KyPSC Case No. 2020-00266
TABLE OF CONTENTS

AG-DR-01-001

REQUEST:

Explain why DEK is proposing the changes set forth in this application, and explain how they will benefit ratepayers. If the proposed changes were not made, explain any potential negative impacts to ratepayers.

RESPONSE:

For the Non-Residential Smart $aver Prescriptive program, Duke Energy Kentucky requested to carry-over $1,396,010 of unspent Non-Residential program funds from the July 2019 – June 2020 program year and add the amount to the current Smart $aver Prescriptive budget of $548,785 for July 2020 – June 2021. This request was submitted due to increased customer demand for Prescriptive energy efficiency incentives during the July 2020 – June 2021 fiscal year. The carry-over dollars will be spent primarily on Smart $aver Prescriptive & Custom customer projects that have already requested incentive reservations and/or been placed on the Smart $aver incentive waitlist for planned upcoming energy efficiency improvements.

If the carry-over of funds is allowed, it will mitigate volatility in the DSM charge in a future period of reconciliation. Otherwise, the unspent funds would be included in the overall reconciliation of the upcoming November 2020 true-up filing and additional funds would need to be requested to cover the anticipated budgetary spend that the Company believes was delayed as a result of COVID-19. If the carry-over of funds is denied, then the existing customer requests for energy efficiency incentives on the waitlist mentioned above may be rejected.

For the Home Energy House Call Program, also known as Residential Energy Assessments, Duke Energy Kentucky requested to add new measures to the program. These new measures are intended to provide customers with additional kWh savings, to help customers lower their energy bills, and to improve customer satisfaction with the program. Additionally, the new LED measures are being offered to expand savings on lighting measures as A-line measures are no longer offered due to EISA 2020 changes.

- Assessment Kit w LEDs Blower Door
- Smart Thermostat - Only CAC Fuel Htd
- Smart Thermostat - Elec
- Bathroom Aerator
- Specialty Showerhead
- Pipe Wrap
- Specialty Candelabra LED
- Specialty Globe LED
- Specialty Recessed LED

If the new measures are not approved, ratepayers will miss out on expanded opportunities to save energy.

PERSON RESPONSIBLE: Greg Simmons

Duke Energy Kentucky
Case No. 2020-00266
Attorney General's First Set of Data Requests
Date Received: September 28, 2020

AG-DR-01-002

REQUEST:

Confirm that DEK's application in Case No. 2019-00406 referred to the Home Energy House Call program as being part of what was then known as "Program 3: Residential Energy Assessment Program."

a. Reference the application in the instant case, page 3. Explain why the Home Energy House Call program is not included within the list of DSM programs set forth therein, nor is it included in Appendices A and B. If it is a subpart of another program, or if the program has been re-named, identify that program.

b. Identify the program in which the cost effectiveness test results for the Home Energy House Call program can be found in Appendix A.

c. If the Home Energy House Call program is a subpart of the Residential Energy Assessments Program: (i) identify the other program components in the Residential Energy Assessments Program; (ii) provide a breakout of the cost effectiveness test results for the Home Energy House Call program, and all other program components of the Residential Energy Assessments Program.

RESPONSE:

a. The program is approved as Residential Energy Assessments, but it is marketed as Home Energy House Call.

b. Residential Energy Assessments and Home Energy House Call are interchangeable. The scores are listed as Residential Energy Assessments in Appendix A.

c. (i) Residential Energy Assessments and Home Energy House Call are interchangeable. The scores are listed as Residential Energy Assessments in Appendix A.

(ii) Please see AG-DR-01-002(c)(ii) Attachment.

PERSON RESPONSIBLE: Trisha Haemmerle – a, b, c(i)
Julie Hollingsworth – c(ii)

Program	Product Code	Measure I	Measure Name	UCT	TRC	RIM	PCT**
Residential Energy Assessments	HCBAER	12207	Home Energy House Call - Bathroom Aerator	824.23	1.27	0.97	97.85
Residential Energy Assessments	HCBLRD	12872	Home Energy House Call - Assess Kit w LEDs Blower Door	1.24	0.62	0.63	14.62
Residential Energy Assessments	HCCNDL	12875	Home Energy House Call - Specialty Candelabra LED	2.52	0.23	0.76	46.29
Residential Energy Assessments	HCGLOB	12876	Home Energy House Call - Specialty Globe LED	511.80	46.52	1.09	15.61
Residential Energy Assessments	HCHHSH	12878	Home Energy House Call - Specialty Showerhead	5,591.54	508.42	0.89	11.92
Residential Energy Assessments	HCLED	12190	Home Energy House Call - Additional LED	31.49	2.08	0.87	5.72
Residential Energy Assessments	HCNSTE	12873	Home Energy House Call - Smart Thermostat -Elec	16.15	1.47	0.75	2.57
Residential Energy Assessments	HCNSTE	12874	Home Energy House Call - Smart Thermostat -Only CAC Fuel Htd	16.15	1.47	0.75	2.57
Residential Energy Assessments	HCPWRP	12206	Home Energy House Call - Pipe Wrap	526.72	34.04	1.03	67.12
Residential Energy Assessments	HCRCSD	12877	Home Energy House Call - Specialty Recessed LED	157.62	14.33	1.06	21.21
Residential Energy Assessments	HEHC	7103	Home Energy House Call - Kit w LEDs	1.37	0.67	0.66	45.45

AG-DR-01-003

REQUEST:

Reference the application at pp. 4-5, Provide the California Test scores for each of the proposed enhancements to the Home Energy House Call program.

RESPONSE:

Please see AG-DR-01-003 Attachment.

