

ComEd ENERGY STAR Retail Products Platform Market Transformation Program Impact Evaluation Report

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

Prepared for:

ComEd

FINAL

April 28, 2022

Prepared by:

Jason Christensen
Cadmus

Jake Fuller
EcoMetric Consulting

Mike Frischmann
EcoMetric Consulting

Bridget Williams
Guidehouse

Gabriel Stelmack
Guidehouse

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

This report was prepared by Guidehouse for ComEd. The work presented in this report represents Guidehouse's professional judgment based on the information available at the time this report was prepared. Use of this report by any other party for whatever purpose should not, and does not, absolve such party from using due diligence in verifying the report's contents. Neither Guidehouse nor any of its subsidiaries or affiliates assumes any liability or duty of care to such parties, and hereby disclaims any such liability.

Table of Contents

1. Introduction	1
2. Market Transformation Program Description	2
3. MT Program Savings Detail	4
4. Cumulative Persisting Annual Savings	5
5. MT Program Savings by Measure	8
6. Impact Analysis Findings and Recommendations	9
Appendix A. Impact Analysis Methodology	A-1
A.1 Data Sources for Developing ESRPP Natural Market Baselines	A-1
A.2 Data Sources for Estimating Savings from Participating Retailers	A-1
A.3 Data Sources for Estimating Savings from Non-participating Retailers	A-3
A.4 Methodology for Estimating CY2021 Energy Savings	A-5
A.5 Methodology for Assessing Market Progress Indicators	A-6
Appendix B. Impact Findings Detailed Results	B-1
B.1 CY2021 ESRPP MT Program Energy Savings	B-1
B.2 Net Lift for Clothes Washers	B-1
B.3 Net Lift for Refrigerators	B-2
B.4 Market Progress Indicators	B-3
Appendix C. Total Resource Cost Detail	C-1

List of Tables and Figures

Figure 2-1. Number of Products Sold by Type	3
Figure 4-1. Cumulative Persisting Annual Savings	7
Figure B-1. Annual Washer ENERGY STAR Market Share – Baseline Forecast vs. Actual ...	B-2
Figure B-2. Annual Refrigerator ENERGY STAR Most Efficient Market Share – Baseline Forecast vs. Actual	B-3
Table 2-1. Number of Participants and Measures	2
Table 2-2. CY2021 Product Categories, Tiers, and Incentives	2
Table 3-1. Total Annual Incremental Electric Savings	4
Table 4-1. Cumulative Persisting Annual Savings (CPAS) – Electric	6
Table 5-1. Number of Measures by Type	8
Table 5-2. Energy Savings by Measure – Electric	8
Table 5-3. Summer Peak Demand Savings by Measure	8
Table A-1. CY2021 Verified Net Savings	A-6
Table B-1. CY2021 Electric Savings	B-1
Table C-1. Total Resource Cost Savings Summary	C-1

1. Introduction

This report presents the results of the impact evaluation of the CY2021 ComEd ENERGY STAR® Retail Products Platform Market Transformation (ESRPP MT) Program.

It summarizes the total energy and demand impacts for the market transformation program broken out by relevant measure and market transformation program structure details. The appendices provide the impact analysis methodology and details of the total resource cost (TRC) analysis inputs. CY2021 covers January 1, 2021 through December 31, 2021.

2. Market Transformation Program Description

The ESRPP MT Program promotes higher levels of efficiency in consumer goods sold via retail channels through participation in a national midstream market transformation program. The national ESRPP MT program began in 2016. ComEd’s ESRPP MT Program launched in June 2020 with the following participating retailers: Best Buy, The Home Depot, Lowe’s, and Nationwide Marketing Group. Abt Electronics also joined ComEd’s ESRPP MT Program in September 2020. Currently, ComEd incentivizes two product categories: top-loading clothes washers and refrigerators. The Northwest Energy Efficiency Alliance (NEEA) facilitates the national ESRPP program and implements ComEd’s ESRPP program.

Table 2-1 and Figure 2-1 show the number of qualifying products sold by the participating retailers in CY2021.

Table 2-1. Number of Participants and Measures

Participation	Total
Participating Retailers	5
Eligible Measures	2
Number of Clothes Washers Sold	48,016
Number of Refrigerators Sold	64,016

Source: ESRPP data administrator portal and evaluation team analysis

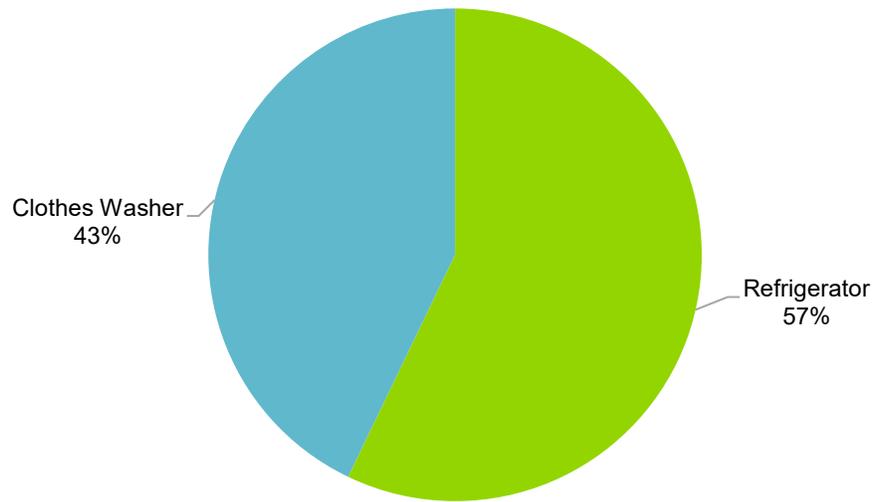
Table 2-2 shows the product categories, tiers, and incentives provided by ComEd.

