CONNECTICUT ENERGY EFFICIENCY BOARD

R1973 Retail Non-Lighting Evaluation

Final Report

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PRESENTED TO:

Connecticut Energy Efficiency Board
Lisa Skumatz and Ralph Prahl
EEB Evaluation Administrators
10 Franklin Square
New Britain, CT 06051

PRESENTED BY:

Brett Close
Associate Director
TRC (formerly EMI Consulting)
807 Roy St., Suite 301
Seattle, WA 98102

Jenna-Bagnall-Reilly
Senior Researcher
TRC (formerly EMI Consulting)
807 Roy St., Suite 301
Seattle, WA 98102

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ABSTRACT

The *R1973 Connecticut Retail Non-Lighting Evaluation* covered two program groups run by Eversource and United Illuminating (Connecticut Utilities): the ENERGY STAR® Retail Products Platform (ESRPP) and E-commerce platform. The study had two main objectives; (1) develop improved impact parameters for ESRPP and the E-commerce platform programs, and (2) recommend improvements to the design and implementation of each program.

The ESRPP and E-commerce programs are part of the Connecticut program administrator's (PA's) efforts to provide additional energy efficiency opportunities to residential customers in the face of recent declining savings opportunities from lighting. This research supports the Connecticut PA's expansion of energy efficiency opportunities to residential customers.

Key Findings and Recommendations

Table 1 and Table 2 below summarize our recommendations out of the engineering review for each of the ESRPP and E-commerce measures, including the original and updated savings values, the source(s) of the recommended update.

Table 1. Summary of 2021 PSD Recommendations – Electric Savings[1]

Measure	Updated Gross Value (kWh)	Existing Gross Value (kWh)[2]	Source for Updated Value (with Year[3,4])
ESRPP Measures			
Refrigerator Tier I	64	64	PSD, 2017
Refrigerator Tier II	96	96	PSD, 2017
Freezer, Upright	50	45	Supplemental PSD documentation, 2017
Freezer, Chest	32		Supplemental PSD documentation, 2017
Clothes dryer, Gas	36	93	VT TRM, 2015
Clothes dryer, Electric	194		VT TRM, 2015
Clothes Washer, Tier I	88.1	66	VT TRM, 2018
Clothes Washer, Tier II	120.3	117	VT TRM, 2018
Room Air Conditioner	10.7	77.5	VT TRM, 2015
Dehumidifier	214	214	PSD, 2017
Air Cleaner/Purifier	214	227	VT TRM, 2004
Sound Bars[4]	24	45	VT TRM, 2013
E-Commerce Measures			
Wi-Fi Thermostats	104	25[6]	MA, 2018
Smart Thermostats	Calculated Deemed		VT TRM, 2018
Adv. Power Strips, Tier I	48	48	PSD, 2016
Adv. Power Strips, Tier II	179		MA TRM, 2018

[1]The table represents gross values, a discussion of NTG values can be found in Section 2.2.3 Net Impacts.
[2]Existing values are pulled from the 2020 Connecticut PSD.
[3]Year represents the date of the source information, not the date the respective TRM was updated.
[4]The evaluation consultant has no reason to believe that a clothes dryer would operate differently in VT than in CT.
[5]A follow-up email was sent on 6/25/20 to confirm there is no additional documentation not shared with the evaluation consultant. To date no additional documentation has been received for sound bars.

[6] The Connecticut PSD deemed savings for Wi-Fi/smart thermostats distributed through ESRPP or E-commerce is for cooling savings only.

Table 2. Summary of 2021 PSD Recommendations – Gas Savings[1]

Measure	Updated Gross Value	Existing Gross Value[2]	Source for Updated Value (with Year[3])
ESRPP Measures			
Clothes dryer – gas[4,5]	1.2 therms	NA	New York, 2017
E-Commerce Measures			
Wi-Fi Thermostats, gas	62.4 therms	NA	MA, 2018
Wi-Fi Thermostats, oil[6]	**5.7 MMBtu**	**NA**	**MA, 2018**

[1]The table represents gross values, a discussion of NTG values can be found in Section 2.2.3 Net Impacts.
[2]Existing values are pulled from the 2020 Connecticut PSD.
[3]Year represents the date of the source information, not the date the respective TRM was updated.
[4]The evaluation consultant has no reason to believe that a clothes dryer would operate differently in NY than in CT.
[5]The evaluation consultant is aware that gas clothes dryers are not currently offered through the ESRPP program in Connecticut.
[6]MA (and other state's TRMs) do not have a value for propane savings. Connecticut could either conduct primary research to determine the propane savings or assume the 5.7 MMBtu for the instance where a residence has propane heat.

ESRPP Findings and Planning Recommendations

Our high-level evaluation findings and conclusions from the engineering review of the ESRPP measures result in the following recommendations.

A number of changes in how the Connecticut Utilities interact with the national program and participating retailers would likely improve the program's success. Retailers make purchasing and marketing decisions one year, or more, in advance of stocking products. **The Connecticut Utilities should institute two-year or three-year incentive levels and budgets to better align with retailer purchasing timelines.** Retailers also need help understanding why customers would be interested in different energy efficient (rebated) products. **The Connecticut Utilities should provide specific directions to national retailers on purchasing and promoting specific products** (e.g., marketing strategies and content) and establish relationships with local retailers to ensure national guidance is implemented. Lastly, the **Connecticut Utilities should work with the national ESRPP collaborative to recruit regional peer utilities into the program.** Recruiting additional, regional Program Sponsors will enhance the impact of the program on retailer stocking and support greater savings.

The Connecticut Utilities can take a number of actions to better track the program's impact on the market and increase short-term savings. **Tracking upright and chest freezer purchases separately (if not doing so already) will allow freezer type-specific savings estimates to be applied.** The amount of potential energy savings is different for these specific products and better tracking may result in higher overall savings depending on the distribution of sales. **The Connecticut Utilities should also monitor key performance indicators (KPIs) to help identify where the program is having success in the shorter-term and where it is lagging.** Table 3 below outlines suggested KPIs that can be

developed using data that is already being collected by the Connecticut Utilities or other ESRPP stakeholders.

Table 3. Key Performance Indicators for ESRPP

Metric Description	Metric Calculation	Data Collection Activity
Total Deemed Savings	Monthly deemed savings overall, and by product category	ICF sales data portal
Net Benefit	Total program spend ($) per kWh or kW saved	Program data
Number of Participating Store Locations	Number of unique store locations participating in utility territory, by retailer	Program data
Number of Product Categories	Count of product categories incented overall	Program data
Efforts to recruit retailers	Documentation of efforts to recruit new national or regional retailers	Program documents
Total incentive dollars paid	Total incentive amount, by retailer and product category	Program data

E-Commerce Findings and Planning Recommendations

Our high-level evaluation findings and conclusions from the engineering review of the E-commerce measures result in the following recommendations.

The literature review indicates that consumers "broader online digital experiences are continually refining and resetting" their expectations, and platform design should enable an "effortless customer experience."[1] The Connecticut Utilities have made recent updates to their E-commerce platforms including additional products and product information that enhances the customer experience. They should **continue to review the design and user experience of E-commerce platforms** by using non-utility E-commerce platforms as a benchmark for platform design. The Connecticut Utilities should also **continue to increase the number of product categories available on E-commerce platforms.** Any products that have existing prescriptive rebates, as well as non-rebated efficient products, that can be sold through the E-commerce platform such as dishwashers and clothes washer and dryers, should be included. Eversource has recently updated their platform to include these products. Lastly, the Connecticut Utilities should **add educational information to help customers understand the benefits of buying efficient products.** Eversource recently updated their site to include educational information, but the UI platform focuses on products and information about other energy efficiency programs. The more robust utility E-commerce sites

[1] Accenture. The New Energy Consumer: Unleashing Business Value in a Digital World. 2015. https://www.accenture.com/_acnmedia/accenture/next-gen/insight-unlocking-value-of-digital-consumer/pdf/accenture-new-energy-consumer-final.pdf

provide specific information on the efficiency of both rebated and non-rebated products, buyers guide information, and customer ratings and reviews to give products more credibility.

To improve the delivery of savings, the Connecticut Utilities should **track Wi-Fi and Smart (learning) thermostat purchases separately, as well as Tier I and Tier II APS purchases separately (if not doing so already).** The amount of potential energy saved is different for these specific products. Tracking them separately will allow for more specific savings claims which may result in higher overall savings depending on the distribution of sales. **The Connecticut Utilities should also leverage direct email for effective marketing outreach.** Peer utilities noted this was their primary and most successful marketing channel to drive traffic to their sites. The Connecticut Utilities should put in place a direct marketing campaign (if they are not doing so already) and could consider either separate engagement or partnering with other program outreach such as Home Energy Reports.

EXECUTIVE SUMMARY

This report summarizes the results from the *R1973 Connecticut Retail Non-Lighting Evaluation* conducted by TRC Companies (TRC), formerly EMI Consulting, on behalf of the Connecticut Energy Efficiency Board (CT EEB). The evaluation covered two program groups run by Eversource and United Illuminating (Connecticut Utilities): the ENERGY STAR® Retail Products Platform (ESRPP) and the Connecticut Utilities' E-commerce platforms.

