%	4.7%	4.5% ✔	4.8%	5.0%
Shifted IDAF	5.3%	5.4%	5.1%	5.6%	5.7%
Uncapped, scalar IDAF	4.3% ✔	4.6%	4.3% ✔	4.6%	4.7%
Uncapped, additive IDAF	4.4% ✔	4.7%	4.4% ✔	4.6%	4.7%

- The current baseline had a median RRMSE of 4.6%, meaning it is predicting load within 4.6% of actual load (either above or below)

- The current baseline was more accurate than most other baselines, including the Shifted IDAF method (shifts the adjustment window to earlier in the day)

- Five baseline methods were more accurate than the current baseline

- The five unadjusted baseline methods were up to 3.5% less accurate than the adjusted methods, with the RRSME ranging from 7.1% to 8.4%

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Bias Metric: All Resources

ARE – All Resources	High 15-of-20	High 4-of-5	High 5-of-10	Middle 8-of-10	Mean 10-of-10
Unadjusted	-1.8%	-1.1%	-4.2%	0.8%	1.2%
Current IDAF	-0.1%	-0.1%	-0.4%	0.2%	0.3%
Shifted IDAF	0.0% ✔	-0.1%	-0.5%	0.3%	0.4%
Uncapped, scalar IDAF	0.0% ✔	0.0% ✔	-0.1%	0.1%	0.2%
Uncapped, additive IDAF	0.1%	0.0% ✔	0.0% ✔	0.1%	0.1%

- The current baseline had an ARE of -0.1% meaning the current baseline is very close to being unbiased (underestimates actual load by 0.1%)

- Five alternative baseline methods performed marginally better than the current baseline, demonstrating no systematic tendency to over- or under- predict load (i.e. ARE is equal to zero)

- The five unadjusted baseline methods exhibited up to 3.8% more bias than the adjusted methods with the ARE ranging from -4.2% to 1.2%

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More accurate baselines ✔

Variability Metric: All Resources

RER – All Resources	High 15-of-20	High 4-of-5	High 5-of-10	Middle 8-of-10	Mean 10-of-10
Unadjusted	2.1%	2.3%	2.2%	2.2%	2.2%
Current IDAF	2.1%	2.3%	2.1% ✔	2.2%	2.2%
Shifted IDAF	2.1% ✔	2.3%	2.1% ✔	2.2%	2.2%
Uncapped, scalar IDAF	2.1% ✔	2.3%	2.1% ✔	2.2%	2.2%
Uncapped, additive IDAF	2.1%	2.3%	2.2%	2.2%	2.2%

- The variability metric performed consistently across all baseline methods, with only a 0.2% difference between the worst and best performing variations

- The current baseline had an RER of 2.1%

- Five alternative methods had a <0.1% smaller RER

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Segmentation Analysis

- Based on the fleet-level bias and variability results, and the fact that the RRMSE accuracy metrics combines the systematic errors measured by the bias metric (the baseline's average relative error) and the variability of errors captured by the variability metric (relative error ratio), the segmentation analysis reports the accuracy metric only[1]

- The following slides report accuracy metrics for summer and winter proxy days, variable and non-variable loads, and different load size

- Weather sensitivity of loads is also addressed

[1] Resource-level accuracy, bias, and variability results are reported in Appendix B

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Seasonal Results

RRMSE – Summer Proxy Days

	High 15-of-20	High 4-of-5	High 5-of-10	Middle 8-of-10	Mean 10-of-10
Unadjusted	8.9%	7.9%	8.2%	8.7%	9.0%
Current IDAF	5.0%	5.2%	4.8% ✔	5.4%	5.5%
Shifted IDAF	6.0%	6.1%	5.6%	6.4%	6.5%
Uncapped, scalar IDAF	4.7% ✔	5.0%	4.7% ✔	5.1%	5.2%
Uncapped, additive IDAF	4.8% ✔	5.2%	4.8% ✔	5.1%	5.2%

RRMSE – Winter Proxy Days

	High 15-of-20	High 4-of-5	High 5-of-10	Middle 8-of-10	Mean 10-of-10
Unadjusted	7.2%	6.4%	6.7%	7.4%	7.7%
Current IDAF	4.1%	4.3%	4.0% ✔	4.4%	4.4%
Shifted IDAF	4.7%	4.9%	4.5%	4.9%	5.0%
Uncapped, scalar IDAF	3.8% ✔	4.2%	3.9% ✔	4.1%	4.2%
Uncapped, additive IDAF	3.9% ✔	4.2%	3.9% ✔	4.1%	4.2%

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Seasonal Results (cont'd)

- The current baseline had a median RRMSE of 5.0% in summer, and 4.1% in winter meaning the current baseline is slightly better at predicting actual load during the winter months

  - Summer results for the current baseline are still within 5.0% accuracy

- For both winter and summer, there were five alternative methods that performed better than the current baseline by between 0.1% and 0.3%

- The five unadjusted baseline methods were less accurate than the adjusted variations with the RRMSE ranging from 7.9% to 9.0% in summer, and 6.4% to 7.7% in winter for the unadjusted methods

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Load Variability – Approach

• Similar to PJM and NYISO studies, the RRMSE metric for the current baseline (High 15 of 20 with IDAF) was used to segment the fleet into variable load resources and non-variable load resources

• The RRMSE was calculated for each resource, and any resource with a mean RRMSE >20% was considered to be a variable load

• 6 of 23 resources (26%) were identified as variable loads, while the remaining 17 resources (74%) were identified as non-variable loads

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Load Variability – Results

RRMSE - Non-Variable Loads	High 15-of-20	High 4-of-5	High 5-of-10	Middle 8-of-10	Mean 10-of-10
Unadjusted	7.0%	6.3%	6.5%	7.0%	7.2%
Current IDAF	4.0%	4.2%	3.9% ✔	4.2%	4.2%
Shifted IDAF	4.6%	4.7%	4.5%	4.7%	4.8%
Uncapped, scalar IDAF	3.7% ✔	4.1%	3.8% ✔	4.0%	4.0%
Uncapped, additive IDAF	3.8% ✔	4.1%	3.9% ✔	4.0%	4.0%

RRMSE - Variable Loads	High 15-of-20	High 4-of-5	High 5-of-10	Middle 8-of-10	Mean 10-of-10
Unadjusted	16.1%	14.7%	13.7%	18.0%	18.7%
Current IDAF	13.4%	12.7% ✔	10.7% ✔	15.4%	15.7%
Shifted IDAF	14.4%	14.1%	11.9% ✔	16.0%	16.8%
Uncapped, scalar IDAF	11.4% ✔	12.2% ✔	10.2% ✔	13.9%	14.1%
Uncapped, additive IDAF	11.8% ✔	11.5% ✔	10.2% ✔	13.0% ✔	13.6%

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Load Variability – Results (cont'd)

- The current baseline had a median RRMSE of 4.0% for non-variable loads, and 13.4% for variable loads, meaning the current baseline is better at predicting actual load for non-variable resources

- For non-variable loads, there were five alternative methods that performed better than the current baseline (up to 0.2%)

- For variable loads, there were ten alternative methods that performed better than the current baseline (up to 3.2%)

- The five unadjusted baseline methods were less accurate than the adjusted methods with the unadjusted RRMSE ranging from 6.3% to 7.2% for non-variable loads, and 13.7% to 18.7% for variable loads