Table 2-2. CY2021 Product Categories, Tiers, and Incentives

Product	ESRPP Tier	Specification	Incentive
Clothes Washer	Basic	ENERGY STAR v8 (Top Load only)	Q1 \$8
Clothes Washer	Advanced	Most Efficient 2021	Q1 \$0
Refrigerator	Basic	ENERGY STAR v5	Q1 \$0
Refrigerator	Advanced	ENERGY STAR Most Efficient 2021	Q1 \$8
Clothes Washer	Basic	ENERGY STAR v8 (Top Load only)	Q2 – Q4 \$8
Clothes Washer	Advanced	Most Efficient 2021	Q2 – Q4 \$0
Refrigerator	Basic	ENERGY STAR v5	Q2 – Q4 \$8
Refrigerator	Advanced	ENERGY STAR Most Efficient 2021	Q2 – Q4 \$8

Source: ESRPP data administrator portal and evaluation team analysis

Figure 2-1. Number of Products Sold by Type



Source: ComEd tracking data and evaluation team analysis

3. MT Program Savings Detail

Table 3-1 summarizes the incremental energy and demand savings the ESRPP MT Program achieved in CY2021. Since the methodology for estimated Illinois’ market transformation offerings inherently estimates net savings¹, neither the evaluation team nor the implementation contractor estimated gross savings and there is no gross realization rate or net-to-gross (NTG) ratio. In addition, the savings presented in this report reflect the best available data and methodologies, however evaluating market transformation programs in Illinois continues to evolve, and we anticipate future refinements to our approach. Guidehouse is pursuing more consistent data cleaning protocols between the IC and evaluation team and will use those in our future evaluations. Guidehouse will also incorporate the results of structured expert judgement panels on any needed adjustments to the natural market baselines for the two product categories

Table 3-1. Total Annual Incremental Electric Savings

Savings Category	Units	Ex Ante Gross Savings	Program Gross Realization Rate	Verified Gross Savings	Program Net-to-Gross Ratio (NTG)*	CY2019 Net Carryover Savings	CY2020 Net Carryover Savings	Verified Net Savings
Electric Energy Savings - Direct	kWh	N/A	N/A	N/A	N/A	N/A	N/A	1,268,111
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	N/A	N/A	N/A	N/A	N/A	N/A	1,268,111
Summer Peak† Demand Savings	kW	N/A	N/A	N/A	N/A	N/A	N/A	163

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

*Market transformation programs estimate net savings, therefore there is no ex ante or verified gross and a NTG ratio does not apply. *Source: IL TRM Attachment C, page 11.*

† 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

¹ "In principle, subtracting the Natural Market Baseline from total market units yields 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." IL TRM Attachment C, page 11.

4. Cumulative Persisting Annual Savings

Table 4-1 and Figure 4-1 show the measure-specific and total verified gross savings for the ESRPP MT Program and the cumulative persisting annual savings (CPAS) for the measures installed in CY2021. The historic rows in each table are the CPAS contribution back to CY2020. The Market Transformation Program Total Electric CPAS is the sum of the CY2021 contribution and the historic contribution. Figure 4-1 shows the savings across the effective useful life (EUL) of the measures. The evaluation team did not verify any gas savings, so electric CPAS is equivalent to total CPAS.

Table 4-1. Cumulative Persisting Annual Savings (CPAS) – 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		
Appliances	Clothes Washer	14.0	N/A	N/A	17,753,557				1,268,111	1,268,111	1,268,111	1,268,111	1,268,111	1,268,111	1,268,111	
Appliances	Refrigerator	17.0	N/A	N/A	-				-	-	-	-	-	-	-	
CY2021 Market Transformation Program Total Electric Contribution to CPAS									1,268,111							
Historic Market Transformation Program Total Electric Contribution to CPAS‡								103,975	103,975	103,975	103,975	103,975	103,975	103,975	103,975	
Market Transformation Program Total Electric CPAS								103,975	1,372,086	1,372,086	1,372,086	1,372,086	1,372,086	1,372,086	1,372,086	
CY2021 Market Transformation Program Incremental Expiring Electric Savings§																
Historic Market Transformation Program Incremental Expiring Electric Savings																
Market Transformation Program Total Incremental Expiring Electric Savings																

End Use Type	Research Category	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Appliances	Clothes Washer	1,268,111	1,268,111	1,268,111	1,268,111	1,268,111	1,268,111	1,268,111	1,268,111				
Appliances	Refrigerator	-	-	-	-	-	-	-	-	-	-	-	-
CY2021 Market Transformation Program Total Electric Contribution to CPAS		1,268,111											
Historic Market Transformation Program Total Electric Contribution to CPAS‡		103,975											
Market Transformation Program Total Electric CPAS		1,372,086	1,268,111										
CY2021 Market Transformation Program Incremental Expiring Electric Savings§										1,268,111			
Historic Market Transformation Program Incremental Expiring Electric Savings									103,975				
Market Transformation Program Total Incremental Expiring Electric Savings									103,975	1,268,111			

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

*Market transformation programs estimate net savings, therefore there is no ex ante or verified gross and a NTG ratio does not apply. Source: IL TRM Attachment C, page 11.