INTRODUCTION

The ESRPP and E-commerce programs are part of the Connecticut program administrator's (PA's) efforts to provide additional energy efficiency opportunities to residential customers in the face of declining savings opportunities from lighting.

ESRPP is a nationally coordinated program that seeks to increase adoption of efficient appliances in select product categories by changing retailer stocking and assortment through midstream incentives, with a long-term goal of advancing codes and standards specifications.[2] E-commerce platforms provide an additional path for residential energy efficiency savings by providing a centralized location for customers to research and purchase energy efficient products.

This project had two main objectives; (1) develop improved impact parameters for ESRPP and the E-commerce platform programs, and (2) recommend improvements to the design and implementation of each program. The ultimate goal is to use this research to support the Connecticut PA's expansion energy efficiency opportunities to residential customers.

METHODOLOGY

Table ES-1 outlines the specific evaluation tasks we conducted to address the evaluation objectives. The table also outlines which program(s) each research task covered. A more detailed description of the evaluation methodology is outlined in Section 1.3 Research Objectives and Methodology, Appendix A: Data Analyses & Methodology, Appendix B-1. Program Sponsor and Stakeholder Interviews, and Appendix C-1. Retailer Interviews Analysis.

[2] The ESRPP logic model cn be found in Section 2.1.2 ESRPP Implementation.

Table ES-1. Research Activities by Program

Research Activities	ESRPP	E-Commerce
Literature review	✓	✓
Peer utility interviews	✓[1] (n=6)	✓ (n=4)
Retailer interview analysis	✓[2] (n=8)	
EM&V best practices comparison	✓	
Shelf assortment survey analysis	✓	
Sales data analysis	✓	
Engineering review of impact parameters	✓	✓

[1]*ESRPP peer utility interviews also include external collaborators.*
[2]*Interactions with retailers through local or regional evaluations is prohibited. Instead, research on retailer participation is done through a national evaluation effort. Retailer interviews were conducted in 2019 by Cadmus as part of a national ESRPP program evaluation. Given that retailers' participation is at the national level, the interviews focus on the program from that perspective. The Connecticut ESRPP was implemented in 2018, and therefore the key results and barriers to the success of the program are applicable to Connecticut.*

FINDINGS AND RECOMMENDATIONS

This section summarizes the research findings as detailed in Section 2. ESRPP Findings and Recommendations and Section 3. E-Commerce Findings and Recommendations. Specific recommendations on impact parameters for each program can be found in Appendix D: Detailed PSD Findings.

ESRPP KEY FINDINGS

ESRPP is designed as a national, long-term market transformation program. However, **most Program Sponsors, including the Connecticut Utilities, operate it as a short-term resource acquisition program** due to the lack of regulatory framework needed to support market transformation programs. This has caused Program Sponsors to stray from the national program design and limited most Sponsors' ability to claim savings and meet cost-effectiveness goals. Many of the Program Sponsors interviewed cited the need to meet cost-effectiveness as a reason to limit product incentives and modify the program to support claiming short-term savings. Up until PY2020 the Connecticut Utilities only provided incentives for advanced tier models which limited available incentives when compared to other Program Sponsors.

Local ESRPP implementation differences weaken the programs ability to impact the market because retailers cannot rely on similar incentives from different Program Sponsors. While retailers generally view the ESRPP program favorably, the different implementation and incentive strategies of the various Program Sponsors dilute the program signal and leave little guidance on which products retailers should purchase. One national program collaborator noted that if sponsors continue to reduce incentive values, at some point it will no longer be worth retailers' time to participate. Notably, the Connecticut Utilities increased incentive values in 2020. Retailers make product decisions over long timelines, at least a year if not more in advance, so having annual incentive levels that are

announced months before the start of the program year do not align with retailer decision-making timelines. This also weakens the impact of the program.

The Connecticut ESRPP program is demonstrating limited impacts to-date. The program is not yet impacting retailer stocking and shelf assortment of energy efficient products. The Connecticut's ESRPP has only been in place since 2018, so this result is expected, as market transformation programs can take up to three years to impact the retailer stocking. The market transformation program theory indicates that increases in efficient product assortment (or stocking) and marketing are mid-term outcomes, occurring after one to three years of implementation because national retailer stocking and promotional decisions are made months to years ahead of products hitting the shelves. These outcomes are critical to increase qualified product sales.

However, room air conditioners and refrigerators showed significant sales increases despite no evidence of retailer changes in stocking for these products. Our analysis of point-of-purchase prices and product placement indicated some qualified products were more likely to receive a larger sales discount (refrigerators, freezers, clothes dryers and clothes washers) or preferential placement within retailer stores. While the program targets retailer stocking of efficient equipment, the increased sales of room air conditions and refrigerators is likely an indirect impact of the program as equipment incentives could be impacting retailer treatment of qualified products.

As implemented for the program year evaluated (2018-19), the Connecticut Utilities' product categories and incentive levels were below the average for peers. The addition of two basic-tier product categories in 2020 – and increases in incentive values across almost all categories – bring the Connecticut program in line with other Program Sponsors. Table ES-2 compares the Connecticut PY2019 and PY2020 incentives to the average product incentive across participating Program Sponsors.

Table ES-2. Connecticut Product Incentive Benchmarking

Advanced-Tier Measure	CT Incentive PY2019	CT as % of 2019 Average	2019 Sponsors	CT Incentive PY2020	CT as % of 2020 Average	2020 Sponsors
Air Cleaner	$0			-		
Room Air Conditioner	$10	55%	6	$20	104%	7
Washer	$15	91%	7	$20	141%	6
Dryer	$45	46%	8	$45	91%	8
Sound bar	$0			-		
Freezer	$10	33%	7	$20	80%	6
Refrigerator	$10	59%	8	$20	127%	10

Most Program Sponsors, including the Connecticut Utilities, do not actively participate in advocacy for equipment standards which limits broader market transformation and reduces long-term savings for all Program

Sponsors. Program Sponsors that operate ESRPP under a resource acquisition framework indicated they do not participate in national ESRPP standards advocacy activities and are more focused on short-term incentives. The Connecticut Utilities only passively participate in standards advocacy activities; however there has been a recent effort to develop a Codes & Standards Plan to more actively address these issues. Two Program Sponsors that operate under longer-view market transformation frameworks stressed the importance of actively participating in national standards discussions and advocacy as a primary activity and benefit of the program. One of these Sponsors is able to claim savings resulting from efficiency improvements achieved through standards changes at the national level, which can be significant. The lack of engagement in market transformation activities limits the long-term prospects to deliver these savings on a national level and for the Connecticut Utilities' ESRPP programs.

To begin to overcome these challenges, the evaluation consultant has outlined specific recommendations the Connecticut Utilities can take to enhance the success of ESRPP. Our recommendations were developed to aid the Connecticut Utilities ESRPP in both supporting long-term market change, as well as striving for enhanced short-term resource acquisition.

ESRPP Design & Implementation Recommendations

The following recommendations relate to the design and implementation of the Connecticut Utilities' ESRPP programs.

1. **Engage DEEP and other Connecticut stakeholders to develop a market transformation framework to begin realizing savings from broader market changes beyond resource acquisition.** A market transformation framework will allow the Connecticut Utilities to effectively implement ESRPP and other market transformation initiatives including claiming broader, long-term savings. Further details are provided in Section 2.4 below.
2. **Implement the recommended ESRPP market transformation indicators (MTIs) to track long-term market transformation progress**. Recommended ESRPP market transformation indicators (MTIs) are listed in Table 2-12 and can be developed using data that is already being collected.
3. **Monitor key performance indicators (KPIs) to help identify where the program is having success in the shorter-term and where it is lagging.** Table 2-13 outlines recommended KPIs that can be developed using data that is already being collected by the Connecticut Utilities or other ESRPP stakeholders.
4. **Begin tracking upright and chest freezer purchases separately (if not doing so already) to allow freezer type-specific savings estimates to be applied for upright and chest types.** More granular product tracking will allow for more specific savings claims and may result in higher overall savings depending on the distribution of sales.
5. **Implement the recommended updates to measure level savings and documentation in the Connecticut PSD outlined in Table ES-3 to bring savings values in line with peers.**[3] A full description of the of suggested

[3] Recommended updates have been incorporated into the 2021 Connecticut PSD as part of the 2021 Plan Update PSD filling.

values and changes for the PSD is in Section 2.3 CT Program Savings Document (PSD) Updates and Appendix D: Detailed PSD Findings.