PERSON RESPONSIBLE: Julie Hollingsworth

Program	Product Code	Measure I	Measure Name	UCT	TRC	RIM	PCT**
Residential Energy Assessments	**HCBLRD**	12872	Home Energy House Call - Assess Kit w LEDs Blower Door	1.24	0.62	0.63	14.62
Residential Energy Assessments	**HCCNDL**	12875	Home Energy House Call - Specialty Candelabra LED	2.52	0.23	0.76	46.29
Residential Energy Assessments	**HCGLOB**	12876	Home Energy House Call - Specialty Globe LED	511.80	46.52	1.09	15.61
Residential Energy Assessments	**HCHHSH**	12878	Home Energy House Call - Specialty Showerhead	5,591.54	508.42	0.89	11.92
Residential Energy Assessments	**HCNSTE**	12873	Home Energy House Call - Smart Thermostat -Elec	16.15	1.47	0.75	2.57
Residential Energy Assessments	**HCNSTE**	12874	Home Energy House Call - Smart Thermostat -Only CAC Fuel Htd	16.15	1.47	0.75	2.57
Residential Energy Assessments	**HCRCSD**	12877	Home Energy House Call - Specialty Recessed LED	157.62	14.33	1.06	21.21

Duke Energy Kentucky
Case No. 2020-00266
Attorney General's First Set of Data Requests
Date Received: September 28, 2020

AG-DR-01-004

REQUEST:

Reference the application, numerical paragraph 9, referring to the Peak Time Rebate program ("PTR," branded to customers as the Peak Time Credits program). Confirm that the PTR program has in fact launched. If so confirmed, explain the measures estimated dates for deploying those measures.

a. Explain whether the nearly seven-month delay in implementing the program will impact DEK's ability to recruit the goal of 1,000 participants, and if so, explain how.

b. Confirm that the two-year pilot program will not cease prior to August of 2022, and that, pursuant to the Commission's final order in Case No. 2019-00277, pp. 5-6, the pilot will continue until DEK files its EM&V report and a request with the Commission to either terminate or continue the program with or without modifications.

c. Given that the PTR program is designed primarily to reduce summertime peak usage, and despite the fact of the nearly seven-month delay in implementing the program, can the Company confirm that the two-year pilot will be in effect for two summers and at least one winter?

RESPONSE:

Objection. This question is vague, overbroad, and misstates facts. Without waiving said objection, and to the extent discoverable, the PTR Pilot program has launched. The Attorney General asks about projected measures and deploying those measures. This request is vague, and the Company is unable to determine the meaning of the AG's question as it related to the PTR Pilot program.

a. The PTR Pilot program did not launch 7 months late. As originally filed, the program intended to launch in mid- to late May 2020. However, given the length of the DSM proceeding to approve this pilot program, the Commission's order was not received until April 27, 2020. Combined with the unprecedented COVID-19 pandemic, the PTR Pilot program launched 2 months later than expected. All participants have been recruited. There is a total of 899 participants in the pilot. See AG-DR-01-004 Attachment for a copy of Nexant's Power Analysis recommending 820 pilot participants. The Company enrolled additional participants but within the approved additional participant allowance of 100 customers.
b. Confirmed. The PTR Pilot program will not cease prior to August 2022. The pilot will continue until the EM&V report is filed and Duke Energy Kentucky requests a final disposition of the pilot program.
c. The PTR Pilot program launched approximately 2 months later than originally planned. Nonetheless, the Company can confirm that the pilot will be active for at least 2 summers and 1 winter period.

PERSON RESPONSIBLE: Legal, as to Objection
Bruce L. Sailers, as to Response

MEMO

Date: August 2020

To: Bruce Sailers and Jean Williams, Duke Energy

From: Eric Bell and Shannon Hees, Nexant

Re: Power Analysis to Determine Treatment Group Size for Duke Energy Kentucky Peak Time Rebate Pilot

---

Summary

This memorandum provides documentation of the process used to determine enrollment size recommendations for Duke Energy Kentucky (DEK)'s Peak Time Rebate (PTR) Pilot. Duke is interested in determining a treatment group size recommendation that can produce statistically significant impacts; noting that the pilot enrollment cap is 1,000 which can be exceeded by no more than 100 participants. Monte Carlo simulation was used in conjunction with a false experiment to determine the precision of estimated event load impacts that would result from a random sampling design with several potential treatment group sizes. The data used for the simulation consisted of AMI data from May 2019 through April 2020 for a random sample of 9,337 customers that are eligible to enroll in the pilot.

Data

The PTR pilot is being designed to provide valid estimates of event impacts for events taking place in both the summer (May to October) and the winter (November to April). DEK expects to call eight to ten summer events and two to four winter events each season, for a maximum of 12 events each year. Summer events are expected to be from 3pm to 7pm, and winter events are expected to be from 6am to 10am. Summer event criteria is any weekday, non-holiday where the temperature humidity index (THI) exceeds 80, and winter event criteria is any weekday, non-holiday where the low temperature goes below 5 degrees. Note that DEK expects to adjust these thresholds during the pilot to provide the 12 opportunities for customers to earn credits but this analysis is based on the thresholds stated here. Given this criteria, 71 summer days were identified as summer proxy event days under mild conditions, and the 14 days with the greatest maximum temperatures were identified as summer proxy event days under hot conditions. The date range did not include any days that satisfy the winter event criteria, so the 8 winter days with the lowest minimum temperature were selected to serve as winter proxy event days. Table 1 presents the range of temperatures during the event window on the days eligible for inclusion in the power analysis.

