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# X1942A Cross-cutting NEI Study – Utility NEI and Arrearage Data Analysis Results

FINAL REPORT

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## **Table of Contents**

<b>SECTION 1</b>	<b>ABSTRACT .....</b>	<b>3</b>
1.1	PURPOSE.....	3
1.2	BACKGROUND .....	3
1.3	GOAL.....	4
1.4	SUMMARY OF RESULTS.....	4
<b>SECTION 2</b>	<b>STUDY TASKS.....</b>	<b>6</b>
2.1	TASK 1 – STUDY DESIGN AND DATA REQUEST .....	6
2.2	TASK 2 – DATA ASSESSMENT, CLEANING, AND PREPARATION .....	7
2.3	TASK 3 – DATA ANALYSIS .....	8
<b>SECTION 3</b>	<b>RESULTS.....</b>	<b>9</b>
3.1	ARREARAGES.....	9
3.2	SHUTOFFS .....	10
3.3	MONETIZATION.....	11
<b>SECTION 4</b>	<b>RECOMMENDATIONS .....</b>	<b>13</b>

## Section 1 Abstract

### 1.1 PURPOSE

As part of the broader X1942 Non-Energy Impacts (NEIs) study, the NMR study team conducted an analysis to quantify and monetize NEIs that accrue to utilities in the form of financial savings from increased bill affordability and reduced arrears for income-eligible energy conservation/weatherization program participants. The study also attempted to quantify a limited set of complementary NEIs that accrue to the participants. The analysis used electric and gas customer data from Eversource and United Illuminating (UI), Southern Connecticut Gas (SCG) and Connecticut Natural Gas (CNG) on arrearages and shutoffs for participants in the EnergizeCT Home Energy Solutions - Income Eligible (HES-IE) program.<sup>1</sup> This report, which will become a section in the broader X1942 study report, discusses the results from this analysis and presents the pertinent NEIs the study was able to monetize with the data available.

### 1.2 BACKGROUND

The 2018 Connecticut Non-Energy Impacts Literature Review study (R1709) identified and recommended a few key areas for additional research and estimation. With respect to NEIs that accrue to utilities, these key areas included affordability impacts and arrearage impacts estimated through an analysis of data on customer balances, arrearages, collection actions, and pertinent utility costs.

Utilities can realize several NEIs from their low-income energy-efficiency programs in the form of financial savings. Energy-efficient technologies installed by energy-efficiency programs often result in reduced energy bills for participants, which can decrease the likelihood that customers experience difficulties paying their utility bills. In turn, utilities realize financial savings through reduced costs associated with arrearages and late payments, uncollectible bills and bad debt write-offs, service terminations and reconnections, bill-related customer calls, and the bill collections process. In addition, utilities may realize savings from their efficiency programs due to a reduction in safety-related emergency calls and reductions in energy use that is eligible for a rate discount. If utilities offer rate discounts to low-income customers that are subsidized by other ratepayers, energy-efficiency programs that reduce the amount of energy consumed by low-income customers can decrease the quantity of energy sold at the discounted rate.

In addition, energy efficiency program participants could also realize several financial savings NEIs such as avoided reconnect fees and avoided collection calls from increased affordability and reduced arrears.

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<sup>1</sup> For income eligible customers, HES-IE program provides no cost in-home assessment and energy conservation/weatherization services such as blower door guided air sealing, insulation, and energy-efficient heating and cooling equipment. The study excluded participants that received an in-home assessment but had not completed any energy conservation measures.

## 1.3 GOAL

The goal of this part of the X1942 study was to quantify and monetize the following NEIs from increased affordability and reduced arrears that accrue either to the utility or the participants.