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Size Segmentation – Results

RRMSE - Loads < 10 MW

	High 15-of-20	High 4-of-5	High 5-of-10	Middle 8-of-10	Mean 10-of-10
Unadjusted	8.1%	8.3%	7.0%	9.0%	9.4%
Current IDAF	4.1%	4.3%	3.9% ✔	4.5%	4.8%
Shifted IDAF	4.8%	5.1%	4.5%	5.5%	6.0%
Uncapped, scalar IDAF	4.0% ✔	4.2%	3.9% ✔	4.3%	4.6%
Uncapped, additive IDAF	4.2% ✔	4.4%	4.0% ✔	4.4%	4.7%

RRMSE - Loads 10 MW - 100 MW

	High 15-of-20	High 4-of-5	High 5-of-10	Middle 8-of-10	Mean 10-of-10
Unadjusted	8.8%	7.5%	8.2%	8.5%	8.7%
Current IDAF	5.5%	5.6%	5.4% ✔	5.5%	5.6%
Shifted IDAF	6.1%	6.1%	5.9%	6.2%	6.2%
Uncapped, scalar IDAF	5.1% ✔	5.5%	5.1% ✔	5.3% ✔	5.4% ✔
Uncapped, additive IDAF	5.1% ✔	5.5%	5.3% ✔	5.4% ✔	5.4% ✔

RRMSE - Loads > 100 MW

	High 15-of-20	High 4-of-5	High 5-of-10	Middle 8-of-10	Mean 10-of-10
Unadjusted	7.1%	6.3%	6.7%	7.0%	7.4%
Current IDAF	4.1%	4.2%	3.9% ✔	4.3%	4.3%
Shifted IDAF	4.7%	4.8%	4.5%	5.0%	5.0%
Uncapped, scalar IDAF	3.7% ✔	3.9% ✔	3.7% ✔	3.9% ✔	3.9% ✔
Uncapped, additive IDAF	3.7% ✔	4.0% ✔	3.7% ✔	3.8% ✔	3.9% ✔

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Size Segmentation – Results (cont'd)

- Loads were segmented by size based on the peak demand during the summer (May – October) and placed into three categories: <10 MW; 10 MW to 100 MW; and > 100 MW

- Baseline performance is consistent with the fleet-level and other segmentation results, with the uncapped adjustments resulting in higher accuracy than the current adjustment method

- The current baseline with in-day adjustment was slightly more accurate for the < 10 MW segment and >100 MW segments compared to the middle size segment (1.4% accuracy improvement)

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Weather Sensitivity

• To determine whether a load was weather sensitive, two approaches were explored (shown visually on next two slides). For each resource:

1. Daily temperature (zonal) was correlated with load to determine whether a relationship between weather and consumption exists;

2. A box plot was derived for a discrete range of temperatures

• Only one load demonstrated characteristics that would indicate it was weather sensitive, so segmentation analysis was not performed

  • Aggregations may mute the effects of a weather-sensitive contributor on a resource's overall load profile
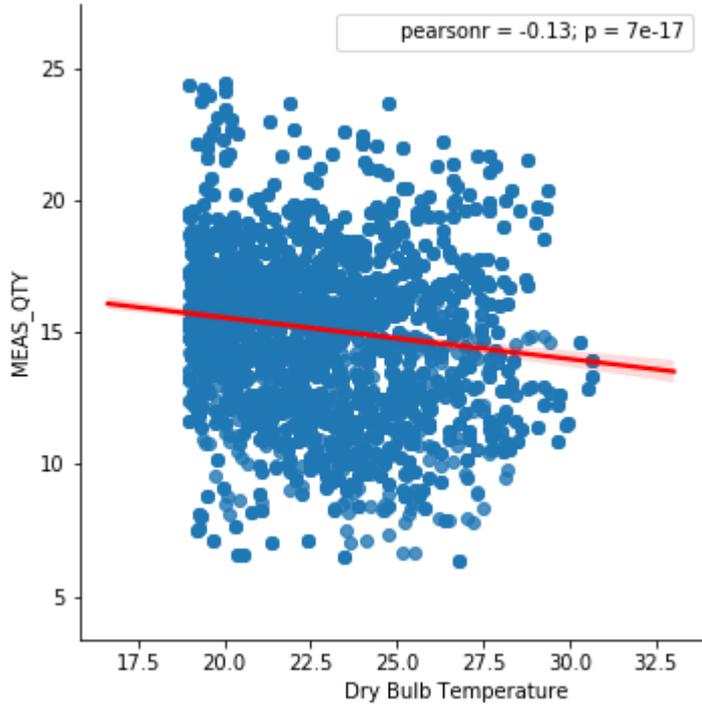
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Weather Sensitivity (cont'd)
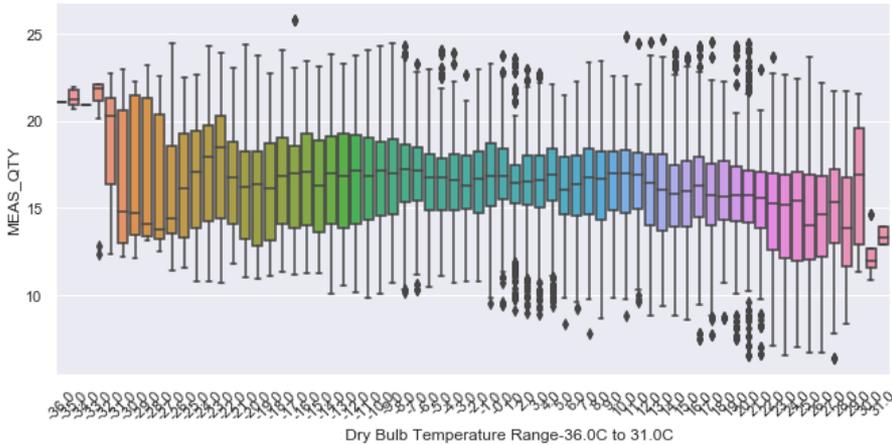
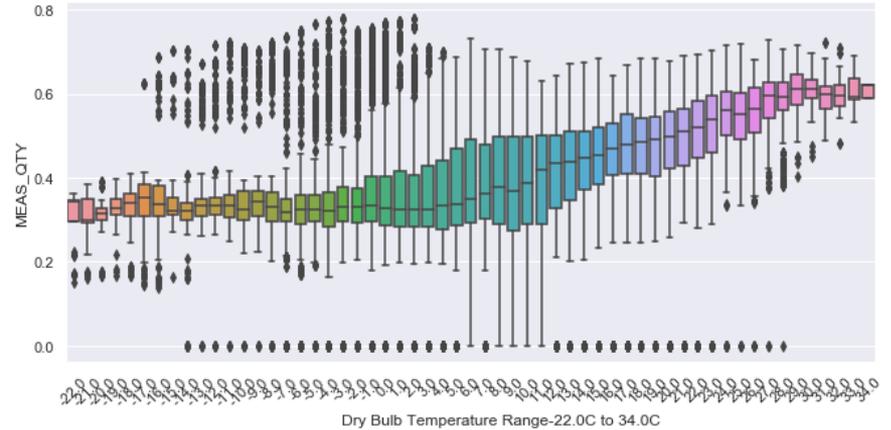Non-weather sensitive load