Table 1: Temperature Profiles for Days Included in Analysis

Event Scenario	Number of eligible days	Minimum temperature in the event window	Maximum temperature in the event window
Summer - Moderate	71	66	94
Summer - Hot	14	79	94
Winter	8	12	27

Monte Carlo Simulation

Monte Carlo simulation (or experimentation) is a methodology that is commonly used for investigating the properties of econometric estimators and verifying that valid methods of statistical inference are being used.[1] The power of the methodology lies in its use of repeated sampling to understand the properties of a particular estimator or statistic under realistic data conditions.[2]

One of the key questions for the design of the PTR pilot is how large of a sample should be used. Sample size is important because it directly affects two related properties of statistical analysis – power and precision. Power is the ability of an analysis to detect an effect if it indeed exists, while precision deals with how close our estimates would be if we conducted the analysis many times using different samples. All else equal, larger sample sizes allow for more power and precision since there is more data available for estimation.

To evaluate the expected power and precision that would result from using different sample sizes, we conducted Monte Carlo simulations that incorporate a false experiment. The idea of a false experiment is to conduct an analysis in a situation where the magnitude of the treatment is known to be zero using data that is similar to what would be used in a real experiment. Knowing the answer beforehand allows us to assess whether or not our estimator may produce biased results and the repeated sampling allows for the precision of the estimator be evaluated.

The simulation process is shown in Figure 1. For each sample size, X, a sample of X customers were randomly selected and assigned to treatment and another sample of X customers were randomly selected and assigned to control. For each sample size, a different set of days were selected to be event and proxy days. For the mild and hot summer scenarios, nine of the eligible days were randomly selected as event days and five as proxy (non-event) days. For the winter scenario, three of the eligible days were randomly selected as event days and five as proxy days. In this experimental framework, the “impact” of the fictional PTR events can be estimated using the following equation, where i subscripts denote individuals and t subscripts denote time periods (days):

$$kW_{i,t}^{\text{eventperiod}} = \alpha + \delta \text{treat}_i + \gamma \text{post}_t + \beta (\text{treatpost})_{i,t} + \varepsilon_{i,t} \qquad (1)$$

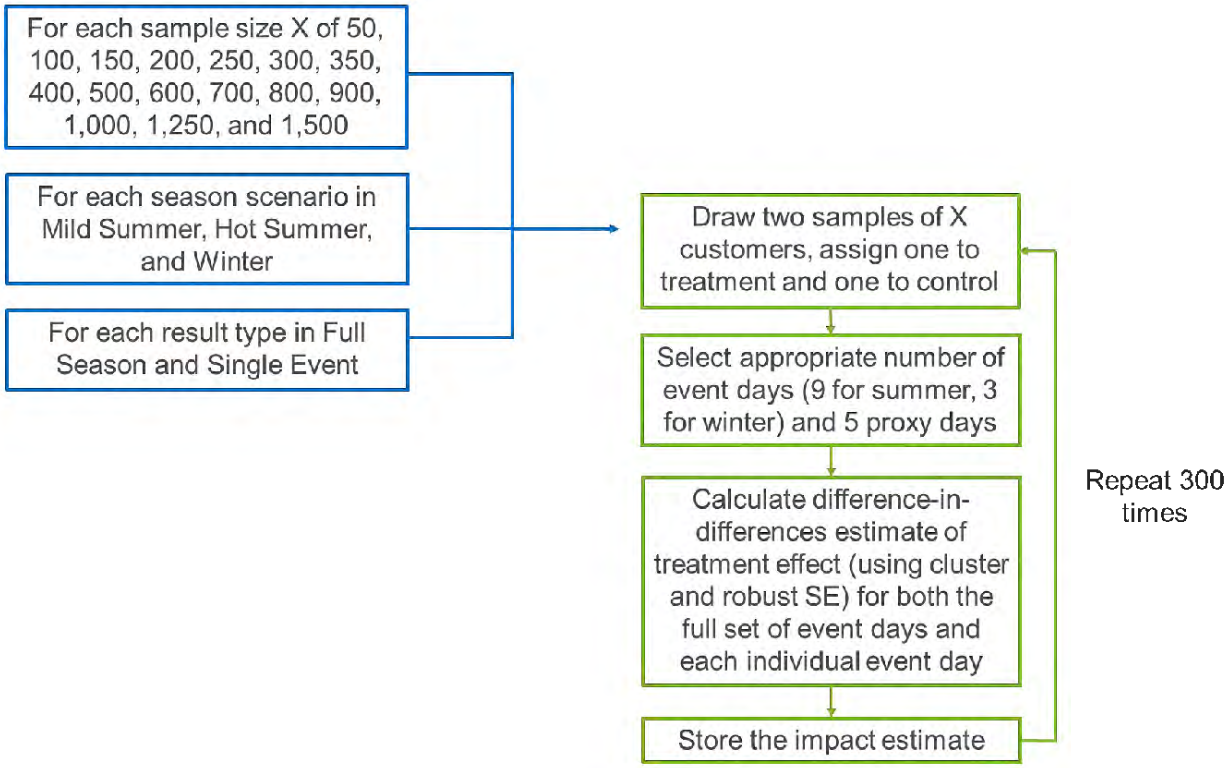
In Equation 1, the variable *treat* is equal to 1 for treatment customers and 0 for control customers, while the variable *post* is equal to 1 for the event days and a value of 0 for the proxy days. The *treatpost* term is the interaction of *treat* and *post* and its coefficient β is a differences-in-differences estimator of the treatment effect that makes use of the “pre-treatment” data. In the simulation, Equation 1 is estimated using OLS regression with cluster robust standard errors to

[1] For a more detailed discussion of Monte Carlo simulation, see Kennedy, Peter, “A Guide to Econometrics” (2008), Section 2.10 - http://www.masonlec.org/site/rte_uploads/files/Econometrics%20Book%20-%20Intro,%20Ch%201%20and%202.pdf

[2] Asymptotic properties of estimators are generally known, but rely on assuming sample sizes that approach infinity that are not appropriate in many applied research situations that rely on finite samples.

account for serial correlation that is likely to be present in the data.[3] We ran the simulations using all of the event days of that season scenario together in Equation 1, providing the full summer average event hour impact, as well as one event at a time to produce the average event hour impact of each single event. This process is repeated 300 times and bootstrapped standard errors are reported.

