NAVIGANT

Residential Education and Outreach Program Impact Evaluation Report

Home Energy Reports Program

Energy Efficiency Plan: Calendar Year 2018 (1/1/2018 - 12/31/2018)

Presented to
Peoples Gas and North Shore Gas

Final

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Home Energy Report Impact Evaluation Report

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E. EXECUTIVE SUMMARY

This report summarizes Navigant Consulting, Inc.'s (Navigant's) findings and results from the impact evaluation of Calendar Year 2018 (CY2018)[1] of the Peoples Gas (PGL) and North Shore Gas (NSG) Home Energy Reports (HER) programs.[2] Initially launched in 2013, these programs are designed to generate energy savings by providing residential customers with information about their energy use and energy conservation suggestions and tips. Program participants receive information in the form of paper and email home energy reports and via the customer's energy management portal online.

In GPY6, PGL and NSG restructured HER waves twice. In April 2017, the utilities underwent a data conversion/CIS migration, for which all customer IDs needed to be remapped on the implementer (Oracle) side to properly track and measure customers from the data changes on the utilities side. The CIS migration work delayed the launch of the 2017/2018 gas season, for which Oracle did not start sending reports until December 2017 instead of the planned September 2017 launch date. As a result, savings took longer to ramp up in 2018. The CY2018 HER impact report continues evaluation of the second set of waves (2017-7mo) from that restructuring. However, since impacts from that second set of waves only covered seven months, and the CY2018 evaluation includes 12-month waves, readers should use caution when comparing GPY6 and CY2018 program impacts.

An important feature of the PGL and NSG HER program is that it is designed as a randomized controlled trial (RCT).[3] Customers in the target group of residential customers from each utility are randomly assigned to either the recipient group or the control (non-recipient) group to estimate changes in energy use due to the program. Customers may opt *out* of the program at any time, but cannot opt *in* due to the RCT design. An implication of the RCT design is that the savings estimates are intrinsically net of free-ridership and most spillover bias. Unless otherwise noted, reported "savings" in this report refer to *net savings*.[4]

E.1 Program Savings

Table E-1 summarizes the HER Program's CY2018 natural gas savings. Navigant verified net savings of 553,286 therms for PGL and 522,118 therms for NSG after uplift adjustment[5], resulting in verified net realization rates of 106% and 129%, respectively. The uplift adjustment resulted in a 3% change in the

[1] CY2018 began January 1, 2018 and ended December 31, 2018.

[2] Due to data quality issues in the first data set, this evaluation presents results from a second data set Oracle sent Navigant on April 24th, 2019. Additional detail about those data issues were provided in an Oracle memo sent to the Franklin Energy team.

[3] In selecting each wave, the program implementer, Oracle, randomly allocated targeted PGL and NSG residential customers between participant and control groups. As each wave was added, Navigant confirmed that the usage data was consistent with an RCT design.

[4] In some instances, the word "net" appears in column headings and summary sentences for added clarity.

[5] Uplift refers to the impact of the HER program on enrollment in *other* PGL and NSG EE programs. To avoid double-counting the savings from this indirect effect, Navigant subtracts the estimated uplift savings from the total HER program savings, including legacy uplift from prior years (cf. Section 5.3 for details). The fact that uplift savings is subtracted from the HER programs' total energy savings does not indicate that the uplift savings was not *caused by* the HER programs, or that the HER programs shouldn't be credited for its occurrence. It is an accounting adjustment to avoid double-counting when aggregating savings over multiple EE programs. Indeed, the existence of uplift is an indicator of successful cross-marketing by the HER programs, and thus should be seen as an added program benefit.

net savings, respectively, which the implementer's savings estimates did not include. The remaining difference in the realization rates were likely due to differences in the regression models used by the evaluation team and the implementer.

Table E-1. CY2018 Peoples Gas and North Shore Gas HER Program Net Savings

Utility	Ex Ante Savings (Therms)	Verified Savings Prior to Uplift Adjustment (Therms)	Total Uplift Adjustment* (Therms)	Verified Net Savings After Uplift Adjustment (Therms)	Verified Realization Rate
PGL	523,780	570,075	16,790	553,286	106%
NSG	406,173	538,238	16,120	522,118	129%

Source: Navigant analysis of PGL and NSG customer billing data.
* The total uplift adjustment includes both the uplift calculated for CY2018 and the legacy uplift from GPY3 to GPY6. See Section 5.3 for details.