- Reduced arrearage carrying cost (utility NEI)
- Reduced bad debt write-off (utility NEI)
- Fewer shutoffs and reconnects (utility NEI)
- Avoided reconnect fees (participant NEI)
- Fewer notices (utility NEI)
- Fewer collections calls (utility and participant NEI)
- Fewer safety-related emergency calls (utility and participant NEI)
- Reduced quantity of energy sold at the discounted rate (utility NEI)

## 1.4 SUMMARY OF RESULTS

Table 1 presents the NEIs that the study was able to quantify and monetize with the data available. The utilities did not systematically track notices, collection calls, and safety-related emergency calls, so they could not provide the data needed to quantify the NEIs related to notices and calls. The utility and participant NEIs related to shutoffs and reconnects were \$0 because the net change in the number of shutoffs for participants from pre- to post-treatment period was not found to be statistically significant for either of the utilities or statewide. The NEI associated with reduced quantity of energy sold at the discounted rate was not applicable because neither of the utilities offered rate discounts to their low-income customers. Table 1 also provides a comparison of the monetized NEIs in this study to the range of NEI values found in the literature from weatherization programs. Currently, none of these NEIs are included in Appendix Six (Non-Energy Impacts) in Connecticut's Program Savings Document (PSD) for use in the Total Resource Cost Test. The NEI values presented in Table 1 are annual values, which are expected to last through the life of the energy conservation/weatherization measures through by the HES-IE program.<sup>2</sup>

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<sup>2</sup> Per Connecticut PSD, measure lives for envelope/weatherization measures range from 15 to 25 years.

Table 1: Summary of Monetized NEIs – Annual NEI per Participant

NEI	Connecticut			NEI Values from Weatherization Programs in the Literature*		
	Eversource	UI	Statewide	Low	High	Typical
Reduced Arrearage Carrying Cost (Utility)	\$0.38	\$0.50	\$0.41	\$1.50	\$4.00	\$2.50
Reduced Bad Debt Write-off (Utility)	\$3.14	\$3.61	\$3.31	\$0.50	\$3.75	\$1.75
Fewer shutoffs and reconnects (Utility)	\$0	\$0	\$0	\$0.10	\$3.65	\$0.65
Avoided reconnect fees (Participant)	\$0	\$0	\$0	\$0.21	\$7.00	\$1.60
Reduced quantity of energy sold at the discounted rate (Utility)	N/A	N/A	N/A	\$3.00	\$25.00	\$13.00
<b>TOTAL</b>	<b>\$3.52</b>	<b>\$4.11</b>	<b>\$3.72</b>	<b>\$5.31</b>	<b>\$43.40</b>	<b>\$19.50</b>

\*Source: Northeast Energy Efficiency Partnerships. (2017). Non-Energy Impacts Approaches and Values: an Examination of the Northeast, Mid-Atlantic, and Beyond. Table 20.

## Section 2 Study Tasks

### 2.1 TASK 1 – STUDY DESIGN AND DATA REQUEST

For the analysis, the treatment group consisted of customers who had participated in the HES-IE program in 2018.<sup>3</sup> The analysis compared the indicators for these customers at the end of 2017 to those at the end of 2019, the years before and after they received program services. This represented the actual change in arrearages, shutoffs, and reconnections for those customers who were served by the program. Some of these changes may have been due to the program, and some of these changes may have been due to other exogenous factors. To control for exogenous factors, the study used the 2020 HES-IE program participants as the comparison group. Later program participants – also referred to as “future” participants – are particularly effective for comparison with prior participants, because they represent other customers that have made the same decision to opt into this specific program. Relative to a non-participant comparison group, future participants are expected to be more aligned with prior participants regarding unobservable characteristics than the general public.<sup>4</sup>

To the extent that the comparison group was similar to the treatment group, the change in indicators for the comparison group represented how the indicators would have changed for the treatment group if they had not received program services. The net change was the difference between the change for the treatment group and the change for the comparison group, and represented the impact of the program, controlling for other exogenous factors.