Figure 1: Monte Carlo Simulation for False Experiment



Simulation Results

At the end of the simulation, we have 300 impact estimates for each sample size and season scenario. The next step of the process is to use this information to draw conclusions about the precision that can be achieved with each sample size. The precision will be based on the standard error of the impact estimate, which we calculate as the standard deviation of the 300 impact estimates for each sample size (bootstrap).

The final step is to translate the estimated standard errors into confidence intervals, which form the basis of statistical inference. This is a straightforward calculation that consists of multiplying the standard error by the t-value corresponding to the desired confidence level (approximately 1.96 for 95% confidence and 1.65 for 90% confidence[4]) to obtain the margin of error (MOE) that will be added and subtracted from the impact estimate to form the confidence interval. In our

[3] Serial correlation certainly exists in the variable of interest (*treatpost*) and is very likely to be present in the dependent variable (daily peak period average load). If unaddressed, serial correlation will lead to standard errors that are systematically too small. This results in overstating the precision of the impact estimate and misleading inference. To adjust for serial correlation, we follow the best practices described by Bertrand, et al. (2002), Wooldridge (2003) and Cameron (2010).
[4] We assume a two-tailed hypothesis test.

false experiment, we know that the true impact is zero, however the MOE captures the precision of that estimate if it was non-zero. For this reason, we focus discussion on the MOE.

Results of the random sampling simulation for are shown in Table 2. The results can be interpreted as follows – "With a sample of 1,000 customers in the pilot, we would expect to be able to estimate a full mild summer of PTR event impacts to be within plus or minus 1.1% with 90% confidence." Put another way, the 90% confidence interval around a true impact of 4% with a sample of 1,000 customers would be (2.9%, 5.1%).

Table 2: Precision for Peak Period Load Impacts in PTR-eligible Population

Season Scenario	Treatment Group Size	Full Season Avg. Event Impact		Single Event Impact	
		90% MOE	95% MOE	90% MOE	95% MOE
Hot Summer	500	1.2%	1.5%	2.4%	3.1%
	600	1.1%	1.4%	2.2%	2.8%
	700	1.0%	1.3%	2.0%	2.6%
	800	1.0%	1.2%	1.9%	2.4%
	900	0.9%	1.1%	1.8%	2.3%
	1,000	0.8%	1.1%	1.7%	2.2%
Mild Summer	500	1.5%	1.9%	3.1%	4.0%
	600	1.4%	1.8%	2.8%	3.7%
	700	1.3%	1.6%	2.6%	3.4%
	800	1.2%	1.5%	2.5%	3.2%
	900	1.1%	1.4%	2.3%	3.0%
	1,000	1.1%	1.4%	2.2%	2.8%
Winter	500	2.5%	3.3%	3.9%	5.0%
	600	2.3%	3.0%	3.5%	4.5%
	700	2.2%	2.8%	3.3%	4.2%
	800	2.0%	2.6%	3.1%	3.9%
	900	1.9%	2.4%	2.9%	3.7%
	1,000	1.8%	2.3%	2.7%	3.5%

The precision of the impact estimates are best for hot summer events and lowest for winter events. Single event impacts have a wider confidence interval than the average impact for the full season.

Power

In addition to precision, a related concept that is generally of interest when determining sample sizes is statistical power. Power refers to the likelihood of finding a statistically significant impact when an impact actually exists, and depends on the magnitude of the impact, sample size, inherent variability in the data, and desired level of confidence. Based on the estimated standard errors from the full season average event impact simulations, we can map out the power level associated with different impact sizes for each sample size. These "power curves" are shown for each season scenario in Figures 2 - 4 for a 90% confidence level. For reference, a 3% impact is marked by a black dotted line.

Figure 2: Power Curves for Mild Summer (90% Confidence)