Weather sensitive load
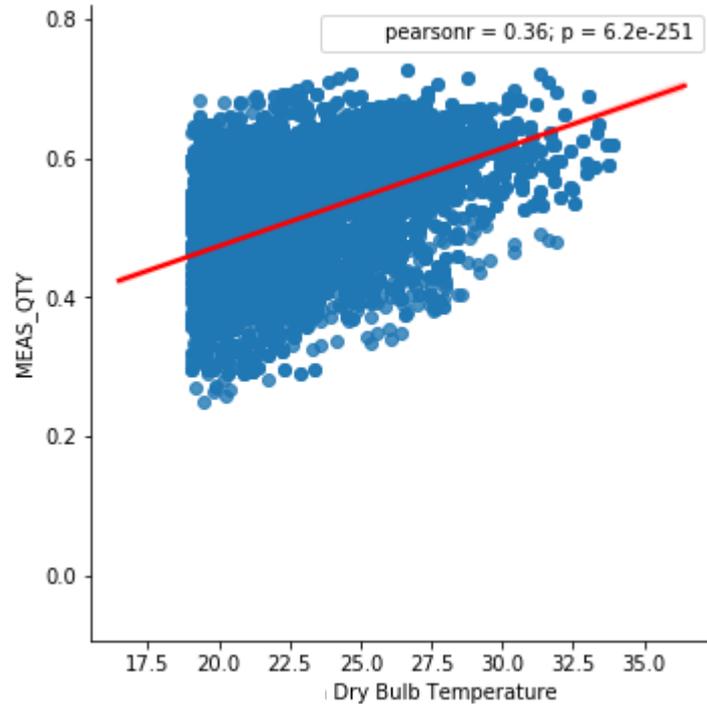
Weather Sensitivity (cont'd)

Non-weather sensitive load

Weather sensitive load

Key finding #1: Current baseline performance

- In response to the question of how well the current baseline (with in-day adjustment) performs relative to a set of alternative methods, it was found that:

  - The current baseline was as accurate or more accurate than most alternative methods, with the exception of the adjusted High 5-of-10 baseline

  - The uncapped adjustment methods applied to the current baseline method and the High 5-of-10 method also increased accuracy

  - Accuracy gains between the capped and uncapped versions of the current baseline was the largest for variable loads (1.7%)

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Implications of key finding #1

• Moving from the current baseline to a High 5-of-10 baseline, or an uncapped adjustment variation (either scalar or additive) would result in fleet-level accuracy gains of 0.3% at most

• The scale and cost of tool changes, both to the IESO and market participants, in moving to a new baseline likely outweigh the potential benefits derived from the minimal accuracy gains that could be realized from such a change, particularly due to the infrequency of activations

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Key finding #2: Rationale for opt-out of IDAF

- In response to the question of whether there is rationale for introducing an opt-out of the IDAF, it was found that:

  - At the fleet-level, resource-level, and for each segment included in the analysis, results clearly indicate that adjusted baseline methods perform significantly better than unadjusted methods in all cases

  - On average, **unadjusted baseline methods reduce accuracy by 3.1%** compared to the best performing adjusted baselines

  - Further, the unadjusted version of the current High 15-of-20 baseline has a tendency to under-estimate load by nearly 2% (bias metric)

Implications of key finding #2

- Under no scenario did the unadjusted baseline methods increase accuracy compared to the adjusted methods, meaning introducing an opt-out of the IDAF will not be considered further

- **If the IESO were to offer an opt-out of the IDAF and an HDR resource were allowed to do so voluntarily, on average, the resource would be credited with less MW curtailed than if the IDAF were applied**

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Implications of key finding #2 (cont'd)

- IESO acknowledges stakeholder concerns regarding the impact of activation day contributor outages on the baseline calculation due to the potential disproportionate impact a large contributor with a relatively small capacity contribution can have on the baseline via the IDAF

  - IESO continues to work with stakeholders to understand the extent of the issue and identify potential solutions if warranted

  - However, removal of the IDAF will not be considered as a potential solution due to the negative impact on baseline accuracy

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Key finding #3: Rationale for multiple baseline options

- In response to the question of whether there is rationale for introducing multiple C&I HDR baselines in Ontario, it was found that:

  - There were **no methods that performed relatively well for some segments, and relatively poorly for other segments**

  - Though the current baseline performed better (i.e. lower RRMSE) for non-variable loads vs. variable loads, the RRMSE for the variable load segment was still well under the standard benchmark of 20%[1]

  - There were 6 resources that, on an individual basis, had a mean RRMSE of >20% for the current baseline

[1] 20% is a common accuracy threshold used in other jurisdictions to determine whether the standard offer baseline should apply

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Implications of key finding #3

- Relative baseline performance is consistent across all segments, and accuracy gains between the current baseline and best performing alternatives are marginal, meaning **there does not appear to be a strong justification for introducing multiple baseline options**

- For a few variable resources identified in the analysis, none of the 25 baseline methods tested resulted in an mean RRSME <20%

- IESO may consider establishing a process to verify that an HDR resource can be effectively modelled

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Contributor-level baseline approach

- Assessment of relative baseline performance was not conducted at the contributor-level due to data availability:

  - Data is limited to a few months when IESO collected contributor data for the purposes of HDR audits for select resources meaning there is not a large enough data sample to enable a rigorous comparison between aggregate- and contributor-level baseline performance

Contributor-level baseline approach (cont'd)

- Based on the incremental upfront cost and effort for both the IESO and market participants, a material improvement in accuracy would need to be demonstrated to consider moving to a contributor-level application of the baseline methodology

- In order for the IESO to undertake a contributor-level analysis, multiple market participants would need to submit contributor-level data covering at least one full year (ideally two)

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Stakeholder feedback requested

- Is there additional segmentation or sensitivity analysis the IESO should consider?

- Do stakeholders feel there is strong alignment between the results presented and the implications the IESO has identified?

- Are there additional implications the IESO has not considered based on the preliminary results?

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Next Steps

- **Q4 2021**:
  - Undertake sensitivity analysis based on stakeholder feedback
  - Present final review results and discuss next steps

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Appendix A: Performance metrics – detailed results

