Guidehouse

ComEd ENERGY STAR Retail Products Platform Pilot Impact Evaluation Report

Energy Efficiency / Demand Response Plan:
Program Year 2020 (CY2020)
(1/1/2020-12/31/2020)

Prepared for:

ComEd

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Prepared by:

Sagar Deo
Guidehouse

Patricia Plympton
Guidehouse

Jason Christensen
Cadmus

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 results from the CY2020 impact evaluation of ComEd's ENERGY STAR® Retail Products Platform Pilot (RPP Pilot). It summarizes the total energy and demand impacts for the pilot broken out by relevant measure and pilot structure details. The appendices provide the impact analysis methodology and details of the total resource cost (TRC) inputs. CY2020 covers January 1, 2020 through December 31, 2020.

This report also represents the first time that an Illinois evaluator calculated savings for a market transformation program using the principles in Illinois Technical Reference Manual (TRM) Attachment C: "Framework for Counting Market Transformation Savings in Illinois."[1] Guidehouse used best available data sources and best available methodologies to estimate first-year savings for ComEd's RPP Pilot. As described in TRM Attachment C, in addition to estimating a Natural Market Baseline using full-category sales data, an essential aspect of market transformation programs is establishing and assessing Market Progress Indicators (MPIs) that measure the amount of influence that the program has had on the market in the short, medium and long-term. Appendix C contains the implementer's description of the role of MPIs as well as a table with the implementer's MPIs.

ComEd launched their RPP Pilot in Q2 CY2020 and Ameren Illinois will launch their RPP Pilot in CY2021. In a statewide effort, Guidehouse is working collaboratively with ComEd, Ameren Illinois, RPP Pilot implementer—the Northwest Energy Efficiency Alliance (NEEA), Ameren Illinois' evaluator—Opinion Dynamics Corporation (ODC), and the Illinois Energy Efficiency Stakeholder Advisory Group (SAG) to refine the data sources and methodologies used to estimate savings. Statewide evaluation activities include:

- Developing a 10-year evaluation plan for the RPP Pilot,
- Vetting a natural market baseline and the net lift analysis methodology with the SAG Market Transformation Working Group, and
- Creating a comprehensive set of MPIs and assessment strategies and presenting to the Working Group.

The approach to estimate savings in Illinois from the RPP Pilot is evolving. Future evaluations will incorporate modifications to the analysis presented in this report and will include an assessment of the relevant MPIs.

2. Pilot Description

The ENERGY STAR® Retail Products Platform Program promotes higher levels of efficiency in consumer goods sold via retail channels through participation in a national midstream market transformation (MT) program. In CY2020, ComEd launched an ENERGY STAR® Retail Products Platform Pilot (RPP Pilot). NEEA implements the RPP Pilot in ComEd's service territory.

[1] https://ilsag.s3.amazonaws.com/IL-TRM_Effective_01-01-20_v8.0_Vol_4_X-Cutting_Measures_and_Attach_10-17-19_Final.pdf

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The RPP Pilot launched in June 2020 with the following retailers: Best Buy, The Home Depot, Lowe's, and Nationwide Marketing Group (an aggregator for small, local stores and chains). Abt Electronics, a local Chicago retailer, also joined the pilot in September 2020. The RPP pilot provides incentives for advanced tier refrigerators and basic tier top load clothes washers as Table 2-1 and Figure 2-1 show. Table 2-2 shows the product categories and tiers and incentives provided by ComEd.

Table 2-1. CY2020 Volumetric Findings Detail

Participation	Total
Participating Retailers	5
Eligible Measures	2
Number of Refrigerators Sold	20,467
Number of Clothes Washers Sold	25,360

Source: RPP data administrator portal and evaluation team analysis

Table 2-2. CY2020 Product Categories, Tiers, and Incentives

Product	RPP Tier	Specification	Incentive
Clothes Washers	Basic	ENERGY STAR v8 (top load only)	$8
	Advanced	ENERGY STAR Most Efficient 2020	0
Refrigerators	Basic	ENERGY STAR v5	0
	Advanced	ENERGY STAR Most Efficient 2020	$8

Source: RPP data administrator portal and evaluation team analysis

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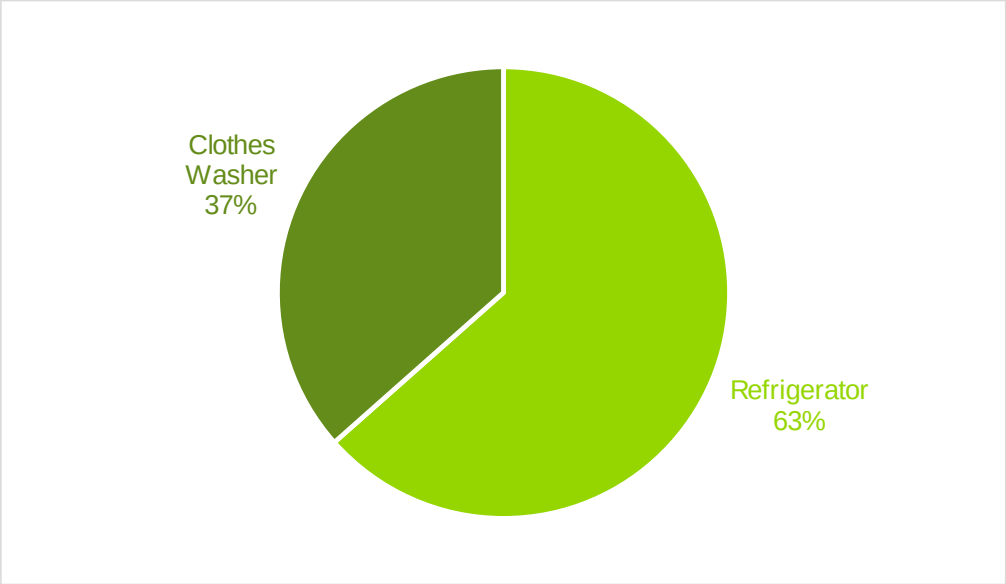
Figure 2-1. Measures Installed by Type