The comprehensive data request from the utilities requested arrearage- and collections-related transactions histories for the period from January 1, 2017, through December 31, 2019, for all residential customers on:

- Arrearages
- Bad debt write-offs
- Customer calls and collections
- Safety-related emergency calls
- Terminations
- Reconnections
- Late payments
- Notices

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<sup>3</sup> Residential customers of Eversource, UI, CNG and SCG whose annual household income does not exceed 60% of the state's median income are qualified for the HES-IE program. The study excluded HES-IE participants that received an in-home assessment but had not completed any energy conservation measures.

<sup>4</sup> While the study examined the change in indicators from 2017 to 2019 for both the treatment and comparison groups, which is the time period prior to the COVID-19 outbreak, the 2020 participants may have been impacted by COVID and therefore have different characteristics than those who participated in the program in 2018.

To determine the monetary value of the pertinent NEIs, the study requested the following additional information from the utilities:

- Utility annual interest rate on short-term debt
- Percent of total arrears written off for residential customers
- Utility cost per shutoff and reconnect
- Customer reconnection fee
- Utility cost per notice
- Utility cost per collections call
- Utility cost per safety-related emergency call
- Rate discount applicable to eligible low-income participants and participation rate

Finally, the study conducted in-depth interviews with utility staff on the following topics to inform the analysis:

- Relationship between arrears and HES-IE and LIHEAP program referral and participation
- Current shutoff policy and any changes in policy over the past five years

### 2.2 TASK 2 – DATA ASSESSMENT, CLEANING, AND PREPARATION

Upon receipt of the arrearage- and collections-related data from the utilities, the study team inspected the data for completeness and identified any data elements that were missing, incomplete, or potentially incorrect. The study team informed utility data teams of any data issues identified, and scheduled meetings as needed, to discuss and resolve these issues. After all data issues were addressed, the study team cleaned the data, merged them with HES-IE program tracking data, and prepared them for the analysis.

For both Eversource and UI, customer account numbers included in the HES-IE program tracking data were different than the customer billing account numbers included in the arrearages and shutoffs data. In order to be able to merge these two data, the study team asked for a crosswalk of the different account numbers or that the billing account numbers be added to the HES-IE data.

The utilities did not systematically track notices, collection calls, and safety-related emergency calls, so they could not provide the data needed to quantify the NEIs related to notices and calls. The NEI associated with reduced quantity of energy sold at the discounted rate was zero because neither of the utilities offered rate discounts to their low-income customers.

Only the following NEIs could be quantified with the data the utilities were able to provide for the study.

- Reduced arrearage carrying cost (utility)
- Reduced bad debt write-off (utility)
- Fewer shutoffs and reconnects (utility)
- Avoided reconnect fees (participant)

## 2.3 TASK 3 – DATA ANALYSIS

In-depth interviews the study team conducted with utility staff indicated a relationship between having arrearage problems and participating in HES-IE, LIHEAP, and arrearage forgiveness programs. Utilities marked customers with high arrears as having financial hardship and the customers on hardship lists would be more likely to be referred to the HES-IE program, as well as LIHEAP and arrearage forgiveness programs. That meant that using all 2018 HES-IE participants as the treatment group and all 2020 HES-IE participants as the comparison group may overstate the impact of HES-IE on arrears and shutoffs because the estimated change is likely to reflect the impact from participation in forgiveness and LIHEAP programs in addition to the impact from participation in the HES-IE program.

To control for the confounding effects from other programs, the study restricted both the treatment and the comparison group to those who carried arrears upfront (i.e., those who had non-zero arrears in December 2017) so that the two groups were more comparable in their likelihood to participate in those other programs during the study period. In this case, the change in arrears for the comparison group reflected the impact from LIHEAP and the arrearage forgiveness programs and the change in arrears for the treatment group reflected the combined impact from HES-IE as well as these other programs. So, the difference between the two reflected the incremental impact from HES-IE program.