E.2. Program Volumetric Detail

Table E-2 presents participation details for the CY2018 PGL and NSG HER programs. The PGL wave achieved an average savings rate of 0.70 percent in CY2018, while the NSG wave had an average savings rate of 0.72 percent.

Table E-2. CY2018 Peoples Gas and North Shore Gas HER Program Participation Detail

Utility	Number of Participants	Number of Controls	Average Participant Net Savings (Therms)	Average Savings Rate	Average Savings Rate Standard Error
PGL	46,417	14,976	12.86	0.70%	0.20%
NSG	54,485	15,024	10.33	0.72%	0.20%

Source: Navigant analysis of PGL and NSG customer billing data.

E.3 Findings and Recommendations

For PGL's HER program, Navigant verified CY2018 impacts of 570,075 therms prior to the uplift adjustment, and 553,286 therms after the adjustment. For NSG, the corresponding figures were 538,238 and 522,118 therms, respectively.

Finding 1. Average daily savings from the HER program were consistent with previous annual evaluations. HER programs often have a savings ramp-up period, so PGL and NSG could reasonably expect an increase in average daily savings for CY2019.

Finding 2. Navigant has consistently found greater than 100% realization rates for NSG.

Recommendation 1. If there is interest, Navigant could conduct additional analysis comparing Oracle and Navigant models to understand underlying causes of this realization rate discrepancy.

1. INTRODUCTION

1.1 Program Description

This report presents a summary of the findings and results from the impact evaluation of calendar year 2018 (CY2018) for the Peoples Gas (PGL) and North Shore Gas (NSG) Home Energy Reports (HER) program. This program is designed to generate energy savings by providing residential customers with information about their energy use and energy conservation suggestions and tips. Program participants receive information in the form of home energy reports that give customers various types of information, including:

- Assessments of how their recent energy use compares to their own energy use in the past
- Tips on how to reduce energy consumption, some of which are tailored to their own circumstances
- Information on how their energy use compares to that of neighbors with similar homes

Recipient customers received reports by mail and were also invited to log onto a dedicated program website that offers suggestions of additional opportunities to save energy and allows participants to fine-tune their profiles and report conservation steps that they have taken. Other studies have shown that receiving reports containing this type of information can stimulate customers to reduce their energy use, creating average energy savings in the one percent to three percent range, depending on local energy use patterns.

An important feature of the PGL and NSG HER programs is that both were designed as randomized controlled trials (RCTs). Customers in the target group of residential customers from each utility were randomly assigned to either the recipient group or the control (non-recipient) group to estimate changes in energy use due to the program. Having an RCT experimental design makes the process of verifying energy savings simpler and more robust. Among other things, it effectively eliminates free-ridership bias and thus the need for net-to-gross research. Customers may opt *out* of the program at any time, but they cannot opt *in* due to the RCT design.

In its GPY6 evaluation report, Navigant confirmed the RCT design of both programs by comparing the distributions of monthly energy usage of each treatment group-control group pair and verifying that they were consistent with randomized allocation.[6]

Table 1-1 provides an overview of the number of accounts who received HERs or served as controls along with their average use during the program period. This table shows that the PGL HER recipients used about 40% more natural gas than the NSG participants.

[6] Navigant, 2018. *Residential Education and outreach Program Impact Evaluation Report; Home Energy Reports Program. Presented to Peoples Gas and North Shore Gas*

Table 1-1. Synopsis of CY2018 PGL and NSG HER Program Waves

Utility	Number of Participants	Number of Controls	Participant Average Daily Usage in Post Period (Therms)
PGL	46,417	14,976	5.00
NSG	54,485	15,024	3.88

Source: Navigant analysis of PGL and NSG customer billing data.

1.2 Evaluation Objectives

The primary objective of this report is to calculate HER program savings in CY2018. A secondary objective is to identify uplift in other PGL and NSG energy efficiency (EE) programs due to participants receiving HERs to avoid double-counting energy savings when aggregating across utility portfolios.

2. EVALUATION APPROACH

The evaluation approach used to produce the results presented in this report is consistent with that of the evaluation in the previous program year, and with evaluations of similar programs in other utilities' territories, relying on statistical analysis appropriate for measuring the impacts of RCTs.

2.1 Data Used in Impact Analysis

In preparation for the impact evaluation, Navigant combined and cleaned the data provided by the implementer. Navigant performed the following data cleaning steps:

- Filtered data to the pre-period (October 2012 – September 2013) and post period (CY2018) for each wave
- Removed exact duplicate observations
- Aggregated bills that ended in the same month
- Excluded outlier observations, defined as observations with average daily usage outside plus or minus one order of magnitude from the median usage

Detailed accounts of the customers and observations removed by each cleaning step for wave are included in Section 5.1 of the Appendix.