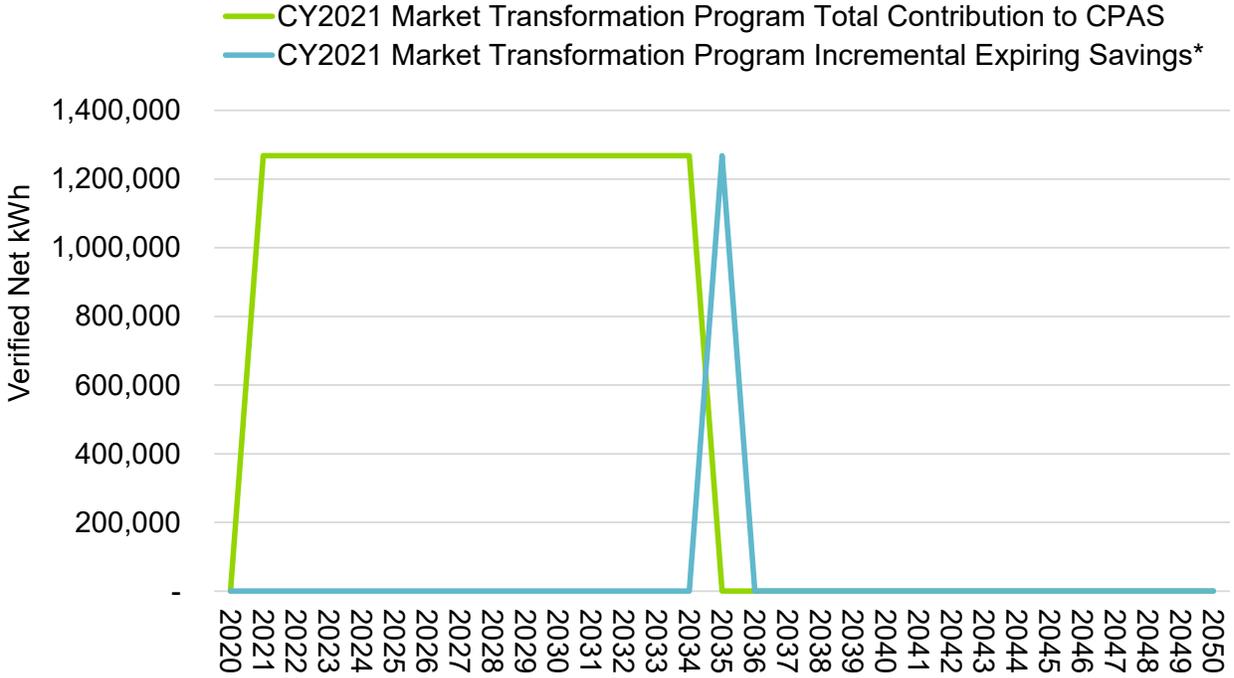
† Lifetime savings are the sum of CPAS savings through the EUL.

‡ Historical savings go back to CY2020.

§ 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. MT Program Savings by Measure

The ESRPP MT Program included the measures shown in Table 5-1.

Table 5-1. Number of Measures by Type

Research Category	Quantity	Unit
Clothes Washer	48,016	Each
Refrigerator	64,016	Each
Total	112,032	

Note: This is the same table as Table 2-1.
Source: ComEd tracking data and evaluation team analysis

Measure level energy and demand savings are in the following tables.

Table 5-2. Energy Savings by Measure – Electric

Research Category	Ex Ante Gross Savings (kWh)	Verified Gross Realization Rate	Verified Gross Savings (kWh)	NTG*	Verified Net Savings (kWh)	EUL (years)
Clothes Washer	N/A	N/A	N/A	N/A	1,268,111	14.0
Refrigerator	N/A	N/A	N/A	N/A	0	17.0
Total	N/A	N/A	N/A	N/A	1,268,111	

*Market transformation programs estimate net savings, therefore there is no ex ante or verified gross and a NTG ratio does not apply. Source: IL TRM Attachment C, page 11.

Source: ComEd tracking data and evaluation team analysis

Table 5-3. Summer Peak Demand Savings by Measure

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)
Clothes Washer	N/A	N/A	N/A	N/A	163.00
Refrigerator	N/A	N/A	N/A	N/A	0.00
Total	N/A	N/A	N/A	N/A	163.00

*Market transformation programs estimate net savings, therefore there is no ex ante or verified gross and a NTG ratio does not apply. Source: IL TRM Attachment C, page 11.

Source: ComEd tracking data and evaluation team analysis

6. Impact Analysis Findings and Recommendations

The issue that had the largest effect on adjusting ex ante savings was accounting for downstream savings from the Appliance Rebate Program (ARP). Net savings for refrigerators incented through ARP exceeded savings above the natural market baseline for ESRPP for refrigerators. Since these savings are already claimed through ARP they cannot be also credited to ESRPP, which resulted in zero savings for refrigerators in CY2021.

The evaluation team developed several recommendations based on findings from the CY2021 evaluation.

Finding 1. Using a natural market baseline developed from mid-western regional data, the evaluation team found net lift in market shares for top-loading washers of 13%, which is significantly higher than the 3% lift estimated by the IC for the same product category in Northwest for CY2021.

Recommendation 1. Revisit the clothes washers natural market baseline using a structured expert judgement panel to better understand trends among different regions and what might drive differences observed in program sales data but cannot be explained solely via program data.

Finding 2. While shares of refrigerators meeting ENERGY STAR Most Efficient 2021 qualifications are still relatively low, market shares have increased relative to the natural market baseline developed with mid-western regional data and produced savings for CY2021.

Recommendation 2. Revisit the refrigerator natural market baseline using a structured expert judgement panel to better understand trends for new product categories with little to no historical sales (e.g., emerging tech).

Finding 3. The evaluation team determined that the ESRPP program is making progress as a MT program according to evidence supporting MPI I. MPI I is defined as:

MPI I: “The portion of US households in ESRPP areas and the related total value of all program sponsor incentive budgets”.