	Accuracy				Bias				Variability			
	10th Pct	Median	Mean	90th Pct	10th Pct	Median	Mean	90th Pct	10th Pct	Median	Mean	90th Pct
High 15-of-20: Unadjusted	1.9%	8.1%	22.0%	41.3%	-29.7%	-1.8%	-12.2%	11.3%	0.6%	2.1%	5.5%	13.1%
High 15-of-20: Current IDAF	1.2%	4.6%	16.1%	30.4%	-15.1%	-0.1%	-7.0%	9.5%	0.6%	2.1%	5.5%	13.0%
High 15-of-20: Shifted IDAF	1.4%	5.3%	17.3%	32.7%	-17.1%	0.0%	-7.5%	10.8%	0.6%	2.1%	5.5%	13.0%
High 15-of-20: Uncapped, scalar IDAF	1.2%	4.3%	12.0%	24.8%	-10.5%	0.0%	-2.9%	9.1%	0.6%	2.1%	5.5%	12.9%
High 15-of-20: Uncapped, additive IDAF	1.2%	4.4%	12.1%	24.2%	-10.3%	0.1%	-2.5%	9.6%	0.6%	2.1%	5.5%	13.1%
High 4-of-5: Unadjusted	1.7%	7.1%	18.4%	35.2%	-24.4%	-1.1%	-8.6%	11.4%	0.6%	2.3%	5.7%	12.8%
High 4-of-5: Current IDAF	1.2%	4.7%	14.1%	27.0%	-12.5%	-0.1%	-4.9%	10.1%	0.6%	2.3%	5.6%	12.5%
High 4-of-5: Shifted IDAF	1.4%	5.4%	15.3%	29.1%	-14.7%	-0.1%	-5.4%	11.6%	0.6%	2.3%	5.7%	12.5%
High 4-of-5: Uncapped, scalar IDAF	1.2%	4.6%	12.2%	25.0%	-10.8%	0.0%	-2.5%	10.4%	0.6%	2.3%	5.7%	12.7%
High 4-of-5: Uncapped, additive IDAF	1.2%	4.7%	12.5%	25.1%	-10.4%	0.0%	-1.9%	10.8%	0.6%	2.3%	5.7%	12.8%
High 5-of-10: Unadjusted	1.7%	7.4%	22.6%	41.1%	-35.0%	-4.2%	-17.2%	5.1%	0.6%	2.2%	5.7%	12.9%
High 5-of-10: Current IDAF	1.2%	4.5%	16.1%	28.2%	-17.5%	-0.4%	-9.1%	7.2%	0.6%	2.1%	5.6%	12.8%
High 5-of-10: Shifted IDAF	1.3%	5.1%	17.2%	29.5%	-19.4%	-0.5%	-9.6%	8.5%	0.6%	2.1%	5.6%	12.9%
High 5-of-10: Uncapped, scalar IDAF	1.2%	4.3%	12.2%	25.0%	-10.8%	-0.1%	-3.5%	8.6%	0.6%	2.1%	5.6%	12.6%
High 5-of-10: Uncapped, additive IDAF	1.2%	4.4%	12.6%	25.1%	-10.7%	0.0%	-3.1%	9.1%	0.6%	2.2%	5.7%	12.9%
Middle 8-of-10: Unadjusted	1.8%	8.1%	19.0%	36.9%	-20.7%	0.8%	-5.0%	17.8%	0.6%	2.2%	5.5%	12.9%
Middle 8-of-10: Current IDAF	1.3%	4.8%	14.5%	29.0%	-11.3%	0.2%	-3.5%	13.2%	0.6%	2.2%	5.5%	12.9%
Middle 8-of-10: Shifted IDAF	1.4%	5.6%	15.7%	31.2%	-13.5%	0.3%	-4.0%	14.4%	0.6%	2.2%	5.5%	12.8%
Middle 8-of-10: Uncapped, scalar IDAF	1.2%	4.6%	12.0%	25.4%	-10.5%	0.1%	-2.1%	11.1%	0.6%	2.2%	5.6%	13.0%
Middle 8-of-10: Uncapped, additive IDAF	1.3%	4.6%	12.1%	25.0%	-10.0%	0.1%	-1.7%	11.2%	0.6%	2.2%	5.5%	12.9%
Mean 10-of-10: Unadjusted	1.9%	8.4%	18.9%	36.2%	-20.2%	1.2%	-4.4%	18.7%	0.6%	2.2%	5.5%	12.7%
Mean 10-of-10: Current IDAF	1.3%	5.0%	14.3%	28.4%	-11.2%	0.3%	-3.4%	13.3%	0.6%	2.2%	5.4%	12.6%
Mean 10-of-10: Shifted IDAF	1.4%	5.7%	15.6%	30.9%	-13.4%	0.4%	-3.9%	14.7%	0.6%	2.2%	5.4%	12.6%
Mean 10-of-10: Uncapped, scalar IDAF	1.3%	4.7%	11.9%	25.2%	-10.3%	0.2%	-2.1%	11.3%	0.6%	2.2%	5.5%	12.8%
Mean 10-of-10: Uncapped, additive IDAF	1.3%	4.7%	12.0%	24.6%	-10.0%	0.1%	-1.7%	11.3%	0.6%	2.2%	5.5%	12.7%

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Appendix B: Resource-level accuracy results (median)