Source: RPP data administrator portal and evaluation team analysis

3. Pilot Savings Detail

Table 3-1 summarizes the incremental energy and demand savings the RPP Pilot achieved in CY2020. The RPP pilot is intended to generate energy and demand savings in the near term while transforming the overall market for these appliances towards higher efficiency in the long term. This report provides the impact evaluation results from the first six months of the RPP Pilot using methodology described in TRM Attachment C: Framework for Counting Market Transformation Savings in Illinois.[2] Since the methodology for estimating Illinois' market transformation offerings inherently estimates net savings[3], neither the evaluation team nor the implementer estimated gross savings and there is no gross realization rate and no net-to-gross (NTG) ratio. The evaluation team removed the savings associated with the measures that also received an incentive from the Appliance Rebates Program.

This pilot evaluation estimated energy and peak demand savings of the net market lift using the methodology described in 6.2Appendix A. The net market lift is defined as the increase in the sale of efficient products excluding existing market trends towards more efficient products.

[2] https://ilsag.s3.amazonaws.com/MT_Savings_Paper_Final_08-23-2019.pdf.

[3] "In principle, subtracting the Natural Market Baseline from total market units yields by definition an estimate of total net savings. This "net" savings includes savings from both MT and RA programs, so the "net" is further adjusted for RA savings." TRM Attachment C, page 11.

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Table 3-1. CY2020 Total Annual Incremental Electric Savings

Savings Category	Energy Savings (kWh)	Summer Peak* Demand Savings (kW)
Electricity		
Ex Ante Gross Savings	NA	NA
Program Gross Realization Rate	NA	NA
Verified Gross Savings	NA	NA
Program Net-to-Gross Ratio (NTG)	NA	NA
Verified Net Savings	103,975	12
Converted from Gas†		
Ex Ante Gross Savings	NA	NA
Program Gross Realization Rate	NA	NA
Verified Gross Savings	NA	NA
Program Net-to-Gross Ratio (NTG)	NA	NA
Verified Net Savings	NA	NA
Total Electric Plus Gas		
Ex Ante Gross Savings	NA	NA
Program Gross Realization Rate	NA	NA
Verified Gross Savings	NA	NA
Program Net-to-Gross Ratio (NTG)	NA	NA
Verified Net Savings	103,975	12

NA = 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 p.m.-5:00 p.m. Central Prevailing Time on non-holiday weekdays, June through August.
† The evaluation team did not estimate gas savings for this pilot.
Source: RPP data administrator portal and evaluation team analysis

4. Cumulative Persisting Annual Savings

Table 4-1 shows the measure-specific and total verified net savings for the RPP Pilot and the cumulative persisting annual savings (CPAS) for the measures sold in CY2020. Figure 4-1 shows the savings across the useful life of the measures. The electric CPAS across all measures installed in 2020 is 103,975 kWh (Table 4-1). Guidehouse did not evaluate gas savings for this pilot and as such, electric CPAS is equivalent to total CPAS.

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Table 4-1. Cumulative Persisting Annual Savings (CPAS) – Electric

End Use Type	Research Category	EUL	CY2020 Verified Gross Savings (kWh)	NTG	Lifetime Net Savings (kWh)†	Verified Net kWh Savings 2018	2019	2020	2021	2022	2023	2024	2025	2026
Appliances	Refrigerator	17.0	NA	NA	-			-	-	-	-	-	-	-
Appliances	Clothes Washer	14.0	NA	NA	1,455,647			103,975	103,975	103,975	103,975	103,975	103,975	103,975
CY2020 Program Total Electric Contribution to CPAS			-		1,455,647			103,975	103,975	103,975	103,975	103,975	103,975	103,975
Historic Program Total Electric Contribution to CPAS‡						-	-	-	-	-	-	-	-	-
Program Total Electric CPAS						-	-	103,975	103,975	103,975	103,975	103,975	103,975	103,975
CY2020 Program Incremental Expiring Electric Savings§								-	-	-	-	-	-	-
Historic Program Incremental Expiring Electric Savings‡§								-	-	-	-	-	-	-
Program Total Incremental Expiring Electric Savings§								-	-	-	-	-	-	-

End Use Type	Research Category	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Appliances	Refrigerator	-	-	-	-	-	-	-	-	-	-	-	-
Appliances	Clothes Washer	103,975	103,975	103,975	103,975	103,975	103,975	103,975	-	-	-	-	-
CY2020 Program Total Electric Contribution to CPAS		103,975	103,975	103,975	103,975	103,975	103,975	103,975	-	-	-	-	-
Historic Program Total Electric Contribution to CPAS‡		-	-	-	-	-	-	-	-	-	-	-	-
Program Total Electric CPAS		103,975	103,975	103,975	103,975	103,975	103,975	103,975	-	-	-	-	-
CY2020 Program Incremental Expiring Electric Savings§		-	-	-	-	-	-	-	103,975	-	-	-	-
Historic Program Incremental Expiring Electric Savings‡§		-	-	-	-	-	-	-	-	-	-	-	-
Program Total Incremental Expiring Electric Savings§		-	-	-	-	-	-	-	103,975	-	-	-	-

Note: The green highlighted cell shows pilot total first year electric savings. The gray cells are blank, indicating values irrelevant to the CY2020 contribution to CPAS.

