Portland General Electric
121 SW Salmon Street · Portland, Ore. 97204

November 5, 2020

Via Electronic Filing

Public Utility Commission of Oregon
Attn: Filing Center
201 High Street, S.E., Suite 100
P.O. Box 1088
Salem, OR 97308-1088

Re: UM 1514 Evaluations of PGE's Energy Partner Demand Response Pilots for the Summer
          2019 and Winter 2019/2020 Seasons

Dear Filing Center:

Enclosed is Guidehouse's (formerly Navigant) evaluations of the Portland General Electric
(PGE's) Energy Partner demand response programs. These evaluations are aimed at determining
the estimated load curtailment provided by medium to large customers through the Nonresidential
Demand Response Program (Schedule 26) and estimate demand impacts for small commercial
customers' thermostats through the Direct Load Control (DLC) Pilot (Schedule 25).   The
evaluation period spanned the Summer 2019 and Winter 2019/2020 seasons.

Summer 2019 marked the first season when smart thermostats were enrolled in Schedule 25 and
four events were called during the season. In order to adequately evaluate Energy Partner,
Guidehouse prepared separate memorandums for Schedule 25 and Schedule 26 because the
technical approach to determine load reduction is different. The evaluation for Winter 2019/20
season assesses only one Energy Partner event due to the mild weather conditions. While both
Schedule 25 and Schedule 26 were deployed, the evaluation only analyzes Schedule 26 because
the number of thermostats enrolled in Schedule 25 in the Winter Season was not large enough to
evaluate. Altogether, only 39 thermostats were eligible for a Winter incentive payment.

The Summer 2019 Schedule 25 evaluation reported the following:

- PGE achieved 139 kW of total demand reduction from customers with a relative precision
  of 30%. The average impact across all events was 92 kW with relative precision of 92%.

- The best performing event (July 22, 2019) delivered 139 kW. This event included the
  greatest number of participating thermostats (120), but also corresponded with the lowest
  temperature day (83 degrees) of the season.

- The event with the greatest per thermostat impact (August 28, 2019) delivered 3.74kW per
  thermostat. The event corresponded to the highest temperature day (96 degrees) of the

season and the lowest participation rate (16%) of the season. However, it also had the highest average event standard error and relative precision at 90% confidence interval. This means that the estimated impact for August 28 may vary as much as 73% from the actual performance.

- The impact evaluation approach will continue to evolve as more customers become enrolled in the program and more observations of response are available. Future evaluations will monitor the curtailment trends evident in this small sample analysis, and seek insights into these research questions:

  o Do longer events (2 hours) have lower participation rates and curtailment savings? What causes degradation of kW over time?

  o Events following pre-event notifications have higher participation rates than those without notifications. How/do pre-event notifications drive event participation? How can notifications better support event participation?

  o The warmest event day had substantially lower participation rates, and event participation rates were lower in the second half of the season. Do extreme temperatures and end of season correlate with or drive lower event participation rates?

- Guidehouse recommends that CLEAResult continually update and revisit their deemed savings value to fine-tune the estimated per thermostat demand reduction value ascribed to the program as it evolves. *(PGE is no longer tracking demand reduction assumptions through 0.3kW per thermostat deemed value and has adopted CLEAResult's RTF[1] approved engineering-based approach which uses efficiency ratings, system tonnage, HVAC[2] type and set points as a means to calculate the demand of each thermostat. The Summer 2020 impact evaluation will assist with validating this engineering approach. It is believed that the initial deemed value was underestimating demand and did not account for the wide range of equipment sizes within the commercial setting.)*

The Summer 2019 Schedule 26 evaluation reported the following:

- PGE achieved up to 13.8 MW of demand reduction per event from Customer Baseline Load (CBL) customers. This year, CBL customers delivered 2.0 MW more demand reduction than PGE's previous high point of 11.8 MW in Summer 2018.

- 42 of 50 CBL customers consistently delivered reductions over the course of the season, with a maximum event realization rate of 91%. Note that the Winter 2017-18 event, Summer 2018, and Winter 2018-19 events had maximum realization rates of 66.5%, 159%, and 68%, respectively.

- Guidehouse identified 14 customers that had a CBL discrepancy between Guidehouse and CLEAResult's calculated impacts that differed by 5% or greater, and the discrepancy was greater than 5% of the customer's nomination. For each event, the demand reduction

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[1] Regional Technical Forum (RTF) is a technical advisory committee to the Northwest Power and Conservation Council established in 1999 to develop standards to verify and evaluate energy efficiency savings
[2] Heating, ventilating, and air conditioning.

discrepancies between Guidehouse and CLEAResult's ranged from -2.5% to 3.7%. Of the 14 customers, only one customer's incentive payment is affected by the discrepancies. In contrast to CLEAResult, Guidehouse's calculated impact for customer B26-AGR-1000034 reached 100% of their nomination and, thus, this customer was provided an incentive payment.

- Guidehouse recommends continuing to enhance quality assurance processes for the data transfer processes between CLEAResult and Guidehouse. In particular, Guidehouse conferred with PGE and CLEAResult in early 2020 to determine if there are potential process improvements for ensuring the same advanced metering infrastructure (AMI) data are provided to CLEAResult and Guidehouse, given that this has been an issue in past evaluation cycles. *(PGE and CLEAResult are closely coordinating with Guidehouse to ensure that data is consistent for the Summer 2020 evaluation.)*

The Winter 2019-20 Schedule 26 evaluation reported that:

- PGE achieved an 8.5MW demand reduction during the only event called with CBL customers, with a realization rate of 73%. Note that the Winter 2018-19 event and the average of the Summer 2019 events had realization rates of 68% and 82%, respectively

- 11 out of 61 customers[3] had performance discrepancies between -62% and 100%. However, only one customer's incentive level is affected—specifically, B26-AGR-1000033 reached over 70% of their nomination (whereas CLEAResult calculated that they reached 0%) and should have received an incentive payment. Based on this discrepancy this customer was provided an incentive payment.

- The discrepancies across these 11 customers are primarily driven by the following:

  1. Minor differences between Pelican's data logger results and AMI hourly data, which proliferates differences in impact results. However, the absolute differences are low and CLEAResult's investigation did not show evidence of systemic difference between AMI and Pelican.

  2. Scalar[4] factors in the Pelican system required adjustment to match AMI readings due to intermittent meters. An intermittent meter is a meter that reads zero most of the time making scalar calculations difficult. *(CLEAResult will update their methodology for calculating scalar values for intermittent meters in the Summer 2020 season.)*

  3. Minor differences occur in AMI hourly data when historical corrections are made to the AMI data after CLEAResult receives daily files. Thus, AMI data delivered to CLEAResult during the season can have differences when compared to the data pulled for Guidehouse after corrections have been made.

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[3] 61 customers reflect CBL customers only and do not include Firm Service Load customers. There were five Firm Service load customers this season, for a total of 66 participants.

[4] Scalar measuring components are measured at unpredictable intervals. For example, "once a month" is not a predictable interval as the amount of time between reads is unpredictable and inconsistent. Scalar measuring components are typically read manually.

- Guidehouse recommends an ongoing evaluation of the new methodology for scalar factors to gauge improvements in effectiveness. *(Scalar factors will be addressed in the Summer 2020 evaluation.)*

The learnings from Guidehouse's impact evaluations directly inform PGE's Grid Performance, which is one of the five key considerations for the pilot to program transition. As programs mature it is essential to determine load predictability and hourly load impacts during events. PGE plans to address Grid Performance along with the other key considerations (Customer Experience, Infrastructure Stability, Financial Performance, and Dispatch Integration) as part of the 2020 deferral reauthorization for schedule 26, pursuant to Commission Order No. 19-151.

If you have any questions or require further information, please call Alina Nestjorkina at (503) 464-2144. Please direct all formal correspondence and requests to the following e-mail address pge.opuc.filings@pgn.com.

Sincerely,

/s/ *Jaki Ferchland*
Jaki Ferchland
Manager, Revenue Requirement

JF: np
Enclosures

cc: UM 1514 Service List

Guidehouse

Memorandum

To:	John Boroski, Gregory Davis, Portland General Electric
From:	Robin Maslowski, Stuart Schare, Nicola Charles, Marielle Magtibay, Peter Steele-Mosey
Date:	March 3, 2020
Re:	PGE Energy Partner Impact Evaluation – Summer 2019 Schedule 25 Summary

Guidehouse conducted an impact evaluation of Portland General Electric's (PGE) Energy Partner Smart Thermostat program for four events called during the Summer 2019 season. The goal of Guidehouse's evaluation was to estimate demand impacts for Schedule 25 customers (small commercial customers) using smart thermostats for demand response.