Resource #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
High 15-of-20: Unadjusted	10.2%	6.4%	22.1%	10.5%	3.8%	6.1%	8.0%	12.1%	9.8%	16.1%	9.4%	6.4%	6.2%	29.8%	26.1%	5.0%	6.3%	5.9%	6.3%	3.3%	4.7%	5.6%	4.7%
High 15-of-20: Current IDAF	6.9%	4.3%	20.7%	3.5%	2.4%	3.1%	6.5%	6.6%	5.1%	12.6%	6.1%	3.7%	3.1%	28.5%	27.0%	3.2%	4.3%	3.5%	4.2%	1.7%	2.1%	2.8%	3.0%
High 15-of-20: Shifted IDAF	7.7%	4.9%	21.0%	4.2%	3.1%	3.8%	6.2%	7.3%	6.1%	13.1%	6.7%	4.3%	3.6%	30.1%	28.2%	3.7%	5.2%	3.7%	4.7%	2.1%	2.3%	3.2%	2.9%
High 15-of-20: Uncapped, scalar IDAF	6.3%	4.2%	19.6%	3.6%	2.3%	2.2%	5.7%	6.3%	5.1%	11.3%	5.8%	3.7%	3.0%	32.8%	30.3%	3.2%	4.2%	3.5%	3.9%	1.7%	2.0%	2.7%	2.9%
High 15-of-20: Uncapped, additive IDAF	6.4%	4.5%	18.6%	3.6%	2.3%	2.3%	6.0%	6.2%	5.2%	11.3%	5.8%	3.8%	3.0%	27.2%	30.4%	3.2%	4.3%	3.6%	3.8%	1.8%	2.1%	2.8%	3.0%
High 4-of-5: Unadjusted	9.1%	5.5%	19.3%	12.3%	3.3%	4.7%	5.8%	9.8%	9.0%	15.1%	8.9%	6.1%	5.4%	31.7%	21.2%	5.0%	6.6%	5.1%	5.6%	3.0%	3.5%	4.3%	3.9%
High 4-of-5: Current IDAF	7.4%	4.6%	17.6%	4.0%	2.4%	2.6%	5.6%	7.1%	6.2%	12.3%	6.5%	4.1%	3.2%	30.7%	21.3%	3.4%	4.5%	3.7%	4.3%	1.7%	2.2%	2.3%	2.4%
High 4-of-5: Shifted IDAF	7.8%	4.8%	18.7%	4.8%	2.8%	3.3%	5.7%	8.1%	7.0%	12.8%	7.3%	4.6%	3.9%	31.0%	21.2%	4.0%	5.5%	4.1%	4.8%	2.1%	2.4%	3.1%	2.8%
High 4-of-5: Uncapped, scalar IDAF	7.3%	4.5%	16.9%	4.1%	2.2%	2.5%	5.4%	6.9%	6.1%	12.3%	6.4%	4.1%	3.2%	33.9%	21.1%	3.3%	4.5%	3.7%	4.1%	1.7%	2.1%	2.3%	2.4%
High 4-of-5: Uncapped, additive IDAF	7.2%	4.7%	16.4%	4.0%	2.2%	2.4%	5.5%	6.8%	6.1%	12.6%	6.4%	4.1%	3.2%	29.9%	21.2%	3.3%	4.5%	3.7%	4.1%	1.9%	2.2%	2.5%	2.5%
High 5-of-10: Unadjusted	9.2%	6.2%	22.3%	12.0%	3.7%	4.9%	6.8%	10.5%	10.4%	16.9%	9.5%	5.9%	6.1%	29.2%	29.6%	5.3%	6.8%	6.0%	6.3%	3.2%	4.5%	4.5%	3.8%
High 5-of-10: Current IDAF	6.7%	4.5%	18.5%	3.6%	2.3%	2.4%	6.0%	6.5%	5.6%	12.1%	6.6%	3.6%	3.1%	28.4%	25.4%	3.2%	4.4%	3.5%	4.1%	1.7%	2.1%	2.2%	2.3%
High 5-of-10: Shifted IDAF	7.5%	4.7%	19.2%	4.0%	2.8%	3.1%	5.6%	7.3%	6.5%	12.5%	7.2%	4.0%	3.6%	28.4%	26.3%	3.7%	5.3%	3.9%	4.6%	2.0%	2.5%	2.7%	2.3%
High 5-of-10: Uncapped, scalar IDAF	6.2%	4.3%	18.0%	3.6%	2.2%	2.2%	5.7%	6.3%	5.6%	11.5%	6.2%	3.6%	3.0%	31.5%	28.5%	3.1%	4.2%	3.4%	3.9%	1.7%	2.1%	2.1%	2.3%
High 5-of-10: Uncapped, additive IDAF	6.3%	4.5%	17.5%	3.7%	2.3%	2.3%	6.0%	6.4%	5.8%	11.7%	6.3%	3.6%	3.0%	28.5%	29.0%	3.1%	4.3%	3.7%	3.8%	1.8%	2.2%	2.3%	2.3%
Middle 8-of-10: Unadjusted	10.4%	5.9%	21.5%	11.4%	3.8%	5.6%	6.9%	11.4%	8.5%	16.6%	9.8%	6.9%	6.4%	37.3%	28.6%	5.0%	7.1%	5.8%	6.0%	3.7%	3.9%	5.5%	5.2%
Middle 8-of-10: Current IDAF	7.2%	4.5%	19.3%	4.1%	2.4%	2.7%	6.1%	6.7%	5.7%	13.7%	6.1%	4.1%	3.3%	33.4%	29.0%	3.4%	4.5%	3.5%	4.5%	1.8%	2.1%	3.1%	3.2%
Middle 8-of-10: Shifted IDAF	8.2%	4.7%	20.2%	4.7%	2.9%	3.7%	6.0%	8.0%	7.0%	14.3%	6.8%	4.8%	3.9%	35.6%	30.6%	3.9%	5.6%	3.9%	4.8%	2.1%	2.3%	3.7%	3.5%
Middle 8-of-10: Uncapped, scalar IDAF	7.0%	4.5%	18.3%	4.1%	2.2%	2.4%	5.6%	6.8%	5.5%	12.1%	6.2%	4.0%	3.3%	35.7%	32.2%	3.3%	4.4%	3.4%	4.0%	1.7%	2.0%	3.0%	3.2%
Middle 8-of-10: Uncapped, additive IDAF	7.0%	4.7%	18.5%	3.9%	2.3%	2.4%	5.7%	6.6%	5.5%	12.1%	6.2%	3.9%	3.3%	30.6%	30.4%	3.3%	4.4%	3.6%	4.0%	1.9%	2.1%	3.1%	3.2%
Mean 10-of-10: Unadjusted	11.1%	6.3%	21.9%	11.3%	4.0%	6.0%	7.0%	11.6%	8.7%	16.5%	10.0%	8.0%	6.3%	36.8%	28.8%	5.1%	7.3%	6.0%	6.4%	3.7%	4.1%	6.2%	5.5%
Mean 10-of-10: Current IDAF	7.0%	4.5%	19.4%	4.5%	2.4%	2.9%	5.8%	6.8%	5.9%	13.4%	6.1%	4.4%	3.3%	33.2%	28.1%	3.3%	4.5%	3.6%	4.5%	1.9%	2.1%	3.6%	3.7%
Mean 10-of-10: Shifted IDAF	8.5%	5.0%	20.5%	5.4%	3.0%	3.5%	5.8%	8.0%	6.9%	13.9%	6.9%	4.9%	3.7%	35.3%	29.7%	3.8%	5.8%	4.0%	4.8%	2.2%	2.4%	5.0%	4.6%
Mean 10-of-10: Uncapped, scalar IDAF	7.1%	4.4%	18.7%	4.5%	2.2%	2.4%	5.5%	6.6%	5.7%	11.8%	6.0%	4.3%	3.2%	35.6%	31.0%	3.2%	4.4%	3.6%	4.0%	1.8%	2.0%	3.4%	3.5%
Mean 10-of-10: Uncapped, additive IDAF	6.8%	4.5%	18.7%	4.3%	2.3%	2.5%	5.6%	6.5%	5.8%	11.7%	6.1%	4.2%	3.2%	30.5%	29.7%	3.3%	4.4%	3.7%	4.0%	1.9%	2.1%	3.5%	3.6%

Appendix B: Resource-level accuracy results (mean)

