

Overview of Non-Energy Impacts and Energy Optimization in the 2021-2023 Plan

NH Benefit Cost Working Group July 31, 2020

Powered hv:







NEI Evaluations: Crosscutting Review

Cross-cutting NEI Review, DNV-GL

- Methods (detailed in memo at PUC evaluation website¹
 - 1. Reviewed 41 NEI studies from other jurisdictions to populate database of NEI values
 - 2. Matched NEI values to NH programs (all programs & measures, both resi & C&I)
 - 3. Develop Confidence Factors to assess the level of rigor of each study
 - 4. Develop Plausibility Factors to measure of relevance of NEIs to the NH measure list
 - 5. Construct economic adjustment factors to make NEIs from other jurisdictions NH specific
 - 6. Develop final calculation for database of adjusted NH NEI values

• Results:

- 1. Database of NEI values, with adjustment factors (discounts), and matched to our BC Model
- 2. Gap analysis (not final), identifying sectors and end-uses without matched NEIs from the jurisdictional scan, or where matched NEIs are deeply discounted (i.e., adjusted)
- 3. Sensitivity analysis²
 - BC ratio results for each utility, without NEIs, with current adders, and with measurespecific NEIs from database applied

¹ <u>https://puc.nh.gov/Electric/Monitoring%20and%20Evaluation%20Reports/Final-NH-NEI-Methodology-Memo-20200409.pdf</u> ² <u>https://puc.nh.gov/Electric/Monitoring%20and%20Evaluation%20Reports/NH-NEI-Sensitivity-Memo-final.pdf</u>



Eversource 2020 NEI Sensitivity

	2020					
		Total Resource Benefit/Cost Ratio				
			With	With	With	With
		With	NEIs and	NEIs and	NEIs and	NEIs and
	Without	10% NEI	100%	90%	80%	50%
	NEIs	Adder	energy	energy	energy	energy
			savings	savings	savings	savings
e	1.48	1.62	2.24	2.22	2.20	2.14
	2.44	2.68	2.92	2.88	2.84	2.71
Energy Star	2.00	2.19	5.27	4.94	4.61	3.62
	1.53	1.65	18.32	16.96	15.60	11.51
	1.69	1.86	37.08	36.95	36.82	36.44
	1.81	1.98	8.09	7.72	7.35	6.23
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Solutions	1.91	2.10	2.24	2.08	1.92	1.43
Solutions	1.51	1.66	1.80	1.68	1.56	1.21
ons	1.10	1.21	1.36	1.27	1.18	0.90
ogram	1.53	1.69	1.53	1.45	1.36	1.11
& Industrial	1.69	1.85	1.97	1.83	1.70	1.29
	1.72	1.89	4.03	3.81	3.59	2.95

Residential Programs

Home Energy Assistance Energy Star Homes Home Performance with Energy Star Energy Star Products Home Energy Reports Sub-Total Residential

Commercial, Industrial & Municipal

Large Business Energy Solutions Small Business Energy Solutions Municipal Energy Solutions Energy Rewards RFP Program Sub-Total Commercial & Industria

Total

*Note: HER BCR heavily influenced by very low per participant cost relative to NEI per participant. **Similar results for other utilities—can be seen in the full memo on the PUC evaluation site.