Guidehouse calculated that PGE's Energy Partner Smart Thermostat program achieved up to 139 kW of total demand reduction from Schedule 25 customers with a relative precision of 30% at a 90% confidence interval. The average impact across all events was 92 kW with relative precision of 92% at a 90% confidence interval.

This memo summarizes the approach and findings of the evaluation and has been divided into the following sections, with accompanying attachments:

- Data Sources
- Impact Summary
- Recommendations
- Appendix A: Technical Approach
- Attachment 1: "Sch 25 – Program Impact Data Tables.xls"
- Attachment 2: "DR Results – Event Day Plots – by Customer.pdf"

Data Sources

This section presents the data available to support the impact evaluation including the total number of participating customers, number of thermostats, event schedule, and weather data. These datasets were provided to Guidehouse by CLEAResult, with the exception of weather data which was obtained from NOAA's Climatic Data Center.

Specifically, Guidehouse used the participant interval data, weather data, event schedule, and cross-sectional data to estimate the average counterfactual (baseline) demand per customer during DR events (Table 1). Guidehouse also employed the weather data to select event-like non-event days to include in the baseline estimation data set.

Table 1 Description of Data Used for Analysis

Category	Description	Fields
Participant Interval Data	Consumption data for all program participants for whom AMI data are available for all months of the Summer 2019 season. The interval data ranged from quarter-hour to hourly across different service point IDs. Guidehouse calculated the hourly consumption for each service point ID and used this as a basis for the regression analysis.	• Consumption (kWh) • Date • Hour ending in which the demand in that interval was observed • Service Point ID[1]
Weather Data	Average hourly weather data for Portland International Airport and Salem Airport McNary Field weather stations[2]	• Dry bulb temperature • Time stamp of the period ending in which the weather in that interval was observed
Participant Cross-Sectional Data	Program tracking data	• Customer names • Number of thermostats • Thermostat participation by event
Event Schedule	DR event schedule	• Day • Date • Event hours and time zone
Notification Schedule	DR event notification schedule	• Date • Notification Time

The number of participants for each event was consistent, but the number of participating thermostats varied, as seen in Table 2. In the last event, there was a significant drop in the number of thermostats participating. This is likely due to the fact that this was one of the hottest days of the year. Guidehouse used the number of participating thermostats to estimate the average impact per thermostat, shown in the Impact Summary section.

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[1] Three service point IDs were excluded from some of the event analysis due to missing interval data for the event day and/or selected non-event day. Service point ID 8770421281 was excluded from the August 28 event; 9980893993 and 4430668223 were excluded the July 25 and August 5 events. Since regressions were done on a per-meter basis, this does not impact results. The meters identified here have negligible to very small consumption values as a percent of the customers' total consumption.

[2] Obtained from NOAA's Climatic Data Center https://www.ncdc.noaa.gov/cdo-web/

Table 2 Event Schedule and Participating Thermostats by Event

Event Date	Event Time (PDT)	Participating Thermostats	Participating Customers
2019-07-22	3 pm – 4 pm	120	6
2019-07-25	5 pm – 7 pm	116	6
2019-08-05	4 pm – 6 pm	102	6
2019-08-28	4 pm – 5 pm	24	6

As of Guidehouse's receipt of Schedule 25 participant cross-sectional data, there were seven customers in the program. Table 3 summarizes the number of thermostats per customer registered for the program as of Summer 2019. It is worth noting that one customer (COMPANY D) did not participate[3] in any of the four events.[4]

Table 3 Number of Thermostats and Service Points by Customer

|	Customer Name	Number of Thermostats	Service Points
1.	COMPANY A	1	1
2.	COMPANY B	1	1
3.	COMPANY C	26	4
4.	COMPANY D	9	3
5.	COMPANY E	2	1
6.	COMPANY F	1	1
7.	COMPANY G	99	19

Impact Summary

Guidehouse calculated that PGE's Energy Partner Smart Thermostat program achieved up to 139 kW of total demand reduction from Schedule 25 customers with a relative precision of 30% at a 90% confidence interval. The average impact across all events was 92 kW with relative precision of 92% at a 90% confidence interval.

The event day plots averaged across all customers can be seen below in Figure 1. This includes all enrolled customers.

[3] Evaluation team analyzed AMI data and reviewed CLEAResults data to confirm this enrolled customer had no savings and therefore did not participate.
[4] Participation data obtained from CLEAResult's program tracking data received on 2019-10-15.

Figure 1 Event Day Average Demand for All Customers
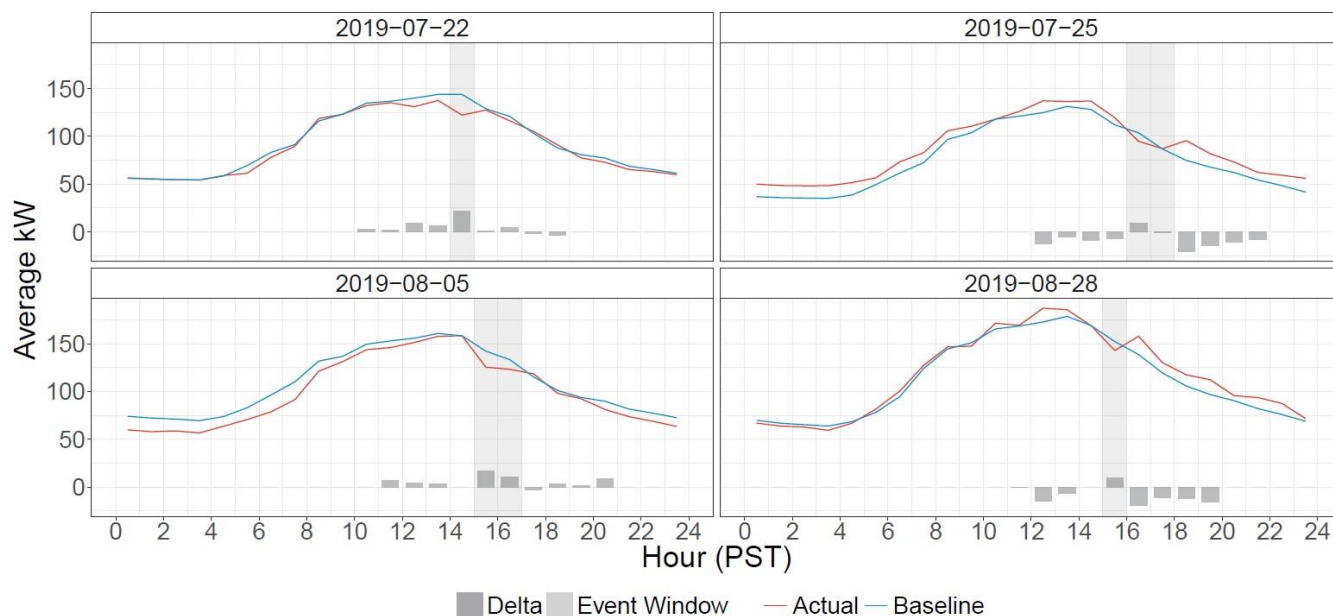
The impact of the events that occurred during the Summer 2019 season is summarized in Table 4, along with the event hours temperature, number of participating thermostats, average impact per thermostat, average event standard error, and relative precision at 90% confidence interval.

Table 4 Summer 2019 Event Impact Summary

Event Date	Program Total Impact (kW)	Event Hours Temperature (F)	Number of Participating Thermostats by Event[5]	Average Impact per Participating Thermostat (kW)	Average Event Standard Error (kW)	Relative Precision at 90% CI
2019-07-22	139	83	120	1.16	25	30%
2019-07-25	70	90	116	0.61	14	33%
2019-08-05	71	89	102	0.70	15	35%
2019-08-28	90	96	24	3.74	40	73%

As per Table 4 above, the maximum impact on the July 22 event corresponded to the highest number of participating thermostats in an event, which was also the lowest event temperature. The August 28 event was the highest event temperature and corresponded to the lowest number of participating thermostats. The August 28 event also resulted in the highest average impact per thermostat compared to the first three events. However, it also has the highest average event standard error and relative precision at 90% confidence interval. This means that the estimated impact for August 28 may vary as much as 73% of the 90 kW total impact or 3.74 kW per thermostat.

Table 5 below summarizes the maximum impact results by customer and the corresponding impact per thermostat. For each customer, the maximum impact reported is the highest impact that customer achieved during an event.

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[5] Number of participating thermostats provided to Guidehouse by CLEAResult.