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

‡ There are no historical savings since CY2020 is the first year of the pilot's implementation.

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

Source: Evaluation team analysis

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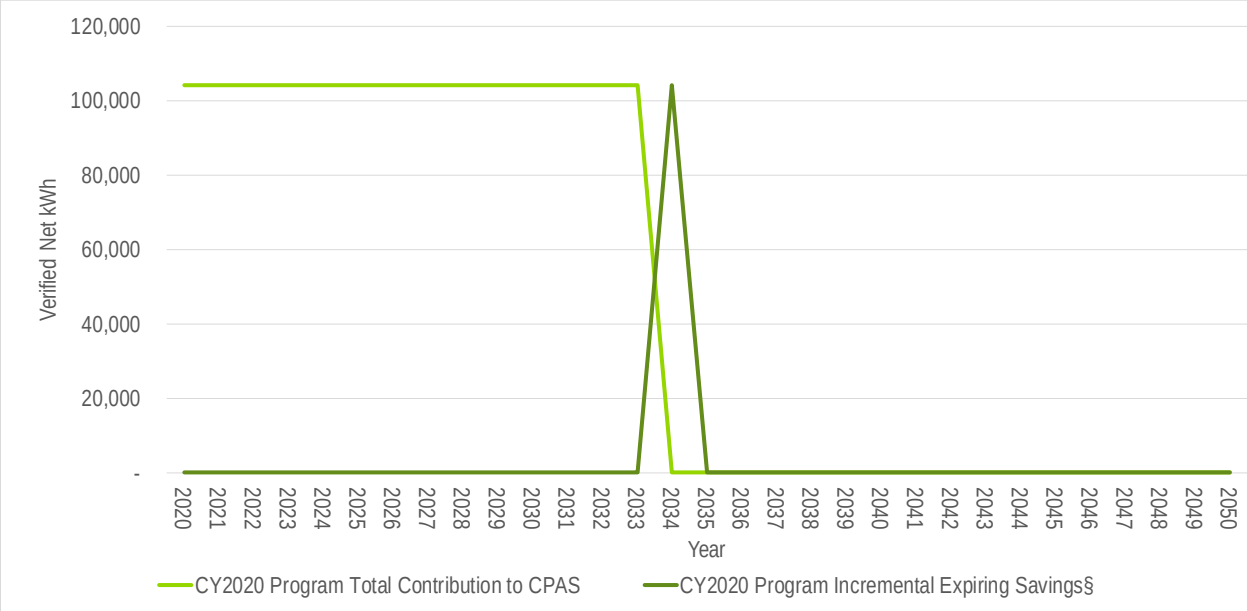
Figure 4-1. Cumulative Persisting Annual Savings



§ Expiring savings are equal to CPAS Y_{n-1} - CPAS $Y_{n.}$

Source: Evaluation team analysis

5. Pilot Savings by Measure

The RPP Pilot includes refrigerator and clothes washer measures. The evaluation team calculated the energy savings and peak demand savings for each measure using the net market lift approach as defined in TRM Attachment C.

The analysis produced statistically significant results for clothes washers but not for refrigerators and so the evaluation set the savings for refrigerators at zero.

Table 5-1. CY2020 Energy Savings by Measure – Electric

End Use Type	Research Category	Ex Ante Gross Savings (kWh)	Verified Gross Realization Rate	Verified Gross Savings (kWh)	NTG	Verified Net Savings (kWh)	EUL (years)
Appliances	Refrigerator	NA	NA	NA	NA	0	17.0
Appliances	Clothes Washer	NA	NA	NA	NA	103,975	14.0
	Total	NA	NA	NA	NA	103,975	NA

Note: The savings in this table includes secondary electric energy (kWh) savings from water supply and wastewater treatment plants for measures claimed by ComEd. The savings account for electric heating penalties, where applicable.
NA = not applicable (refers to a piece of data that cannot be produced or does not apply).

Source: Evaluation data reports from the RPP data administrator portal and evaluation team analysis

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Table 5-2. CY2020 Summer Peak Demand Savings by Measure

End Use Type	Research Category	Ex Ante Gross Peak Demand Reduction (kW)	Verified Gross Realization Rate	Verified Gross Peak Demand Reduction (kW)	NTG	Verified Net Peak Demand Reduction (kW)
Appliances	Refrigerator	NA	NA	NA	NA	0.00
Appliances	Clothes Washer	NA	NA	NA	NA	12.20
	Total	NA	NA	NA	NA	12.20

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

Source: Evaluation data reports from the RPP data administrator portal and evaluation team analysis

The clothes washer measure saves water in addition to electricity. That reduction in water produces secondary kWh savings from water supply and wastewater treatment. Table 5-3 shows the secondary measure level savings. The savings in this table are included within the electricity savings in the previous tables in this section.

Table 5-3. Secondary Energy Savings from Water Reduction by Measure – Electric

End Use Type	Research Category	Ex Ante Annual Water Savings (gallons)	Ex Ante Gross Savings (kWh)	Verified Gross Realization Rate (RR_{water})	Verified Gross Savings (kWh)	NTG	Verified Net Savings (kWh)
Appliances	Refrigerator	NA	NA	NA	NA	NA	0
Appliances	Clothes Washer	NA	NA	NA	NA	NA	7,052
	Total	NA	NA	NA	NA	NA	7,052

Note: The savings in this table reflects only secondary electric energy (kWh) savings from water supply and wastewater treatment plants for measures claimed by ComEd, not those claimed by gas utilities.
NA = not applicable (refers to a piece of data that cannot be produced or does not apply).