Table ES-3. 2021 PSD Measure Updates - ESRPP[1]

Electric Measure[2]	Existing Gross Value (kWh)	Updated Gross Value (kWh)[3]	Source for Updated Value (with Year[4,5])
Refrigerator Tier I	64	64	PSD, 2017
Refrigerator Tier II	96	96	PSD, 2017
Freezer, Upright	45	50	Supplemental PSD documentation, 2017
Freezer, Chest		32	Supplemental PSD documentation, 2017
Clothes dryer, Gas	93	36	VT TRM, 2015
Clothes dryer, Electric		194	VT TRM, 2015
Clothes Washer, Tier I	66	88.1	VT TRM, 2018
Clothes Washer, Tier II	117	120.3	VT TRM, 2018
Room Air Conditioner	77.5	10.7	VT TRM, 2015
Dehumidifier	214	214	PSD, 2017
Air Cleaner/Purifier	227	214	VT TRM, 2004
Sound Bars[6]	45	24	VT TRM, 2013
Gas Measures			
Clothes dryer – gas	1.2 therms	NA	New York, 2017

[1]The table represents gross values, a discussion of NTG values can be found in Section 2.2.3 Net Impacts.
[2]Detailed measure specific recommendations are in Appendix D: Detailed PSD Findings.
[3]Existing values are pulled from the 2020 Connecticut PSD.
[4]Year represents the date of the source information, not the date the respective TRM was updated.
[5]The evaluation consultant has no reason to believe that a clothes dryer would operate differently in VT than in CT.
[6]A follow-up email was sent on 6/25/20 to confirm there is no additional documentation not shared with the evaluation consultant. To date no additional documentation has been received for sound bars.

ENGAGEMENT RECOMMENDATIONS

The following recommendations relate to how the Connecticut Utilities' engage with the national ESRPP program and participating retailers.

6. **Participate actively with ESRPP national partners specifications and standards tasks, such as providing data and engaging in comment process for standards.** These activities take place within the national ESRPP Products Workgroup. Active engagement in this process will support greater savings for the Connecticut Utilities ESRPP program.[4]
7. **Work with the national ESRPP collaborative to recruit regional peer utilities into the program.** This will enhance the program's impact on retailer stocking and support greater savings for the Connecticut Utilities ESRPP program.

[4] NEEA claims savings attributed to impacts on national appliance standards.

8. **Provide specific marketing strategies and content to national retailer partners on promoting specific products and establish relationships with local retailers to ensure national guidance is implemented.** Some Program Sponsors have also had success expanding the scope of the program by signing up local retailers in addition to the national retailers.

Incentive Recommendations

The following recommendations relate to the incentives offered through the Connecticut Utilities' ESRPP programs.

9. **Incorporate a structured assessment of incentive levels.** Adoption of a market transformation framework, recommended above, would allow the Connecticut Utilities to implement this approach to setting incentive levels.
10. **Institute two-year or more incentive levels and budgets instead of current annual process, even if other Program Sponsors are budgeting annually.** This will better allow retailers to factor a known incentive level into their purchasing decisions, sending a stronger signal to retailers to purchase efficient products.

E-COMMERCE KEY FINDINGS

As more retail sales shift to online venues, utilities are establishing E-commerce (online) platforms as a way meet customers where they shop, educate customers on existing rebate products, and deliver energy savings. Our research of peer E-commerce platforms reveals a number of trends and practices the Connecticut Utilities could implement to drive additional savings from their platforms.

Product strategy planning would help the Connecticut Utilities' define clear goals for the purpose of their E-commerce platforms. The outcomes of this activity should inform future updates to the product functionality and design. One peer utility noted it was a best practice to first define whether the platform will be a channel to deliver rebated products to customers or an educational platform to help customers discover energy efficient products and their features, or both. Some E-commerce platforms offer products for purchase directly through the site. Others only allow for product comparisons and direct users to other retailer sites for purchasing. If Connecticut Utilities' primary aim is to educate consumers about energy attributes of products, platform design should be focused on sorting and ranking products by energy and cost savings. If increasing sales of rebated products is the primary outcome, the promotions and costs of these specific products should be the focus.

Utilities' E-commerce platforms feature both rebated and non-rebated efficient products, with some including non-energy related products as well. There is little incremental cost to adding more product categories to the platform, so all of the peer platforms reviewed use the platform to increase visibility of efficient products, even if they do not offer direct incentives for them. Two of the four Program Managers interviewed mentioned including additional products categories to offer a more integrated, seamless customer experience. The

Connecticut Utilities have recently updated their platforms to include some non-rebated efficient products.

Peer utilities also had a strong focus on customer experience to remain competitive with other online-shopping venues customers are familiar with. Rebates are an important element of the platform for most utilities. However, all of the utilities' E-commerce platforms provided information (such as buyers guides or customer reviews) on both rebated and non-rebated products. Customers compare utility platforms against other online experiences where they shop, according to the literature review. Eversource has recently added some product information to their E-commerce platform.

Peer utilities market their E-commerce platforms primarily through direct email, and special promotions like Black Friday or Father's Day. They also used social media and banner advertising online, promotion on the utility's home page, collateral at public events, and paid search promotion. Peer utilities track web engagement metrics, including unique visits and click-through rates, among others. Our initial discussion with the Connecticut Utilities' indicated they were developing a more standard marketing strategy, and they have since included special promotions (such as Black Friday sales) on their platforms.

Almost all peers claim savings from the platform – generally using the same savings calculations for the products as sold through existing downstream channels. In Connecticut, United Illuminating (UI) is claiming savings through their E-commerce platform; however, Eversource just recently launched their platform in the Spring of 2020. Two peer utilities have developed an estimation method to potentially claim savings from product sales influenced by the educational component of the platform, but not bought or rebated through the platform. However, neither has currently received approval to claim savings with this approach.

Through our research, we have developed the following recommendations to support the success of the Connecticut Utilities' E-commerce platforms.

E-commerce Design Recommendations

The following recommendations relate to the design of the Connecticut Utilities' E-commerce platforms.

1. **Continue to review the design and user experience of E-commerce platforms.** The Connecticut Utilities' should continue to use non-utility E-commerce platforms that customers are familiar with as a benchmark for platform design.[5] The Connecticut Utilities should also consider the possibility of

[5] The Connecticut Utilities have made recent updates to their E-commerce platforms including additional products and product information that enhances the customer experience.

offering a single, combined E-commerce platform as a way to streamline the user experience.[6]

2. **Create a dashboard of tracking metrics to gauge monthly platform performance.** Best practices for monthly or quarterly metrics include monthly unique visitors, product category page views, marketing campaign clickthrough rates, completed product sales, and customer satisfaction.[7]
3. **Connecticut Utilities should add educational information to help customers understand the benefits of buying efficient products.**[8] This should include specific information on the efficiency and lifetime cost savings of both rebated and non-rebated products, buyers guide information, and customer ratings and reviews to give products more credibility.

Platform Marketing Recommendations

The following recommendations relate to the marketing of the Connecticut Utilities' E-commerce platforms.

4. **Leverage direct email for effective marketing outreach.** Peer utilities noted this was their primary and most successful marketing channel to drive traffic to their sites. The Connecticut Utilities should establish a direct marketing campaign (if they are not doing so already).
5. **Continue to offer special-promotions to drive customer engagement.** Customers are interested in and expect deals around holidays. Work with E-commerce platform vendors and product manufacturers to continue to develop special, limited-time promotions on rebated or high-savings products.

Product Selection and Tracking Recommendations

The following recommendations relate to the Connecticut Utilities' E-commerce platforms product selection and tracking.

6. **Continue to increase the number of product categories available on E-commerce platforms.** Any products that have existing prescriptive rebates, as well as non-rebated efficient products, that can be sold through the E-commerce platform should be included.[9]
7. **Track Wi-Fi and Smart (learning) thermostat purchases separately, as well as Tier I and Tier II APS purchases separately (if not doing so already).**[10] The amount of potential energy saved is different for these specific products. This level of product tracking will allow for more specific savings

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[6] A single platform could be administered similarly to the Mass Save E-commerce site that serves customers across six different Massachusetts utilities, https://www.poweredbyefi.org/masssave.
[7] Our initial discussion with the Connecticut Utilities' indicated they did not have a structure for tracking performance metrics and were in the process of determining which metrics to track.
[8] Eversource has recently incorporated product information on energy savings and efficiency ratings; however, UI's platform remains focused on product prices and rebates.
[9] Eversource recently expanded their products to include appliances such as refrigerators, freezers, dishwashers, clothes washers and dryers, dehumidifiers, and other home electronics.
[10] Smart thermostats are WiFi enabled thermostats that "learn" from the behavior of the user and automatically adjusts the heating and cooling temperature settings for optimal performance.

claims which may result in higher overall savings depending on the distribution of sales.

Additional Program Impacts Recommendations

The following recommendations relate to the assessment of additional impacts for the Connecticut Utilities' E-commerce platforms.

8. **Conduct additional evaluation research to identify if greater savings from indirect purchases can be claimed.** E-commerce products may help steer customers toward buying an efficient product, even if they buy it from a different retailer. These savings may be claimable but would require defining a methodology and conducting customer research to estimate the influence of the platform on broader consumer purchase decisions. AEP Ohio and PG&E have developed similar methodologies to estimate these savings, but neither has sought approval to claim them from regulators. A detailed discussion of the methodologies can be found in Section 3.2 Claiming Savings.