Table 5 Summer 2019 Impact Summary by Customer

		Maximum Event Impact per Customer (kW)		Date of Event with Maximum Impact	Average Standard Error	Average Relative Precision at 90% CI
	Customer Name	Per Customer	Per Thermostat			
1.	COMPANY A	*Did not deliver any DR*				
2.	COMPANY B	4.43	4.43	2019-08-28	0.30	7%
3.	COMPANY C	66.92	2.79	2019-07-22	20.31	30%
4.	COMPANY D	*Did not participate*				
5.	COMPANY E	3.17	3.17	2019-07-25	1.50	48%
6.	COMPANY F	0.08	0.08	2019-08-05	0.05	63%
7.	COMPANY G	69.93	0.75	2019-07-22	5.03	7%

Guidehouse plans to explore different methods for day-of load adjustment calculation for future evaluations of the Schedule 25 pilot. This will be done to fine-tune program impacts and better address effects that are not otherwise wholly captured by the regression analysis.

While none of the participating customers were located within PGE's testbed areas in the Summer 2019 season, Guidehouse plans to evaluate these customers as a subset of the broader population in future evaluations of the Schedule 25 pilot. To this end, CLEAResult will flag customers and indicate their status as testbed versus non-tested customers for future evaluation cycles.

Given the nascence of this program and limited number of participants for this initial season, Guidehouse anticipates that our impact evaluation approach will continue to evolve as more customers become enrolled in the program and more observations of actual response are available. Our goal is to ensure that our approach is continually improving to deliver the most accurate results possible in a manner that is regulatorily robust. Thus, if our approach changes in future evaluation cycles as more data becomes available, we will revisit these results using the new approach to ensure consistency and understand the changes that result. In many cases, this process leads to updating to prior evaluation cycle results, which could lead to an update of the Summer 2019 estimated impacts reported here.

Memorandum

Recommendations

Based on the results of the Summer 2019 impact evaluation, Guidehouse recommends the following for PGE's and CLEAResult's consideration:

- Guidehouse recommends that PGE and CLEAResult refine their process for providing complete event information for future seasons. CLEAResult originally provided an event schedule specifying four events, including two test events, which were evaluated. However, PGE's notification schedule detailed six events in total, including four test events. It is important to note that Guidehouse did not evaluate the two additional test events recorded by PGE or remove these days from the non-event days for the baseline, but would ideally have done so. Guidehouse anticipates that the main high-level takeaways from the Summer 2019 evaluation would remain the same even with these test events included. That said, we may consider revisiting these Summer 2019 impacts in future evaluation cycles to understand the exact changes associated with including these test events, if discussed with and approved by PGE.
- Based on the results presented here, Guidehouse recommends that CLEAResult continually update and revisit their deemed savings value to fine-tune the estimated per thermostat demand reduction value ascribed to the program as it evolves.

Appendix A: Technical Approach

This section describes the five main steps in Guidehouse's approach for impact evaluation of PGE's Energy Partner Smart Thermostat Program.

1. Non-Event Days Selection

2. Regression Model Specification

3. Unadjusted Baseline Prediction

4. Day-of Load Adjustment Calculation

5. Estimation of Impacts and Uncertainty

1. **Non-Event Days Selection**
The average event counterfactual (baseline) demand was estimated using event and event-like non-event days. For each event day, three non-event days were selected based on the proximity of hourly temperature observations to the event day's hourly temperature observations. In assessing the match quality of non-event days, event-hours were given three times the weight of non-event hours to allow for better approximation of the baseline and program impact during that time. In other words, there is a closer temperature match during coincident event hours for selection of non-event days.

Holidays and weekends were excluded from the pool of non-event days from which the event-like non-event days were selected. Table 1 shows the list of Oregon statutory holidays excluded for the non-event day selection.

Table 6 Oregon Statutory Holidays in Summer 2019 Season

Day	Holiday Date	Holiday
Monday	2019-05-27	Memorial Day
Thursday	2019-07-04	Independence Day
Monday	2019-09-02	Labor Day

Across four events, a total of 12 unique non-event days were included in the regression. Attachment 1 (Tab: Non-Event Days) contains a detailed table summarizing the temperatures of selected non-event days and distance of temperatures from the corresponding event day.

2. **Regression Model Specification**
Guidehouse estimated baselines using an individual regression analysis applied to AMI data for each service point. The regression controlled for the following variables:

1) **Weather Effects:** These capture the effect of temperature on the estimated baseline.

2) **Calendar Effects:** These account for the hour of the day

3) **Program Effects:** These include the demand response impact of curtailment during the event, and increased demand after the event, referred to as snapback.

Equation 1 below shows the regression equation estimated separately for each service point (meter).

Equation 1.

$$y_t = \sum_{h=1}^{H=24} \beta_h hour_{h,t} + \sum_{h=1}^{H=24} \beta_h hour_{h,t} ema4\_cdh_t + \sum_{c=1}^{C=6} \gamma_c c_{c,t} + \sum_{s=1}^{S=16} \gamma_s sb_{s,t} + \varepsilon_t$$

Definition of variables:

1. y_t = Is the dependent variable estimating impact by meter at period t.
2. $hour_{h,t}$ = Is a set of 24 dummy variables flagging each hour of the day. Each one is equal to one when hour t is in the h-th hour of the day, and zero otherwise.
3. $ema4\_cdh_t$ = Is the four-hour exponential moving average of cooling degree hours observed at period t. An exponential moving average is used instead of a simple contemporaneous observation of temperature to allow for the fact that sudden drops in temperature (due to, e.g., a thunderstorm) do not have an immediate effect on building thermal load.
4. $c_{c,t}$ = A set of dummy variables to capture the DR event hourly periods. Each variable is equal to one when hour t is the c-th DR hour observed in the period.
5. $sb_{s,t}$ = A set of dummy variables to capture the snapback impacts in the four-hour period immediately following the end of each event. Each variable is equal to one when hour t is the s-th hour of snapback assumed in the period.
6. ε_t = Errors.

Important note: the estimated parameters associated with the program effects dummy variables deliver an estimated impact equivalent to the difference between the unadjusted baseline and actual demand. These values are not directly used in the estimation of the impacts (estimated as the difference between the adjusted baseline and the actual demand) but are estimated in order to deliver the standard errors which (when appropriately adjusted using the day-of adjustment) are used to provide the estimated uncertainty associated with the impacts.[6]

Guidehouse's original approach was to use the estimated program effects parameters resulting from the regression analysis to deliver estimated impacts directly. Upon examiningthe preliminary results derived directly from the program effect dummy variable parameter estimates, Guidehouse observed that the model results for August 28, 2019, the hottest event in the season, appeared to be understating baseline demand (and therefore, impacts). To ensure a more accurate estimate of impacts, Guidehouse applied an additive day-of load adjustment and calculated ex-post impacts as the difference between that adjusted baseline and actually observed demands. Standard errors were estimated using the coefficient covariance matrix, as discussed in Estimation of Impacts and Uncertainty.

3. Unadjusted Baseline Prediction
To estimate the unadjusted baseline, Guidehouse used predicted values, actual demand, and residuals and curtailment and snapback estimated impact parameters from the regression analysis (Equation 2 and Equation 3).

Equation 2.

$$\hat{y}_t = Actual\ Demand_{i,t} - e_{i,t}$$

Where "$\hat{y}_t$" is the predicted value and $e_{i,t}$ is the residual.

Equation 3.

$$Unadjusted\ Baseline_{\ i,t} = \hat{y}_t - (estimated\ impact\ parameters)_{i,t}$$

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[6] As described below, unadjusted counterfactual (baseline) demand is estimated by applying the observed independent variable values to all estimated parameters, except those associated with program effects (or, equivalently, applying all observed independent variables to estimated parameters but setting all program effect dummy variables to zero).

4. Day-of Load Adjustment Calculation

Guidehouse applied a day-of load adjustment to fine-tune program impacts and address effects that are not otherwise wholly captured by the regression analysis. An additive adjustment comparing the unadjusted baseline to actual demand during the hour interval preceding notification time was calculated as per Equation 4 and Equation 5. When participants were not notified, the hour interval preceding the event was used.

Equation 4.

$$Day-of\ Load\ Additive\ Adjustment = Unadjusted\ Baseline - Actual\ Demand$$

Table 7 Notification Schedule and Hour for Day-of Load Adjustment by Event

Event Date	Event Time (PDT)	Notification Time (PDT)	Hour for Day-of Load Adjustment (Hour Starting PDT)
2019-07-22	3 pm – 4 pm	11 am	10 am
2019-07-25	5 pm – 7 pm	12 pm	11 am
2019-08-05	4 pm – 6 pm	None	3 pm
2019-08-28	4 pm – 5 pm	None	3 pm

The day-of load adjustment was applied to the hourly baseline estimation resulting from the regression model as per Equation 5.