2.2 Statistical Models Used in the Impact Evaluation

Navigant estimated program impacts using two approaches: a lagged dependent variable regression (LDV) analysis with lagged individual controls and a linear fixed-effects regression (LFER) analysis, both applied to monthly billing data. Both approaches should, in principal, produce unbiased estimates of program savings under a wide range of conditions, but Navigant prefers the LDV results for two reasons. First, savings estimates produced by the LDV model tend to be more accurate and more precisely estimated than those from the LFER model[7] based on past experience analyzing similar HER programs' impacts and recent findings from the academic literature.[8] Second, the implementer uses a similar model for their evaluation, which makes the two sets of results comparable. Although the LDV and LFER models are structurally very different, they should generate similar program savings estimates, assuming the RCT is well balanced with respect to the drivers of energy use. Navigant used the LDV results for reporting total program savings for CY2018, while the LFER provided a robustness check.

The LFER model combines cross-sectional and time-series data in a single panel dataset. The regression essentially compares pre- and post-program billing data for participants and controls to identify the effect of the program on usage. The customer-specific fixed effect is a key feature of the LFER analysis and captures all customer-specific factors affecting natural gas usage that do not change over time, including those that are unobservable. Examples of the latter include the construction and square footage of the premise, the number of occupants, the amount of seasonal sun exposure, and the thermostat settings. The fixed effect represents an attempt to control for any small, systematic differences between the treatment and control customers that might occur due to chance.

[7] One likely reason for this is that the LDV model embodies more flexibility than the LFER model, in that the former allows the individual customer control variable to vary seasonally while the latter does not – a particularly attractive feature given the highly seasonal nature of natural gas usage. The LFER model treats all unobserved inter-household heterogeneity affecting households' energy usage as time-invariant, while the LDV model uses lagged individual controls that can vary over time. This is discussed in more detail in section 6.2.1 of the Appendix.

[8] Allcott, Hunt and Todd Rogers, 2014. "The Short-Run and Long-Run Effects of Behavioral Intervention: Experimental Evidence from Energy Conservation." *American Economic Review*, 104(10): 3003-37.

Like the LFER model, the LDV model also combines cross-sectional and time-series data in a panel dataset. Unlike the LFER model, however, it uses only the post-program data for estimation and includes the customer's lagged energy usage for the same calendar month of the pre-program period to serve as the control for any small, systematic differences between the treatment and control customers, in that sense serving the same purpose as the customer fixed effect included in the LFER model. Section 5.2 of the Appendix presents the details of the LDV and LFER models used in the analysis.

2.3 Accounting for Uplift in Other Energy Efficiency Programs

The home energy reports sent to participating households included energy-saving tips, some of which encouraged participants to enroll in other PGL-NSG EE programs. If participation rates in other EE programs were the same for HER participant and control groups, the savings estimates from the regression analysis are already "net" of savings from the other programs, as this indicates the HER Program had no net effect on participation in the other EE programs. However, if the receipt of HERs increased participation rates of recipients relative to controls in other EE programs, then the combined savings across all programs would be lower than indicated by the simple summation of savings in the HER and the other EE programs. For instance, if the HER Program increases participation in another EE program, the resulting increase ("uplift") in savings may be allocated to either the HER Program or the EE program, but cannot be allocated to both programs simultaneously.[9]

As data permitted, Navigant used a difference-in-difference (DID) statistic to estimate uplift in other EE programs. To calculate the DID statistic, Navigant subtracted the change in the participation rate in another EE program between CY2018 and the pre-program period for the control group from the same change for the treatment group. For instance, if the rate of participation in an EE program during CY2018 is five percent for the treatment group and three percent for the control group, and the rate of participation during the year before the start of the HER Program is two percent for the treatment group and one percent for the control group, then the rate of uplift due to the HER Program is one percent, as reflected the following calculation:

(CY2018 treatment group participation – pre-PY treatment group participation) – (CY2018 control group participation – pre-PY control group participation) = DID statistic

(5% – 2%) – (3% – 1%) = 1%

The DID statistic generates an unbiased estimate of uplift when the baseline average rate of participation is the same for the treatment and control groups, or when they are different due only to differences between the two groups in time-invariant factors, such as the square footage of the residence.