1 INTRODUCTION

The ESRPP and E-commerce programs are part of the Connecticut program administrators' (PAs') efforts to provide additional energy efficiency opportunities to residential customers in the face of recent declining savings opportunities from lighting. These relatively new types of utility programs represent promising opportunities to cost-effectively expand energy efficiency opportunities to residential customers over the long-term.

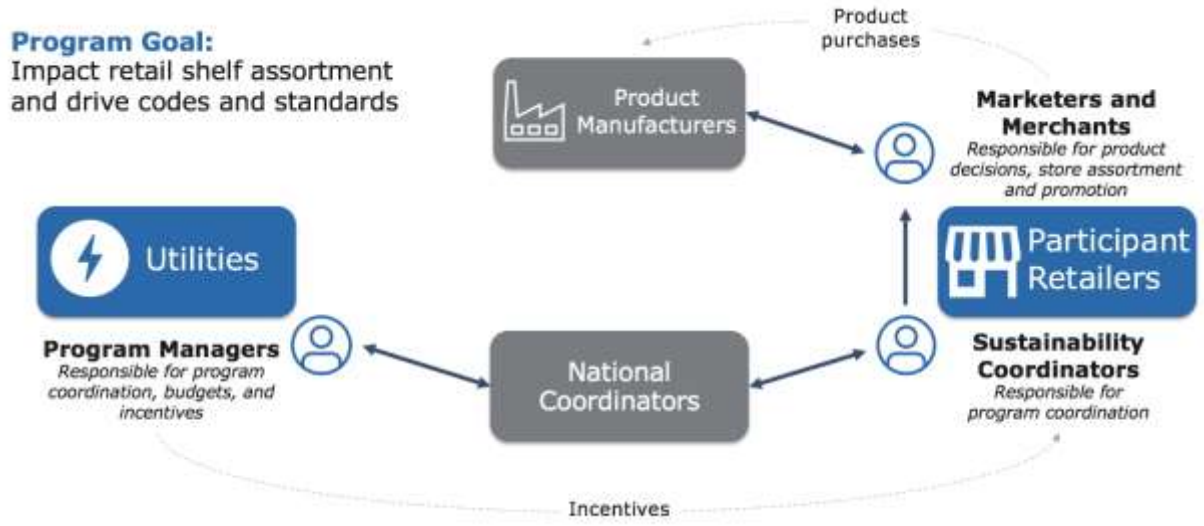
1.1 ESRPP

The ENERGY STAR® Retail Products Platform (ESRPP) Program is a long-term market transformation program that uses a nationally-coordinated midstream design aimed at influencing retailers to increase the stocking, and sales, of high efficiency equipment.

The program is not designed to reduce the price of qualified products to the end use customer. Rather, it is designed to transform the market by changing the decisions of retailers about what products to offer, leading more customers to choose a program qualified model, in turn leading retailers to offer more of them, creating a virtuous cycle. Longer-term, this increase in demand should lead retailers to request more efficient options from manufacturers, and allow codes and standards to advance, locking in greater savings. This process of market transformation is slow and expected to occur over many years.

Figure 1-1 below demonstrates the structure of the ESRPP program. Each participating Program Sponsor (e.g., utility or other entity) pays participating retailers per-unit incentives for every program-qualified unit sold during the program period. Program Sponsors work with retailer staff, including merchants who are responsible for purchasing equipment, marketers that provide retail locations direction on marketing the equipment, and sustainability coordinators that manage retailers' energy efficiency initiatives. Product merchants are the ultimate decision makers at the retailer, and thus the target of the program. But sustainability coordinators in general have more active interest in the program and can act as champions within the organization.

Figure 1-1. ESRPP Program Structure



Program-qualified models are divided into basic and advanced tiers based on efficiency levels set by the Program Sponsors.[11] The models in the basic tiers meet or exceed the minimum ENERGY STAR® specification; advanced tiers consist of more efficient models for which retailers receive higher per-unit incentives. The program theory holds that by increasing the sales of energy efficient models over less efficient models, the ESRPP Program will generate energy and demand savings for utility customers in the short-, mid-, and long-terms through participating retailers, while also transforming the overall market towards higher efficiency equipment in the long-term.

Starting in March 2016, the ESRPP Program became a national effort under the auspices of ENERGY STAR®. The program aims to enlist additional Program Sponsors over time. The most recent estimate from EPA (December 2016) indicated the program covered roughly 18% of the total U.S. residential population.[12]
In PY2018, the participating retailers were Best Buy, The Home Depot, Nationwide, and Lowe's. The 2018 Program Sponsors were:

- Con Edison
- PG&E
- Northwest Energy Efficiency Alliance (NEEA)
- Sacramento Municipal Utility District (SMUD)
- Xcel Energy (Colorado and Minnesota)[13]
- Efficiency Vermont
- Eversource (Connecticut)

[11] Sound bars have the same specification for both basic and advanced, making them single-tier. Additionally, in the 2018 program year, Con Edison only provided incentives for the advanced tiers for refrigerators, room air conditioners, and washers, making them effectively single-tier. Incentives are provided for both basic and advanced tiers for air cleaners, clothes dryers, and freezers.
[12] https://www.energystar.gov/ESRPP
[13] Xcel Colorado discontinued their ESRPP program at the end of PY2019.

- United Illuminating
- Wisconsin Focus on Energy

EmPower MD (Maryland), Rochester Gas and Electric (RG&E), and New York State Electric and Gas (NYSEG) joined the program in 2019, while Wisconsin Focus on Energy left the program. Com Edison has joined for 2020.

Table 1-1 summarizes the product mix that has been incented through the national ESRPP program from PY2016 through PY2019.[14] For the 2017 program cycle, two additional product categories were added to the program: clothes washers, and refrigerators. Dehumidifiers were added for the 2018 program cycle (April 2018-March 2019). Both sound bars and air cleaners were dropped from the program for 2019 (April 2019-March 2020).

Table 1-1. National ESRPP Product Categories by Program Year[1]

Product Category	PY2016	PY2017	PY2018	PY2019
Air cleaners	✓	✓	✓	
Clothes dryers (gas and electric	✓	✓	✓	✓
Clothes washers		✓	✓	✓
Dehumidifiers			✓	✓
Freezers	✓	✓	✓	✓
Refrigerators		✓	✓	✓
Room Air Conditioner	✓	✓	✓	✓
Sound Bars	✓	✓	✓	

[1]*ESRPP program years run from April to March of the following year.*

1.2 E-COMMERCE PLATFORMS

E-Commerce platforms are web-based tools provided by energy providers or third parties to aid customers in identifying, researching, and shopping for energy-efficient appliances and household products. Program Administrators (PA's) provide incentives to customers who purchase specific high-efficiency equipment through the online platform. As a greater portion of consumer spending moves to online channels, these tools can complement or supplement traditional retail strategies to help customers understand the benefits of efficient products.

[14] The national program cycle runs from April through March, though the first-year started in March 2016; new retailers or Program Sponsors can join at any time.

E-commerce platforms are fairly replicable across utilities, with some customization for product categories and fulfilling orders or applying incentives. There are at least five vendors providing licensable products[15] to utilities, including:

- EnergyStar® Product Finder
- Energy Federation Inc., (EFI) Online Tool
- TechniArt Online Platforms
- Enervee
- Uplight Marketplace (formerly Simple Energy and EnergySavvy)

In addition to helping customers research and purchase efficient products, some platforms have the opportunity to generate new sources of revenue for utility product administrators. The platforms may generate advertising or sales referral revenue from retailers, which can be split between the platform developer and utility. This revenue to the utility can in turn be used to offset administrative costs or re-invested in enhancements to the product.

1.3 RESEARCH OBJECTIVES AND METHODOLOGY

1.3.1 RESEARCH OBJECTIVES

This project had two main objectives; (1) develop improved impact parameters for ESRPP and the E-commerce platform programs, and (2) recommend improvements to the design and implementation of each program. The following four research questions were developed to address the research objectives:

1. What methods have been adopted in other states?
2. Is it appropriate to adopt or adapt parameters from other states?
3. What assumptions for gross savings and attribution should be adopted?
4. What are recommended improvements to program design and implementation?

Table 1-2 compiles the evaluation outputs that resulted from the different research tasks and outlines the recommendations that will be derived for each program.

[15] Northeast Energy Efficiency Partnerships (NEEP), Exploring the Nexus of E-Commerce and Energy Efficiency, December 2015 (page 8).