Equation 5.

$$Adjusted\ Baseline = Unadjusted\ Baseline + Day-of\ Load\ Additive\ Adjustment$$

The day-of load adjustment can increase or decrease the estimated program impact estimation on the load profiles in the hour preceding the event. Attachment 1 contains details on the additive adjustments applied to the unadjusted baseline and impacts for each event by customer.

5. Estimation of Impacts and Uncertainty

Using a day-of-load adjustment means that the estimated impact resulting from the regression analysis cannot be used. Guidehouse calculated the adjusted impacts by taking the difference between the adjusted baseline and the actual demand (Equation 6).

Equation 6.

$$Adjusted\ Impact = Adjusted\ Baseline - Actual\ Demand$$

The regression-estimated standard errors are on a per service point (meter) basis. Guidehouse used the estimated treatment dummy parameter standard errors from the regression analysis to estimate the standard errors associated with the adjusted impact on a per customer and per event basis. When doing this calculation, each customer's meters were assumed to be independent of one another.

The day-of-load adjustment was treated as a constant for the purposes of estimating standard errors.

To: John Boroski, Gregory Davis, Portland General Electric

From: Marielle Magtibay, Robin Maslowski, Stuart Schare, Nicola Charles, Peter Steele-Mosey

Date: February 19, 2020

Re: PGE Energy Partner Impact Evaluation – Summer 2019 Schedule 26 Summary

Navigant conducted an impact evaluation of Portland General Electric's (PGE) Energy Partner program for three events called during the Summer 2019 season. The goal of Navigant's impact evaluation was to replicate and validate the impact calculations for settlement payment performed by CLEAResult, PGE's implementation contractor. This memo summarizes the findings and issues encountered while validating CLEAResult's impact results for Schedule 26 customers (medium / large customers).

In comparison to CLEAResult's calculated impacts, Navigant identified discrepancies in results for 14 out of 50 customers; however, only one customer's incentive level is affected. Specifically, Navigant calculated that B26-AGR-1000034 attained 100% of their nomination for the June 12th event and should have received an incentive payment, whereas CLEAResult calculated that they attained 57%. PGE has provided this customer their incentive payment. Details on the root causes are discussed further in the Impact Result Discrepancies section, below.

To mitigate data issues for future impact evaluation cycles, Navigant recommends continuing to enhance quality assurance processes for the data transfer processes. In particular, Navigant will confer with PGE and CLEAResult in early 2020 to determine if there are potential process improvements for ensuring the same AMI data are provided to CLEAResult and Navigant, given that this has been an issue in past evaluation cycles.

Approach and Data Sources

CLEAResult's impact evaluation primarily used Pelican data, where it was available. If Pelican data was not available or complete, CLEAResult used AMI data from their daily feed. In contrast, Navigant used primarily AMI data provided by PGE. If AMI data was not available or complete, Navigant supplemented specific gaps with Pelican data provided by CLEAResult. Note that Navigant filled the gaps such that a set of baseline days for an event will have a combination of Pelican and AMI data. This is in contrast to CLEAResult's approach of using one data source for each set of baseline days for an event.[1]

Navigant used PGE's Customer Baseline Load (CBL) methodology to calculate the impact for the Summer 2019 demand response (DR) events.

The CBL calculation started with a participant's interval data for ten non-event days preceding the event day. A non-event day is a business day in which an event was not called and does not fall on a holiday.

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[1] For example, if a customer was missing Pelican data for *only one* of the baseline days for the June 12th event, CLEAResult would use AMI data for *all* of the baseline days for the June 12th event for this particular customer. With Navigant's approach, only the one missing baseline day would be supplemented with the other data source.

Navigant calculated the average load for each non-event day during the same hours as the event hours. Navigant selected baseline days as the five non-event days with the highest average loads. The average load across the five baseline days for each hour of the event period represented the Unadjusted Baseline.

To calculate the Adjusted Baseline, an additive adjustment was first calculated based on an adjustment period. The adjustment period is the two-hour period beginning six hours before the event start time and ending four hours before the event start time. Navigant calculated the average load during the adjustment period on the event day and baseline days, which are the event day adjustment load and baseline adjustment load, respectively. The additive adjustment is the event day adjustment load minus the baseline adjustment load. Navigant calculated the Adjusted Baseline as the sum of the Unadjusted Baseline and additive adjustment.

Additive adjustments are calculated for participants, unless:

- the participant received an 18-hour advance notification,
- the participant was set-up to only use the Unadjusted Baseline[2], or
- the event occurred during a winter morning

In such cases, a participant's Unadjusted Baseline is the basis for their payment settlement. For this analysis, the Unadjusted Baseline applied to 8 out of 10 participants in June, and 10 out of 50 participants in August.[3]

Each participant's system impact was calculated as the difference between their Adjusted (or Unadjusted) Baseline and average load during the event day. A positive system impact denotes that a participant's demand is higher than their baseline, thus, no DR was delivered. A negative system impact indicates that a participant delivered DR.

Impact Summary

The impact of the events that occurred during the Summer 2019 season is summarized in Table 1. Navigant calculated that PGE's Energy Partner program achieved up to 13.8 MW of demand reduction per event from CBL customers. This year, CBL customers delivered 2.0 MW more demand reduction than PGE's previous high point of 11.8 MW in Summer 2018. Forty-two of 50 CBL customers consistently delivered reductions over the course of the season, with a maximum event realization rate of 91%. Note that the Winter 2017-18 event, Summer 2018, and Winter 2018-19 events had maximum realization rates of 66.5%, 159%, and 68%, respectively.

The 15 MW of nominated DR load from Schedule 26 CBL customers in Summer 2019 contributed nearly 56% of the 2020 year-end target of 27 MW, which is comprised of:
- nominated DR load from Schedule 26
- nominated DR load from Fixed Service Level (FSL) customers, and
- estimated Schedule 25 (smart thermostats) participation rates and kW reductions.

Navigant identified 14 CBL customers where the discrepancy between Navigant and CLEAResult's calculated impacts differed by 5% or greater, and the discrepancy was greater than 5% of the customer's nomination. For each event, the demand reduction discrepancies between Navigant and CLEAResult's ranged from -2.5% to 3.7%. These customers are further discussed in Impact Result Discrepancies section, below.

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[2] For some CBL customers the Unadjusted baseline more accurately reflects their load profile.

[3] Incentives are based on Unadjusted Baselines for the following participant remote IDs: B26-AGR-1000006, B26-AGR-1000009, B26- AGR-1000019, B26-AGR-1000046, B26-AGR-1000048, B26-AGR-1000049, B26-AGR-1000055, B26-AGR-1000058, B26-AGR-1000060, and B26-AGR-1000063.

Table 1 Summary of Summer 2019 Events[4]

Event Date	6/12/2019	8/5/2019	8/28/2019
Event Time	5pm to 7pm	4pm to 6pm	4pm to 7pm
CBL Customers Called in Event	48	50	50
Navigant Calculated Total Reduction - CBL Customers (kW)	13,788	12,141	11,170
CLEAResult Calculated Total Reduction - CBL Customers (kW)	14,146	11,702	11,510
Difference (kW)	-358	439	-340
Difference (%)	-2.5%	3.7%	-3.0%
Total Nomination – CBL Customers (kW)	15,070	15,220	15,220
CBL Customers That Delivered DR	42	42	42
Realization Rate[5]	91%	80%	73%

Customers Not Delivering Demand Response

Fifteen CBL customer sites did not deliver any DR during at least one of the Summer 2019 events. **Error! Reference source not found.** through **Error! Reference source not found.** list these customers and compare their nomination and system impact.

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[4] Reflects only CBL customers. Evaluation of Firm Service Load customers is out of scope. The Navigant Calculated Total Reduction and the Total Nomination represent the demand reduction across all hours of the curtailment window for all CBL participants. The Navigant Calculated Total Reduction is based only on CBL customers whose event loads were below the baseline; customers whose event loads were above the baseline are considered as not having delivered DR and are assigned a zero-reduction value for the purposes of the Navigant Calculated Total Reduction.

[5] Total curtailment divided by total nomination.