Resource #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
High 15-of-20: Unadjusted	19.4%	11.1%	32.2%	17.0%	10.9%	15.7%	13.2%	31.5%	12.8%	27.7%	15.6%	15.8%	9.9%	39.9%	32.9%	7.4%	13.8%	9.0%	11.6%	7.2%	8.6%	69.7%	84.8%
High 15-of-20: Current IDAF	13.1%	6.9%	27.0%	8.7%	7.3%	10.9%	9.1%	20.6%	7.8%	19.9%	9.5%	10.4%	5.4%	35.8%	31.7%	4.4%	8.4%	4.5%	6.4%	4.1%	3.9%	58.6%	70.1%
High 15-of-20: Shifted IDAF	14.3%	7.5%	27.9%	9.6%	8.0%	12.0%	9.2%	22.0%	9.1%	20.5%	10.3%	12.0%	6.2%	36.4%	33.0%	5.0%	10.6%	5.1%	7.1%	4.5%	4.2%	62.5%	74.0%
High 15-of-20: Uncapped, scalar IDAF	10.4%	6.2%	25.5%	8.0%	3.0%	4.3%	7.1%	11.7%	7.5%	15.1%	8.4%	8.9%	5.2%	41.0%	35.0%	4.0%	6.2%	4.2%	5.0%	2.8%	2.5%	38.0%	33.3%
High 15-of-20: Uncapped, additive IDAF	10.4%	6.5%	24.6%	8.0%	3.0%	4.3%	7.3%	12.7%	7.5%	15.1%	8.4%	8.9%	5.2%	35.1%	34.9%	4.0%	6.2%	4.4%	5.0%	2.9%	2.6%	42.8%	35.2%
High 4-of-5: Unadjusted	16.0%	9.7%	27.1%	17.8%	7.1%	10.1%	9.4%	23.8%	11.7%	22.7%	13.3%	14.2%	8.5%	40.3%	23.7%	7.1%	13.3%	7.6%	9.4%	5.5%	6.3%	61.0%	61.1%
High 4-of-5: Current IDAF	12.1%	7.0%	23.4%	8.9%	4.5%	6.8%	7.6%	16.2%	8.3%	17.6%	9.3%	10.2%	5.5%	36.8%	23.5%	4.4%	7.9%	4.5%	5.8%	3.3%	3.1%	52.3%	51.6%
High 4-of-5: Shifted IDAF	13.2%	7.6%	24.6%	10.0%	5.3%	7.9%	8.0%	17.7%	9.6%	18.0%	10.1%	11.6%	6.4%	37.4%	23.5%	5.1%	10.1%	5.2%	6.6%	3.7%	3.5%	56.2%	56.8%
High 4-of-5: Uncapped, scalar IDAF	11.1%	6.6%	22.0%	8.5%	3.0%	4.5%	6.8%	12.4%	8.2%	15.8%	9.0%	9.2%	5.5%	43.5%	23.4%	4.2%	6.6%	4.4%	5.2%	2.9%	2.6%	38.3%	33.2%
High 4-of-5: Uncapped, additive IDAF	11.0%	6.8%	22.2%	8.6%	3.1%	4.5%	7.0%	12.7%	8.2%	16.4%	9.1%	9.2%	5.5%	37.0%	23.7%	4.3%	6.6%	4.6%	5.2%	3.0%	2.7%	44.4%	35.5%
High 5-of-10: Unadjusted	18.6%	11.4%	33.7%	19.0%	8.3%	11.7%	11.3%	30.4%	14.3%	30.0%	16.6%	16.5%	10.4%	41.4%	36.6%	8.2%	15.1%	9.1%	11.1%	6.4%	8.1%	75.2%	90.8%
High 5-of-10: Current IDAF	12.5%	7.0%	27.4%	9.0%	5.0%	7.3%	7.9%	19.6%	8.2%	20.6%	9.9%	10.5%	5.4%	35.0%	30.9%	4.5%	8.8%	4.6%	6.1%	3.4%	3.5%	62.5%	74.3%
High 5-of-10: Shifted IDAF	13.6%	7.5%	28.3%	9.9%	5.7%	8.3%	8.0%	20.9%	9.5%	21.0%	10.7%	12.0%	6.2%	35.2%	31.9%	5.1%	10.9%	5.1%	6.8%	3.8%	3.9%	66.6%	78.3%
High 5-of-10: Uncapped, scalar IDAF	10.6%	6.3%	26.0%	8.0%	3.0%	4.3%	7.0%	11.9%	7.9%	15.3%	8.6%	9.1%	5.2%	40.8%	34.3%	4.1%	6.4%	4.3%	5.0%	2.8%	2.6%	40.1%	35.4%
High 5-of-10: Uncapped, additive IDAF	10.6%	6.6%	26.3%	8.0%	3.0%	4.3%	7.1%	12.5%	8.0%	15.8%	8.7%	9.1%	5.3%	35.5%	34.5%	4.1%	6.5%	4.6%	5.0%	2.9%	2.7%	44.4%	39.1%
Middle 8-of-10: Unadjusted	17.3%	9.6%	27.7%	16.1%	9.4%	13.0%	11.1%	23.9%	11.1%	24.9%	14.1%	14.8%	9.3%	42.4%	32.6%	7.0%	13.4%	8.1%	10.5%	6.4%	7.4%	55.9%	64.4%
Middle 8-of-10: Current IDAF	12.6%	6.8%	23.8%	8.8%	6.2%	9.4%	8.4%	16.1%	8.0%	18.5%	9.0%	10.2%	5.5%	38.8%	32.7%	4.3%	7.9%	4.5%	6.3%	3.8%	3.5%	48.5%	54.6%
Middle 8-of-10: Shifted IDAF	13.9%	7.4%	24.9%	9.8%	6.9%	10.4%	8.6%	17.3%	9.3%	19.2%	9.9%	11.9%	6.3%	39.5%	33.4%	5.0%	10.1%	5.1%	7.0%	4.2%	3.9%	52.0%	61.5%
Middle 8-of-10: Uncapped, scalar IDAF	11.0%	6.3%	22.4%	8.3%	3.0%	4.4%	6.9%	12.0%	7.8%	15.6%	8.7%	9.3%	5.4%	44.6%	36.5%	4.2%	6.3%	4.3%	5.1%	2.9%	2.6%	36.3%	32.5%
Middle 8-of-10: Uncapped, additive IDAF	10.8%	6.6%	21.8%	8.2%	3.0%	4.4%	7.0%	12.2%	7.8%	15.7%	8.7%	9.2%	5.4%	37.4%	35.9%	4.2%	6.2%	4.5%	5.1%	3.0%	2.6%	41.5%	34.5%
Mean 10-of-10: Unadjusted	17.3%	9.8%	27.5%	16.0%	9.3%	12.9%	11.0%	23.8%	11.2%	24.7%	14.0%	14.7%	9.2%	41.6%	31.9%	7.0%	13.3%	8.1%	10.5%	6.4%	7.3%	55.3%	63.8%
Mean 10-of-10: Current IDAF	12.4%	6.8%	23.6%	9.0%	5.9%	9.1%	8.2%	15.8%	8.0%	18.2%	8.8%	10.1%	5.5%	37.9%	32.0%	4.3%	7.7%	4.5%	6.1%	3.8%	3.4%	48.4%	54.5%
Mean 10-of-10: Shifted IDAF	13.7%	7.5%	24.7%	10.0%	6.7%	10.1%	8.5%	17.0%	9.3%	18.8%	9.7%	11.9%	6.3%	38.6%	32.8%	4.9%	10.0%	5.1%	6.9%	4.1%	3.7%	52.1%	61.8%
Mean 10-of-10: Uncapped, scalar IDAF	10.8%	6.3%	22.0%	8.6%	3.0%	4.4%	6.8%	11.8%	7.8%	15.5%	8.5%	9.3%	5.4%	43.1%	35.8%	4.1%	6.2%	4.3%	5.1%	2.9%	2.5%	36.6%	32.9%
Mean 10-of-10: Uncapped, additive IDAF	10.7%	6.6%	21.7%	8.5%	3.0%	4.4%	6.9%	12.0%	7.8%	15.6%	8.5%	9.2%	5.4%	36.9%	35.2%	4.1%	6.2%	4.5%	5.0%	3.0%	2.6%	41.4%	34.4%

Appendix B: Resource-level bias results (median)