Table 1-2. Research Outputs and Program Recommendations

Evaluation Tasks	Evaluation Outputs	ESRPP Program Recommendations	E-Commerce Recommendations
Literature review Peer utility interviews Retailer interview analysis (ESRPP only)	Program Metrics / EM&V Best Practices	Recommendations to program design and implementation	Recommendations to program design and implementation
Engineering review of impact parameters	PSD Updates	Recommended updates to CT PSD (UES, UDR, and savings algorithms)	Recommended updates to CT PSD (UES, UDR, and savings algorithms)
Shelf assortment Survey analysis Sales data analysis	Indicators of program impact	Product selection, Tier definitions and incentive levels	Not Applicable

The evaluation outputs related to ESRPP can be found in Section 2: ESRPP Findings and Recommendations which is organized by topic and contains the following sub-sections:

- Section 2.1 ESRPP Program Design and Implementation
- Section 2.2 Evidence of Program Impacts
- Section 2.3 CT Program Savings Document (PSD) Updates
- Section 2.4 ESRPP Recommendations

The evaluation outputs related to the Connecticut Utilities' E-commerce platforms can be found in Section 3: E-Commerce Findings and Recommendations which is organized by topic and contains the following sub-sections:

- Section 3.1 Platform Design & Implementation
- Section 3.2 Claiming Savings
- Section 3.3 CT Program Savings Documentation (PSD) Updates
- Section 3.4 E-Commerce Platform Comparisons
- Section 3.5 E-Commerce Recommendations

1.3.2 METHODOLOGY

This section provides a high-level overview of the methods used to evaluate the Connecticut Utilities ESRPP and E-commerce programs. Additional information on the methods used can be found in Appendix A: Data Analyses & Methodology, Appendix B-1. Program Sponsor and Stakeholder Interviews, and Appendix C-1. Retailer Interviews Analysis.

TRC conducted a comprehensive set of qualitative and quantitative research activities for the evaluations of ESRPP and E-Commerce. These included both primary and secondary data collection and analysis. The research activities conducted for each program are listed below in Table 1-3.

Table 1-3. Research Activities by Program

Research Activities	Timeframe	ESRPP	E-Commerce
Discussions with Connecticut program staff	Spring 2020	✓	✓
Literature review	Spring 2020	✓	✓
Peer utility interviews	Spring 2020	✓[1] (n=6)	✓ (n=4)
Retailer interview analysis	Summer 2020	✓[2] (n=8)	
EM&V best practices comparison	Summer 2020	✓	
Shelf assortment survey analysis	Summer 2020	✓	
Sales data analysis	Summer 2020	✓	
Engineering review of impact parameters	Summer 2020	✓	✓

[1]ESRPP peer utility interviews also included external collaborators
[2]Retailer interviews were conducted by Cadmus as part of a national ESRPP program evaluation, prior to the research conducted for this report. Given retailers' participation is at the national level, the interviews focus on the program from that perspective. The information contained in these interviews had not been previously analyzed.

1.3.2.1 Discussions with Connecticut Program Staff

The evaluation consultant conducted a formal interview with Eversource program staff on the implementation of ESRPP and E-commerce platforms prior to conducting our research activities. United Illuminating was unable to meet, therefore we submitted our formal questions to program staff via email. Initial information on the status of the different programs was exchanged during our project kick-off meeting on December 20, 2019. The evaluation consultant held subsequent interviews with Eversource program staff in April 2020 and followed up with United Illuminating via email, as UI program staff were unable to find a time to meet prior to the launch of our research.

1.3.2.2 Engineering Review

The evaluation consultant reviewed Connecticut's 2020 PSD (Connecticut PSD) and compared savings calculations and source references for the measures included in ESRPP and E-commerce platforms to other states Technical Reference Manuals (TRMs). TRC collected information on the overall approach to calculating savings for each measure, assumptions for a measure's baseline and efficient cases, deemed savings values, equations used to determine savings, and all relevant sources for these measures. The engineering review focused on gross savings, a discussion of net savings for ESRPP measures is provided in Section 2.2.3 Net Impacts.

- For ESRPP measures we compared the Connecticut PSD to three other states TRMs, including New York[16], Vermont[17], and California's Database for Energy Efficiency Resources (DEER).[18,19]
- For E-Commerce measures the evaluation consultant also reviewed TRMs for five other states. In addition to the TRMs listed above, we reviewed Massachusetts[20] and Rhode Island[21], due to their proximity to and similarities with Connecticut.

1.3.2.3 Retail Partner Interview Analysis

Interviews with retail partners are important to understanding the program's impact on the stocking of high efficiency equipment. Cadmus had conducted detailed interviews with a sample of retailers as recently as 2019. This data was collected as part of the national evaluation of ESRPP. The agreement between participating retailers and utilities specifically does not allow individual program administrators or their evaluators to individually engage in soliciting feedback from retailers (including the Nationwide buyers group). Therefore, this data is the best way to gain insight into the programs impact on retailer decision-making. The evaluation consultant reviewed interview data Cadmus collected from participating national retailers in 2019. This data included 8 interviews with sustainability staff, marketing staff, or merchants from one of four national retailers, with some interviews conducted jointly with multiple staff members.[22]

Given the retailers' participation in ESRPP is at a national level, the interviews are conducted from that perspective and not specific to individual program sponsors. This interview data has not been previously analyzed and represents new information. While the interviews were not specific to Connecticut's ESRPP implementation, the insights from these national interviews are applicable to the decisions Connecticut utilities make relevant to their participation in the national ESRPP program.

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[16] Version 6 of the New York Standard Approach for Estimating Energy Savings from Energy Efficiency Programs was issued on April 16, 2018, and effective as of January 1, 2019.
[17] The Efficiency Vermont Technical Reference User Manual (TRM) was published December 31, 2018.
[18] The DEER2021 Database was adopted on September 12, 2019.
[19] Although information was collected about California measures, due to differences in climate and geography compared to the other states reviewed (all of which are in close proximity to Connecticut), California was ultimately excluded from the analysis.
[20] The Massachusetts Technical Reference Manual (TRM) is regularly updated, the most recent measure update was published in January 2020.
[21] The National Grid Rhode Island Technical Reference Manual (TRM) was published in November 2018.
[22] The 2019 interviews were a follow up on previous research, conducted in 2016 with retail merchants (responsible for retailer purchasing decisions), marketing staff, and sustainability specialists from Best Buy, Sears/Kmart, and The Home Depot. Cadmus also conducted follow up in 2018 with a single interview per retailer focused on high-level corporate engagement with the program. While our analysis focused on the 2019 interviews, we also drew upon the previous research to support our findings.

1.3.2.4 Peer Utility and ESRPP Stakeholder Interviews

TRC conducted six interviews of ESRPP peer Program Sponsors and nationally collaborating stakeholders (from April to May 2020) to better understand local implementations of the ESRPP program, how sponsors have experienced successes and challenges, and methodologies for claiming savings. The following entities were interviewed as part of this effort. The results specific to each interviewee are kept anonymous throughout the report.

- ConEdison
- Efficiency Vermont
- NEEA
- PG&E
- Navitas
- ENERGY STAR®

Specific topic areas covered through interviews with Program Sponsors and national stakeholders included:

- National program structure and sponsor involvement
- Local program design and sponsor adaptations
- Approaches to product incentives
- Claiming savings and methodologies
- Approach to short-term resource acquisition and long-term market transformation outcomes

Four interviews with program administrators (from April to May 2020) explored the following E-commerce topics:

- Platform structure, incentivized measures
- Strategies for improved design
- Identify useful platform metrics
- Claiming savings and methodologies

The following entities were interviewed as part of this effort. The results specific to each interviewee are kept anonymous throughout the report.

- AEP Ohio
- Mass Save
- National Grid (NY/RI)
- PG&E

1.3.2.5 Shelf Survey Analysis

This section describes the approach underlying the shelf assortment survey analysis.[23] Eversource and United Illuminating staff conduct in-store shelf assortment surveys at participating retailer stores to count the number of *unique models*. This provides the share of qualified models that retailers choose to stock on their shelves. Program impacts are indicated by:

- Increases in qualified models

[23] Our analysis of full category sales data is outlined in the next section.

- Increase in the percent of program-qualified models

The shelf survey analysis involves determining if trends in the assortment of qualified models are changing over time. To track trends the analysis must link model numbers for similar products over time. The primary challenge is many model numbers vary slightly between products whose usage characteristics are identical, but vary in color, retailer or other characteristics such as manufacture month. We use a "fuzzy matching" program to match model numbers to official qualification lists. Once the model numbers have been matched, we calculate the program qualified share (PQS) based on the number of unique model number-by-store location combinations.

In addition to the assessment of PQS, we also performed an analysis of retailer treatment of program qualified products which included placement within the store and discounts given for purchases. The shelf assortment data contained information on the regular price, sale price (if the model was on sale), and placement within the store for all products, both program qualified and non-qualified. After controlling for higher prices for some products, we performed statistical testing to determine the products that were more likely to receive a sales discount at all or to receive a larger sales discount when on sale. In addition, we assessed preferential placement or dedicated signage for program qualified and non-qualified products.

1.3.2.6 Sales Data Analysis

The evaluation consultant estimated changes in unit sales for ESRPP products through a pre/post model-averaging baseline comparison. This analysis involved statistical modeling of sales in the pre-program and program periods, and then comparing the model predictions to the observed sales. We estimated increases in qualified product sales as the difference between the observed sales and the predicted sales.
For each product group and classification tier, we developed three statistical models of baseline sales behavior that incorporate different assumptions about how the program affects qualified product sales and how the baseline sales behavior will change. Each of these models allows for "naturally occurring" pre-program trends in market share and is evaluated on the pre-program sales data. The three statistical models are detailed in Appendix A-2 Sales Data Analysis.