The analysis in customer arrearage- and collections-related data quantified the following indicators for participants compared to the comparison group:

- Change in arrearages
- Change in incidence of shutoffs and reconnects



## Section 3 Results

### 3.1 ARREARAGES

Arrears are customer balances that are past due. For both the treatment and comparison group participants, the study defined arrears as of December 2017 as “Pre” and arrears as of December 2019 as “Post”. The net change, or difference in differences, is the change in arrears for the treatment group minus the change for the comparison group. [Table 2](#) presents the results for the change in arrears when all participants – with or without pre-arrears – were included in the analysis.<sup>5</sup> Average pre-arrears were higher for the treatment group than the comparison group, which implies that the treatment group customers had higher levels of bill payment issues in December 2017, and were, therefore, more likely to be referred to other programs than the comparison group.

**Table 2: Change in Arrears, All Participants**

Utility	Study Group	n	Pre	Post	Change (\$)	Significant at 90%?	Net Change (Difference-in-Differences)		Significant at 90%?
			(Mean Arrears as of Dec 2017)	(Mean Arrears as of Dec 2019)			\$	%	
Eversource	Treatment	3,836	\$112	\$94	-\$18	Yes	-\$36	-32%	Yes
	Comparison	2,048	\$74	\$91	+\$18	Yes			
UI, CNG, SCG	Treatment	1,320	\$124	\$118	-\$6	No	-\$55	-44%	Yes
	Comparison	454	\$73	\$122	+\$49	Yes			
Statewide	Treatment	5,156	\$115	\$100	-\$15	Yes	-\$38	-33%	Yes
	Comparison	2,502	\$74	\$97	+\$23	Yes			

To control for the confounding effects from the differences between the two groups in the likelihood to participate in other programs, which may also help reduce arrears, the analysis restricted the treatment and comparison groups to only those participants who had arrears as of December 2017. [Table 3](#) presents the results when participants with no pre-arrears were excluded. In this case, the pre-arrears were very similar for the two groups (about \$300), which implies that the participants in the comparison group were having similar levels of bill payment issues as those in the treatment group. Therefore, the participants in the two groups were comparable in their likelihood to receive LIHEAP assistance or arrearage forgiveness during the analysis period. The net reduction in arrears for participants with pre-arrears, which was

<sup>5</sup> The analysis did not distinguish participants who receive electric and gas service, electric-only service, or gas-only service from a utility. Each account number listed in the Eversource HES-IE program tracking database was treated as a unique program participant, and each UI account number listed in the UI HES-IE program tracking database, which included UI as well as CNG and SCG customers, was treated as a unique program participant.

statistically significant for both utilities as well as statewide, was \$41 for Eversource, \$60 for UI, CNG, SCG, and \$46 statewide. That corresponds to a 14% reduction in arrears statewide.

**Table 3: Change in Arrears, Participants with Pre-Arrears**

Utility	Study Group	n	Pre	Post	Change (\$)	Significant at 90%	Net Change (Difference-in-Differences)		Significant at 90%
			(Mean Arrears as of Dec 2017)	(Mean Arrears as of Dec 2019)			\$	%	
Eversource	Treatment	1,544	\$308	\$188	-\$120	Yes	-\$41	-13%	Yes
	Comparison	587	\$284	\$205	-\$79	Yes			
UI, CNG, SCG	Treatment	488	\$334	\$242	-\$93	Yes	-\$60	-18%	Yes
	Comparison	98	\$340	\$307	-\$33	No			
Statewide	Treatment	2,032	\$315	\$202	-\$113	Yes	-\$46	-14%	Yes
	Comparison	685	\$298	\$231	-\$67	Yes			

### 3.2 SHUTOFFS

For both the treatment and comparison group participants, the study defined the number of shutoffs per customer in 2017 as “Pre” and the number of shutoffs per customer in 2019 as “Post”. The net change, or difference in differences, is the change in the number of shutoffs per customer for the treatment group minus the change for the comparison group. Table 4 presents the results for the change in the number of shutoffs when all participants – with or without pre-arrears – were included in the analysis. Similar to the pre-arrears, the average number of shutoffs per customer in 2017 was higher for the treatment group than the comparison group when all participants were included in the analysis.