The evaluation team found the number of households and total value of incentive budgets increased in the national ESRPP service territories between 2019 and 2020.

Recommendation 3. To provide more progress towards MPI I, the evaluation team recommends that the program expand the ESRPP marketing to recruit additional program sponsors to the ESRPP.

Finding 4. The evaluation team determined that the ESRPP program is making progress as a MT program according to evidence supporting MPI III-4. MPIII-4 is defined as:

MPI III-4: “Program sponsor confidence in the program operations process”.

The evaluation team found that program sponsors trust NEEA to facilitate the national ESRPP program, and that ComEd trusts NEEA as their implementer. Program sponsors trust the market

transformation program theory to influence the market. The program sponsors would also like to be better informed about the program with regular updates and more detailed data. ComEd also indicated that the ESRPP data portal provides only a partial view of overall program performance. ComEd would like the portal to reflect quantitative information that directly correlates to the MPIs over time as evidence of the program's success. Other sponsors indicated that they lack visibility into customer behavior which has created a lag in the understanding of the market trends for ESRPP products.²

Recommendation 4. To enhance progress towards MPI III-4, the evaluation team recommends that the IC provide more regular reports of progress to program sponsors and provide more regular two-way communication with program sponsors.

Finding 5. Evidence for MPI V yielded inconclusive findings regarding if the ESRPP program is making progress as a MT program to increase the sale of efficient clothes washers and refrigerators in select U.S. states. MPI V is defined as:

MPI V: "Retailer consideration of ESRPP qualification in assortment and marketing decisions".

The evaluation team found that factors influencing retailer product assortment decisions are diverse and influenced by perceived consumer demand. Retailer interviews have consistently found that incentives can sway retailer decisions if they are choosing between assorting a qualified product or a similar, non-qualified alternative. Retailer marketing decisions are also varied, and some retailers do not adjust their marketing processes because of participating in the ESRPP program. The evaluation team did not have access to detailed quantitative data on retailer's stocking and marketing decisions or the program's influence on these that could be used to measure changes to MPI V.³

Recommendation 5. To be able to evaluate MPI V's impact on program success, the evaluation team recommends that the IC and ComEd share their data collection and reporting process for retailer behavior. Data should include quantifiable changes in retailer considerations of ESRPP qualification in assortment and marketing decisions such that evaluators can track progress for MPI V over time. If not already incorporated into program design and implementation, the evaluation team recommends that the IC conduct a retailer participation journey. The participation journey is created by mapping out touchpoints and user journeys to understand retailer consideration of the program for assortment and marketing decisions.

² "Retail Product Portfolio Market Progress Evaluation Report #1", Apex Analytics and Cadeo Group, December 22, 2021. <https://neea.org/img/documents/RPP-MPER-1.pdf>. And interviews with ComEd's ESRPP program manager in January 2022.

³ "2021 ESRPP Retailer Interview Findings". Apex Analytics. September 27, 2021, and Abt Electronics interviews conducted by Guidehouse in 2021 and 2022.

Appendix A. Impact Analysis Methodology

The evaluation team estimated natural market baseline (NMB) market shares for each product category to measure net market lift induced by the ESRPP MT program. The program theory predicts that program support will lead to permanent transformation of 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 increased sales and market shares of efficient products after direct incentives are no longer applied to specific products. To the degree that sales of less efficient products are displaced, and less efficient products are pushed out of the market, this generates net market lift. Net market lift is the difference between the expected NMB and the observed market shares.

A.1 Data Sources for Developing ESRPP Natural Market Baselines

Market transformation programs aim to transform the entire market for each product category. To estimate savings for the ESRPP MT program, the evaluation team estimated the NMB across the entire market, including participating and non-participating retailers. Because the NMB estimates market shares absent any ESRPP MT program influence, the NMB represents expected market shares in both participating and non-participating retailers. During the program period, the evaluation team extrapolated beyond participating retailers when estimating market shares.

The evaluation team analyzed the sales data to replicate and verify the IC's NMB for both clothes washers and refrigerators using a combination of ESRPP tracking data from participating retailers, historical reported market shares from a prior program sponsor in Wisconsin, data from the American Community Survey (ACS), and the Association of Home Appliance Manufacturers (AHAM).

The ACS and AHAM data are used to estimate total unit sales in ComEd's service area and account for non-participating retailers. The team validated the IC's methodology and applied the extrapolated total market and non-participating retailer unit counts provided by the IC in their savings calculations.⁴

A.2 Data Sources for Estimating Savings from Participating Retailers

The ESRPP data administrator portal provides evaluation data reports which contained most of the data required for measuring net market lift. The data administrator portal⁵ is a data management tool for retailers and energy efficiency ESRPP MT program 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

⁴ NEEA. "Savings Calculation Framework for the ENERGY STAR® Retail Products Portfolio (ESRPP)". February 16, 2022.

⁵ Evaluation data reports are provided via <https://www.retailproductsplatform.com>.

- Per-unit incentive
- Retailer (for qualified products)
- Inputs for gross savings (energy factor, capacity, etc.)

Each of the five participating ESRPP MT program retailers provided full category 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. The monthly sales data includes 12 months of pre-program sales data as well as sales from each month the program has been active in ComEd's service area.

Since its launch in 2016, the national ESRPP MT program has influenced retailer stocking practices for various product categories, and therefore market shares of efficient products within targeted categories. Because the ComEd ESRPP MT program began in 2020, the evaluation team supplemented ComEd's ESRPP portal data with ESRPP reported market shares from Wisconsin Focus on Energy. Since Focus on Energy sponsored ESRPP from March 2016 – December 2018, the evaluation team utilized Wisconsin data from March 2015 - December 2018. The evaluation team used both the Wisconsin and the ComEd data to estimate market shares and control for any naturally occurring trends prior to the launch of ESRPP in Illinois. The Wisconsin data also ensures the baseline represents the Midwest regional market rather than the Northwest market estimates provided by the IC. The data from Wisconsin contains all of the same fields as the ComEd data since it is an extract from the same ESRPP data portal.