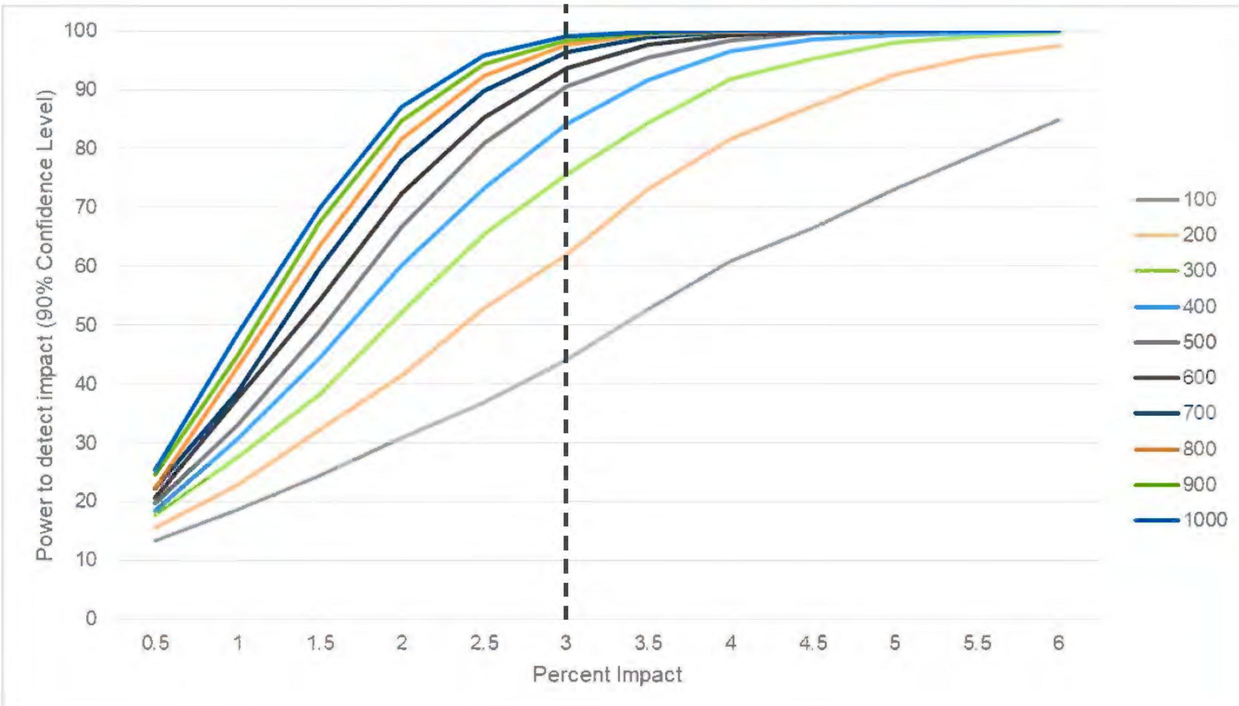


Figure 3: Power Curves for Hot Summer (90% Confidence)

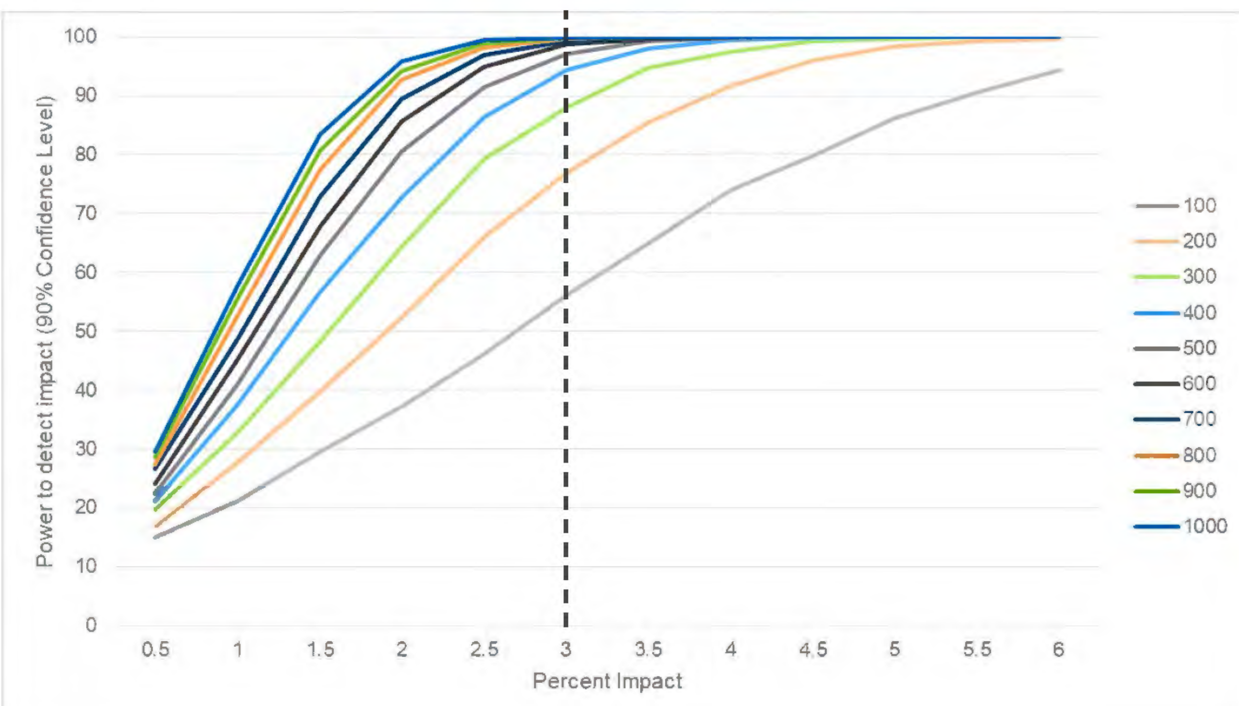
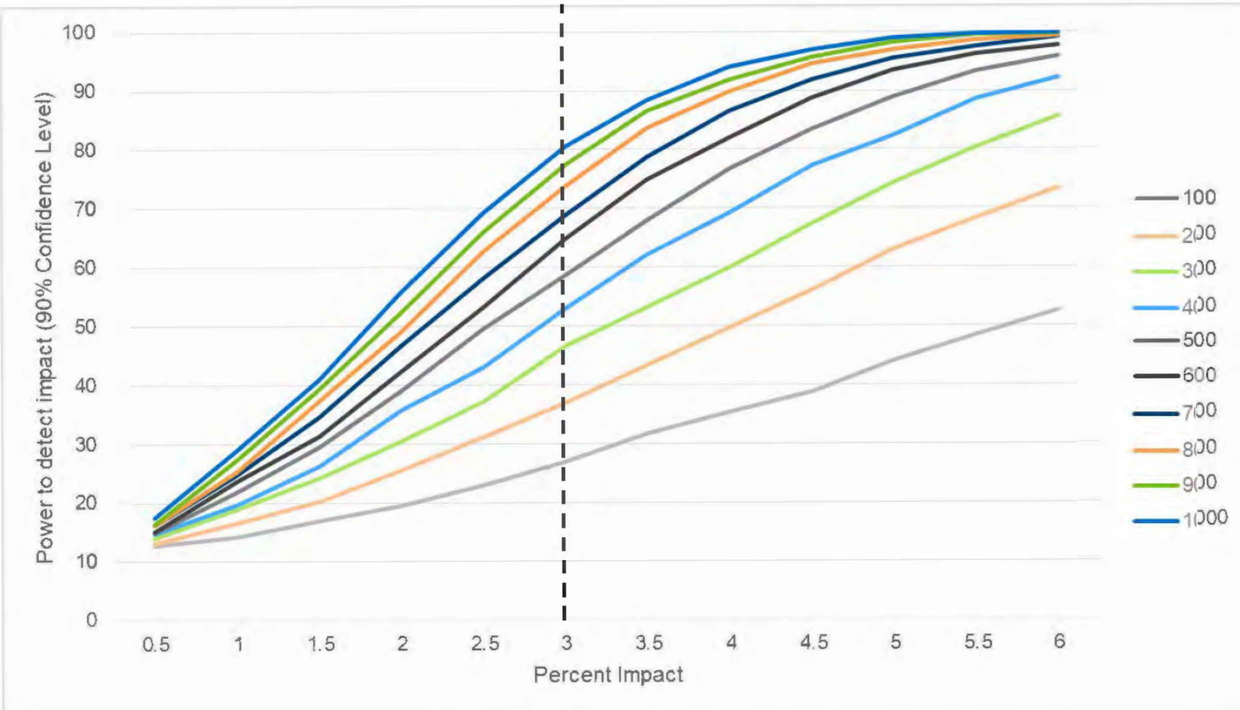