Resource #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
High 15-of-20: Unadjusted	-1.5%	-2.9%	-3.4%	-4.5%	0.1%	-0.2%	-1.7%	-4.1%	-5.0%	-3.2%	-2.7%	-1.6%	-1.9%	1.8%	-5.1%	-2.3%	-1.6%	-2.6%	-2.1%	-1.0%	-2.0%	-1.2%	-0.9%
High 15-of-20: Current IDAF	-0.2%	-1.0%	-2.1%	0.2%	0.0%	0.6%	0.4%	-0.4%	-0.2%	-1.2%	-1.8%	0.2%	0.0%	6.2%	0.3%	0.2%	-0.9%	-0.1%	0.0%	0.1%	0.0%	0.3%	0.2%
High 15-of-20: Shifted IDAF	0.0%	-0.7%	-2.7%	0.4%	0.3%	0.8%	0.4%	0.1%	-0.5%	-2.1%	-2.0%	0.2%	-0.1%	6.5%	0.4%	0.1%	-0.6%	0.1%	-0.2%	0.2%	0.0%	0.3%	0.4%
High 15-of-20: Uncapped, scalar IDAF	-0.2%	-0.6%	-2.8%	0.6%	-0.4%	-0.1%	0.1%	0.8%	-0.1%	0.2%	-1.0%	0.3%	0.1%	11.0%	2.8%	0.4%	-0.8%	0.0%	-0.2%	0.1%	-0.1%	0.7%	0.5%
High 15-of-20: Uncapped, additive IDAF	-0.1%	-0.3%	-2.2%	0.4%	-0.4%	-0.1%	0.1%	0.7%	-0.1%	0.5%	-0.9%	0.3%	0.1%	7.4%	3.1%	0.4%	-0.8%	0.4%	-0.1%	0.1%	0.1%	0.8%	0.4%
High 4-of-5: Unadjusted	-1.6%	-1.6%	-2.9%	-2.5%	-0.4%	-0.3%	-1.4%	-1.5%	-3.2%	-2.4%	-1.5%	-1.1%	-1.1%	2.4%	-2.3%	-1.2%	-1.6%	-1.4%	-1.2%	-0.7%	-1.1%	-1.0%	-0.7%
High 4-of-5: Current IDAF	-0.8%	-0.4%	-1.8%	0.0%	-0.2%	0.3%	0.0%	0.0%	-0.2%	-0.6%	-0.8%	0.2%	-0.2%	8.6%	1.3%	-0.2%	-0.8%	-0.4%	-0.2%	0.0%	0.1%	0.0%	0.0%
High 4-of-5: Shifted IDAF	-0.8%	-0.8%	-1.7%	-0.2%	0.1%	0.0%	-0.1%	-0.3%	-0.4%	-0.5%	-0.7%	0.3%	0.0%	7.2%	-1.9%	-0.1%	-0.8%	0.1%	0.0%	0.1%	0.0%	0.0%	0.1%
High 4-of-5: Uncapped, scalar IDAF	-0.1%	-0.4%	-1.9%	0.3%	-0.4%	0.1%	0.0%	0.8%	0.0%	0.7%	-0.7%	0.2%	-0.1%	6.3%	4.2%	-0.1%	-0.7%	-0.4%	-0.2%	0.0%	0.1%	0.1%	0.0%
High 4-of-5: Uncapped, additive IDAF	-0.1%	-0.3%	-1.7%	0.4%	-0.3%	0.2%	-0.1%	0.9%	0.1%	1.0%	-0.5%	0.2%	-0.1%	5.5%	3.9%	-0.1%	-0.7%	-0.2%	-0.3%	0.1%	0.2%	0.1%	0.1%
High 5-of-10: Unadjusted	-5.7%	-4.2%	-10.6%	-10.7%	-1.8%	-2.7%	-3.4%	-6.6%	-8.0%	-9.3%	-5.7%	-3.8%	-4.2%	-10.8%	-17.4%	-4.0%	-4.7%	-4.6%	-4.0%	-2.0%	-3.2%	-2.5%	-1.9%
High 5-of-10: Current IDAF	-0.8%	-0.6%	-5.2%	-0.5%	-0.4%	0.2%	0.0%	-0.9%	-0.3%	-2.0%	-1.6%	-0.3%	-0.2%	-2.1%	-5.3%	-0.4%	-1.4%	-0.5%	-0.5%	0.1%	-0.1%	-0.1%	0.0%
High 5-of-10: Shifted IDAF	-0.9%	-0.8%	-6.0%	-0.7%	-0.2%	0.1%	0.0%	-1.1%	-0.6%	-2.2%	-1.6%	-0.3%	-0.2%	-3.2%	-4.6%	-0.2%	-1.5%	-0.2%	-0.6%	0.1%	-0.1%	-0.1%	0.0%
High 5-of-10: Uncapped, scalar IDAF	-0.1%	-0.4%	-5.4%	0.5%	-0.5%	0.1%	0.0%	0.3%	0.2%	1.0%	-0.6%	-0.2%	0.0%	8.5%	0.9%	-0.3%	-1.2%	-0.1%	-0.4%	0.1%	-0.1%	0.1%	0.1%
High 5-of-10: Uncapped, additive IDAF	0.0%	0.1%	-5.5%	0.4%	-0.5%	0.2%	0.2%	0.3%	0.3%	1.2%	-0.5%	-0.2%	0.0%	5.5%	1.0%	-0.2%	-1.2%	0.5%	-0.2%	0.2%	0.2%	0.2%	0.1%
Middle 8-of-10: Unadjusted	2.4%	0.4%	0.9%	1.6%	1.1%	1.7%	0.9%	1.2%	-0.4%	2.8%	0.8%	0.8%	0.3%	19.2%	6.0%	0.2%	1.5%	0.0%	0.4%	0.4%	0.0%	-0.1%	0.1%
Middle 8-of-10: Current IDAF	-0.2%	-0.6%	-0.6%	0.7%	0.1%	0.5%	0.7%	0.7%	0.0%	-0.1%	-1.0%	0.5%	0.2%	16.0%	5.5%	0.1%	-0.3%	0.0%	0.2%	0.2%	0.1%	0.0%	0.1%
Middle 8-of-10: Shifted IDAF	0.0%	-0.2%	0.2%	0.6%	0.4%	0.5%	0.5%	1.3%	0.1%	-0.7%	-0.4%	0.4%	0.0%	17.1%	5.3%	0.2%	0.7%	-0.2%	0.2%	0.2%	0.0%	0.3%	0.3%
Middle 8-of-10: Uncapped, scalar IDAF	-0.1%	-0.6%	-1.0%	0.8%	-0.2%	0.2%	0.4%	0.8%	0.0%	-0.2%	-1.2%	0.5%	0.1%	8.4%	3.2%	0.1%	-0.2%	-0.1%	0.0%	0.1%	0.1%	0.2%	0.1%
Middle 8-of-10: Uncapped, additive IDAF	-0.1%	-0.4%	-0.6%	0.9%	-0.2%	0.2%	0.3%	0.8%	-0.1%	-0.5%	-1.1%	0.5%	0.1%	9.6%	3.1%	0.2%	-0.1%	0.0%	-0.1%	0.2%	0.2%	0.2%	0.1%
Mean 10-of-10: Unadjusted	3.6%	1.3%	1.5%	2.9%	1.3%	2.2%	1.0%	1.7%	-0.6%	3.3%	1.8%	1.6%	0.8%	20.7%	5.9%	0.4%	2.3%	0.3%	0.7%	0.7%	0.2%	0.1%	0.2%
Mean 10-of-10: Current IDAF	-0.2%	-0.3%	-0.6%	0.9%	0.2%	0.6%	1.1%	0.2%	0.0%	-0.3%	-0.8%	1.0%	0.2%	17.4%	6.1%	0.2%	0.1%	0.1%	0.4%	0.2%	0.1%	-0.1%	0.1%
Mean 10-of-10: Shifted IDAF	0.0%	-0.1%	0.3%	0.7%	0.6%	0.5%	0.9%	0.7%	-0.2%	-1.2%	-0.1%	1.1%	0.0%	18.9%	5.1%	0.2%	1.0%	0.1%	0.5%	0.3%	0.1%	0.0%	0.1%
Mean 10-of-10: Uncapped, scalar IDAF	-0.2%	-0.2%	-1.1%	1.1%	0.0%	0.0%	0.4%	0.6%	0.0%	-0.2%	-1.0%	1.0%	0.2%	9.8%	2.5%	0.3%	0.2%	0.0%	0.2%	0.2%	0.0%	0.1%	0.1%
Mean 10-of-10: Uncapped, additive IDAF	-0.1%	-0.4%	-0.7%	1.0%	-0.1%	0.0%	0.5%	0.5%	0.0%	-0.4%	-1.0%	0.9%	0.1%	9.2%	2.9%	0.3%	0.1%	0.0%	0.0%	0.1%	0.1%	0.1%	0.2%

Appendix B: Resource-level variability results (median)