An alternative statistic that generates an unbiased estimate of uplift when the baseline average rate of participation in the EE program is the same for the treatment and control groups is a simple difference in participation rates during CY2018. Navigant uses this alternative statistic –the "post-only difference" (POD) statistic – in cases where the EE program did not exist for the entire pre-program year.

Navigant examined the uplift associated with three other PGL-NSG EE programs: Home Energy Jumpstart, Home Energy Rebate, and Multifamily Energy Savings. For each EE program, uplift savings were calculated separately for each utility. In addition, legacy uplift (uplift from GPY6, GPY5, GPY4, and GPY3) was also calculated. These calculations are described in greater detail in Section 5.3.

[9] It is not possible to avoid double-counting of the savings generated by programs for which tracking data are not available, such as upstream lighting programs.

2.4 Process Evaluation

Navigant's CY2018 PGL and NSG HER process evaluation included interviews with the program implementer to update our information about the program, such as plans for additional waves. The evaluation did not include any participant surveys or interviews.

3. NET IMPACT EVALUATION

A key feature of the RCT design of the HER program is that the analysis inherently estimates net savings because there are no participants who would have received the individualized reports in the absence of the program. While some customers receiving reports may have taken energy-conserving actions or purchased high-efficiency equipment anyway, the random selection of program participants (as opposed to voluntary participation) implies that the control group of customers not receiving reports would be expected to exhibit the same degree of energy-conserving behavior and purchases. Therefore, this method estimates net savings, and no further NTG adjustment is necessary.

Table 3-1 summarizes total program savings. Relative to the implementer's *ex ante* estimates, Navigant verified higher savings for the NSG wave and the PGL wave. However, the implementer's estimates are within Navigant's 90% confidence interval (See Table 3-3).

Table 3-1. CY2018 PGL and NSG HER Program Gas Savings

Savings Category	PGL Savings (Therms)	NSG Savings (Therms)
Implementer Estimated Savings*	523,780	406,173
Verified Savings Prior to Uplift Adjustment	570,075	538,238
Verified Net Savings after Uplift Adjustment	553,286	522,118
Verified Net Realization Rate†	106%	129%

Source: Navigant analysis of PGL and NSG program tracking and customer billing data.

* This estimate comes from the implementation contractor's ex post analysis of the program.

† Calculated as the ratio of verified savings prior to uplift adjustment to implementer estimated savings.

3.1 LDV and LFER Model Parameter Estimates

The LDV and LFER models generated very similar results for program savings estimates. Navigant used the LDV results for reporting CY2018 total program savings. Across the two models, the parameter estimates are not statistically different; that is, the estimates for each model are within the 90 percent confidence bounds for the other model. Section 5 includes detailed information for each wave and model.

3.2 Uplift Analysis Results

The LDV estimates include savings that resulted from participation in other EE programs caused by the HER program. To avoid double-counting when aggregating savings across a portfolio, Navigant removes from HER impacts uplift in other EE programs. Legacy uplift captures energy savings from previous program years (GPY3, GPY4, GPY5, and GPY6) for measures that have multi-year measure lives. CY2018 uplift captures savings from other EE programs that occurred in 2018. Table 3-2 shows uplift figures for PGL and NSG, and how the adjustment affected total savings.

Table 3-2. CY2018 PGL and NSG Uplift Results

	PGL Savings (Therms)	NSG Savings (Therms)
Verified Net Savings, Prior to Uplift Adjustment	570,075	538,238
CY2018 Uplift Adjustment	6,691	1,885
Legacy Uplift Adjustment	10,098	14,235
Final Verified Net Savings	553,286	522,118

Source: Navigant analysis of PGL and NSG program tracking and customer billing data.

Section 5.3 in the Appendix presents detailed calculations of CY2018 and legacy uplift for each of the EE programs considered in the analysis: the HEJ (Home Energy Jumpstart), HEReb (Home Energy Rebate), MF (Multi-Family) programs, SF (Single-Family), Weatherization (Wx), and IHWAP (Illinois Home Weatherization Assistance Program). CY2018 had some new EE programs (Wx, SF, and IHWAP), which is why those programs do not appear in the legacy uplift calculations.

3.3 Verified Program Impact Results

Table 3-3 summarizes estimated program savings by participant wave, including CY2018 and legacy uplift adjustments. The table also included the number of participants, controls, and average savings rates. Both verified savings prior to uplift and average savings rates include standard error figures.