Source: Evaluation data reports from the RPP data administrator portal and evaluation team analysis

6. Impact Analysis Findings and Recommendations

6.1 Impact Parameter Estimates

The evaluation team estimated energy and demand savings using a pre-post baseline comparison to measure net market lift induced by the RPP Pilot. This involves calculating the average monthly unit energy savings (UES) for products that received pilot support at any point in time, followed by regression modeling to forecast monthly UES during the pilot period. Appendix A provides more details about the impact analysis methodology.

The evaluation team calculated the UES values using the savings algorithms and inputs deemed by the Illinois Statewide Technical Reference Manual (TRM v8.0). Table 6-1 shows the source of different input parameters used for calculating the UES values.

Table 6-1. Savings Parameters

Measure Name	Custom Input Parameters	Deemed Input Parameters	Source *
Clothes Washer	Capacity, IMEFeff, IWFeff	IMEFbase, Ncycles, CF, IWFbase	TRM v8.0 – Section 5.1.2
Refrigerator	UECEE	UECBASE, TAF, LSAF	TRM v8.0 – Section 5.1.6

* TRM is the State of Illinois Technical Reference Manual version 8.0 from http://www.ilsag.info/technical-reference-manual.html.

Source: Evaluation team analysis

6.2 Other Impact Findings and Recommendations

The evaluation team developed two recommendation based on findings from the CY2020 evaluation.

Finding 1. Because retailers often make purchasing decisions 6-18 months in advance, it is normal for a market transformation program like the ENERGY STAR Retail Products Platform to take time to reach its full savings potential. The evaluation team developed a pre-post regression model to quantify the energy and demand savings for the RPP Pilot in CY2020. The model's results did not reveal any energy and demand savings for the RPP-qualified refrigerator measures and revealed small energy and demand savings for RPP-qualified clothes washers. The average monthly UES for refrigerators during the pilot period showed no difference compared to the expected natural market baseline. Appendix A includes additional details about the impact analysis methodology.

Finding 2. The evaluation team compared the market shares within participating retailers in the baseline and pilot periods against five years of monthly sales and market share data from the Northwest provided to the team by NEEA.

In the RPP Pilot, market shares of ENERGY STAR basic and advanced tier clothes washers with participating retailers were similar to the Northwest market shares. The participating retailers' market share number were between 20%-30% of the Northwest numbers for 2019 and most of 2020; there was a slight uptick in advanced tier clothes washers market shares toward the end of 2020.

Basic tier refrigerator market shares were slightly lower for participating retailers in ComEd's service area compared with the Northwest sales data in both the pre-period and during the pilot period. Advanced tier refrigerator shares were slightly higher in ComEd's service area in both the pre-period and during the pilot period.

The trends observed in the Northwest data appear consistent with those observed in the pilot data from participating retailers in ComEd's service area. The Northwest data appear to be a reasonable proxy for establishing time trends going back farther than the one year of pre-pilot data provided by participating retailers, though refrigerator shares may need calibrating given the higher shares of advanced tier and lower shares of basic tier compared to the Northwest data.

Finding 3. The evaluation team accounted for the secondary kWh Savings for Water Supply and Wastewater Treatment as part of estimating the total energy savings associated with clothes washers.

Recommendation 1. The evaluation team recommends that the implementer account for energy savings from water savings from clothes washers, if they have not already done so.

Finding 4. There was a significant drop in refrigerator and clothes washer sales following the public health-related restrictions enacted in March 2020 due to COVID-19. The evaluation team accounted for this change in purchasing behavior by including the months that were most impacted by these restrictions as a separate variable in the regression model. This variable controls for COVID-19 related changes in purchasing behavior separately from typical seasonal effects we would expect in a year without a pandemic response.

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Recommendation 2. The evaluation team recommends that the implementer account for this effect in the ex ante calculations for CY2021 in the unlikely event that similar restrictions occur in 2021.

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Appendix A. Impact Analysis Methodology

The RPP program is a national market transformation program targeting long-term savings in the market. The RPP program also has the potential to produce short-term savings. While the majority of the savings manifest when the program matures, other utility evaluations of the ENERGY STAR® Retail Product Platform Program have shown detectable short-term savings in the early stages of the program's offering. For example, in the 2019 PG&E ENERGY STAR® Retail Product Platform Program Pilot Early Evaluation report[4], sales data analysis showed increased program-qualified unit sales and savings for the first two years of the Pilot. In addition, shelf survey analysis revealed upward trends in program-qualified model assortments and preferential treatment of program-qualified products (i.e. featured in promotions) also in the first two years of the Pilot. In addition, in the Focus on Energy Calendar Year 2018 Evaluation Report,[5] sales data analysis showed short-term savings for refrigerators and clothes dryers in the first year of the ENERGY STAR® Retail Product Platform Program Pilot. Based on these evaluations, Guidehouse conducted an impact analysis derived from the baseline comparison model to determine if short-term savings were in evidence and statistically significant.

The evaluation team used a pre-post baseline comparison to measure net market lift induced by the RPP Pilot. The program theory predicts that program support will lead to permanent shifts in the market by (1) retailers stocking more efficient products and (2) the Federal government accelerating the adoption of more efficient ENERGY STAR® specifications and appliance standards. Specifically, these market shifts may lead to persistent increases in sales of efficient products after direct incentives are no longer applied to specific products. To the degree that sales of less efficient products are displaced, this generates net market lift.

