

ComEd Electric Homes New Construction Pilot Impact Evaluation Report

Energy Efficiency/Demand Response Plan:
Program Year 2021 (CY2021)
(1/1/2021-12/31/2021)

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Prepared by:

Michael Frischmann
EcoMetric Consulting

Pranav Wale
EcoMetric Consulting

Himanshu Haridas
EcoMetric Consulting



Submitted to:

ComEd
2011 Swift Drive
Oak Brook, IL 60523

Submitted by:

Guidehouse Inc.
150 N. Riverside Plaza, Suite 2100
Chicago, IL 60606

Contact:

Charles Maglione, Partner
703.431.1983
cmaglione@guidehouse.com

Jeff Erickson, Director
608.616.4962
jeff.erickson@guidehouse.com

Patricia Plympton, Associate Director
202.253.9356
patricia.plympton@guidehouse.com

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1. Introduction

This report presents the results of the impact evaluation of the CY2021 Electric Homes New Construction (EHNC) Pilot.

It summarizes the total energy and demand impacts for the pilot broken out by relevant pilot structure details. The appendices provide the impact analysis methodology and the total resource cost (TRC) analysis inputs. The CY2021 reporting period for this pilot includes projects completed between May 1, 2020 and December 31, 2021.¹

¹ The EHNC Pilot paid the first incentives for all-electric homes in Q3 CY2020. Due to the small number of participants and initial ramp up of the pilot, ComEd did not claim savings in CY2020. Guidehouse included all pilot projects completed to date in this CY2021 pilot report.

2. Pilot Description

The EHNC Pilot provides incentives to builders for the construction of energy efficient all-electric homes. The pilot targets single-family homes, duplexes, townhomes, 2-4 flats, or accessory dwelling units. Eligible projects receive an incentive of \$2,000 for installing a best-practice suite of energy efficient electric measures. Builders may install a list of prescriptive measures or meet a performance-based compliance approach. There were no projects completed using the performance-based compliance approach.

The pilot had nine participating builders and 18 completed homes (see Table 2-1).

Table 2-1. Number of Participants and Projects

Participation	Total
Total Homes	18
Total Participants	9

Source: ComEd tracking data and evaluation team analysis

3. Pilot Savings Detail

Table 3-1 summarizes the incremental energy and demand savings the EHNC Pilot achieved in CY2021. There are no gas savings from this pilot.

This was a new pilot for CY2021 and did not have a net-to-gross (NTG) value deemed through the Illinois Stakeholder Advisory Group (SAG) process. Guidehouse provided a NTG research memo to ComEd in September 2021, which recommended a NTG value of 0.80 for CY2021.²

Table 3-1. Total Annual Incremental Electric Savings

Savings Category	Units	Ex Ante Gross Savings	Pilot Gross Realization Rate	Verified Gross Savings*	Pilot Net-to-Gross Ratio (NTG)	CY2019 Net Carryover Savings	CY2020 Net Carryover Savings	Verified Net Savings
Electric Energy Savings - Direct	kWh	171,166	1.12	192,185	0.8	N/A	N/A	153,748
Electric Energy Savings - Converted from Gas	kWh	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total Electric Energy Savings	kWh	171,166	1.12	192,185	0.8	N/A	N/A	153,748
Summer Peak§ Demand Savings	kW	13.87	1.10	15.32	0.8	N/A	N/A	12.25

N/A = not applicable (refers to a piece of data that cannot be produced or does not apply).

§ The coincident summer peak period is defined as 1:00-5:00 p.m. Central Prevailing Time on non-holiday weekdays, June through August.