To measure savings, the evaluation team summarized sales of qualified products in the monthly sales data provided by the ESRPP data administrator. The team determined a given model number was qualified if that model number was marked as qualified for ESRPP support at any point in time, not just during the program or the baseline period. Additionally, the team relied on historical ENERGY STAR qualified product lists from the IC to track models that dropped out of the market before ComEd's program launch (and therefore would not be able to match current status to products that no longer exist in ComEd program data). By tracking model numbers consistently over time, the baseline captures natural levels of sales for efficient products before any ESRPP program influence as well as sales of products that may meet current standards but were not certified in the baseline period.

Once all qualified clothes washers were identified and labeled consistently, the team separated sales by DOE product class, since ComEd only pays incentives for top-loading washers, and summarized market shares for each month, spanning 76 months in total, and by year, 2015 through 2021. Focus on Energy's ESRPP program ended in December 2018 and ComEd joined in June 2020, so the data series was missing monthly market shares for January through May of 2019 (since participating retailers provided 12 months of historical sales for Illinois once ComEd joined). Market shares from June through December 2019 were assumed to be representative of the entire year.

For clothes washers, the evaluation team created a simple linear forecast to estimate the NMB. The team used the annual market shares in 2016 through 2018 to forecast market shares in 2019 through 2021. The team dropped 2015 from the historical period after discussions with the IC due to 2015 being only a partial year and two of the primary participating retailers were not yet part of the program.

Though the national ESRPP program was active before 2019, it was early enough that there is unlikely to be any significant observable market transformation effect since these effects take longer to appear than downstream and midstream buy-down programs.⁶ Additionally, the IC noted that ESRPP began specifically incenting top-loading configurations (rather than front-loading washers that were incented through 2018) in 2019 because they observed declining market shares of ENERGY STAR top-loading machines prior to 2019 and high shares of efficiency products for front loading washers.

The historical trends observed in the Midwest sales data from 2016 to 2019 aligned closely with the trends observed in the IC's Northwest sales data for top loading clothes washers, with an estimated baseline share of 36% compared to 49% actual market share in CY2021, resulting in a net lift of 13% above baseline. The Guidehouse team adjusted the *ex ante* savings for clothes washers because the *ex ante* savings were derived from the original forecast that included data from 2015. After dropping 2015 from the forecast, the NMB changed slightly, increasing by one percent, from 35% to 36%, which reduced *ex ante* savings by 113 MWh (6% of the reported 1,845 MWh savings).

While refrigerator sales were broken out by product class to calculate per-unit savings, per the Illinois TRM, sales were not broken out to estimate the NMB because market shares were at or near zero for some of the classes, making any trends within ENERGY STAR tier and product class highly volatile. The team's NMB forecasts were based on combined products classes within the advanced ENERGY STAR tier, combining sales of ENERGY STAR Most Efficient and Emerging Tech products across product configurations (top-freezer, bottom-freezer, side-mount, and compact configurations).

Similar to clothes washers, the Guidehouse team's refrigerator NMB forecast closely approximated the IC's refrigerator forecast derived from Northwest data. Given the close alignment, the Guidehouse team did not make any adjustments to the *ex ante* refrigerator savings.

A.3 Data Sources for Estimating Savings from Non-participating Retailers

Because the baseline and observed market shares reflect the sales at participating retailers only, the evaluation team used other factors to extrapolate potential net lift at non-participating retailers. Participating retailers are influenced directly via program incentives. Non-participating retailers are mostly influenced only indirectly, however the Emerging Tech Award might be an example of a more direct influence on non-participating retailers.

The degree to which the ESRPP MT program influences the market outside of participating retailers is unknown and difficult to measure. Longer term program effects, such as changes to ENERGY STAR specifications, including adding new efficiency tiers, such as Emerging Tech Awards, or changes to federal standards for a product category influenced by the program,

⁶ SEE Action Evaluation, Measurement, and Verification Working Group. "ENERGY STAR® Retail Products Platform (RPP): Conditions and Considerations in Evaluating Market Transformation Programs and Evaluation Guidance for RPP". January 2018.

provide a clear mechanism that directly affects non-participating retailers as well as participating retailers. However, in the short term, the effect on non-participating retailers is unknown.

The IC hypothesizes that non-participating retailers respond in real-time to competitive pressure from participating retailers and, therefore, the market shares of efficient products within non-participating retailers mirror those observed in participating retailers. Because direct measurement of sales within non-participating retailers are not possible to measure directly, the evaluation team conducted two tasks to assess evidence in support of the IC's hypothesis.

First, the evaluation team is scraping data from participating and non-participating retailer websites and collecting product assortments within sponsored product categories. Data collection began in Q4 2021 and will continue monthly. The team will analyze and compare shares of efficient products (shares of unique models since sales and inventories are not available) and compare between participating and non-participating retailers over time to see whether a) shares of product assortments are a reasonable proxy for market shares within participating retailers, and b) whether shares of efficient products converge over time between participating and non-participating retailers. This analysis will be completed for the CY2022 evaluation but does not inform the CY2021 evaluation.

The second task was to conduct a literature review to understand whether and under what conditions retailers mimic one another, testing the underlying logic of the IC's assumption.

The literature review found 17 papers discussing inventory management, product substitution and pricing strategies, and optimal retailer stocking levels. Additionally, the team reviewed papers discussing competitive dynamics, strategy and organizational survival, retailer power and market performance, why firms imitate one another, and strategies of low market share businesses.