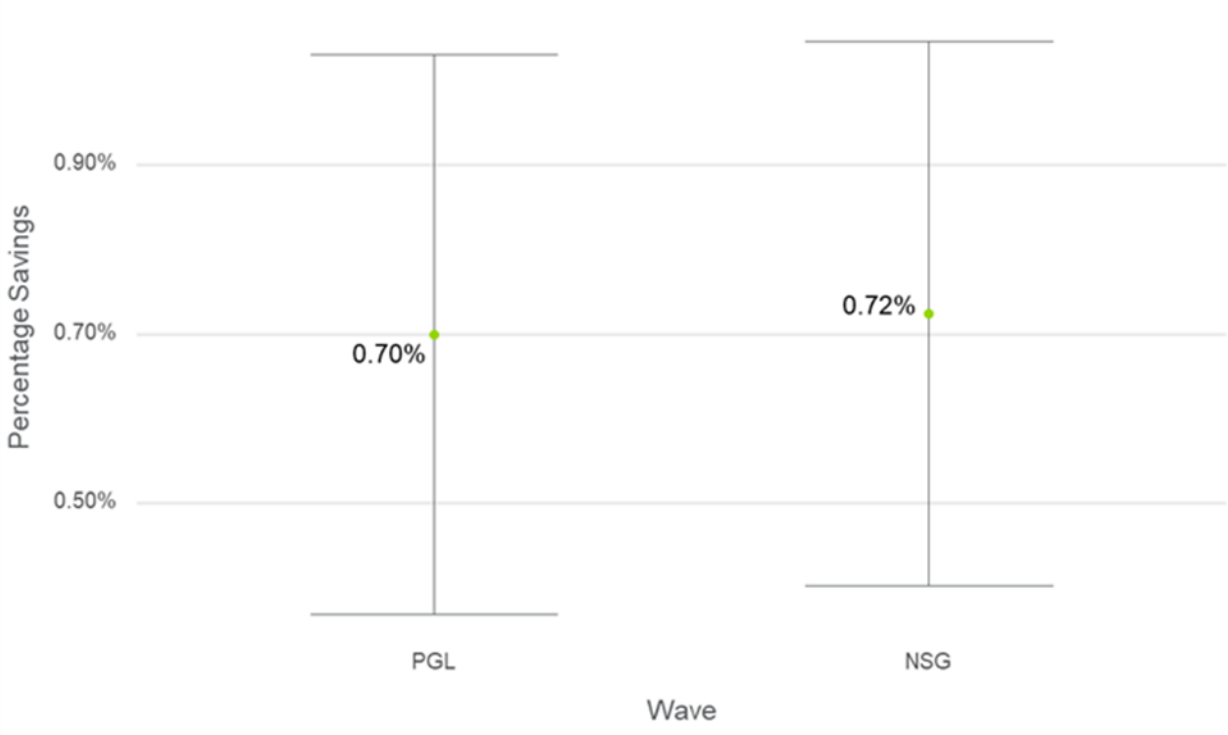
Table 3-3. PGL and NSG CY2018 HER Program Savings

Savings Category	PGL	NSG
Ex Ante Net Savings, therms	523,780	406,173
Number of Participants	46,417	54,485
Number of Controls	14,976	15,024
Verified Savings Prior to Uplift Adjustment, therms	570,075	538,238
(Standard Error)	*(164,233)*	*(145,766)*
Average Savings Rate	0.70	0.72
(Standard Error)	*(0.20)*	*(0.20)*
CY2018 Uplift Adjustment, therms	6,691	1,885
Legacy Uplift, therms	10,098	14,235
Total Uplift Adjustment, therms	16,790	16,120
Verified Net Savings After Uplift Adjustment, therms	553,286	522,118

Source: Navigant analysis of PGL and NSG program tracking and customer billing data.

Figure 3-1 shows energy savings for each wave with 90 percent confidence intervals.

Figure 3-1. CY2018 Percent Savings and 90 Percent Confidence Interval, by Wave



Source: Navigant analysis of PGL and NSG customer billing data.

4. FINDINGS AND RECOMMENDATIONS

For PGL's HER program, Navigant verified CY2018 impacts of 570,075 therms prior to the uplift adjustment, and 553,286 after the adjustment. For NSG, the corresponding figures were 538,238 and 522,118 therms, respectively.

Finding 1. Average daily savings from the HER program were consistent with previous annual evaluations. HER programs often have a savings ramp-up period, so PGL and NSG could reasonably expect an increase in average daily savings for CY2019.

Finding 2. Navigant has consistently found greater than 100% realization rates for NSG.