Resource #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
High 15-of-20: Unadjusted	2.8%	2.3%	15.4%	1.7%	1.1%	1.1%	3.2%	3.0%	2.4%	6.3%	3.1%	2.0%	1.3%	19.6%	18.6%	1.6%	2.5%	1.5%	2.0%	0.9%	1.2%	1.2%	1.2%
High 15-of-20: Current IDAF	2.8%	2.3%	15.8%	1.7%	1.0%	1.1%	3.1%	3.0%	2.4%	6.1%	3.0%	2.0%	1.3%	21.9%	18.6%	1.6%	2.5%	1.5%	2.0%	0.8%	1.2%	1.1%	1.2%
High 15-of-20: Shifted IDAF	2.8%	2.3%	15.7%	1.7%	1.1%	1.1%	3.2%	3.0%	2.4%	6.1%	3.0%	2.0%	1.3%	21.6%	18.8%	1.6%	2.5%	1.5%	2.0%	0.8%	1.2%	1.1%	1.2%
High 15-of-20: Uncapped, scalar IDAF	2.8%	2.3%	16.7%	1.7%	1.0%	1.1%	3.1%	3.0%	2.4%	6.0%	3.0%	2.0%	1.3%	23.5%	18.6%	1.6%	2.5%	1.5%	1.9%	0.8%	1.2%	1.1%	1.2%
High 15-of-20: Uncapped, additive IDAF	2.8%	2.3%	15.4%	1.7%	1.1%	1.1%	3.2%	3.0%	2.4%	6.3%	3.1%	2.0%	1.3%	19.6%	18.6%	1.6%	2.5%	1.5%	2.0%	0.9%	1.2%	1.2%	1.2%
High 4-of-5: Unadjusted	3.3%	2.3%	12.7%	2.0%	1.1%	1.2%	2.7%	3.1%	3.0%	7.2%	3.3%	2.3%	1.5%	20.0%	21.2%	1.7%	2.6%	1.6%	2.1%	0.9%	1.3%	1.0%	0.9%
High 4-of-5: Current IDAF	3.3%	2.3%	12.5%	2.0%	1.1%	1.2%	2.7%	3.0%	2.9%	6.8%	3.2%	2.3%	1.6%	21.1%	21.3%	1.7%	2.5%	1.6%	2.1%	0.9%	1.2%	0.9%	0.9%
High 4-of-5: Shifted IDAF	3.3%	2.4%	12.4%	2.0%	1.1%	1.2%	2.8%	3.1%	3.0%	6.9%	3.2%	2.2%	1.5%	21.0%	21.2%	1.7%	2.5%	1.6%	2.1%	0.9%	1.2%	0.9%	0.9%
High 4-of-5: Uncapped, scalar IDAF	3.3%	2.3%	12.6%	2.0%	1.1%	1.2%	2.7%	3.1%	2.9%	6.7%	3.3%	2.3%	1.6%	23.6%	21.1%	1.7%	2.5%	1.6%	2.1%	0.9%	1.2%	0.9%	0.8%
High 4-of-5: Uncapped, additive IDAF	3.3%	2.3%	12.7%	2.0%	1.1%	1.2%	2.7%	3.1%	3.0%	7.2%	3.3%	2.3%	1.5%	20.0%	21.2%	1.7%	2.6%	1.6%	2.1%	0.9%	1.3%	1.0%	0.9%
High 5-of-10: Unadjusted	2.9%	2.3%	13.7%	1.8%	1.1%	1.1%	2.7%	3.0%	2.6%	7.0%	3.2%	2.1%	1.5%	19.1%	19.3%	1.6%	2.6%	1.5%	2.0%	0.9%	1.3%	1.0%	0.9%
High 5-of-10: Current IDAF	2.7%	2.3%	13.8%	1.8%	1.0%	1.0%	2.8%	2.9%	2.7%	6.8%	3.2%	2.0%	1.5%	21.3%	19.1%	1.6%	2.6%	1.5%	1.9%	0.8%	1.2%	1.0%	0.9%
High 5-of-10: Shifted IDAF	2.7%	2.4%	13.5%	1.8%	1.0%	1.0%	2.8%	2.9%	2.6%	6.7%	3.2%	2.0%	1.5%	20.7%	19.2%	1.6%	2.6%	1.5%	1.9%	0.8%	1.2%	1.0%	0.9%
High 5-of-10: Uncapped, scalar IDAF	2.7%	2.3%	14.2%	1.8%	1.0%	1.0%	2.9%	2.9%	2.7%	6.4%	3.2%	2.0%	1.5%	23.2%	19.0%	1.6%	2.6%	1.5%	1.9%	0.8%	1.2%	1.0%	0.9%
High 5-of-10: Uncapped, additive IDAF	2.9%	2.3%	13.7%	1.8%	1.1%	1.1%	2.7%	3.0%	2.6%	7.0%	3.2%	2.1%	1.5%	19.1%	19.3%	1.6%	2.6%	1.5%	2.0%	0.9%	1.3%	1.0%	0.9%
Middle 8-of-10: Unadjusted	3.0%	2.4%	15.1%	2.0%	1.1%	1.2%	2.9%	3.1%	2.5%	7.1%	3.2%	2.1%	1.5%	22.1%	19.7%	1.7%	2.4%	1.5%	2.0%	0.9%	1.2%	1.1%	1.1%
Middle 8-of-10: Current IDAF	3.0%	2.4%	14.7%	2.0%	1.1%	1.2%	3.0%	3.1%	2.5%	6.8%	3.1%	2.1%	1.5%	22.1%	19.5%	1.7%	2.5%	1.5%	2.0%	0.9%	1.2%	1.0%	1.1%
Middle 8-of-10: Shifted IDAF	3.0%	2.4%	14.6%	2.0%	1.1%	1.2%	2.9%	3.1%	2.5%	6.8%	3.1%	2.1%	1.5%	22.0%	19.9%	1.7%	2.5%	1.5%	2.0%	0.9%	1.2%	1.0%	1.1%
Middle 8-of-10: Uncapped, scalar IDAF	3.1%	2.4%	14.8%	2.0%	1.1%	1.2%	3.0%	3.1%	2.5%	6.8%	3.2%	2.1%	1.5%	24.9%	19.5%	1.7%	2.4%	1.5%	2.0%	0.9%	1.2%	1.0%	1.0%
Middle 8-of-10: Uncapped, additive IDAF	3.0%	2.4%	15.1%	2.0%	1.1%	1.2%	2.9%	3.1%	2.5%	7.1%	3.2%	2.1%	1.5%	22.1%	19.7%	1.7%	2.4%	1.5%	2.0%	0.9%	1.2%	1.1%	1.1%
Mean 10-of-10: Unadjusted	3.0%	2.5%	15.7%	2.0%	1.1%	1.2%	3.1%	3.1%	2.5%	6.8%	3.1%	2.1%	1.5%	21.7%	19.4%	1.7%	2.5%	1.5%	2.0%	0.9%	1.2%	1.1%	1.1%
Mean 10-of-10: Current IDAF	3.1%	2.4%	15.2%	2.0%	1.1%	1.2%	3.0%	3.1%	2.6%	6.6%	3.0%	2.2%	1.5%	22.2%	19.7%	1.7%	2.4%	1.5%	2.0%	0.9%	1.2%	1.1%	1.1%
Mean 10-of-10: Shifted IDAF	3.1%	2.5%	15.0%	2.0%	1.1%	1.2%	3.0%	3.1%	2.5%	6.6%	3.0%	2.2%	1.5%	21.7%	19.4%	1.7%	2.4%	1.5%	2.0%	0.9%	1.2%	1.1%	1.1%
Mean 10-of-10: Uncapped, scalar IDAF	3.1%	2.4%	15.3%	2.0%	1.1%	1.2%	3.0%	3.1%	2.6%	6.5%	3.0%	2.2%	1.5%	24.5%	19.6%	1.7%	2.4%	1.5%	2.0%	0.9%	1.2%	1.0%	1.1%
Mean 10-of-10: Uncapped, additive IDAF	3.0%	2.5%	15.7%	2.0%	1.1%	1.2%	3.1%	3.1%	2.5%	6.8%	3.1%	2.1%	1.5%	21.7%	19.4%	1.7%	2.5%	1.5%	2.0%	0.9%	1.2%	1.1%	1.1%

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