**Table 4: Change in Number of Shutoffs, All Participants**

Utility	Study Group	n	Pre	Post	Change (#)	Significant at 90%?	Net Change (Difference-in-Differences)		Significant at 90%?
			(Shutoffs per customer in 2017)	(Shutoffs per customer in 2019)			#	%	
Eversource	Treatment	3,836	0.057	0.100	+0.044	Yes	+0.009	+15%	No
	Comparison	2,048	0.035	0.070	+0.035	Yes			
UI, CNG, SCG	Treatment	1,320	0.155	0.155	0	No	-0.067	-43%	Yes
	Comparison	454	0.071	0.137	+0.067	Yes			
Statewide	Treatment	5,156	0.082	0.115	+0.032	Yes	-0.009	-11%	No
	Comparison	2,502	0.042	0.083	+0.041	Yes			

To control for the confounding effects from the differences between the two groups in the likelihood to participate in LIHEAP and arrearage forgiveness programs, which may also help prevent shutoffs, the analysis restricted the treatment and comparison groups only to those participants who had arrears as of December 2017. Table 5 presents the results when participants

with no pre-arrears were excluded. This made the two groups more comparable in terms of the number of shutoffs they had in 2017. The results showed a statistically significant increase in the number of shutoffs for Eversource customers in both treatment and comparison groups. The in-depth interviews the study team conducted with the utility staff revealed that while the utility shutoff policy remained the same in the past five years, Eversource increased its enforcement over these years. That increased enforcement was probably the driver for the increase in the shutoffs in 2019 compared to 2017. The net change in the number of shutoffs per customer was not statistically significant at the utility or statewide level.

**Table 5: Change in Number of Shutoffs, Participants with Pre-Arrears**

Utility	Study Group	n	Pre (Shutoffs per customer in 2017)	Post (Shutoffs per customer in 2019)	Change (#)	Significant at 90%?	Net Change (Difference-in-Differences)		Significant at 90%?
							#	%	
Eversource	Treatment	1,544	0.097	0.174	+0.077	Yes	+0.033	+34%	No
	Comparison	587	0.089	0.133	+0.044	Yes			
UI, CNG, SCG	Treatment	488	0.310	0.300	-0.010	No	-0.061	-20%	No
	Comparison	98	0.276	0.327	+0.051	No			
Statewide	Treatment	2,032	0.148	0.204	+0.056	Yes	+0.011	+7%	No
	Comparison	685	0.115	0.161	+0.045	Yes			

### 3.3 MONETIZATION

With the data available, only the following NEIs could be quantified and monetized:

- Reduced arrearage carrying cost (utility NEI)
- Reduced bad debt write-off (utility NEI)
- Fewer shutoffs and reconnects (utility NEI)
- Avoided reconnect fees (participant NEI)

Table 6 shows the calculation of the annual monetary values of the above NEIs.

**Table 6: NEI Monetization**

NEI per participant	Calculation
Reduced arrearage carrying cost (Utility NEI)	Reduction in arrearage per participant with pre-arrears (\$) × % participants with pre-arrears × utility annual interest rate on short-term debt
Reduced bad debt write-off (Utility NEI)	Reduction in arrearage per participant with pre-arrears (\$) × % participants with pre-arrears × % arrears written off (5-year average)
Fewer shutoffs and reconnects (Utility NEI)	Reduction in the number of shutoffs due to non-payment per participant × (utility cost per shutoff + utility cost per reconnect net of customer reconnect fee)
Avoided reconnect fees (Participant NEI)	Reduction in the number of shutoffs due to non-payment per participant × customer reconnect fee

The HES-IE program can reduce arrearages for participants and the associated carrying cost of that debt for the utilities. [Table 7](#) shows the calculations and the resulting monetized NEI value for the reduced arrearage carrying cost. For the utility annual interest rate, instead of using the current interest rates from the utilities, which were at historic lows at the time of this analysis, the analysis chose to use the Federal Funds rate projection, which would better reflect the typical interest rates. The annual NEI is \$0.38 for Eversource, \$0.50 for UI, and \$0.41 statewide.