Recommendation 1. If there is interest, Navigant could conduct additional analysis comparing Oracle and Navigant models to understand underlying causes of this realization rate discrepancy.

Historical Results

Table 4-1 below shows the historical net savings realization rates for the Home Energy Reports Program. The impact analysis method provides net savings directly. Gross savings are not estimated, and there is no NTG ratio.

Table 4-1. Historical Realization Rates and NTG Values

Program Year	PGL Verified Net Savings RR	NSG Verified Net Savings RR	PGL NTG	NSG NTG
GPY1	No Program	No Program		
GPY2	No Program	No Program		
GPY3	105%	98%	NA	NA
GPY4	110%	125%	NA	NA
GPY5	98%	101%	NA	NA
GPY6	92%	116%	NA	NA
2018	106%	129%	NA	NA

Source: Navigant evaluation research. Analysis method provides net savings directly. The program was first offered in GPY3.

5. APPENDIX 1. IMPACT METHODOLOGY DETAIL

5.1 Detailed Data Cleaning

Navigant performed the following data cleaning steps:

- Excluded post-period data from outside of the period of examination (calendar year 2018)
- Filtered to relevant pre-period data for each wave
- Removed exact duplicate observations
- Aggregated bills that ended in the same month
- Excluded outlier observations, defined as observations with average daily usage outside plus or minus one order of magnitude from the median
- Removed observations that did not have a usage value in the same month of the pre-period.

Table 5-1 and Table 5-2 give counts of customers and observations removed for the data cleaning steps identified above. Each data cleaning step removed a similar percentage of treatment and control customers for each wave. This suggests that non-random biases were not introduced into the data by the cleaning steps.

Table 5-1. North Shore Gas CY2018 Data Cleaning Results

Cleaning Step	Customers		Observations	
	Treatment	Control	Treatment	Control
Raw Data	54,485	15,024	4,300,046	1,185,252
Subset to pre/post periods	54,485	15,024	1,266,950	349,382
Remove exact duplicate observations	54,485	15,024	1,266,950	349,382
Bill Flattening	54,485	15,024	1,231,550	339,523
Exclude outliers	54,485	15,024	1,229,491	338,900
Remove pre-period data (for LDV analysis)	54,109	14,907	602,935	166,185
Remove observations without a monthly pre-use value (for LDV analysis)	54,064	14,895	581,249	160,177

Source: Navigant analysis of PGL and NSG customer billing data.

Table 5-2. Peoples Gas CY2018 Data Cleaning Results

Cleaning Step	Customers		Observations	
	Treatment	Control	Treatment	Control
Raw Data	46,417	14,976	3,615,807	1,166,269
Subset to pre/post periods	46,417	14,976	1,070,719	345,119
Remove exact duplicate observations	46,417	14,976	1,070,719	345,119
Bill Flattening	46,417	14,976	1,045,337	336,808
Exclude outliers	46,417	14,976	1,045,291	336,799
Remove pre-period data (for LDV analysis)	45,016	14,519	505,317	162,664
Remove observations without a monthly pre-use value (for LDV analysis)	44,998	14,516	491,182	158,046

Source: Navigant analysis of PGL and NSG customer billing data.

5.2 Detailed Impact Methodology

Navigant used two regression models to estimate impacts: an LDV model and an LFER model. The following sections present each model.

5.2.1 LDV Model

The LDV model controls for non-program differences in energy use between the treatment and control groups using each customer's lagged energy usage as an explanatory variable. In particular, the model frames energy use in calendar month *t* of the post-program period as a function of both the treatment variable and energy use in the same calendar month of the pre-program period. The underlying logic is that systematic differences between control and treatment customers will be reflected in differences in their past energy use, which is highly correlated with their current energy use. Formally, the model is shown in Equation 5-1.

Equation 5-1. Lagged Dependent Variable Regression Model

$$ADU_{kt} = \beta_1 Treatment_k + \sum_J \beta_{2j} Month_{jt} + \sum_J \beta_{3j} Month_{jt} \cdot ADUlag_{kt} + \varepsilon_{kt}$$

where:

ADU_{kt}	is average daily consumption of therms by household k in bill period t
$Treatment_k$	is a binary variable taking a value of 0 if household k is assigned to the control group, and 1 if assigned to the treatment group
$ADUlag_{kt}$	is household k's energy use in the same calendar month of the pre-program year as the calendar month of month t
$Month_{jt}$	is a binary variable taking a value of 1 when $j = t$ and 0 otherwise[10]
ε_{kt}	is the cluster-robust error term for household k during billing cycle t; cluster-robust errors account for heteroscedasticity and autocorrelation at the household level.[11]

The coefficient β_1 is the estimate of the average daily therms energy savings due to the program.