Source: ComEd tracking data and evaluation team analysis

² Guidehouse, "ComEd EHNC CY2021 NTG Memo," September 30, 2021.
<https://ilsag.s3.amazonaws.com/ComEd-EHNC-CY2021-NTG-Memo-2021-09-30-Final.pdf>

4. Cumulative Persisting Annual Savings

Table 4-1 and Figure 4-1 show the measure-specific and total verified gross savings for the EHNC Pilot and the cumulative persisting annual savings (CPAS) for the measures installed in CY2021. The electric CPAS across all measures installed in 2021 is shown in Table 4-1. The historic rows in the table would be the CPAS contribution back to CY2018. Because the EHNC Pilot was new in CY2021, there are no historic CPAS values. Figure 4-1 shows the savings across the effective useful life (EUL) of the measures.

There were no gas savings for this pilot so electric CPAS is equivalent to total CPAS.

Table 4-1. Cumulative Persisting Annual Savings – Electric

End Use Type	Research Category	EUL	CY2021 Verified Gross Savings (kWh)	NTG*	Lifetime Net Savings (kWh)†	Verified Net kWh Savings									
						2018	2019	2020	2021	2022	2023	2024	2025	2026	
Whole Home	Electric Home New Construction	15.1	192,185	0.80	2,319,002				153,748	153,748	153,748	153,748	153,748	153,748	
CY2021 Pilot Total Electric Contribution to CPAS									153,748	153,748	153,748	153,748	153,748	153,748	
Historic Pilot Total Electric Contribution to CPAS‡						-	-	-	-	-	-	-	-	-	
Pilot Total Electric CPAS						-	-	-	153,748	153,748	153,748	153,748	153,748	153,748	
CY2021 Pilot Incremental Expiring Electric Savings§															
Historic Pilot Incremental Expiring Electric Savings															
Pilot Total Incremental Expiring Electric Savings															

End Use Type	Research Category	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Whole Home	Electric Home New Construction	153,748	153,748	153,748	153,748	153,748	153,748	153,748	153,748	153,748	12,788	-	-
CY2021 Pilot Total Electric Contribution to CPAS		153,748	153,748	153,748	153,748	153,748	153,748	153,748	153,748	153,748	12,788	-	-
Historic Pilot Total Electric Contribution to CPAS‡		-	-	-	-	-	-	-	-	-	-	-	-
Pilot Total Electric CPAS		153,748	153,748	153,748	153,748	153,748	153,748	153,748	153,748	153,748	12,788	-	-
CY2021 Pilot Incremental Expiring Electric Savings§		-	-	-	-	-	-	-	-	-	140,960	12,788	-
Historic Pilot Incremental Expiring Electric Savings		-	-	-	-	-	-	-	-	-	-	-	-
Pilot Total Incremental Expiring Electric Savings		-	-	-	-	-	-	-	-	-	140,960	12,788	-

Note: The green highlighted cell shows pilot total first-year electric savings. The gray cells are blank, indicating values irrelevant to the CY2021 contribution to CPAS.

* A deemed value. Source: <https://ilsag.s3.amazonaws.com/ComEd-EHNC-CY2021-NTG-Memo-2021-09-30-Final.pdf>.