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	Home Energy Assistance, Eversource			Ì
	PA	Eversource		
	Program	(Multiple Items)		
	Rov Labels 🔹	Sum of Adjust	ed NEI Value	
	🖻 \$/household/year	\$	1,094.55	
	Avoided pollution - Societal - Residential	\$	3.37	
	Bad Debt Write-offs - Utility - Residential	\$	1.49	
	Calls to utility - Utility - Residential	\$	0.41	
	Carrying cost on arrearages - Utility - Residential	\$	0.70	
	Ease of Selling or Leasing - Participant - Residential	\$	0.72	
	Economic development – Societal – Residential	\$	1,008.48	
	Fewer moves - Participant - Residential	\$	0.24	
	Fires/insurance damage - Participant - Residential	\$	0.01	
	Health and safety - Participant - Residential	\$	1.35	
	National Security - Societal - Residential	\$	66.69	
	Other Impacts - Utility - Residential	\$	9.71	
	Shutoffs/Reconnects - Utility - Residential	\$	0.01	
	Transmission and distribution savings - Utility - Residential	\$	0.45	
	Water/Wastewater - Participant - Residential	\$	0.92	
	🗏 \$/installed measure/lifetime	\$	93.53	
	Lighting Quality and Lifetime - Participant - Residential	\$	93.53	
	🗏 \$/installed measure/year	\$	2,314.35	
	Bad Debt Write-offs - Utility - Residential	\$	17.36	
	Calls to utility - Utility - Residential	\$	152.78	
1	Carrying cost on arrearages - Utility - Residential	\$	12.12	
1	Ease of Selling or Leasing - Participant - Residential	\$	132.60	
	Health and safety - Participant - Residential	\$	1,457.43	
	Noise – Participant – Residential	\$	227.90	
	Notices - Utility - Residential	\$	1.58	
	Other - Participant - Residential	\$	24.07	
	Shutoffs/Reconnects - Utility - Residential	\$	2.00	
	Thermal Comfort - Participant - Residential	\$	286.52	
	🗏 \$/installed unit/year	\$	333.03	
	Health and safety - Participant - Residential	\$	76.68	
	0&M - Participant - Residential	\$	256.35	
	🗏 \$/k\h/year	\$	0.36	
	Avoided illness from pollution - Participant - Residential	\$	0.00	
	Avoided pollution - Societal - Residential	\$	0.00	
	Fires/insurance damage - Participant - Residential	\$	0.01	
	Other Impacts - Utility - Residential	\$	0.33	
	Productivity - Participant - Residential	\$	0.01	
	🖻 \$/measure/year	\$	0.40	
	Waste disposal - Societal - Residential	\$	0.40	
	🗏 \$/therm/year	\$	2.62	
	Other Impacts - Utility - Residential	\$	2.62	
:	Grand Total	\$	3,838.84	



NEI Evaluations: HEA NEI Review

Home Energy Assistance Impact/Process/NEI Evaluation, Opinion Dynamics

Methods

1. Quantified select participant and utility NEIs:

Researched Utility and Participant Non-Energy Impacts			
Utility	Reduced arrearages		
	Reduced asthma symptoms		
Deuticineut	Reduced thermal stress (both hot and cold)		
Participant	Improved comfort		
	Decreased internal/external noise		

- 2. Participant NEIs:
 - Increased comfort and decreased noise: **surveys** to estimate share of participants that experienced these NEIs and their perceived value relative to the energy savings
 - Health-related NEIs: **survey** data on incidence of seeking medical attention before and after participation in the HEA Program; **secondary research** to quantify the dollar impact of medical attention
- 3. Utility NEIs: Analysis of **utility arrearage data**, using a "difference-in-difference" approach to compare participants' unpaid balances before HEA treatment to unpaid balances after treatment (vs. change for non-participants).



HEA NEI Results

• Participant NEIs

Participant NEI Results Summary			
Variable	Monetary NEI		
Increased comfort	\$416,302		
Decreased noise inside the home	\$22,284		
Decreased noise coming from outside the home	\$84,154		
Avoided overnight hospital stays due to reduced asthma symptoms	\$8,064		
Reduced doctor visits for colds/illnesses related to thermal stress	\$41.81		
Total Participant NEIs	\$531,078		
Participant NEI per 2016-2017 HEA Participants	\$343		

• Utility NEIs

Summary of Electric Arrearage Analysis				
	Average per Month			
Utility	Unpaid Amount in the	Un-paid Amount in	Percent	
	Pre-Period	the Post Period	Change	
NHEC Electric Arrearage Reduction*	\$23.30	\$5.93	-25%	
Eversource Electric Arrearage Reduction ⁺	\$85.63	\$58.45	-32%	

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*Eversource's reduction is *not* statistically significant, because despite the reduction in <u>average</u> amount unpaid shown above, the <u>incidence</u> of unpaid bills drastically increased—~700 out of 761 unpaid bills were in the post-period.
→ Methodological limitations—participation often coincides with financial hardships....