The literature review found that retailer decision making is complex, and retailers consider many factors when deciding whether to mimic other retailers in the market. For example, firm A may not have the resources to conduct primary research on which products are likely to appeal to consumers over the next buying cycle. In this case, they may copy a competitor, firm B, if firm A believes firm B to have access to better information about trends in consumer demand. Alternatively, firm C may try to differentiate from firms A and B and may decide to purchase a different set of products, especially if firm C believes they do not have the resources to compete directly with firms A or B. Or firm C may use their own information and expectations of what their consumers will demand.

While the literature review was not conclusive, there are certain conditions under which retailers may choose to imitate their competitors. When interacting with smaller retailers, we discovered that their marketing and stocking behavior was highly structured. Smaller retailers focused on stocking lower volume of high efficiency washers. In comparison, larger box stores specialize in higher volume of lower-end washers. However, none of the papers directly supported the claim that non-participating retailers will mirror decisions made by participating retailers. Absent any clear empirical findings, the evaluation team settled on a compromise for the CY2021 evaluation by assuming net lift for non-participating retailers is 50% of the lift observed in participating retailers.

A.4 Methodology for Estimating CY2021 Energy Savings

In the ESRPP portal, appliance-specific savings values are referred to as unit energy consumption (UEC) – estimated annual energy use of this model, and unit energy savings (UES) – which is the difference between the UEC of non-qualifying models (baseline) and the UEC of qualifying models (efficient case). The evaluation team reviewed the tracking data for completeness to ensure each model has necessary parameters for calculating savings via IL-TRM equations for each appliance model. The team calculated UECs for each model using the TRM equations for each product category. UES values were calculated for each model by taking the difference between the efficient UECs and the federal standard UEC.

Equation A-1 is the TRM equation for clothes washer savings:

Equation A-1. TRM Clothes Washer Savings

$$\Delta \text{kWh} = \text{Capacity} * (1/\text{IMEF}_{\text{base}} - 1/\text{IMEF}_{\text{eff}}) * \text{Ncycles}$$

Where capacity and the efficient integrated modified energy factor (IMEF_{eff}) are provided in the tracking data and IMEF_{base} and Ncycles default values are provided in the TRM.

The TRM equation for refrigerator savings provides an equation for UECs, with a default constant kWh value for each refrigerator configuration and a parameter for kWh per cubic foot of adjusted volume (volume is provided in the tracking data). UES values are based on the efficiency tier defined by the improvement over federal standard where basic tier is 10% better, advanced tier is 15% better, and emerging tech are 20% better than federal standard.

Equation A-2 is the general equation for estimating ESRPP savings.

Equation A-2. ESRPP Energy Savings

$$\text{ESRPP Savings} = (\text{UES} * \text{Total Market Units}) - (\text{UES} * \text{Total Market Units} * \text{NMB})$$

Where:

- *UES* is the difference between sales-weighted average annual kWh for program qualified models and federal baseline models
- *Total Market Units* are the total quantity of qualified model sales from participating retailers plus the estimated quantity of qualified units sold through non-participating retailers
- *NMB* is the forecast natural market baseline market share

Once the Guidehouse team calculated savings above the NMB, the team removed savings for product categories incented through ComEd's downstream Appliance Rebate Program (ARP). The Midwest data did not include any downstream savings because Focus on Energy did not provide simultaneous incentives for products sold through ESRPP.⁷

The evaluation team was not able to match each installed measure's tier in the ARP dataset to the incented ESRPP tiers to ensure that the downstream savings that we removed from the program savings only reflected product categories incented by ComEd. However, the tier

⁷ While ComEd did offer downstream incentives for products sold through ESRPP, the Guidehouse team did not use ComEd's 2019 data in our forecast. See page A-2 for details.

definitions provided by the IC and those tracked in the portal itself suggest there is substantial overlap with both basic and advance tier refrigerators between ESRPP and ARP (in addition to historical program support for basic tier refrigerators). The evaluation team will incorporate more detailed analysis of downstream products in future years to more accurately account for overlapping downstream savings.

Downstream savings were limited to product categories incented by ESRPP – i.e., top-loading clothes washers and supported refrigerator configurations. Downstream savings are also adjusted for the measure-level NTG ratio so only the savings attributable to ARP are removed.

Table A-1 shows the adjustment for downstream savings. ESRPP does not apply a NTG ratio as other programs since program savings are only those above the natural market baseline, referred to here as gross ESRPP savings. Verified net savings are then equal to gross program savings less net downstream savings.

Table A-1. CY2021 Verified Net Savings

Research Category	Downstream Net Savings (kWh)	Gross ESRPP Savings (kWh)	Verified Net ESRPP Savings (kWh)
Clothes Washer	464,395	1,732,506	1,268,111
Refrigerator	1,113,462	1,005,026	0

A.5 Methodology for Assessing Market Progress Indicators

Following the guidance in IL-TRM Attachment C⁸, the evaluation team assessed several of the early Market Progress Indicators (MPIs) by examining evidence of ESRPP MT program’s influence in the market. The evaluation team assessed MPIs I, III-4, and V. The evaluation team reviewed data and information related to the ESRPP MT program and assessed the progress toward the MPI and if it indicates that the ESRPP program is making progress as a MT program to increase the sale of efficient clothes washers and refrigerators in select U.S. states.

MPI I: Portion of US households in ESRPP areas and the related total value of all program sponsor incentive budgets.