5.2.2 LFER Model

The LFER model used by Navigant is one in which average daily consumption of therms by household k in bill period t, denoted by ADU_{kt}, is a function of the following three terms:

1. The binary variable $Treatment_k$
2. The binary variable $Post_t$, taking a value of 0 if month t is in the pre-treatment period, and 1 if in the post-treatment period.
3. The interaction between these variables, $Treatment_k \cdot Post_t$

Formally, the LFER model is shown in Equation 5-2.

Equation 5-2. Linear Fixed Effects Regression Model

$$ADU_{kt} = \alpha_{0k} + \alpha_1 Post_t + \alpha_2 Treatment_k \cdot Post_t + \varepsilon_{kt}$$

In this model, the coefficient α_{0k} captures all household-specific effects on energy use that do not change over time, including those that are unobservable, the coefficient α_2 captures the average effect *across all households* of being in the post-treatment period, and the effect of being both in the treatment group and in the post period (i.e., the effect directly attributable to the program) is captured by the coefficient α_2. In other words, while the coefficient α_1 captures the change in average daily therms use across the pre- and post-treatment for the *control* group, the sum α_1 + α_2 captures this change for the treatment group, and so α_2 is the estimate of average daily therms energy savings due to the program.

5.3 Detailed Uplift Analysis Results

5.3.1 CY2018 Uplift

Table 5-3 and Table 5-4 present program savings due to participation in other EE programs in CY2018. Each table provides the uplift for a single program group in each of four EE Programs for which estimates for deemed savings are available: Home Energy Jumpstart (HEJ), Home Energy Rebates (HEReb), Multi-Family (MF), Single Family (SF), Weatherization (Wx), and Illinois Home Weatherization Assistance Program (IHWAP). While these tables show estimates of both positive and negative uplift, only positive values were used to adjust program savings for double-counting. For all cases where the EE program did not exist in the pre-program year, the estimate is based on a post-only difference (POD) statistic; otherwise it is based on a difference-in-difference (DID) statistic.[12]

The tables also include the percentage change in EE program participation rate for HER participants. This differs from the change in EE program participation rate for the entire EE program, which is not reported here. These rates should be interpreted with caution because they likely have very wide error bounds,

[10] In other words, if there are *T* post-program months, there are *T* monthly dummy variables in the model, with the dummy variable $Month_{tt}$ the only one to take a value of 1 at time t. These are, in other words, monthly fixed effects.

[11] Ordinary Least Squares (OLS) regression models assume that the data are homoscedastic and not autocorrelated. If either of these assumptions is violated, the resulting standard errors of the parameter estimates are incorrect (usually underestimated). A random variable is heteroskedastic when the variance is not constant. A random variable is autocorrelated when the error term in one period is correlated with the error terms in at least some of the previous periods.

[12] See section 2.5 for more information on POD and DID statistics.

many of which likely include zero. The calculation of standard errors on these rates is not straightforward and therefore Navigant does not report them here.

Table 5-3. CY2018 PGL HER Uplift Adjustment Details

	HEJ	HEReb	IHWAP†	MF	WX	SF
Median program savings (annual therms per participant)*	46.43	276.00	n/a	28.59	77.45	473.27
Number of treatment customers	53,501	53,501	n/a	53,501	53,501	53,501
Treatment rate of participation, CY2018 (%)	0.08%	0.01%	n/a	0.00%	0.00%	0.00
Change in rate of treatment participation from pre-program year (%)	-1.37%	-1.15%	n/a	-0.01%		
Number of control customer	17,268	17,268	n/a	17,268	17,268	17,268
Control rate of participation, CY2018 (%)	0.08%	0.00%	n/a	0.00%	0.01%	0.00
Change in rate of control participation from pre-program year (%)	-1.30%	-1.19%	n/a	-0.01%		
DID or POD statistic	-0.06%	0.05%	n/a	0.00%	0.00%	(0.00)
Participant uplift	(33.89)	24.24	n/a	(0.80)	(2.10)	(3.39)
Statistically significant at the 90% confidence level?	No	No	n/a	No	No	No
Savings attributable to other programs (therms)	(1,573.5)	6,691	n/a	(23.0)	(162.5)	(1,605.84)
Percentage change in EE program participation rate for HER participants	-45%	-120%	n/a	-100%	-68%	-27%

Source: Navigant analysis of PGL program tracking and customer billing data.