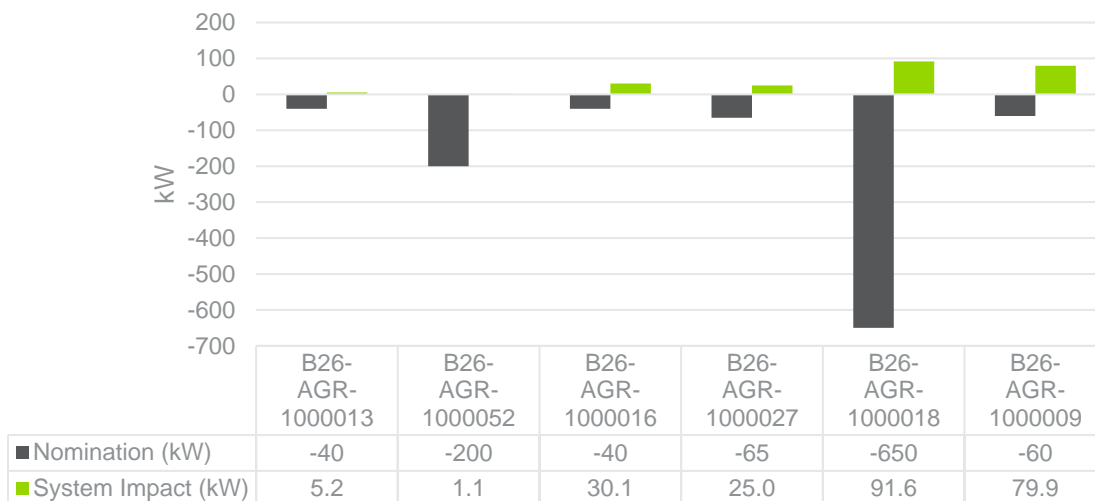*Figure 1 CBL Customers Not Delivering DR for June 12, 2019*

	B26-AGR-1000013	B26-AGR-1000052	B26-AGR-1000016	B26-AGR-1000027	B26-AGR-1000018	B26-AGR-1000009
■ Nomination (kW)	-40	-200	-40	-65	-650	-60
■ System Impact (kW)	5.2	1.1	30.1	25.0	91.6	79.9

Figure 2 CBL Customers Not Delivering DR for August 5, 2019

	B26-AGR-1000049	B26-AGR-1000029	B26-AGR-1000060	B26-AGR-1000013	B26-AGR-1000043	B26-AGR-1000063	B26-AGR-1000040	B26-AGR-1000009
■ Nomination (kW)	-500	-200	-70	-40	-45	-25	-200	-60
■ System Impact (kW)	28.3	16.9	4.8	36.4	28.4	40.2	89.8	31.6
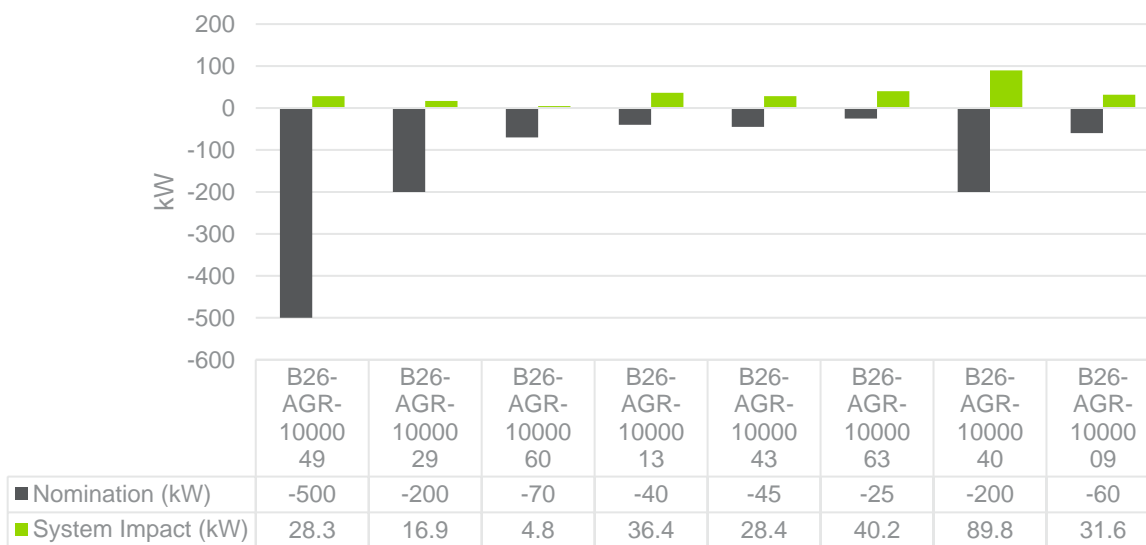
Figure 3 CBL Customers Not Delivering DR for August 28, 2019

	B26-AGR-1000012	B26-AGR-1000013	B26-AGR-1000052	B26-AGR-1000063	B26-AGR-1000059	B26-AGR-1000042	B26-AGR-1000040	B26-AGR-1000009
■ Nomination (kW)	-100	-40	-200	-25	-125	-400	-200	-60
■ System Impact (kW)	2.9	0.8	17.6	6.0	8.7	53.3	7.6	28.9

Table 2 summarizes the event dates in which 15 CBL customers did not deliver DR. Most of these customers show an increase in their load during the event compared to their baseline. Each participant's system impact was calculated as the difference between their Unadjusted or Adjusted CBL and average load during the event hours. Note that a positive system impact indicates that a participant's demand is higher than their baseline, thus, no DR was delivered. A negative system impact indicates that a participant delivered DR.

As part of the analysis, Navigant evaluated the event impacts based on both the Unadjusted CBL and Adjusted CBL. For these customers, either both the Unadjusted and Adjusted system impacts were positive, or there was a small difference between the two, which suggests that switching the customer's CBL type would not necessarily result in a negative system impact.

Table 2 CBL Customers Not Delivering DR by Event Date

Customer Site	CBL Type	2019-06-12	2019-08-05	2019-08-28
1. **B26-AGR-1000009**	Unadjusted	✓	✓	✓
2. **B26-AGR-1000012**	Adjusted			✓
3. **B26-AGR-1000013**	Adjusted	✓	✓	✓

4.	B26-AGR-1000016	Adjusted	✓		
5.	B26-AGR-1000018	Adjusted	✓		
6.	B26-AGR-1000027	Adjusted	✓		
7.	B26-AGR-1000029	Adjusted		✓	
8.	B26-AGR-1000040	Adjusted		✓	✓
9.	B26-AGR-1000042	Adjusted			✓
10.	B26-AGR-1000043	Adjusted		✓	
11.	B26-AGR-1000049	Unadjusted		✓	
12.	B26-AGR-1000052	Adjusted	✓		✓
13.	B26-AGR-1000059	Adjusted			✓
14.	B26-AGR-1000060	Unadjusted		✓	
15.	B26-AGR-1000063	Unadjusted		✓	✓

Impact Result Discrepancies

Navigant compared its impact results with CLEAResult's and identified 14 out of the 50 CBL customers where the discrepancy of calculated impacts differed by 5% or greater, and the discrepancy was greater than 5% of the customer's nomination. Navigant and CLEAResult further investigated these customers to determine root causes for these discrepancies and how customer incentive payments are affected. The discrepancies across these 14 customers are driven by one of the following four main reasons:

- Minor differences between Pelican and AMI hourly data, which propagates to differences in impact results. However, the absolute differences are low and CLEAResult's investigation did not show evidence of systemic difference between AMI and Pelican.
- Scalar factors in the Pelican system required adjustment to match AMI readings. Part of this may be due to differences in the AMI data provided to CLEAResult versus Navigant. CLEAResult has reviewed the customer sites and made scalar adjustments to better align Pelican and AMI readings.

- Minor pulse sync errors (which CLEAResult subsequently addressed to the extent possible).
- Mismatch in customer SPID and meter code / serial number, which has been corrected since the analysis.

Of the 14 customers, only one customer's incentive payment is affected by the discrepancies. In contrast to CLEAResult, Navigant's calculated impact for customer B26-AGR-1000034 reached 100% of their nomination and, thus, this customer was provided an incentive payment.

Table 3 provides details by customer on the percentage and absolute difference between Navigant and CLEAResult's calculated impacts, along with impact on incentive payments and root causes for the difference.

Table 3 Summary of Impact Result Discrepancies

Customer Site	Impacts Percentage Difference [6]	Absolute Difference (kW)	Impact Difference as a Percent of Nomination	Events with Discrepancies [7]			Notes
				2019-06-12	2019-08-05	2019-08-28	
B26-AGR-1000045	9% to 20%	100.9 to 326.4	7% to 31%	✓	✓	✓	• There are significant differences in Pelican and AMI data for SPID 7530897823 for the three events. CLEAResult identified scalar issues for this customer that has been resolved since • AMI data sent to CLEAResult and Navigant have differences for SPID 7530897823. • Customer's system impact is above 70% of their nomination in analysis of all three events, thus, the resulting difference does not impact their incentive payments.
B26-AGR-1000033	8%	23.0	8%	✓			• There are minor differences in Pelican and AMI data. As a result, some of the baseline days differ between the analyses. CLEAResult identified scalar issues for this customer that have been resolved since this analysis. • Customer's system impact is above 70% of their nomination in analysis for the first event, thus, the resulting difference does not impact their incentive payments.
B26-AGR-1000034	41% to 74%	19.3 to 25.5	32% to 42%	✓	✓		• There are significant differences in Pelican and AMI data resulting in differences between selected baseline days in each analysis.