To measure persistent impact—and the resulting savings—the evaluation team modeled average monthly unit energy savings (UES), counting savings for products that qualified for pilot support at any point in time. This approach captured natural market savings from sales of a given product before it received pilot support as well as the savings that occurred during the pilot period.

The RPP data administrator portal provides evaluation data reports which contained most of the data required for measuring net market lift. The data administrator portal[6] is a data management tool for retailers and energy efficiency RPP program and pilot sponsors that provides separate evaluation data reports for each product category. The evaluation data reports contained the following monthly data:

- Unit sales by model number
- Qualified status of model
- Per-unit incentive
- Retailer (for qualified products)
- Inputs for gross savings (energy factor, capacity, etc.)

[4] https://pda.energydataweb.com/api/view/2128/PGE%20ESRPP%20Eval%20Report%20v5%20optimized.pdf EMI Consulting. January 18, 2019.

[5] https://focusonenergy.com/sites/default/files/WI_FOE_CY_2018_Volume_II.pdf Cadmus May 17, 2019.

[6] Evaluation data reports are provided via https://www.retailproductsplatform.com.

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Each of the five participating RPP Pilot retailers provided 12 months of full category pre-pilot sales data by model number for each product category. The evaluation data reports included sales of each model number by month and the qualified status of each model number in that month.

After assigning savings to qualified units based on the algorithms deemed in Illinois Technical Reference Manual (TRM) v8.0, the evaluation team calculated average monthly UES after deducting savings of products that received downstream rebates through the CY2019 and CY2020 Appliance Rebate Program during the baseline and pilot periods. Deducting the downstream savings ensures that any differences between the baseline and pilot period monthly UES values are not due to changes in the Appliance Rebate Program.

Table A-1 shows the total savings for the pilot period and pre-pilot period for all qualified, efficient products and the downstream savings from the Appliance Rebate Program as well as the final efficient savings totals used to derive the monthly UES values.

Table A-1. RPP Pilot and Downstream Savings Totals

Product	Period	All Efficient Product Savings (kWh)	Downstream Savings (kWh)	Efficient Savings Net of Downstream (kWh)
Refrigerator	Pre-period	6,517,994	317,618	6,200,376
	Pilot period	4,622,441	270,241	4,352,200
Clothes Washer	Pre-period	19,378,902	6,777,467	12,601,434
	Pilot period	9,934,946	3,393,386	6,541,561

Source: Evaluation team analysis

The team calculated average monthly UES using Equation A-1:

Equation A-1. Average Monthly UES Calculation

$$\frac{\sum_{it}(EffQuantity_{it} * UES_i)}{Total\ Quantity_t}$$

Where:

Eff Quantity = Number of units sold of product *i* in month *t* if product *i* currently or historically received pilot incentives.

UES = Energy savings per unit for efficient product *i*.

Total Quantity = Number of all units sold in month *t*.

As the share of efficient products increases, the numerator in this equation increases. The RPP Pilot generates savings by increasing the average monthly UES above the expected baseline UES.

Using the baseline period monthly UES, the team developed a regression model to forecast monthly UES during the pilot period. The evaluation team selected the model specification using stepwise model selection with Akaike's Information Criterion as the selection criterion, with only

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the pre-period observations used to train the model.[7] [8] The model selection procedure chose the specification that had the smallest Akaike's Information Criterion for each product.

The evaluation team developed a separate model for each product to estimate baseline sales. The model selection procedure considered seasonal effects through monthly indicator variables. Additionally, the evaluation team included a time trend, which tested whether there were any pre-existing trends in UES over time (increasing or decreasing). To account for changes in purchasing patterns due to COVID-19-related restrictions distinct from typical monthly variation that would not extrapolate, the evaluation team also included a variable for the months of April and May 2020 in the regression model.

The evaluation team used the baseline models to forecast the average monthly UES for each product into the pilot period with upper and lower 95% confidence bounds. Because the model controls for pre-existing trends in the baseline period, the evaluation team assumes the differences between the forecast and actual observed average monthly UES to be driven by the pilot. However, pending the comprehensive evaluation and assessment of MT indicators described in this report's introduction, these results are preliminary indicators.

Once the baseline model specifications had been selected, the evaluation team estimated savings for the pilot period using two statistical approaches:

- **Model 1:** Baseline model forecasts monthly UES into pilot period accounting for seasonal trends observed in baseline period. Actual monthly UES is compared to forecast average monthly UES. Savings occur when actual monthly UES is above the confidence interval in a given month.
- **Model 2:** This model uses the same baseline model but rather than forecasting into the pilot period, a post term is added to the model and interacted with the time trend. This captures term tests whether there is a statistically significant change in average monthly UES over time in the pilot period compared to the baseline period.

- When month *t* was during the pilot period, the team calculated monthly net savings using Equation A-2:

Equation A-2. Monthly Net Savings calculation

$$(Actual\ UES_t - Forecast\ UES_t) * Eff\ Quantity_t$$

Where:

Eff Quantity = Number of units sold in month *t* for products that currently receive incentives through the pilot or had received incentives in previous months.

Actual UES = Actual mean UES in month *t.*

[7] ENERGY STAR Retail Product Platform evaluations in other states have used leave-one-out cross validation rather than stepwise selection with Akaike's Information Criterion. However, with smaller sample sizes cross validation adds complexity without additional benefit and Akaike's Information Criterion is asymptotically equivalent to One-Leave-Out Cross Validation.