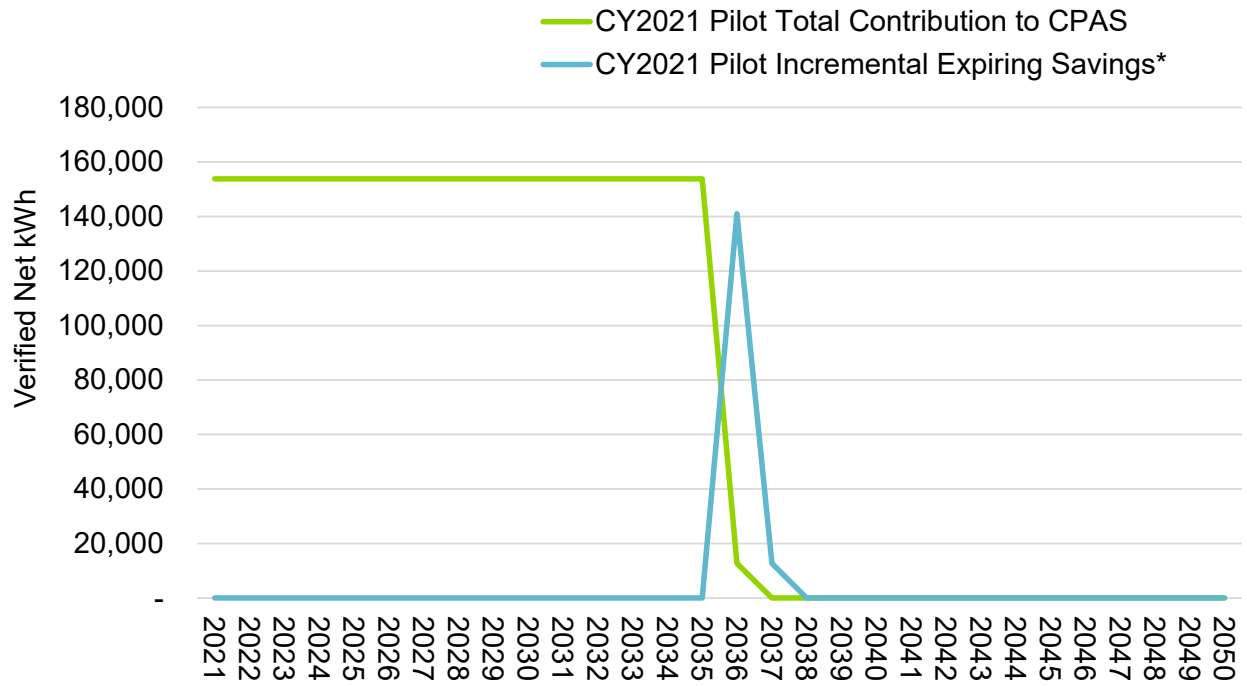
† Lifetime savings are the sum of CPAS savings through the EUL.

‡ There are no historic savings for this pilot.

§ Incremental expiring savings are equal to CPAS Y_{n-1} - CPAS Y_n.

Source: Evaluation team analysis

Figure 4-1. Cumulative Persisting Annual Savings



* Expiring savings are equal to CPAS Y_{n-1} - CPAS Y_n .

Source: Evaluation team analysis

5. Pilot Savings by Measure

The evaluation team analyzed savings for the EHNC Pilot at the site level and so are not reporting measure-level savings. For more information about site-level savings, see Appendix A.

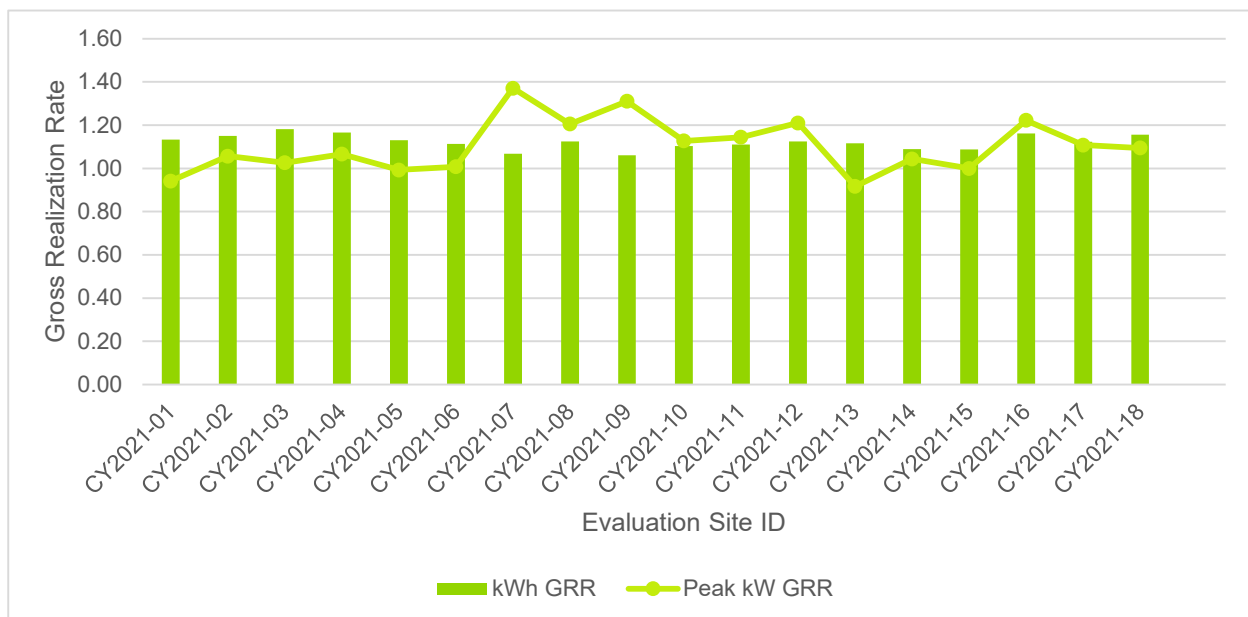
6. Impact Analysis Findings and Recommendations