To assess MPI I, the evaluation team reviewed information supplied by the IC:

1. EIA-861 Utility Dataset
2. ESRPP program documents including “ESRPP Program Sponsor Status_2021.xlsx”

⁸ IL-TRM v8 “Attachment C: Framework for Counting Market Transformation Savings in Illinois.” 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

MPI III-4: Program sponsor confidence in program operations process

To assess MPI III-4, the evaluation team combined quantitative and qualitative findings from ESRPP program sponsor interviews⁹ conducted by the IC's contractors with findings from an interview with ComEd's ESRPP MT Program Manager.

MPI V: Retailer consideration of ESRPP qualification in assortment and marketing decisions

To assess MPI V, the evaluation team reviewed qualitative and quantitative findings from the national retailer interviews¹⁰ conducted by the IC's contractor. In addition, the evaluation team conducted interviews with local retail partner Abt Electronics using a similar interview format as the interviews with the national retailers. The evaluation team combined the findings from both the national retailer interviews and the local retailer interviews to assess progress toward MPI V.

In addition to the retailers' interview findings, the evaluation team included findings from interviews with ComEd ESRPP program managers and IC staff to determine any short-term activities participating retailers might have conducted with regard to ESRPP participation.

⁹ "Retail Product Portfolio Market Progress Evaluation Report #1", Apex Analytics and Cadeo Group, December 22, 2021. <https://neea.org/img/documents/RPP-MPER-1.pdf>.

¹⁰ "2021 ESRPP Retailer Interview Findings". Apex Analytics. September 27, 2021.

Appendix B. Impact Findings Detailed Results

B.1 CY2021 ESRPP MT Program Energy Savings

The evaluation team conducted the impact analysis using the most recent market sales data available on the ESRPP data administrator portal. The team observed 13.1% net lift for clothes washers and 9.3% lift for refrigerators. Guidehouse also removed the savings claimed through the downstream Appliance Rebate Program, to avoid double counting, which resulted in the savings shown in Table B-1 for CY2021. Since the downstream program achieved greater refrigerator savings than ESRPP, the resulting verified net kWh and kW savings from refrigerators were zero.

Table B-1. CY2021 Electric Savings

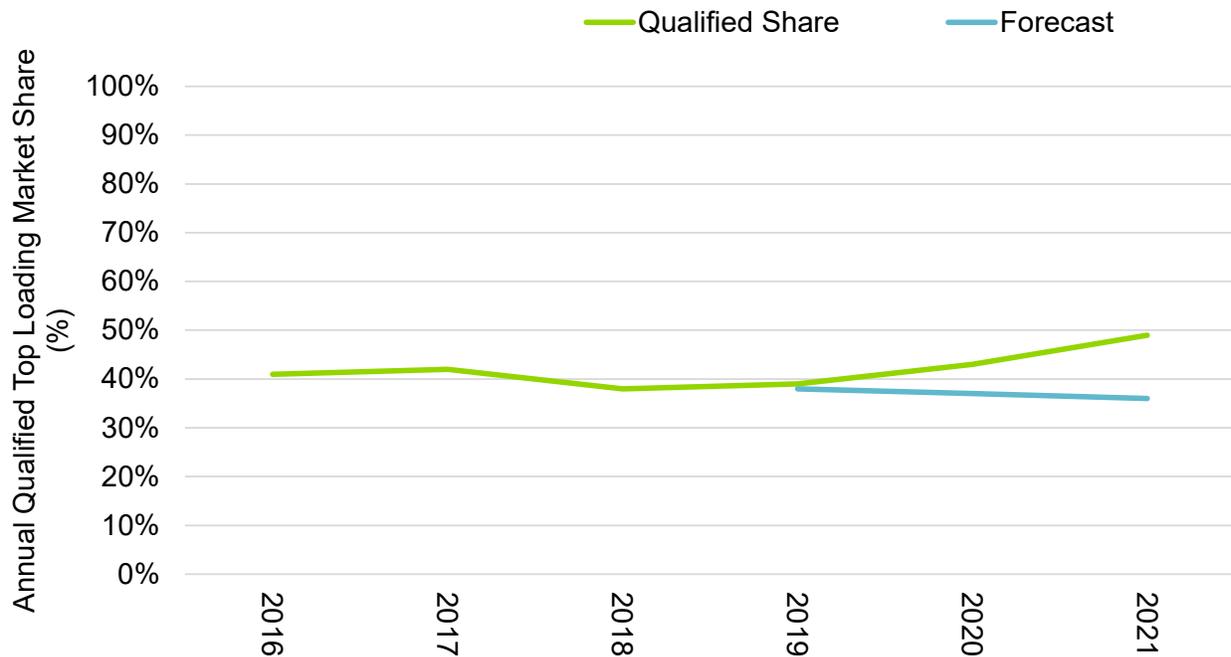
Metric	Clothes Washer	Refrigerator	Total
[1] Ex Ante Net kWh Savings	1,845,378	1,005,026	2,850,405
[2] Forecast Market Share	36.19%	20.50%	270,158
[3] CY2021 Pilot Period Market Share	49.30%	29.80%	10,893,761
[4] Net Percent [3] - [2]	13.11%	9.30%	1.24%
[5] Total Gross kWh Savings	1,732,506	1,005,026	2,737,532
[6] Net Downstream kWh Savings	464,395	1,113,462	1,577,857
[7] Verified Net kWh Savings [5] - [6]	1,268,111	0	1,268,111
[8] Total Gross kW Savings	223	151	374
[9] Net Downstream kW Savings	60	168	228
[10] Verified Net kW Savings [8] - [9]	163	0	163

Source: Evaluation team analysis

B.2 Net Lift for Clothes Washers

Figure B-1 compares forecast and observed annual market shares for program-qualified top-loading clothes washers. In the baseline years, market shares decreased from 41% in 2016 to 38% in 2018. The forecast assumes these trends would continue and expected market shares in 2019 through 2021 would decrease slowly from 38% to 36%. Actual market shares began increasing in 2020.