[8] Stone, M. "An Asymptotic Equivalence of Choice of Model by Cross-Validation and Akaike's Criterion." *Journal of the Royal Statistical Society. Series B (Methodological)*, vol. 39, no. 1, 1977, pp. 44–47. *JSTOR*, www.jstor.org/stable/2984877. Accessed 9 Mar. 2021.

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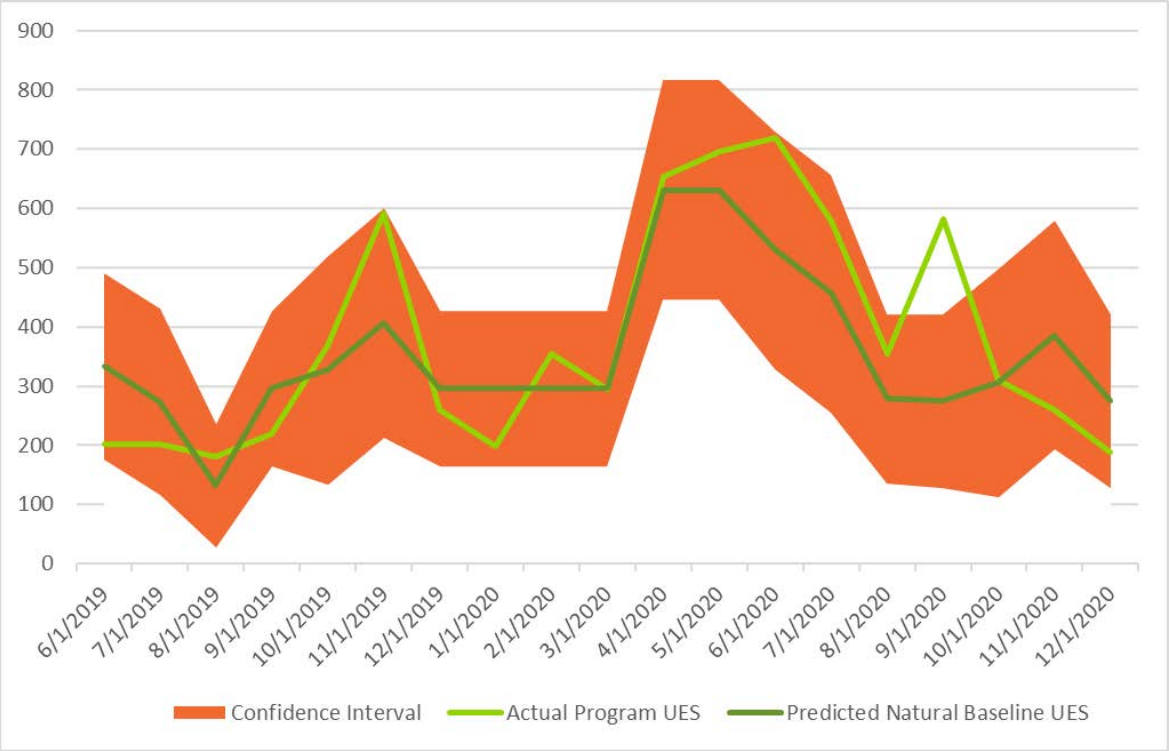
Forecast UES = Forecast mean UES in month *t*.

Figure A-1 shows the forecast monthly UES for clothes washers given the trends observed in the baseline period compared to the actual pilot UES. The shaded area represents the confidence interval of the forecast. The light green line represents the actual pilot monthly UES and shows the actual monthly UES is above the confidence interval for only one month in September 2020. After September 2020, actual monthly UES values fall back within the confidence interval, representing the range of expected values absent pilot effect.

Figure A-1. Forecast Monthly UES and Actual Monthly UES – Clothes Washers



Source: Evaluation team analysis

Figure A-2 shows the forecast monthly UES for refrigerators. The shaded area represents the confidence interval of the forecast derived from baseline period trends. The blue line represents the actual pilot monthly UES and the red line shows the predicted baseline UES. The actual UES values are well within the range of expected values absent pilot effect represented by the confidence interval therefore there were no savings observed for refrigerators in CY2020.