The evaluation team reviewed the input assumptions used to calculate savings from eligible measures. The team determined whether the project-specific savings assumptions are consistent with v8.0 or v9.0³ of the IL-TRM. Guidehouse used IL-TRM v8.0 to evaluate projects that closed before December 31, 2020, and IL-TRM v9.0 for projects that closed between January 1 and December 31, 2021.

The evaluation team completed a census review of the 18 projects completed through the pilot.

Figure 6-1 compares each evaluated project’s energy and demand realization rates. The CY2021 energy savings realization rates ranged from 1.06 to 1.18, which resulted in a pilot-level realization rate of 1.12. The gross peak demand realization rates ranged from 0.92 to 1.37, resulting in a pilot-level realization rate of 1.10.

Figure 6-1. Energy and Demand Realization Rates



Source: ComEd tracking data and evaluation team analysis

The evaluation team developed several recommendations for ComEd based on findings from the CY2021 evaluation. These recommendations are similar to those presented during the Wave 1 review memo. Two items had the largest effect on adjusting ex ante gross savings: the heating derating factors for heat pump quality installation, and secondary electric savings from water conservation measures. These two items applied to all of the reviewed projects in CY2021.

Finding 1. The ex ante data included summary data for total kWh but did not separate the secondary and heating penalty kWh values. However, the data include secondary savings and

³ The time period for this pilot spans 2020 and 2021.

heating penalties within the project workbooks for each home. Guidehouse used these workbook calculations to generate the verified secondary kWh and heating penalty savings.

Recommendation 1. Separate the secondary kWh savings from the water conservation measures and electric heating penalty kWh in the tracking data to be consistent with other ComEd programs and pilots. The applicable key fields are *Total_Gross_Gallons*, *Total_Secondary_Gross_kWh_from_Water* for secondary water savings, and *Total_Gross_Electric_Heating_Penalty* for electric heating penalties. This process also serves to cross-check savings values to ensure secondary savings and heating penalties are correctly included.

Finding 2. The savings spreadsheet includes the calculation of savings from installing high efficiency air source heat pumps. The savings algorithm correctly follows the Illinois Technical Reference Manual (IL-TRM), v8.0 or v9.0,⁴ to determine the cooling energy savings. However, the algorithm for heating savings did not include the derating or adjustment factors (*DeratingHeat_{Eff}*, *DeratingHeat_{Base}*, and *HSPF_{adj}*). Guidehouse incorporated these factors into the heating savings algorithm for heat pumps in the verified savings. Per the IL-TRM v8.0 and v9.0,⁵ *DeratingHeat_{Base}* equals 10% and *DeratingHeat_{Eff}* is equal to 0% if quality installation is performed. Including the derating factors increased the average per-home savings by 11%. This adjustment represented the largest influence on the pilot's realization rate of 1.12 for electric savings.

Recommendation 2. Include the derating factors in calculating heating savings from air source heat pumps to be consistent with the IL-TRM.