[6] Positive denotes Navigant calculated impact is higher than CLEAResult's and vice versa

[7] Checkmarks denote events in which there were discrepancies between CLEAResult and Navigant's system impact results.

Customer Site	Impacts Percentage Difference [6]	Absolute Difference (kW)	Impact Difference as a Percent of Nomination	Events with Discrepancies [7]			Notes
				2019-06-12	2019-08-05	2019-08-28	
							• For the first event, CLEAResult notes that communications were down for this site. • For the first event, CLEAResult's calculations with Pelican results in an impact that is 57% of their nomination. Navigant's calculations with AMI data results in 100% of their nominated load, exceeding the 70% threshold, thus, this customer was paid their incentive. • For the subsequent events, the customer's system impact is above 70% of their nomination in both CLEAResult and Navigant's analyses, thus, the resulting difference does not impact their incentive payments. • CLEAResult to review scalars and syncing to better align Pelican and AMI data.
B26-AGR-1000035	-42% to 27%	19.8 to 95.7	14% to 68%	✓	✓	✓	• There are minor differences in Pelican and AMI data. As a result, some of the baseline days differ between the analyses. • For the first event, CLEAResult highlighted that the AMI and Pelican data are generally close, but there is a slight 5-min pulse syncing error. • Customer's system impact is above 70% of their nomination in all analysis of all three events, thus, the resulting difference does not impact their incentive payments. • CLEAResult to review scalars and syncing to better align Pelican and AMI data.
B26-AGR-1000036	-6% to 8%	8.4 to 13.5	6% to 9%	✓	✓		• There are minor differences in Pelican and AMI data. • For the second event, Navigant used Pelican data for one baseline day where AMI data was missing. • Customer's system impact is above 70% of their nomination in all analysis of all three events, thus, the resulting difference does not impact their incentive payments.

Customer Site	Impacts Percentage Difference [6]	Absolute Difference (kW)	Impact Difference as a Percent of Nomination	Events with Discrepancies [7]			Notes
				2019-06-12	2019-08-05	2019-08-28	
							• CLEAResult to review scalars and syncing to better align Pelican and AMI data.
B26-AGR-1000037	-32% to 22%	10.8 to 23.3	11% to 23%	✓	✓	✓	• There are minor differences in Pelican and AMI data. As a result, some of the baseline days differ between the analyses. • Customer's system impact is below 70% of their nomination in both analysis of the first event, and above 70% for the subsequent events, thus, the resulting difference does not impact their incentive payments. • CLEAResult to review scalars and syncing to better align Pelican and AMI data.
B26-AGR-1000038	-9% to -12%	3.8 to 5.9	6% to 10%	✓	✓		• There are minor differences in Pelican and AMI data. • Customer's system impact is below 70% of their nomination in both analysis of the first event, and above 70% for the subsequent event, thus, the resulting difference does not impact their incentive payments. • CLEAResult to review scalars and syncing to better align Pelican and AMI data.
B26-AGR-1000031	-9%	22.7 to 29.5	5% to 7%	✓		✓	• There are minor differences in Pelican and AMI data. • CLEAResult highlighted a scalar issue for this customer with Pelican data being consistently higher than AMI. • Customer's system impact is below 70% of their nomination in both analysis of the first event, and above 70% for the subsequent event, thus, the resulting difference does not impact their incentive payments.
B26-AGR-1000023	-39% to -60%	152.7 to 630.0	61% to 252%	✓	✓	✓	• For the first event, CLEAResult notes that communications were down for this site. Due to this, there is not enough Pelican data to use in calculations. CLEAResult therefore recommends using Navigant's AMI calculations for this customer. • For the second event, there are significant differences in Pelican and AMI data. Navigant's analysis indicates that this customer did

Customer Site	Impacts Percentage Difference [6]	Absolute Difference (kW)	Impact Difference as a Percent of Nomination	Events with Discrepancies [7]			Notes
				2019-06-12	2019-08-05	2019-08-28	
							not meet 70% of their nomination. Given that CLEAResult has already issued an incentive to this customer, no adjustment is recommended. • For the first and third events, the customer's system impact is above 70% of their nomination in both analyses, thus, the resulting difference does not impact their incentive payments. • AMI data sent to CLEAResult and Navigant have significant differences for SPID 8200353172.
B26-AGR-1000055	-19% to -74%	8.7 to 78.0	7% to 65%	✓		✓	• For the first and third event, there is misalignment between Pelican and AMI data due to SPID 6210651022. CLEAResult identified they were missing AMI data for SPID 6210651022. • For the first event, the customer's system impact is below 70% of their nomination in both analyses, thus, the resulting difference does not impact their incentive payments. • For the third event, Navigant's analysis indicates that this customer did not meet 70% of their nomination. Given that CLEAResult has already issued an incentive to this customer, no adjustment is recommended.
B26-AGR-1000022	-5%	20.3	9%	✓			• There are no differences in Pelican and AMI data for this customer for each event, however, there are discrepancies in the calculations for the first event. CLEAResult notes that a one-time dip in Pelican data during the adjustment hours for one baseline day caused issues. CLEAResult investigated the Pelican data, but no major issue was found for this site. • Customer's system impact is above 70% of their nomination, thus, the resulting difference does not impact their incentive payments.
B26-AGR-1000040	-16% to -90%	16.7 to 39.7	8% to 20%	✓	✓		• There are significant differences in Pelican and AMI data. As a result, some of the baseline days differ between the analyses. CLEAResult to investigate the large spikes in AMI.

Customer Site	Impacts Percentage Difference [6]	Absolute Difference (kW)	Impact Difference as a Percent of Nomination	Events with Discrepancies [7]			Notes
				2019-06-12	2019-08-05	2019-08-28	
							• For the first event, CLEAResult notes that the Pelican serial numbers and SPIDs were switched. Subsequent events were done correctly. • Customer's system impact is below 70% of their nomination in both analysis of the first and second events, thus, the resulting difference does not impact their incentive payments.
B26-AGR-1000063	-184%	13.2	53%			✓	• For the third event, there are significant differences in AMI data. Both Navigant and CLEAResult used AMI data for this customer for this event. • Customer's system impact is below 70% of their nomination in both analyses of the third event, thus, the resulting difference does not impact their incentive payments.
B26-AGR-1000001	-19%	6.7	7%			✓	• For the third event, there are significant differences in between Pelican and AMI data. • Customer's system impact is below 70% of their nomination in both analyses of the third event, thus, the resulting difference does not impact their incentive payments.

Navigant calculated that PGE's Energy Partner program achieved up to 13.8 MW of demand reduction from CBL customers per event, representing about 51% of the 27 MW of the DR capacity target by year-end 2020, with a maximum realization rate of 91% over the course of the season. For each event, the demand reduction discrepancies between Navigant and CLEAResult's ranged from -2.5% to 3.7%. However, only one customer's incentive level was affected, and PGE has provided this customer their incentive payment.

Root causes for the discrepancies in CLEAResult and Navigant's results include errors in the scalar factors used in the Pelican system to match AMI readings, mismatch in customer SPID and meter code / serial number, and meter pulse sync issues.

Finally, Navigant recommends continuing to enhance quality assurance processes for the data transfer processes to ensure the same AMI data is provided to CLEAResult and Navigant. This may help mitigate the scalar factor issues for future evaluation.

Guidehouse

Memorandum

To: Adam Gardels, John Boroski, Gregory Davis, Portland General Electric

From: Robin Maslowski, Stuart Schare, Nicola Charles

Date: June 25, 2020

Re: PGE Energy Partner Impact Evaluation – Winter 2019-20 Summary

Introduction and Summary

Guidehouse conducted an impact evaluation of Portland General Electric's (PGE) Energy Partner program for the one event called during the Winter 2019-20 season. The goal of Guidehouse's impact evaluation was to replicate and validate the impact calculations for settlement payment performed by CLEAResult, PGE's implementation contractor. This memo summarizes the findings and issues encountered while validating CLEAResult's impact results for medium / large customers.

In comparison to CLEAResult's calculated impacts, Guidehouse identified discrepancies in results for 11 out of 61 customers[1]. However, only one customer's incentive level is affected—specifically, B26-AGR-1000033 reached over 70% of their nomination (whereas CLEAResult calculated that they reached 0%) and should have received an incentive payment. Guidehouse recommends that PGE provide this customer their incentive payment. Upon receiving up-to-date data, CLEAResult agrees with this recommendation. Details on the root causes are discussed further in the Impact Result Discrepancies section, below.