Figure B-1. Annual Washer ENERGY STAR Market Share – Baseline Forecast vs. Actual



Since baseline market shares are lower than the observed market shares for clothes washers, there was 13.1% net lift.

The net lift for clothes washers observed in ComEd’s service territory is significantly greater than the 3% lift the IC reported for the Northwest service territory for the same subset of products. The approach used by the Guidehouse team and the IC for estimating baseline and lift align closely and does not explain a discrepancy of 10% difference in net lift.

Additionally, the difference cannot be explained in the data alone – we can observe the trends in the data but the program theory, being a national intervention, does not predict such differences between service areas (particularly given the baselines are essentially the same). While the program theory does not preclude differences in net lift, it also does not provide a clear rationale for differences in net lift in different service territories.

Future evaluation work should further explore sales trends – potentially via structured expert judgement panel or market analyses – that cannot be explained by program data alone (trends in consumer preference, marketing, etc.) that may be driving trends in market share beyond program influence so that these trends can be accurately captured in the baseline or explain differences between regions.

B.3 Net Lift for Refrigerators

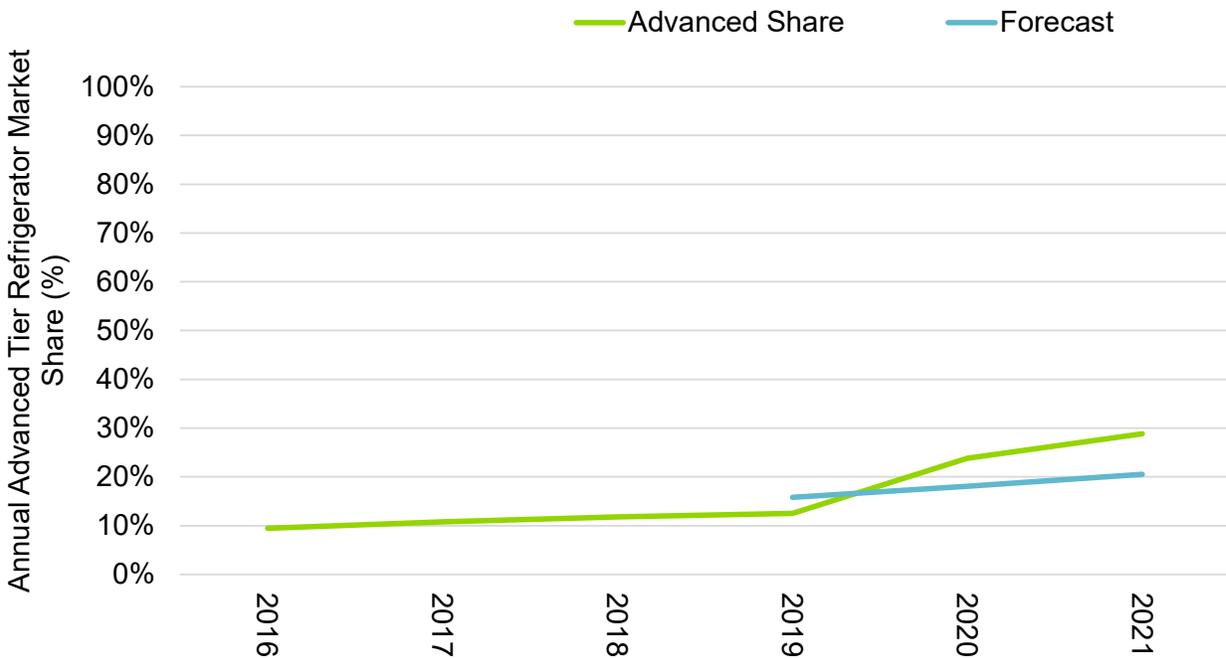
Figure B-2 compares forecast and observed annual market shares for advanced tier and basic ENERGY STAR Most Efficient (ESME) refrigerators. Market shares were combined across all product configurations because baseline shares within each configuration (top freezer, bottom

freezer, side-mount, or compact) and ENERGY STAR tier (ESME and Emerging Tech) were very small for multiple combinations and produced unreliable forecast estimates.

In the baseline years, market shares increased from 9% in 2016 to 11% in 2017. Market shares remained relatively flat until 2020 when shares roughly doubled, increasing to 24%. The forecast assumes these trends would continue and expected market shares in 2021 would be 20.5%, 9.3% lower than observed market shares of 29.8%.

Since baseline market shares are actually lower than the observed market shares for refrigerators, there was 9.3% net lift.

Figure B-2. Annual Refrigerator ENERGY STAR Most Efficient Market Share – Baseline Forecast vs. Actual



Source: Evaluation team analysis

B.4 Market Progress Indicators

The evaluation team will present detailed findings and recommendations in a forthcoming “ComEd ESRPP MT Program CY2021 Market Progress Indicators Assessment” memo, to be issued in Q2 2022.

Appendix C. Total Resource Cost Detail

Table C-1 shows the Total Resource Cost (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, market transformation program-level incentive and non-incentive costs); ComEd will provide this data to the evaluation team later.

Table C-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	Clothes Washer	Each	48,016	14.0	NO	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1,268,111	163.00	0	0	0	0
Appliances	Refrigerator	Each	64,016	17.0	NO	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0	0.00	0	0	0	0
Total				17.0		0	0	0	0	0	0				1,268,111	163.00	0	0	0	0

* 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 market transformation program savings.

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

Source: ComEd tracking data and evaluation team analysis