Figure 4: Power Curves for Winter (90% Confidence)



Because the power curves are based on the same estimated standard error as the precision calculations, similar patterns are apparent. As the sample size increases, so does the likelihood of finding statistically significant results for a given sized impact. For example, in Figure 3, the power associated with detecting a 3% impact for the full mild summer season with 90% confidence using a sample of 500 customers is about 90%, but with a sample of 1,000 customers, power increases to about 99%.

Single Event Power

The single event power curves for each season scenario are presented in Figures 5 - 7. Similar to the pattern in the margins of error, we see lower power for each sample size when looking at producing significant impacts for a single event compared to when looking at the full season of events. For comparison, in Figure 5, the power associated with detecting the same 3% impact for a single mild summer event with 90% confidence using a sample of 500 customers is about 48%; with a sample of 1,000 customers, the power is about 67%.

Figure 5: Power Curves for Mild Summer Single Event Day (90% Confidence)

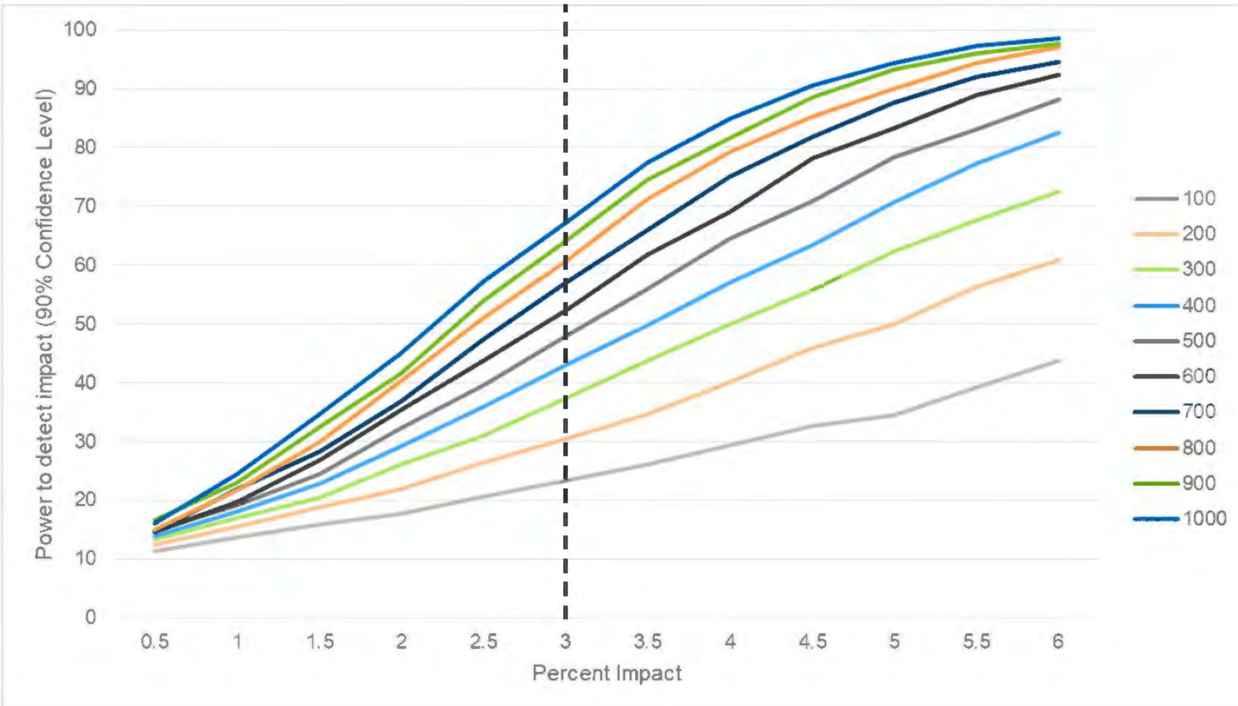


Figure 6: Power Curves for Hot Summer Single Event Day (90% Confidence)