Finding 3. There is an error in the savings spreadsheet for measure 11, High-Performance Water Heating Equipment, where the useful life incorrectly transfers to the summary page. The error occurs because the tankless water heater's useful life is left blank, causing the formula to return zero useful life regardless of the installed water heater. The ex ante useful life was calculated using zero-year lifetimes for high-performance water heaters, which lowered the weighted average measure life (WAML) for each home in the sample. Guidehouse fixed this error and included the useful life for the water heating equipment in the verified calculations. Including the water heater savings for the 15-year useful life increased the WAML for each home from about 11 years to about 15 years.⁶

Recommendation 3. Update the savings workbook to fix the formula error causing the useful life for high-performance water heaters to be zero. The error occurs on the M11 tab of the workbook in the blank rows associated with tankless water heater useful lives.

Finding 4. The pilot inconsistently calculated secondary electric savings from water supply and wastewater treatment savings. The formulas for secondary water savings in the project workbooks include a logic statement that uses the IL-TRM version (i.e., TRM8, TRM9, etc.) to determine if secondary water savings are appropriate. Both IL-TRM v8.0 and IL-TRM v9.0 include calculations of secondary electric savings from water-reducing measures. Guidehouse

⁴ Measure 5.3.1, Air Source Heat Pump. Guidehouse used the IL-TRM v8.0 for projects completed in CY2020 and IL-TRM v9.0 for projects completed in CY2021.

⁵ For projects completed during CY2020, the evaluation team used IL-TRM v8.0 to verify savings. For projects completed during CY2021, the team used IL-TRM v9.0 to verify savings.

⁶ The verified WAML for each home varies depending on the measure-specific savings and ranged from 14.5 years to 15.5 years for the Wave 1 projects.

included secondary water savings in the verified savings calculations for hot water conservation and efficient appliance measures (measures 12 and 13 in the savings workbook). Secondary water savings represent less than 1% of pilot savings.

Recommendation 4. Update the savings workbook to include secondary water savings calculations in the ex ante savings.

Finding 5. The pilot calculations included the coincidence factor for peak demand savings when applicable. The appropriate measures in the IL-TRM include different coincidence factors depending on if the home is single-family or multifamily. The coincidence factor (CF_{pjm}) was not always updated to the appropriate value for single-family homes. The evaluation team used CF_{pjm} of 0.466 for single-family homes and 0.285 for multifamily homes per measure 5.3.1 of the IL-TRM v9.0.

Recommendation 5. Use the appropriate coincidence factor for air source heat pumps (measure 4 in the workbook) depending on if the home is single-family or multifamily.

Appendix A. Impact Findings Detailed Results

The EHNC Pilot contained 18 projects. Table A-1 and Table A-2 show each project’s verified energy and peak demand savings.

Table A-1. CY2021 Energy Savings by Project

Evaluation Site ID	Ex ante Gross Savings (kWh)	Verified Gross Realization Rate	Verified Gross Savings (kWh)	NTG*	Verified Net Savings (kWh)
CY2021-01	6,127	1.13	6,946	0.80	5,557
CY2021-02	7,649	1.15	8,795	0.80	7,036
CY2021-03	14,434	1.18	17,055	0.80	13,644
CY2021-04	6,906	1.17	8,048	0.80	6,439
CY2021-05	8,723	1.13	9,862	0.80	7,890
CY2021-06	10,119	1.11	11,269	0.80	9,015
CY2021-07	8,927	1.07	9,530	0.80	7,624
CY2021-08	9,135	1.13	10,277	0.80	8,222
CY2021-09	9,291	1.06	9,850	0.80	7,880
CY2021-10	6,854	1.10	7,558	0.80	6,046
CY2021-11	11,205	1.11	12,442	0.80	9,953
CY2021-12	8,954	1.13	10,075	0.80	8,060
CY2021-13	7,836	1.12	8,750	0.80	7,000
CY2021-14	11,511	1.09	12,533	0.80	10,027
CY2021-15	11,936	1.09	12,984	0.80	10,387
CY2021-16	14,107	1.16	16,389	0.80	13,111
CY2021-17	10,581	1.12	11,877	0.80	9,502
CY2021-18	6,871	1.16	7,944	0.80	6,355