* Median program savings are the median therms impacts of HER recipients in each program.

† None of the PGL accounts who received HERs participated in IHWAP, so it did not have an uplift value.

Table 5-4. CY2018 NSG HER Uplift Adjustment Details

	HEJ	HEReb	IHWAP	MF	WX	SF†
Median program savings (annual therms per participant)*	54.78	272.00	318.00	29.96	100.00	n/a
Number of treatment customers	62,892	62,892	62,892	62,892	62,892	n/a
Treatment rate of participation, CY2018 (%)	0.06%	0.03%	0.00%	0.00%	0.01%	n/a
Change in rate of treatment participation from pre-program year (%)	-0.22%	-1.62%		-0.08%		n/a
Number of control customer	17,274	17,274	17,274	17,274	17,274	n/a
Control rate of participation, CY2018 (%)	0.04%	0.02%	0.00%	0.00%	0.01%	n/a
Change in rate of control participation from pre-program year (%)	-0.24%	-1.44%		-0.10%		n/a
DID or POD statistic	0.02%	-0.18%	0.00%	0.03%	0.00%	n/a
Participant uplift	11.27	(113.43)	2.00	16.54	1.36	n/a
Statistically significant at the 90% confidence level?	No	Yes	No	No	No	n/a
Savings attributable to other programs (therms)	617.7	(30,853)	636.0	495.4	135.9	n/a
Percentage change in EE program participation rate for HER participants	48%	-85%		-100%	37%	n/a

Source: Navigant analysis of NSG program tracking and customer billing data.

* Median program savings are the median therms impacts of HER recipients in each program.

† None of the NSG HER recipients or controls participated in the SF program, so it did not have an uplift value.

5.3.2 Legacy Uplift

To determine legacy uplift, Navigant calculated savings for three residential EE programs from previous program years: HEJ, HEReb, and MF. The total resource cost report provided individual measure lives.[13] They are the simple average of the measures included in that program. Table 5-5, Table 5-6, Table 5-7, and Table 5-8 show double counted savings (therms) from each program for GPY3, GPY4, GPY5, and GPY6, respectively. These tables show estimates of both positive and negative uplift; however, only positive uplift was used to adjust program savings for double-counting.

[13] Navigant Consulting, 2016. *Plan Year 1 through 3 Total Resource Cost Test Results and Impact Summary Evaluation Report.* Presented to Peoples Gas

Table 5-5. Doubled Counted Savings (Therms) from GPY3

	HEJ	HEReb	MF
Measure Life	10	15	12
PGL	78	-10,222	3
NSG	2,503	4,195	292

Source: Navigant analysis of PGL and NSG program tracking and customer billing data.

Table 5-6. Doubled Counted Savings (Therms) from GPY4

	HEJ	HEReb	MF
Measure Life	10	15	12
PGL	1,261	-5,067	227
NSG	1,085	-50,262	321

Source: Navigant analysis of PGL and NSG program tracking and customer billing data.

Table 5-7. Doubled Counted Savings (Therms) from GPY5

	HEJ	HEReb	MF
Measure Life	10	15	12
PGL	-2,915	26	34
NSG	2,946	-13,405	495

Source: Navigant analysis of PGL and NSG program tracking and customer billing data.

Table 5-8. Doubled Counted Savings (Therms) from GPY6

	HEJ	HEReb	MF
Measure Life	10	15	12
PGL	-2,479	8,406	63
NSG	1,902	-30,077	495

Source: Navigant analysis of PGL and NSG program tracking and customer billing data.

6. APPENDIX 2. TOTAL RESOURCE COST DETAIL

Table 6-1 the Total Resource Cost table for PGL and NSG includes cost-effectiveness analysis inputs available at the time of finalizing the CY2018 HER impact evaluation report. Additional required cost data (e.g., measure costs, program level incentive and non-incentive costs) are not included in this table and will be provided to evaluation later. Detail in this table (e.g., EULs), other than final CY2018 savings and program data, are subject to change and are not final.

Table 6-1. Total Resource Cost Savings Summary for PGL and NSG

Savings Category	PGL	NSG
Number of Participants	46,417	54,485
Effective Useful Life (Years)	5	5
Ex Ante Savings, therms	523,780	406,173
Verified Net Savings Before Uplift Adjust., therms	570,075	538,238
Verified Net Savings After Uplift Adjust., therms	553,286	522,118

Source: Navigant analysis of PGL and NSG program tracking and customer billing data.