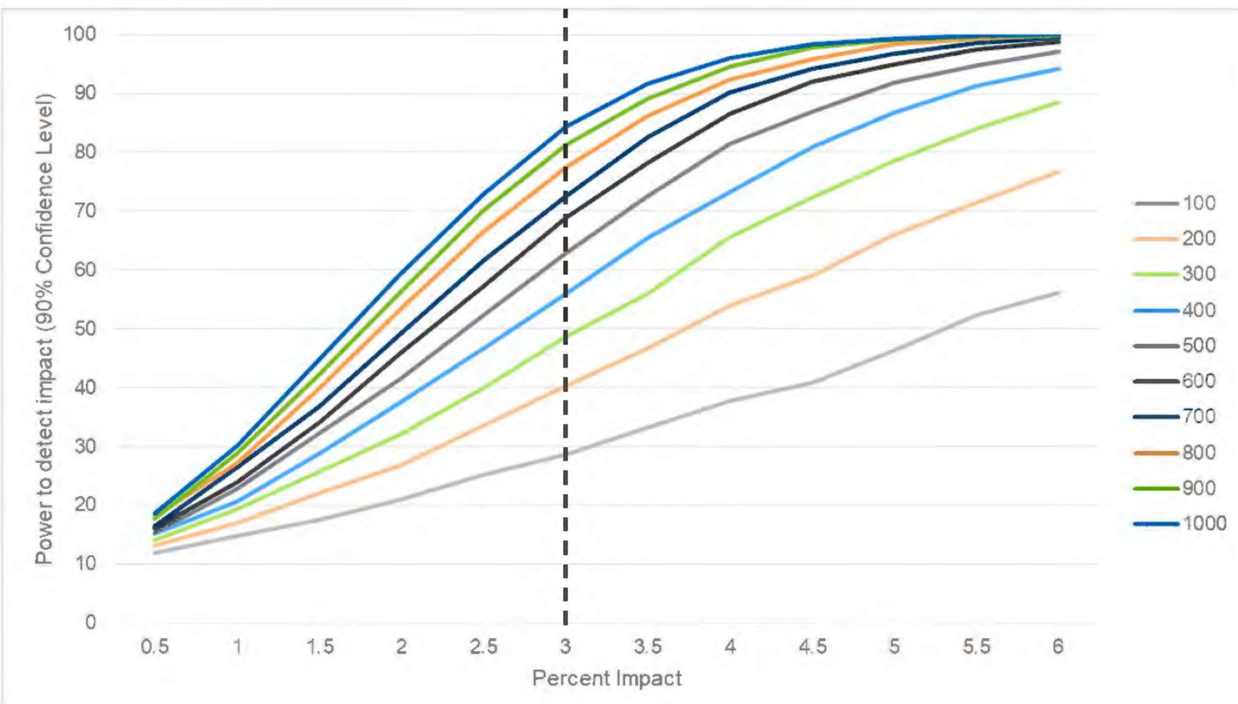
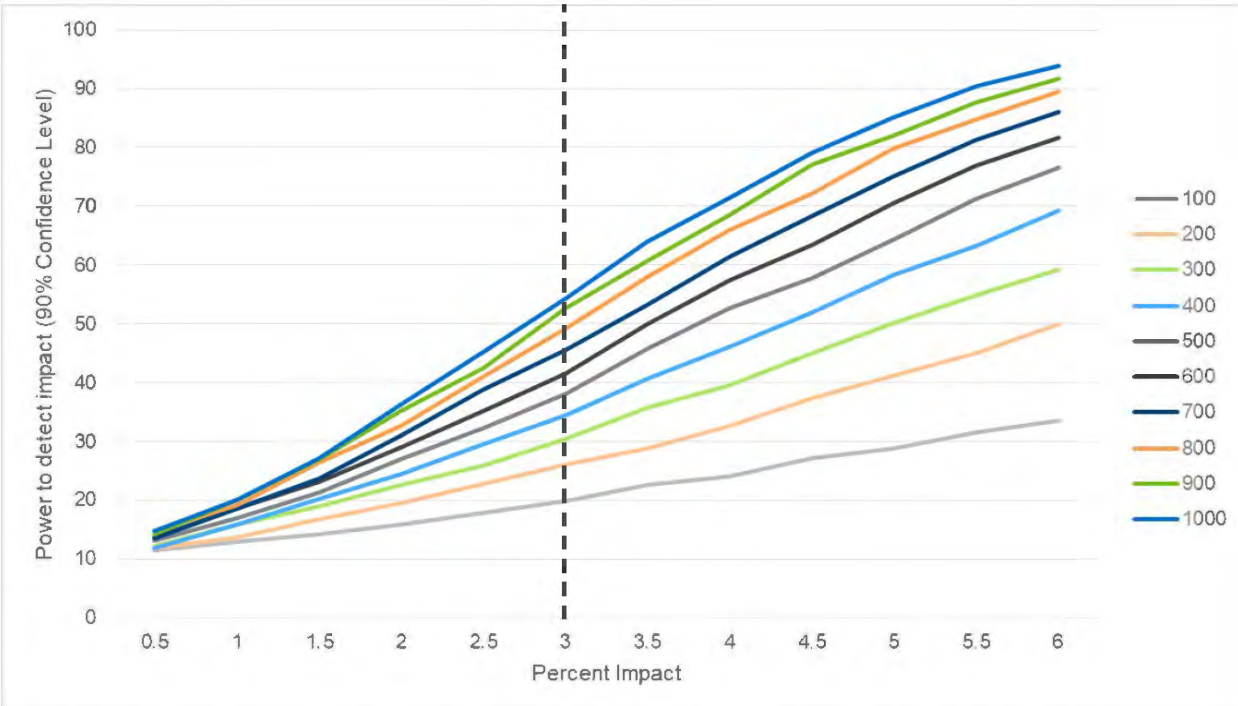


Figure 7: Power Curves for Winter Single Event Day (90% Confidence)