**Table 7: Reduced Arrearage Carrying Cost**

Utility	Reduction in arrearage per participant (A)	% Participants with pre-treatment arrearage (B)	Utility annual interest rate on short-term debt* (C)	Annual NEI value per participant (A*B*C)
Eversource	\$41	37%	2.5%	\$0.38
UI, CNG, SCG	\$60	33%	2.5%	\$0.50
Statewide	\$46	36%	2.5%	\$0.41

\*Median Federal funds rate projection for 2025 and beyond

The HES-IE program can reduce arrearages for participants, which in turn can reduce the bad debt write offs for the utilities. [Table 8](#) shows the calculations and the resulting monetized NEI value for the reduced bad debt write-off. The annual NEI is \$3.14 for Eversource, \$3.61 for UI, and \$3.31 statewide.

**Table 8: Reduced Bad Debt Write-off**

Utility	Reduction in arrearage per participant (A)	% Participants with pre-treatment arrearage (B)	% Arrears written off (5-year average) (C)	Annual NEI value per participant (A*B*C)
Eversource	\$41	37%	21%	\$3.14
UI, CNG, SCG	\$60	33%	18%	\$3.61
Statewide	\$46	36%	20%	\$3.31

Since the reduction in the number of shutoffs due to non-payment was not statistically significant, which means that it was not statistically significantly different from zero, for either of the utilities or statewide, the monetized values of the utility and participant NEIs related to shutoffs and reconnects were \$0 as shown in [Table 9](#). The NEI associated with reduced quantity of energy sold at the discounted rate was not applicable because neither of the utilities offered rate discounts to their low-income customers.

**Table 9: Other NEIs – Annual NEI per Participant**

NEI	Eversource	UI	Statewide
Fewer shutoffs and reconnects (utility)	\$0	\$0	\$0
Avoided reconnect fees (participant)	\$0	\$0	\$0
Reduced quantity of energy sold at the discounted rate (utility)	N/A	N/A	N/A

## Section 4 Recommendations

Neither Eversource nor UI currently tracks data on customer notices, collection calls, and safety-related emergency calls in a systematic manner. Because of the absence of data on these metrics, any potential utility and participant NEIs associated with fewer notices, collection calls, and safety-related emergency calls as a result of HES-IE program participation could not be quantified in this study. The typical annual per-participant values found in the literature for weatherization programs for NEIs associated with fewer notices, collection calls, and safety-related emergency calls, are \$0.60, \$0.90, and \$3.25, respectively.<sup>6</sup> The study team recommends that the utilities either use these values from the literature or start tracking these metrics so that future NEI studies could quantify the associated NEIs specific to HES-IE program participants.

The customer account numbers included in the HES-IE program tracking data were different than those tracked in the customer shutoffs and arrearage data from UI, CNG, and SCG.<sup>7</sup> In order to be able to link the data for the same customer across the different datasets in the future, the study team recommends that the HES-IE program tracking database include the customer account numbers used by the billing department.

The study found that the reduction in the number of shutoffs due to non-payment was not statistically significantly different from zero. A potential confounding factor for that analysis was a change in the enforcement of service disconnection due to non-payment policy by Eversource. The study team recommends that utility and participant NEIs related to shutoffs and reconnects be revisited in a future NEI study.

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<sup>6</sup> Northeast Energy Efficiency Partnerships. (2017). Non-Energy Impacts Approaches and Values: an Examination of the Northeast, Mid-Atlantic, and Beyond. Table 20.

<sup>7</sup> For Eversource, account numbers were listed in different formats in the two tracking systems. Reformatting of account numbers in the HES-IE program tracking database was sufficient to link the data for the same customer across the two tracking systems.