Source: ComEd tracking data and evaluation team analysis

*<https://ilsag.s3.amazonaws.com/ComEd-EHNC-CY2021-NTG-Memo-2021-09-30-Final.pdf>

Table A-2. Peak Demand Savings by Project

Evaluation Site ID	Ex ante Gross Savings (kW)	Verified Gross Realization Rate	Verified Gross Savings (kW)	NTG*	Verified Net Savings (kW)
CY2021-01	0.60	0.94	0.56	0.80	0.45
CY2021-02	0.60	1.06	0.63	0.80	0.51
CY2021-03	1.30	1.03	1.33	0.80	1.07
CY2021-04	0.50	1.07	0.53	0.80	0.43
CY2021-05	0.60	0.99	0.60	0.80	0.48
CY2021-06	0.80	1.01	0.81	0.80	0.64
CY2021-07	0.80	1.37	1.10	0.80	0.88
CY2021-08	0.70	1.21	0.84	0.80	0.67
CY2021-09	0.80	1.31	1.05	0.80	0.84
CY2021-10	0.60	1.13	0.68	0.80	0.54
CY2021-11	1.10	1.14	1.26	0.80	1.01
CY2021-12	0.60	1.21	0.73	0.80	0.58
CY2021-13	0.60	0.92	0.55	0.80	0.44
CY2021-14	0.90	1.04	0.94	0.80	0.75
CY2021-15	1.06	1.00	1.06	0.80	0.85
CY2021-16	0.90	1.22	1.10	0.80	0.88
CY2021-17	0.73	1.11	0.80	0.80	0.64
CY2021-18	0.68	1.09	0.74	0.80	0.60

Source: ComEd tracking data and evaluation team analysis

*<https://ilsaq.s3.amazonaws.com/ComEd-EHNC-CY2021-NTG-Memo-2021-09-30-Final.pdf>

Appendix B. Total Resource Cost Detail

Table B-1 shows the TRC cost-effectiveness analysis inputs available at the time of finalizing this impact evaluation report. This table does not include additional required cost data (e.g., measure costs, pilot-level incentives, and non-incentive costs). ComEd will provide this data to the evaluation team later.

Table B-1. Total Resource Cost Savings Summary

End Use Type	Research Category	Units	Quantity	EUL (years)*	ER Flag†	Gross Electric Energy Savings (kWh)	Gross Peak Demand Reduction (kW)	Gross Gas Savings (Therms)	Gross Secondary Savings due to Water Reduction (kWh)	Gross Heating Penalty (kWh)§	Gross Heating Penalty (Therms)	NTG (kWh)	NTG (kW)	NTG (Therms)	Net Electric Energy Savings (kWh)	Net Peak Demand Reduction (kW)	Net Gas Savings (Therms)	Net Secondary Savings due to Water Reduction (kWh)	Net Heating Penalty (kWh)§	Net Heating Penalty (Therms)
Whole Home	Electric Home New Construction	Homes	18	15.1	NO	191,424	15.32	0	760	-4,473	0	0.80	0.80	0.80	153,139	12.25	0	608	-3,578	0
	Total			15.1		191,424	15	0	760	-4,473	0				153,139	12	0	608	-3,578	0

Note: To avoid double counting, the verified gross kWh and net kWh used in the TRC analysis exclude secondary energy savings from water reduction measures. The pilot saved 258,855 gallons of water representing 760 gross kWh and 608 net kWh.

* The total of the EUL column is the WAML and is calculated as the sum product of EUL and measure savings divided by total pilot savings.

† Early replacement (ER) measures are flagged as YES, otherwise a NO is indicated in the column.

§ The kWh savings account for electric heating penalties, where applicable. The electric heating penalties columns show the magnitude of adjustments applied to the pilot savings.

Source: ComEd tracking data and evaluation team analysis