**Data for Unitil and Liberty was unavailable for arrearage analysis.

NEI Options for BC Modeling

• Option 1: Keep the current adders in place for all sectors

- HEA 20% adder for GST and GST-2
- Residential 10% adder for GST-2
- C&I 10% adder for GST-2

Status quo – requires no updates to models or methodology

• Option 2: Use DNV NEIs for all sectors, plus HEA study results

- HEA \$343 NEI per participant plus non-duplicative NEIs from DNV for GST and GST-2
- Residential NEIs from DNV for GST-2
- C&I NEIs from DNV for GST-2

Models to be updated to accommodate measure-level assumptions; potentially subject to false precision in secondary tests

- Option 3: Measure-specific NEIs for HEA, and adders for Residential and C&I
 - HEA \$343 NEI per participant plus non-duplicative NEIs from DNV for GST and GST-2
 - Residential 10% adder for GST-2
 - C&I 10% adder for GST-2

Models to be updated to accommodate measure-level assumptions; higher bar for rigor (measure-level) for NEIs in primary test; other residential and C&I measures retain more streamlined adders for secondary test

Energy Optimization – Pilot Goal

- Test Energy Optimization ("EO") approaches, with the goal of minimizing customers' total energy usage across all energy sources and maximizing customers' benefits
 - The pilot will focus on conversions from delivered fossil-fuel systems to higher efficiency electric systems
- Test key regulatory questions related to accounting for EO costs and benefits to the utility system, participants, and non-participants
 - \circ Electricity load and fossil fuel savings \rightarrow net MMBtu impacts

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- o Impact on summer or winter peak demand
- Potential load factor improvements and opportunities for ratepayer benefits due to increased kWh sales without significant system cost increases
- o Participant and non-participant bill impacts

Energy Optimization – Pilot Design

- Targeting 100 participants per year
- Homes heated with delivered fuels, and where homeowners are not already planning to install HPs for heating:
 - customers with central A/C systems that are failing or old;
 - customers with window A/C units;
 - o customers actively considering installation of a central A/C system
 - o customers interested in heat pumps as a cooling solution

• Multiple participation pathways

• HPwES program customers (past, present, and future)

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- Existing customers of HVAC contractors
- o Solar PV utility net metering customers
- Direct market (as needed)

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Energy Optimization – Pilot Design

• Eligibility requirements:

- Cold-climate central or mini-split HP
- Installation of integrated controls that determine which heating system will operate based on outdoor air temperatures
- Conversion of heating source for at least one full heating zone
- Provide two years of delivered fuel billing records or sign a release form allowing collection of billing records from fuel company for two years prior and up to two year after installation, for evaluation purposes

• Recommended, but not required:

o Weatherization

EVERS URCE

• Maintain existing heating system

Liberty Utilities

Electric Co-op

Energy Optimization – Pilot Design

Proposed incentive structure

REBATE CALCULATOR

		Per Ton (MA)
	per zone	\$0
-	per ton	\$1,250
Home	Mini Splits	
2	ton	\$2,500
1	zone	
2	ton	\$2,500
2	zone	
3	ton	\$3,750
2	zone	
4	ton	\$5,000
2	zone	
	ASHPs (central)	
3	ton	\$3,750
1	zone	
4	ton	\$ 5,000
1	zone	

Incentives:

- \$1,250 per ton. Average incentive \$4,000
- Cost per ton is approximately \$3,800 installed
- Considering additional \$250 per ton if customer enrolls in HPWES

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Energy Optimization – PI

- Costs are included in the PI calculation, savings and benefits are not
- Same approach taken with the DR pilots in 2019 and 2020



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Energy Optimization – Evaluation

Impact and process evaluation beginning in 2021, under EM&V Working Group oversight. Gather data as projects are installed through 2022-23, to inform future decisions on expanding to full scale program:

- Impact evaluation to measure impacts on total energy consumption for both heating and cooling, and across all fuels, via analysis of
 - o heat pump usage data from integrated control systems
 - o delivered fuels billing data, where available
 - o whole home electric usage data from the NH Utilities
- Process evaluation, including post-inspection customer surveys, and contractor surveys or interviews to assess
 - o pilot design and offerings,
 - o understand customer behavior and satisfaction
 - o contractor technical capacity and training needs
 - o equipment configurations and baselines