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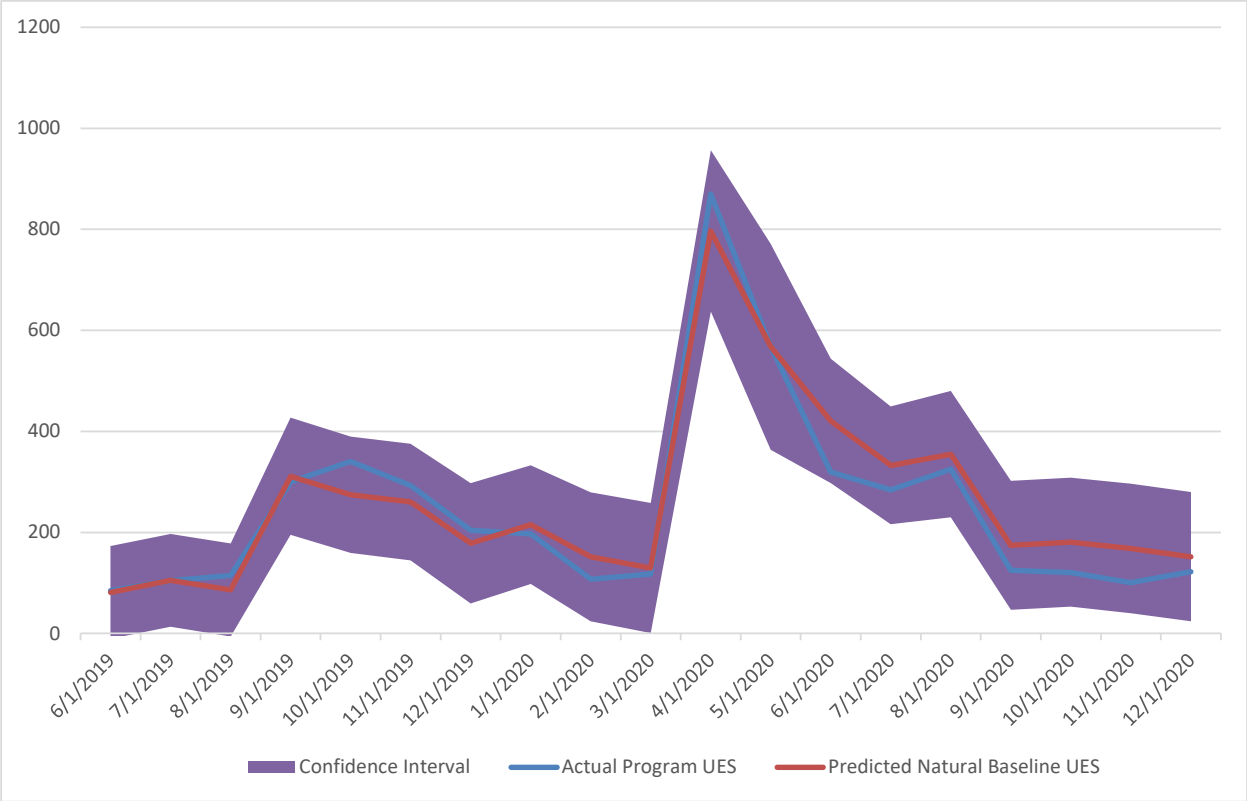
Figure A-2. Forecast Monthly UES and Actual Monthly UES – Refrigerators



Source: Evaluation team analysis

The analysis only yielded energy and demand savings for clothes washers and details of the calculations are shown in Table A-2. The verified net energy and demand savings are calculated using a combined average (row 4) of the values estimated using Model 1 (row 2) and Model 2 (row 3). The Total Pilot Period Savings (row 5) is the energy savings associated with all the ENERGY STAR units that were sold during the pilot period and is used to calculate the Net Market Lift (row 6). The Total Incented kWh and kW Savings (row 7 and 9 respectively) are the energy and demand savings associated with all the ENERGY STAR clothes washers and refrigerators actually incentivized by ComEd as a part of the RPP pilot. Finally, the Verified Net kWh and kW Savings (row 8 and row 10 respectively) are calculated by multiplying the Total Incented kWh and kW by the net market lift.

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Table A-2. CY2020 Total Pilot Net Electric Savings

Metric	Clothes washer	Refrigerator	Total
[1] Ex Ante Net kWh Savings	NR	NR	1,478,000,000[9]
[2] Forecast Net Savings (Model 1)	270,158	0	270,158
[3] Pre-Post Net Savings (Model 2)	0	0	0
[4] Combined Average	135,079	0	135,079
[5] Total Pilot Period Savings	6,541,561	4,352,200	10,893,761
[6] Net Percent [4] / [5]	2.10%	0%	1.24%
[7] Total Incented kWh Savings	5,035,255	1,601,076	6,636,331
[8] Verified Net kWh Savings [6] * [7]	103,975	0	103,975
[9] Total Incented kW Savings	591	241	832
[10] Verified Net kW Savings [6] * [10]	12.20	0	12.20

Source: Evaluation team analysis

The evaluation team conducted the impact analysis using the most recent market sales data available on the RPP Pilot data administrator portal. The evaluation team relied on the following documents for conducting the impact analysis:

- CY2019 and CY2020 final tracking data for the Appliance Rebates Program.
- Illinois Technical Reference Manual (TRM v8.0) for deemed input parameters for developing the UES values.
- Clothes washer and Refrigerator sales data available on the RPP data administrator portal.
- Market Penetration data available on the RPP data administrator portal.

[9] Explanation from the implementer regarding the ex ante savings value in an email from ComEd on April 26, 2021: "Note that savings in the early years of ComEd's participation in ESRPP, including 2020, come exclusively from the influence of the midstream incentives on retailer purchasing decisions. The group of Program Sponsors collectively is influencing the decision-makers at retailer organizations and has been impacting the market since the national program launched in 2016. This dynamic is distinct from a market transformation effort that would be solely focused on ComEd's territory, because of national decision-making of the retailers. Because the national program as a whole is relatively mature, savings are already being produced for Program Sponsors that joined the program in the earlier years; by joining subsequently, newer Sponsors like ComEd are able to reinforce the ability of the collaborative to influence the retailers and continue this flow of savings. In addition, there are longer term activities, including revising ENERGY STAR specifications, Federal standards, and Federal test procedures, that will have much greater savings impacts than those from midstream incentives alone."

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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. Additional required cost data (e.g., measure costs, pilot level incentive and non-incentive costs) are not included in this table and will be provided 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)
Appliances	Refrigerator	Each	44,037	17.0	No	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	0.0	0	0	0	0
Appliances	Clothes Washer	Each	25,360	14.0	No	NA	NA	NA	NA	NA	NA	NA	NA	NA	96,923	12.2	0	0	0	0
	Total			14.0		NA	NA	NA	NA	NA	NA	NA	NA	NA	96,923	12	0	0	0	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. Table C-1 represents the kWh savings from Table 5-1 minus those shown in Table 5-3.

* The total of the EUL column is the weighted average measure life (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.