These models also incorporate external factors that help explain product sales:

- Weather (heating and cooling degree days)
- Local employment values,
- Local wages levels, and
- Local housing starts.

Within each of these models, the factors to include were selected using leave-one-out cross validation, an approach that assesses out-of-sample model fit to conduct model selection without over-fitting. For each product group, we combined the three models into a 'Model Averaging' result to predict sales levels during the

program period. If observed sales were larger than predicted sales, then that constituted an increase in the qualified product sales attributable to the program.

1.3.2.6.1 Challenges & Limitations

The primary challenge of estimating sales increase is lack of data in the pre-program period. Because product groups have only 12 months of pre-program sales data ,[24] adjustments for seasonality and pre-existing trends in qualified product sales require making assumptions about the underlying seasonality and trend behavior.[25] For example, if there are two observations from the month of June and those observations are high, we assume that those are June seasonal effects and not random fluctuations or due to some other cause. As no comparison group data are available, the only comparison is based on using the pre-program period to inform what we think would happen to sales in the absence of the program.

The design of the ESRPP program did not include online sales in the participating product categories during the evaluation period.[26] As online sales increase, this will become a blind-spot for the program if left outside of the program design.

It is important to note that this analysis does not explicitly factor in efforts by the Connecticut Utilities and other Program Sponsors to advance the uptake of energy-efficient equipment through other programs within their portfolio. For example, if any previous downstream programs have influenced retailer or consumer decision-making in a way that is not consistent between the baseline and evaluation periods, then those impacts would influence the results of this analysis. It is difficult to estimate the precise impacts that these many programs may have had on efficiency levels for ESRPP products.

[24] Sound bars only have 11 months of pre-program sales data.
[25] The program design specifies one year or pre-program data, so no new additional baseline sales data will become available. Other market information would be needed to extend the baselines out farther than two years. ENERGY STAR shipment data could not be used to extend the baseline because this data is only shipments and not sales and the classifications in the shipment data do not match up with ESRPP tier classifications.
[26] As of May 2020, the national program was investigating ways to incorporate online sales into the program.

2 ESRPP FINDINGS AND RECOMMENDATIONS

This section summarizes the key results related to the Connecticut and National ESRPP Program. Recommendations based on these findings are summarized in Section 2.4 ESRPP Recommendations.

TRC conducted a comprehensive evaluation of the Connecticut ESRPP program. As ESRPP is a nationwide program focused on market transformation, this evaluation considers the Connecticut Utilities' implementation of ESRPP within the national context. The research activities included:

- Discussions with Connecticut program staff
- Literature review of EM&V best practices
- Program Sponsor and ESRPP stakeholder interviews
- Analysis of ESRPP retail partner interviews (conducted for the national ESRPP under the auspices of U.S. EPA)
- Analysis of Connecticut shelf assortment survey data
- Analysis of Connecticut full category sales data
- Engineering review of Connecticut PSD documentation and impact values

The key findings from these research activities are detailed below, and organized by Program Design and Implementation, Evidence of Program Impacts, Connecticut Program Savings Document (PSD), and Recommendations. Further detail regarding the methodologies for these activities and detailed findings are included in the Appendices.

2.1 ESRPP PROGRAM DESIGN AND IMPLEMENTATION

ESRPP's near-term goal is to encourage retailers to sell, promote, and increase demand for more energy efficient models of home appliances and consumer electronics in targeted product categories. Utilities and organizations (Program Sponsors) across the United States have partnered with national appliance retail chains and buyers groups to develop and implement ESRPP. The Connecticut Utilities signed on to the national program starting in program year 2018 (PY2018).[27]

2.1.1 CHALLENGES WITH ESRPP PROGRAM DESIGN

ESRPP is designed as a nationwide, long-term market transformation program. However, most Program Sponsors do not have a market transformation program framework in their state. Instead ESRPP is typically implemented under a resource acquisition framework. This causes challenges for utilities with implementation, and tension between the national program design (or theory) and more local

[27] ESRPP program year runs from April through March.

implementation goals, particularly for resource acquisition. This is the case for the Connecticut ESRPP, as the Department of Energy and Environmental Protection (DEEP), does not currently have a specific market transformation framework in place for implementing, monitoring, and evaluating the program specifically related to cost-effectiveness. Establishing a framework would require engaging DEEP, and other stakeholders, to determine the mechanism for claiming savings, program tracking, and determining cost-effectiveness methodology.

This dichotomy between program design and implementation goals also causes challenges for claiming savings and cost-effectiveness, which results in unique modifications to the program design based on the unique needs of each individual Program Sponsor. The specific challenges related to cost-effectiveness and claiming savings are discussed in Section 2.1.5 Policy and Evaluation. This modification of the program implementation across Program Sponsors dilutes the influence of the program on national retailers, thus impacting the ability of the program to impact local markets (such as Connecticut).

Per ESRPP program theory outlined in Figure 2-1, the collective activities of Program Sponsors across the country is intended to create the scale needed to influence retailers purchasing and stocking decisions. As a result, each Program Sponsor's observed impacts and savings are affected both by their unique decisions and the collective actions of the group – no one Program Sponsor has complete control over their own savings achievements.

In Connecticut, UI did not claim savings for PY2018/19, and both Eversource and UI incentivized only advanced tier models for PY2018/19. Interviews with Program Sponsors and stakeholders revealed at least three Program Sponsors choose to incentivize product categories based on cost-effectiveness or have reduced incentive levels to improve cost-effectiveness. After seeing low realization rates, one Program Sponsor added a consumer point-of-purchase markdown, and lowered retailer incentives, in an attempt to claim greater, more cost-effective savings. As each Program Sponsor makes decisions unique to their needs, the lack of cohesive incentive opportunities for retailers reduces the national program influence on retailer purchasing, stocking, and promotion of efficient products.

Stakeholders and most Program Sponsors that implement ESRPP as a resource acquisition program highlighted challenges achieving market transformation goals within the context of their resource acquisition frameworks. Our interviews confirmed that resource-acquisition Program Sponsors view participation in the national ESRPP coordination as focused discussions of product incentives rather than activities focused on long-term market changes. The Connecticut Utilities are also not actively participating in national standards discussions; however, they have signed on to letters of support for testing protocols, as a more passive participation in these national market transformation activities.[28]

[28] The Connecticut Utilities are also committed to and currently working to develop a Codes & Standards Plan that addresses savings attribution.

To alleviate this tension between program design and implementation goals, the Connecticut Utilities should formally decide to either treat ESRPP as a market transformation program, allowing it to operate as designed, or treat it as a resource acquisition program, acknowledging that the outcomes will be limited to smaller, short-term energy savings. Table 2-1 outlines the considerations (and differences) for a resource acquisition approach as compared to a market transformation approach. We recommend the Connecticut Utilities consider treating ESRPP as a market transformation program, as greater impacts will likely occur when the program operates as it was designed. While the Connecticut Utilities can use different frameworks for different programs, establishing a market transformation framework for ESRPP would require support from stakeholders and regulators, and would include agreements on evaluation, mechanism for claiming savings, and cost-effectiveness methodology. Some components, such as baselines and long-term program attribution, will need to be established ahead of time and may be particularly challenging to determine given the current benefit-cost framework. However, if a market transformation framework were put in place, the Connecticut Utilities could claim broader savings that stem from the program transforming the market. Even without this framework the Connecticut Utilities can take actions that have a long-term view of the program. These actions include participating in code and standards discussions, collaboration with participating retailers, and promotion of the program to other utilities. These actions are outlined in more detail below. Whether the Connecticut Utilities take more long-term actions or actively pursue a market transformation framework, they will be acting in line with DEEP's current policy as laid out in the 2018 Comprehensive Energy Strategy.[29]

[29] One of the initiatives in the 2018 CES is to advance market transformation of the energy efficiency industry, and to specifically "ensure that higher-efficiency HVAC equipment, appliances, and other products are available in the market."

Table 2-1. ESRPP Program Key Considerations Under Resource Acquisition and Market Transformation Approaches

Component	Resource Acquisition Approach	Relevant Section(s) Discussing Challenges	Market Transformation Approach
Incentive Structure	Short-term cost-effectiveness and budget impacts	Section 2.1.3 Incentives Comparison	The need to drive retailer stocking and assortment decisions
Product and Intervention Selection	Offer incentives in line with short-term cost-effectiveness	Section 2.1.3 Incentives Comparison and Section 2.1.5 Policy and Evaluation	Target the intervention to the needs of the specific market, including incentives, codes and standards support, retailer engagement, and market monitoring
Cost-effectiveness	Limited to short-term view of program costs and associated benefits from measures purchased through the program	Section 2.1.5 Policy and Evaluation	Ability to include long-term benefits of increasing market share
National Working Groups	Only passive participation, such as signing on to letters for advancement of codes	Section 2.1.2 ESRPP Implementation	Active participation in discussions to advance specifications, active recruitment of peer program sponsors
Savings Claims[1]	Currently limited to 1 to 5% of Portfolio	Section 2.1.5 Policy and Evaluation	Potential to expand savings up to 25% of electric savings Portfolio[2]

[1]Eversource ESRPP made up <1% of its residential portfolio in 2018. UI did not claim any savings.
[2]NEEA achieves roughly 25% of its residential savings from ESRPP.