To help mitigate data issues for future impact evaluation cycles, Guidehouse recommends continuing to enhance quality assurance processes during the season to ensure CLEAResult has AMI data for identified customers experiencing issues with Pelican data. Given these processes will be changing for the upcoming Summer 2020 season, Guidehouse recommends revisiting discussions with PGE and CLEAResult on this topic at the end of the Summer 2020 season to adjust evaluation processes as needed and accommodate going forward. Finally, as the methodology for calculating scalars for meters with frequent zero readings is being updated by CLEAResult for the Summer 2020 season, Guidehouse recommends an ongoing evaluation of this new methodology to gauge improvements in effectiveness.

Approach and Data Source

CLEAResult's impact evaluation primarily used Pelican data[2], where it was available. If Pelican data was not available or complete, CLEAResult used in-season AMI data from their daily feed. Since CLEAResult performs post-event analysis in season, they are limited to use either Pelican data or in-season AMI data. Since their AMI

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[1] 61 customers reflect CBL customers only and do not include Firm Service Load customers. There were five Firm Service load customers this season, for a total of 66 participants.
[2] Pelican data are real-time usage data from CLEAResult's Pelican devices.

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feed is sometimes delayed for some sites, Pelican data is used primarily. In contrast, Guidehouse used primarily AMI data provided by PGE. If AMI data was not available or complete, Guidehouse supplemented the gaps with Pelican data provided by CLEAResult. Guidehouse primarily uses historically corrected post-season AMI data since it is the system of record. Note that in previous evaluation cycles before Winter 2018-19, Guidehouse and CLEAResult used identical data sources, which were mainly AMI interval data supplemented by Pelican.

Guidehouse used PGE's Customer Baseline Load (CBL) methodology to calculate the impact for the Winter 2019-20 demand response (DR) event. The CBL calculation starts with a participant's interval data for ten non-event days preceding the event day. A non-event day is a business day in which an event was not called and does not fall on a holiday.

Guidehouse calculated the average load for each non-event day during the same hours as the event hours. Guidehouse selected baseline days as the five non-event days with the highest average loads. The average load across the five baseline days for each hour of the event period represented the Unadjusted Baseline.

To calculate the Adjusted Baseline, an additive adjustment was first calculated based on an adjustment period. The adjustment period is the two-hour period beginning six hours before the event start time and ending four hours before the end start time. Guidehouse calculated the average load during the adjustment period on the event day and baseline days, which are the event day adjustment load and baseline adjustment load, respectively. The additive adjustment is the event day adjustment load minus the baseline adjustment load. Guidehouse calculated the Adjusted Baseline as the sum of the Unadjusted Baseline and additive adjustment.

Additive adjustments are calculated for all participants with the following exceptions: the participant receives an 18-hour advance notification, the event occurred during a winter morning, or CLEAResult has determined that a non-adjusted baseline is a better measure for on-site operations. In such cases identified by CLEAResult, a participant's Unadjusted Baseline is the basis for their payment settlement. For this analysis, the Unadjusted Baseline applied to 31 out of 61 participants.

Each participant's system impact was calculated as the difference between their Adjusted or Non-Adjusted Baseline and average load during the event day. A positive system impact denotes that a participant's demand is higher than their baseline, thus, no DR was delivered. A negative system impact indicates that a participant delivered DR.

Impact Summary

The impact of the one event that occurred during the Winter 2019-20 season is summarized in Table 1. Guidehouse estimates a total reduction of 8,515 kW, with a realization rate of 73%. Note that the Winter 2018-19 event and the average of the Summer 2019 events had realization rates of 68% and 82%, respectively.

Guidehouse's estimated total demand reduction is 9.8% higher than CLEAResult's. Guidehouse identified 11 customers where the discrepancy between Guidehouse and CLEAResult's calculated impacts differed by 5% or greater and had an absolute difference of 5 kW or greater. These customers are further discussed in Impact Result Discrepancies section, below.

Table 1 Summary of Winter 2019-20 Event[3]

Event Date	2020-01-15
Event Time	4 - 7 pm
Customers Called in Event	61
Total Nomination (kW)	11,751
Guidehouse Calculated Total Reduction (kW)	8,515
CLEAResult Calculated Total Reduction (kW)	7,756
Difference (kW)	759
Difference (%)	9.8%
Customers That Delivered DR (Guidehouse Analysis)	54
Guidehouse Realization Rate[4]	73%

Customers Not Delivering Demand Response

Seven customer sites did not deliver any DR for the one event called during the Winter 2019-20 season. Figure 1 lists these customers and compares their nomination and system impact.

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[3] Reflects only CBL customers. Evaluation of Firm Service Load customers is out of scope.
[4] Total curtailment divided by total nomination.

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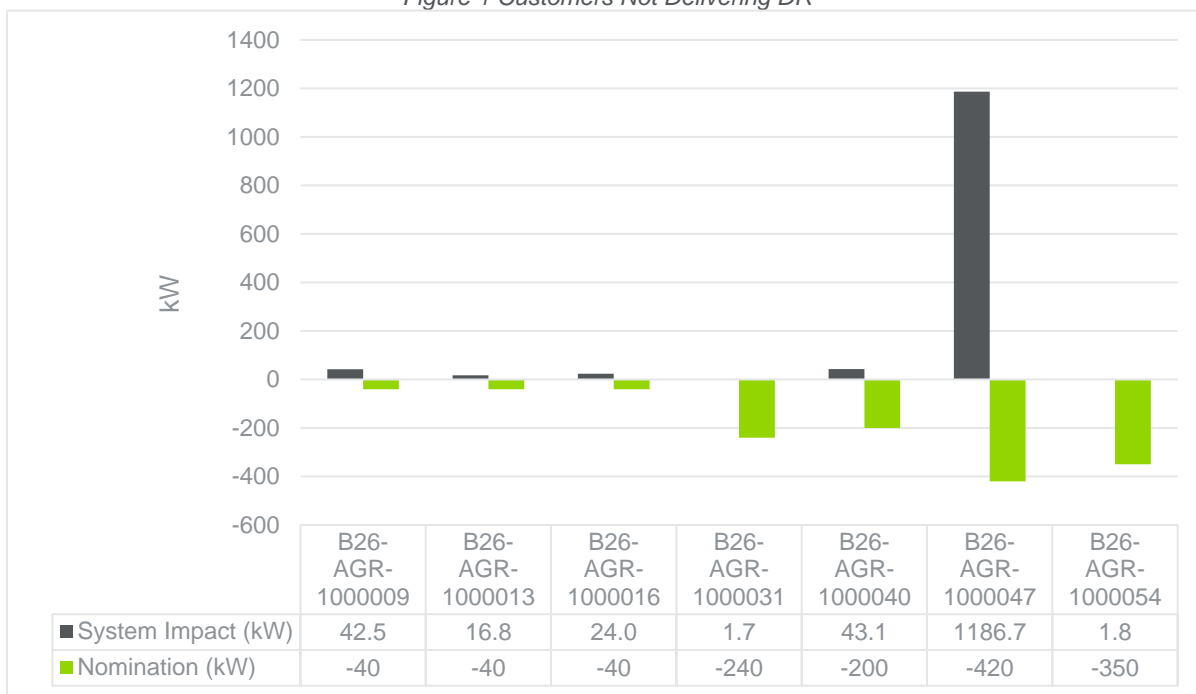
Figure 1 Customers Not Delivering DR

	B26-AGR-1000009	B26-AGR-1000013	B26-AGR-1000016	B26-AGR-1000031	B26-AGR-1000040	B26-AGR-1000047	B26-AGR-1000054
■ System Impact (kW)	42.5	16.8	24.0	1.7	43.1	1186.7	1.8
■ Nomination (kW)	-40	-40	-40	-240	-200	-420	-350

Table 2 provides details on the CBL analysis results for each customer that did not deliver DR. Most of these customers show an increase in their load during the event compared to their CBL. As part of the analysis, Guidehouse evaluated the system impacts based on both the Unadjusted CBL and Adjusted CBL.   Each participant's system impact was calculated as the difference between their CBL and average load during the event day. Note that a positive system impact indicates that a participant's demand was higher than their baseline, thus, no DR was delivered. A negative system impact indicates that a participant delivered DR.