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

Source: RPP data administrator portal and evaluation team analysis

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Appendix C. Market Progress Indicators

The implementer provided the following[10]:

"Energy savings from market transformation programs result from increased and accelerated market adoption of energy efficient products or practices. As outlined in the Illinois TRM, attributing savings to market transformation programs requires a "preponderance of evidence" approach to demonstrate that observed changes in market adoption are the result of the program. Evidence of a program's influence on its target market is gathered through an assessment of market progress indicators (MPIs) designed to assess whether the program is achieving its intended outcomes. The MPIs for ComEd's ESRPP program were designed to assess progress toward outcomes such as growing the national scale of the program, influencing retailer assortment and sales of qualified products, and influencing ENERGY STAR® specifications, test procedures, and Federal standards for products in the ESRPP portfolio.

The [table below] shows the MPIs for ComEd's RPP program. Data were not yet available at the end of 2020 to support robust assessment of many of the MPIs, and the evaluator will provide a more comprehensive assessment of MPIs in the CY2021 evaluation."

[10] Email from ComEd, April 26, 2021.

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Table C-1. Market Progress Indicators

Outcome (Timing)	Outcome	Market Progress Indicator	2020 – 2023 Target	Data Sources
I (S)	Program **achieves sufficient scale** of program sponsors, customers and incentive budgets to influence retailer decision-making	Portion of US households in RPP areas and the related total value of all program sponsor incentive budgets	Portfolio-level target: Program represents 25% of nation-wide customers and program sponsor incentive budgets grow proportionally	• U.S. Census Bureau data • ESRPP program documents
II (S)	ENERGY STAR data and federal **test procedures better** reflect real world energy consumption	1. Number of products for which RPP provides data to ENERGY STAR 2. Number of products for which test procedures are improved	Product-level targets: 1. Data provided to ENERGY STAR for two products 2. *There are unlikely to be opportunities to influence federal test procedures for products in ComEd's RPP portfolio in 2020-2023. We will continue to monitor.*	• Longitudinal tracking of RPP engagement with ENERGY STAR revision processes (MPI 1) • DOE rulemaking documents (MPI 2)
III (S)	Data platform enables **effective program operations processes**	1. Data access and accuracy are sufficient to support product-by-product analysis and participation in the ENERGY STAR specification process 2. Speed with which incentives are paid 3. Number of corrections or data errors 4. Program sponsor confidence in program operations process	Portfolio-level target: 1. Data access and accuracy continue to be sufficient to support participation in the ENERGY STAR specification process 2. Incentives are paid on time 3. Corrections/data error rates are low 4. All program sponsors report confidence in the program operations process	• Longitudinal tracking of data quality indicators available through the data portal (MPIs 1-3) • Longitudinal tracking of RPP engagement with ENERGY STAR revision processes (MPI 1) • Qualitative evidence from ENERGY STAR stakeholder interviews (MPI 1) • Qualitative evidence from program sponsors interviews (MPI 4)
IV (S)	**Reliable market share** and **portfolio management** informs program design and evaluation	1. Efficient and transparent portfolio management process 2. Annual savings process and evaluation are efficient and verifiable	Portfolio-level target: 1. Portfolio management process continues to be efficient and transparent. 2. Annual savings process and evaluation work are conducted efficiently and can be verified.	• Qualitative evidence from Program Sponsor interviews (MPIs 1-2) • Qualitative evidence from RPP staff interviews (MPIs 1-2)
V (S/M)	Retailers and merchants **incorporate incentives into their assortment and marketing** decision making process	Retailer consideration of ESRPP qualification in assortment and marketing decisions	Portfolio-level target: All retailer partners report using incentives to inform product decisions	• Qualitative evidence from retailer interviews • Qualitative evidence from RPP staff communication • Quarterly presentations and information provided by retailers to ESRPP
VI (S/M)	Increase in ENERGY STAR (or higher tiers) **market share** for RPP product categories	Market share of RPP-qualified product tiers	Product-level targets: Measurable increase in market share for at least one product (Note: this shift could have a different pace among different products)	Longitudinal tracking of market share
VII (M)	Reliable **per-unit energy savings** values for RPP product categories	Number of products categories (bins, tiers, configurations) with reliable energy savings values	Product-level target: All active products in portfolio have reliable energy savings values	Longitudinal tracking of measure planning documentation and methodologies
VIII (M)	Data management system builds sufficient **trust with retailers** that access to data is no longer a barrier	1. Timeliness and completion of retailer uploads 2. Retailer confidence in data warehousing	Portfolio-level target: 1. Retailer uploads continue to be timely and complete 2. All retailers report confidence in data warehousing and their contract extensions continue on schedule each year	• Longitudinal tracking of data quality indicators available through the data portal (MPI 1) • Qualitative evidence from retailer interviews (MPI 2) • ESRPP program documents (MPI 2)
IX (M/L)	Increase in **ENERGY STAR** (or higher tiers) **qualifying criteria** for RPP product categories	Number of products for which RPP influences an increase in ENERGY STAR (or higher tiers) qualifying criteria	Product-level target: *2 ENERGY STAR revision processes are expected to begin in 2020-2023 for products in ComEd's portfolio. We will continue to monitor.*	• Longitudinal tracking of RPP engagement with ENERGY STAR revision processes (MPI 1) • Qualitative evidence from ENERGY STAR stakeholder interviews (MPI 2)
X (L)	Change in **federal minimum standards** for RPP categories	ESRPP sponsors inform federal minimum standards for product categories in the portfolio	Product-level target: *2 federal standard revision processes are expected to begin in 2020-2023 for products in ComEd's portfolio. We will continue to monitor.*	Longitudinal tracking of RPP engagement with federal standard revision processes

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