While midstream incentives are a core component of ESRPP, the incentives need not be viewed by Program Sponsors as the only program activity. Two Program Sponsors that operate under longer-view market transformation frameworks stressed the importance of participating in national standards discussions and advocacy as a primary activity that produces long-term benefits. One external stakeholder noted that one of best ways Sponsors can support the growth of the program (in size and influence) is helping bring in neighboring utilities, as greater geographic and consumer scale increases influence on retailer decisions. However, few resource-acquisition Program Sponsors actively participate in these non-incentive related activities as they are solely focused on incentive discussions. As these activities are low cost, the Connecticut Utilities could still engage in these longer-term activities without undermining cost-effectiveness and savings in the near term.

Table 2-2 summarized the program performance indicators tracked by the different Program Sponsors. Peer Program Sponsors listed a variety of metrics that they track to measure program performance. These metrics were noted either in interviews or listed in program documentation and evaluation reports found through our literature review. Many Sponsors focus on metrics aimed at tracking short-term resource acquisition impacts, while only a few are tracking longer-term market transformation outcomes such as retailer engagement activities and codes and standards advancement.

Table 2-2. Performance Indicators Tracked by Peer Program Sponsors

Program Sponsor	Total Savings	Cost	Qualified Sales Share	Model Assortment Share	Retailer Promo Activity	Standards and Spec's Advancement
Connecticut Utilities	✓		✓	✓		
ConEdison	✓	✓	✓	✓	✓	
Focus on Energy	✓			✓		✓
NEEA	✓		✓			✓
PG&E			✓	✓	✓	✓
Efficiency Vermont	✓	✓			✓	
Xcel Energy	✓	✓	✓	✓	✓	

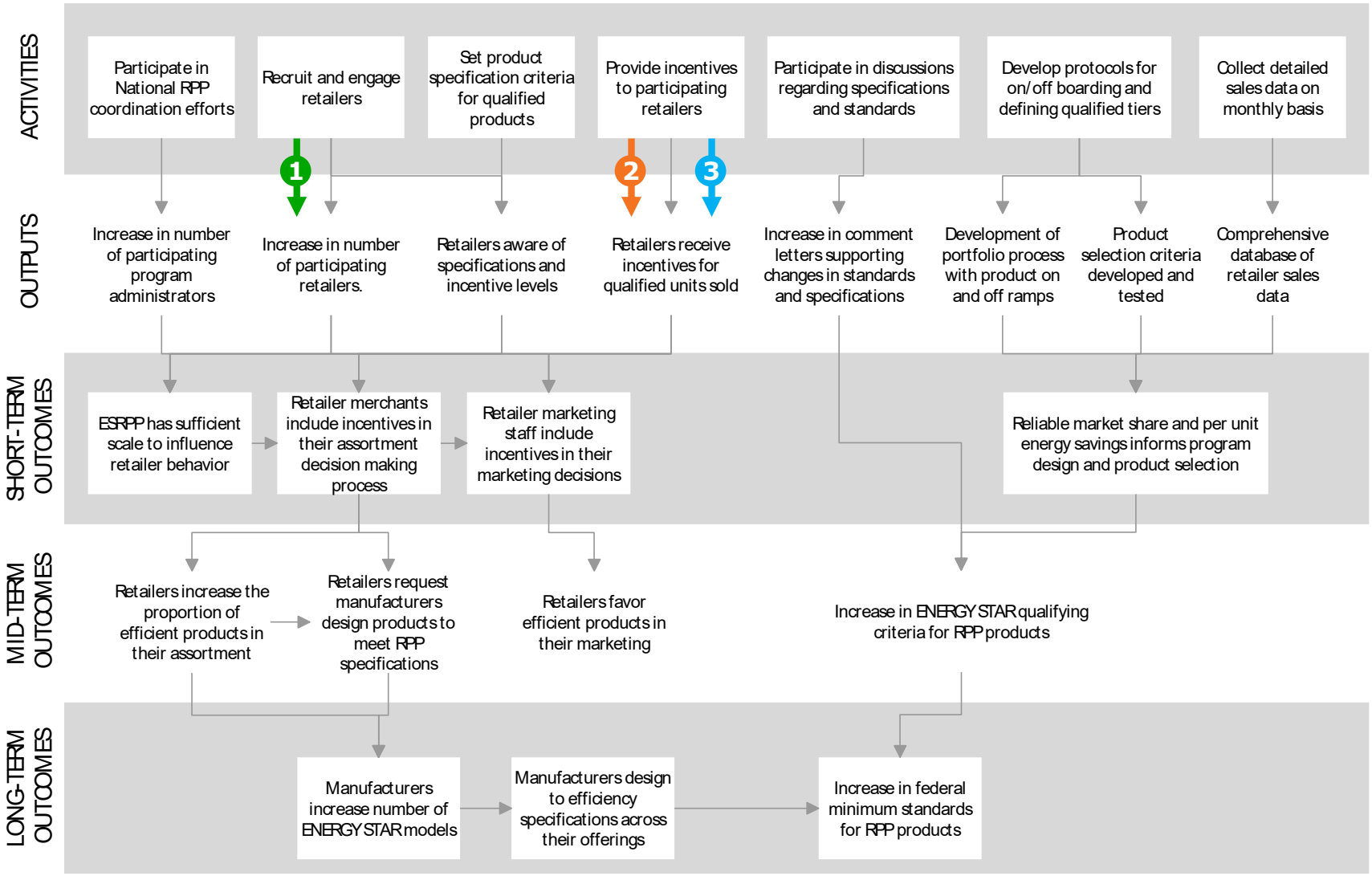
Many of the issues limiting the market transformation impacts of ESRPP are national and will need to be addressed as a group by all of the Program Sponsors. However, the Connecticut Utilities can support these fixes through greater engagement as a market transformation program, instead of limiting their focus on near-term incentives and resource acquisition savings. Each Program Sponsor must make their own decision about treating the program as a true market transformation program as opposed to a resource acquisition program, but the more Program Sponsors that do so, the greater the impact will be. NEEA, the Program Sponsor who has had the longest and most active commitment to running ESRPP as a market transformation program has by far the greatest success in terms of measured impacts and claimed savings.[30] NEEA is an alliance comprised of over 140 Northwest utilities and energy efficiency organizations whose mission is to transform markets towards energy efficiency.[31] As NEEA's mission is market transformation, they are well positioned to successfully implement ESRPP.

[30] PG&E has also transitioned its program to a more dedicated market transformation focus starting in late 2019 but has not been able to claim savings for its program.
[31] https://neea.org/about-neea

2.1.2 ESRPP IMPLEMENTATION

The national program is designed to be a market transformation program, but most states lack a market transformation framework. Therefore, many Program Sponsors modify the national program design to fit individual needs to achieve cost-effectiveness and claiming short-term savings. One program stakeholder noted that these local program design changes were anticipated when ESRPP was initially envisioned – that individual Program Sponsors would be running their own "experiments in market transformation" across multiple service areas. However, currently these modifications often weaken the program's impact on the market by confusing or limiting the business value to retailers. Results from the national retailer interviews indicated confusion among retail staff about the program. Retailers found the program challenging to work with because of the regional differences. This nationwide issue translates to lower observed program impacts for the Connecticut Utilities and other Program Sponsors. The magnitude of this impact is unknown, but is evident from interviews with Program Sponsors, program stakeholders, and participating retailers.
outlines the ESRPP program logic model. Program activities are listed across the top, with subsequent outputs and short- mid- and long-term outcomes below. Per the national ESRPP program theory outlined in Figure 2-1, short-term outcomes are expected to occur within 1 to 2 years, mid-term outcomes within 3 to 6 years, and long-term outcomes within 7 to 10 years. For example, the Program Sponsors provides incentives to participating retailers (activity), retailers receive incentive for qualified units sold (output), retailer merchants include incentives in their assortment decision-making (short-term outcome), retailers increase the proportion of efficient products in their assortment (mid-term outcome), manufacturers increase the number of ENERGY STAR models (long-term outcome).

Figure 2-1. ESRPP National Program Theory Logic Model[1] with Local Program Sponsor Modifications



[1] Per the national ESRPP program theory, short-term outcomes are expected to occur within 1 to 2 years, mid-term outcomes within 3 to 6 years, and long-term outcomes within 7 to 10 years.

Peer Program Sponsor interviews revealed the following local program implementation modifications, which are noted by colored arrows in the basic ESRPP program theory logic model in

Figure 2-1.[32]

- Two Program Sponsors have worked with local retailer locations to provide point-of-purchase marketing materials (**#2 arrow** in

[32] Peer utility program administrator responses are anonymized.