Table 2 Detailed Notes on Customers Not Delivering DR

Customer Site	CBL Type Used	Notes (CLEAResult and Guidehouse both used the same CBL type)
1. B26-AGR-1000009	Unadjusted CBL	• Both the Unadjusted CBL and Adjusted CBL system impacts were positive, switching their CBL type would not result in a negative system impact. • Overall, this customer did not deliver DR.
2. B26-AGR-1000013	Adjusted CBL	• The day-of-adjustment resulted in a positive average system impact.
3. B26-AGR-1000016	Adjusted CBL	• The Unadjusted CBL system impacts were negative. Significant differences between the Unadjusted CBL and Adjusted CBL system impacts suggests further investigation into the appropriate CBL type for these customers may be beneficial.
4. B26-AGR-1000031	Unadjusted CBL	• Both the Unadjusted CBL and Adjusted CBL system impacts were positive, switching their CBL type would not result in a negative system impact.

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		• Overall, this customer did not deliver DR.
5. B26-AGR-1000040	Adjusted CBL	• Both the Unadjusted CBL and Adjusted CBL system impacts were positive, so switching their CBL type would not result in a negative system impact.
6. B26-AGR-1000047	Adjusted CBL	
7. B26-AGR-1000054	Adjusted CBL	• Overall, these customers did not deliver DR.

Impact Result Discrepancies

Guidehouse compared impact results with CLEAResult and identified discrepancies greater than or equal to 5% for 11 out of the 45 customers. Guidehouse and CLEAResult further investigated these customers to determine root causes for these discrepancies, how customer incentive payments are affected, and if a site visit is required to resolve any issues. The discrepancies across these 11 customers are driven by the following main reasons:

- Minor differences between Pelican and AMI hourly data, which propagates to differences in impact results. However, the absolute differences are low and CLEAResult's investigation did not show evidence of systemic difference between AMI and Pelican.
- Scalar factors in the Pelican system required adjustment to match AMI readings due to intermittent meters. An intermittent meter is a meter that reads zero most of the time which makes scalar calculations difficult. CLEAResult will be updating their methodology for calculating scalar values for intermittent meters in the Summer 2020 season.
- Minor differences in AMI hourly data, which are due to historical corrections made to the AMI data after CLEAResult receives it. Thus, AMI data delivered to CLEAResult during the season can have differences when compared to the data pulled for Guidehouse after the season after corrections have been made.

Of the 11 customers, only one customer's incentive payment is affected by the discrepancies. In contrast to CLEAResult, Guidehouse's calculated impact for customer B26-AGR-1000033 reached 202% of their nomination and, thus, this customer should have received an incentive payment.

Table 3 provides details by customer on the percentage and absolute difference between Guidehouse and CLEAResult's calculated impacts, along with impact on incentive payments and root causes for the differences.

Table 3 Summary of Impact Result Discrepancies

Customer Site	Impacts Percentage Difference[5]	Absolute Difference (kW)	Impact Difference as a Percent of Nomination	Notes
1. B26-AGR-1000022	18%	8.46	6.8%	• There are minor (0-2%) differences in Pelican and AMI data for the event day and baseline days upon examination of individual hours, which propagates to differences in impact results.

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[5] Positive denotes Guidehouse calculated impact is higher than CLEAResult's and vice versa

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Customer Site	Impacts Percentage Difference[5]	Absolute Difference (kW)	Impact Difference as a Percent of Nomination	Notes
				• Customer's system impact is not close to 70% of their nomination, thus, the resulting difference does not impact their incentive payment.
2. B26-AGR-1000023	79%	380.64	152.3%	• The difference comes directly from the secondary meter readings (SPID 8200353172). CLEAResult's Pelican data showed no load, whereas the AMI data used by Guidehouse showed load averages of approx. 250 kW. Upon further investigation with CLEAResult and PGE for data sources, it was determined that the secondary meter is reading the load correctly in the case of AMI data. • Both analyses resulted in system impacts well above 70% of their nomination, thus, the resulting difference does not impact their incentive payment.
3. B26-AGR-1000025	-11%	31.18	10.2%	• CLEAResult and Guidehouse both used AMI data, however, Guidehouse's AMI data includes all historical corrections occurring after the DR season. There are minor (0-2% typically, with up to 10% in one case) differences between the AMI reads for the event day and baseline days upon examination of individual hours, which propagates to differences in impact results. • Difference between Guidehouse and CLEAResult's impact calculations does not affect

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Customer Site	Impacts Percentage Difference[5]	Absolute Difference (kW)	Impact Difference as a Percent of Nomination	Notes
				customer incentive payments as they have reached full payment threshold in both cases.
4. B26-AGR-1000032	-12%	5.54	1.1%	• There are minor (0-4%) differences in Pelican and AMI data for the event day and baseline days upon examination of individual hours, which propagates to differences in impact results. • Customer's system impact is not close to 70% of their nomination, thus, the result difference does not impact their incentive payments.
5. B26-AGR-1000033	100%	201.68	201.7%	• CLEAResult did not have data for this customer and assumed an impact of 0 kW. Using historically corrected AMI data, Guidehouse showed that this customer did in fact deliver DR. • Guidehouse showed this customer delivered more than 200% of their nomination and should be paid their incentive. PGE then provided CLEAResult with the updated AMI data and CLEAResult agreed that this customer delivered 201.7% of their nomination. This customer will be provided with the appropriate payment.
6. B26-AGR-1000040	43%	12.97	6.5%	• CLEAResult and Guidehouse both used AMI, however CLEAResult notes that the quality of their AMI data was estimated whereas the quality of the AMI data Guidehouse received was good. • There are minor (0-2%) differences in AMI data for the event day and baseline days upon examination of

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Customer Site	Impacts Percentage Difference[5]	Absolute Difference (kW)	Impact Difference as a Percent of Nomination	Notes
				individual hours, which propagates to differences in impact results. • Difference between Guidehouse and CLEAResult's impact calculations does not affect customer incentive payments as they did not deliver DR.
7. B26-AGR-1000045	22%	223.48	18.2%	• CLEAResult and Guidehouse both used AMI data, however, Guidehouse's AMI data includes all historical corrections occurring after the DR season. There are minor (0-2%) differences between the AMI reads for the event day and baseline days upon examination of individual hours, which propagates to differences in impact results. • Difference between Guidehouse and CLEAResult's impact calculations does not affect customer incentive payments as they have reached full payment threshold in both cases.
8. B26-AGR-1000047	-5%	66.83	15.9%	• There are minor (0-2%) differences in Pelican and AMI data for the event day and baseline days upon examination of individual hours, which propagates to differences in impact results. • Incentives are not affected.
9. B26-AGR-1000063	-17%	6.47	25.9%	
10. B26-AGR-1000065	16%	8.70	87.0%	• There are minor (0-2%, and up to 5% in one case) differences in Pelican and AMI data for the event day and baseline days upon examination of individual hours, which propagates to differences in impact results. • Difference between Guidehouse and

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Customer Site	Impacts Percentage Difference[5]	Absolute Difference (kW)	Impact Difference as a Percent of Nomination	Notes
				CLEAResult's impact calculations does not affect customer incentive payments as they have reached full payment threshold in both cases.
11. B26-AGR-1000069	-62%	19.89	22.1%	• Pelican and AMI data are consistently off by a factor of 3 times which indicates a scalar issue with this site. • Difference between Guidehouse and CLEAResult's impact calculations does not affect customer incentive payments as they have not reached the payment threshold in both cases.

Key Takeaways and Recommendations

Guidehouse estimates a total reduction of 8,515 kW, with a realization rate of 73% for the Winter 2019-20 event. Guidehouse's estimated total demand reduction is 9.8% higher than CLEAResult's due to discrepancies in calculated impact results for 11 out of 61 customers.

Root causes for the discrepancies in CLEAResult and Guidehouse's results include errors in the scalar factors used in the Pelican system to match AMI readings, small differences in Pelican and AMI data, and mismatch in in-season AMI data versus AMI data pulled after historical corrections have been made. For additional details on the data source selection process for CLEAResult and Guidehouse, see Approach and Data Source section above.

Furthermore, one customer did not have any available Pelican or AMI data on the event day; thus, CLEAResult's records did not show any impact for this customer. However, Guidehouse's analysis using the post-season AMI dataset shows that this customer delivered significantly more than their nomination and should have received an incentive payment. Upon the initial finding Guidehouse, CLEAResult and PGE investigated the discrepancy and all parties concur. PGE indicated that customer (B26-AGR-1000033) will receive the incentive payment previously withheld.

Guidehouse recommends continuing to enhance quality assurance processes during the season to ensure CLEAResult has AMI data for all customers experiencing issues with Pelican data. Given these processes will be changing for the upcoming Summer 2020 season, Guidehouse recommends revisiting discussions with PGE and CLEAResult on this topic at the end of the Summer 2020 season to adjust evaluation processes as needed and accommodate going forward. Finally, as the methodology for calculating scalars for meters with frequent zero readings is being updated by CLEAResult for the Summer 2020 season, Guidehouse recommends an ongoing evaluation of this new methodology to gauge improvements in effectiveness.