Conclusions

The analysis summarized above indicates that it is possible to decrease the pilot sample size below the cap of 1,000 customers, depending on the priorities of evaluating impacts. It is Nexant's understanding that while a handful of events will be called in the winter, their impacts are not the priority when evaluating the pilot, and it will be much more important to be able to determine the level of impact from the summer events. While the hot summer season scenario suggests that the pilot size could be as low as 500 customers and still maintain 100% power at a 4% average event impact, this estimate could be overly optimistic, and more likely the events will be called on a mix of hot and moderate summer days (due to uncertainty in weather forecasts) that are represented in the mild summer scenario. The mild summer scenario suggests that the pilot size can be set at 700 customers and still maintain 100% power to detect a 4% average event impact. Pilot enrollment of 700 allows for the impact to be as low as 3% while still maintaining a robust 96% power. For a single event, the power is 75% to detect an impact of 4% with 700 customers on the pilot. At the pilot enrollment cap level of 1,000 customers, the power improves to 85% power to detect a single event impact of 4%.

It is important to note that there are no assumptions regarding un-enrollment from the pilot or account turnover in the sample size estimates listed above, meaning that the power related to an expected percent impact is based on the pilot size *after* all attrition (un-enrollment and turnover). Thus, by suggesting that the pilot target enrollment can be reduced to 700 customers, that is the number of customers on PTR at the end of the pilot, not the number initially enrolled. The number of customers initially enrolled will need to be greater than 700, in order to account for the fact that customers may leave throughout the pilot period. If, for example, turnover due to customers moving was 10% annually, and approximately 1% of pilot customers decide to unenroll from the pilot (consistent with the findings from the 2015 Duke Energy Pilot in North Carolina), then approximately 820 customers should be recruited at the start of the pilot. This will allow for 0.9% customer attrition per month, for 16 months,[5] resulting in a population of approximately 700 customers after the end of the second summer, in October 2021. Nexant is open to revising the initial enrollment target numbers should Duke Energy have a more refined assumption regarding annual customer attrition rates, or if the timelines for the pilot change significantly.

References

Bertrand, Marianne, Esther Duflo, and Sendhil Mullainathan. *How much should we trust differences-in-differences estimates?* No. w8841. National Bureau of Economic Research, 2002.

Wooldridge, Jeffrey M. "Cluster-sample methods in applied econometrics." *American Economic Review* (2003): 133-138.

Cameron, Adrian Colin, and Pravin K. Trivedi. "Microeconometrics using stata." (2010): 166.

[5] 16 months assumes customer recruitment starts in July, 2020, and that load impacts from events after October 2021 are not of primary interest to stakeholders, as they would fall under the winter season. It is Nexant's understanding that load impacts from the winter season are not a primary metric of interest to stakeholders.

AG-DR-01-005

REQUEST:

Reference the Commission's final order in Case No.2019-00277, p. 7, wherein it is stated that customers with a deferred payment plan will not be eligible to participate in the PTR. Explain whether DEK will allow customers who have deferred payment plans as a result of the moratorium on disconnections as set forth in Case No. 2020-00085 to participate in the PTR program.

RESPONSE:

The Company followed the Commission's Order in Case No. 2019-00277. Customers with a deferred payment plan were not eligible to participate. This did not impact the ability to reach the enrollment target, as the program is fully subscribed.

PERSON RESPONSIBLE: Bruce L. Sailers

AG-DR-01-006

REQUEST:

Reference the Commission's final order in Case No. 2019-00277, the attached Joint Stipulation and Recommendation ("Stipulation") at p. 4, paragraph (d)(iii), which provides: "Duke Energy Kentucky agrees to use its best efforts to include the year 1 results of the pilot program into the PJM load forecast. Depending upon timing of approval of the pilot, if the Company is able to implement the PTR pilot in time for summer 2020, Duke Energy Kentucky will attempt to have PJM include such results in PJM's final load forecast for the 2021/2022 delivery year, assuming PJM accepts it."

a. Explain whether the nearly seven month delay in implementing the PTR pilot program will affect this commitment, and any other commitment set forth in the Stipulation, and if so, how.

RESPONSE:

Objection. This question misstates facts. The PTR Pilot program launched approximately 2 months later than originally planned due to the timing of the Commission's Order approving the program and due to the pandemic. Nonetheless, the Company has submitted documents to PJM requesting a Peak Shaving Adjustment (PSA). PJM has notified the Company that PSAs are rounded to the nearest MW value. The pilot program provides less than 0.5 MW of peak load reduction. Although the Company has submitted the forms and requested the PSA, we do not currently anticipate a favorable reply from PJM. However, we have not received a final PJM determination regarding the PSA request.

PERSON RESPONSIBLE: Bruce L. Sailers

AG-DR-01-007

REQUEST:

Reference the Commission's final order in Case No. 2019-00277, the attached Joint Stipulation and Recommendation at pp. 4-5, paragraphs 2(d) – (e). Additionally, refer generally to the recently-issued FERC Order 2222 ("FERC Order"). Provide a discussion regarding whether the FERC Order could help DEK meet the goal set forth in pp. 4-5 of the Joint Stipulaton and Recommendation in Case No. 2019-00277 by, *inter alia*, potentially allowing DEK to aggregate the conservation achieved under the PTR program either as demand response, peak shaving adjustment, and/or price responsive demand together with other market participants.

RESPONSE:

FERC Order 2222 is a recent order dealing with distributed energy resources (DERs) in organized regional wholesale markets. PJM will be required to review this order and submit a filing to FERC for compliance that will propose rules on how these resources can be aggregated and participate. At this time, the Company has no knowledge to suggest how PJM will comply with the FERC order or the rules that will be established for participation of these resources.

PERSON RESPONSIBLE: Bruce L. Sailers