- Figure 2-1), including product stickers and hangers, with the Sponsor's branding and labeling the products as a "smart choice". These adaptations are intended to leverage the Sponsor's strong brand locally to improve efficient sales.
- One program Sponsor reduced their retailer incentive levels and complemented those with point-of-purchase consumer mark-downs on three of four ESRPP product categories. This created a hybrid of midstream and downstream program designs, while allowing the Sponsor to efficiently administer rebates at the retailer level and improve the program cost-effectiveness (**#3 arrow** in

- Figure 2-1). This modification required establishing additional agreements with the participating retailers, beyond the national contracts that govern the program.
- Two Program Sponsors worked to add local, independent retailers to the program within their service area, given a propensity among customers to shop at local businesses (**#1 arrow** in

- Figure 2-1). This also required establishing agreements with multiple parties and ensuring these smaller businesses could provide the required sales data for the program. This type of activity could strengthen the program's impact on local markets, but not many Sponsors have done this successfully.
- One Program Sponsor significantly limited the number of product categories incentivized to focus on those with promising cost-effectiveness (not displayed in the figure).

The Connecticut Utilities have made improvements to their local implementation in 2020 to support the overall national ESRPP program design. In 2019 the Connecticut Utilities were below the group average for both number of product categories rebated and incentive values. By adding two product categories in 2020, Connecticut's implementation is on par with the group average. Connecticut also increased incentive values to bring them in line with the average values of other Program Sponsors.

ESRPP's market transformation theory laid out in the logic model above, likely does not hold when implemented as a midstream resource acquisition program. Program Sponsors lose sight of the long-term goals in exchange for variations in short-term implementation. Additionally, the varying implementation approaches of Program Sponsors cause fracturing of the national structure which results in variations in program incentives to retailers. For example, when Program Sponsors have varying incentives structures, the retailer merchants may not include incentives in their assortment decision-making (limited short-term outcome), retailers would not be strongly incentivized to increase the proportion of efficient products in their assortment (limited mid-term outcome), and manufacturers would not increase the number of ENERGY STAR models (failed long-term outcome).

Interviewed stakeholders said a cohesive national program is critical to the program's overall design, and ultimately local success. When Program Sponsors don't work as one cohesive group, they all suffer from reduced impacts on retailer stocking, efficient sales, and limited cost-effectiveness. So far there is limited evidence of market transformation impacts that are expected from the program, although the young age of the program makes it hard to know if they are not occurring or simply have not occurred enough to be detectable.

Our analysis of interview data indicated retailers make stocking decisions at a national level. Retailers also requested more centralized and specific product guidance from Program Sponsors; however, Program Sponsors are tailoring the program, offering different incentives on different products, which clouds the program's signal to retailers. The program theory relies on outcomes from retailers who make decisions at the national level, thus the combined actions of all Program Sponsors have the greatest influence on these outcomes.

As detailed in Section 2.2 Evidence of Program Impacts below, the shelf assortment analysis determined that Connecticut's ESRPP program is not currently impacting retailer stocking decisions in Connecticut. This result is, in part, a reflection of the

national program, not just Connecticut's implementation, as Connecticut is impacted by the decisions of its peer Program Sponsors. When Program Sponsors don't work as one cohesive group, they all suffer from reduced impacts on retailer stocking, efficient sales, and more limited cost-effectiveness. The Connecticut Utilities' ESRPP program is also fairly new, as it was implemented in 2018, and therefore the lack of impact on retailer stocking is both due to the young age of the program and the lack of cohesion by all Program Sponsors.

While ESRPP is facing challenges, Program Sponsors (including Connecticut) should not give up. As one national program collaborator pointed out, despite these differences and a number of challenges facing Program Sponsors, it is worth noting that retailers remain interested in and excited about the program. Many Sponsors also continue to experiment with the program because they believe it can be a model for the future of program design for residential energy efficiency.

2.1.3 INCENTIVES COMPARISON

As noted throughout this section, Program Sponsors choose to incentivize differing product categories at differing values. These variations help Program Sponsors meet individual needs (e.g., budgets, cost-effectiveness), but also weaken the program impact because national retailers cannot rely on consistent incentive levels. For example, over the evaluation period (PY2018-2019) the Connecticut Utilities offered incentives for only advanced tier products. As the Connecticut Utilities only incentivized advanced tier products prior to PY2020, this likely limited the ability of the program to impact the sales of freezers and clothes dryers. Sales data analysis found that very few of these advanced tier products have been sold (both across the country and in Connecticut).

Starting in PY2020 the Connecticut program added incentives for basic tier dryers and freezers. The Connecticut Utilities are also increasing product incentives in PY2020 for air conditioners, washers, freezers and refrigerators to be more in-line with other program administrators. This will broaden the impact of the program, as it adds more eligible measures; however, it will take some time to understand the extent to which the changes to incentives will impact retailer stocking practices. We recommend the Connecticut Utilities re-evaluate the program's impact on retailer stocking practices after the increased incentive levels have been in place for a minimum of two years.

A few patterns emerged in reviewing which Program Sponsors participate in each product category. Notably, few Sponsors incentivized basic tier refrigerators (3 out of 9), while all participants incentivized advanced refrigerators. The only category that had a plurality of participants but not including the Connecticut Utilities, was basic room air conditioners. Additional patterns are shown in Table 2-3 below along with the full list of ESRPP measures.

Table 2-3. Comparison of Incentivized Product Categories[1]

Product	Tier	CT Utilities	Number of Sponsors (2019)	Other Program Sponsors
Room Air Conditioners	Basic		7	Xcel, SMUD, NEEA, PG&E, Con Edison, EmPower MD*, EVT, NYSEG
	Advanced	✓	6	SMUD, NEEA, PG&E, Con Edison, EmPower MD, EVT
Elec. Dryers	Basic	✓*	5	SMUD, PG&E, Con Edison†, EmPower MD, EVT
	Advanced	✓	8	Xcel, SMUD, NEEA, PG&E, Con Edison†, EmPower MD, EVT, NYSEG
Freezers	Basic	✓*	8	Xcel, SMUD, NEEA, PG&E†, Con Edison†, EmPower MD, EVT, NYSEG
	Advanced	✓	7	Xcel, SMUD, NEEA, PG&E†, Con Edison†, EmPower MD, EVT
Refrigerators	Basic		3	SMUD†, PG&E*, Con Edison†, EVT
	Advanced	✓	9	Xcel, SMUD, NEEA, PG&E, Con Edison, EmPower MD, EVT, NYSEG, Com Ed
Washers	Basic		5	SMUD, NEEA, PG&E, Con Ed†, EVT†
	Advanced	✓	7	Xcel, SMUD, PG&E, Con Edison†, EmPower MD, EVT,† NYSEG

**Incentives added in PY2020,*
†Incentives dropped in PY2020.
[1]Sound bars were removed from the program, therefore they are not summarized in this table.

Program Sponsors cited varying reasons for incentivizing different products. Peer utility interviews revealed that several Program Sponsors have reduced the number of product categories they incentivize, removing products that have shown poorer cost-effectiveness results. Most also cite the goal to improve short-term cost-effectiveness as the primary reasons for modifying the incentive structure. Several Sponsors reduced incentive levels to improve cost-effectiveness. Another Sponsor noted that while they incentivize all product categories, they would be reviewing sales and savings data at the end of the program year and may reduce incentive levels for some categories based on results. Because these programs are expected to deliver on short-term outcomes, they are constrained in its ability to offer incentives that cover a broad range of products, and to have a greater impact on the market.

Alternatively, two Program Sponsors noted different approaches to incentive selection, rather than cost-effectiveness. One interviewee offers incentives for all product categories because this provides their utility with the product category

sales data which has significant value for their organization. The second interviewee, NEEA, has developed a strategic approach to determining products to incentivize and at what level. Under NEEA's framework, incentives are the most impactful market intervention for products with specific levels of technology development, efficient market share, and other factors. Operating under a market transformation framework allows NEEA to incentivize more products, as well as claim larger savings from the program.

Assessing incentive values as a percent of estimated retailer markup provides a proxy for how meaningful incentives may be to retailers, and their ability to influence retailer choices in stocking and assortment. Connecticut Utilities' incentive values for 2019 as a percent of estimated retailer markups ranged from 2% for refrigerators to 13% for dryers. Increased incentive values for 2020 mark an improvement in some categories (particularly freezers and room air conditioners). Table 2-4 summarizes the comparison of incentive categories as they relate to retailer markup of ESRPP products.

Table 2-4. Connecticut Utilities Incentive Values and Estimated Retailer Product Markups

Measure	CT Incentive PY2019	CT Incentive PY2020	Retail Markup $[1]	2019 Incentive As % Of Markup	2020 Incentive As % Of Markup
Air Cleaner	-	-	$70	-	-
Air Conditioner	$10	$20	$105	10%	19%
Washer	$15	$20	$367	4%	5%
Dryer[2]	$45	$45	$335	13%	13%
Sound bar	$0	-	$54	-	-
Freezer[2]	$10	$20	$119	8%	17%
Refrigerator	$10	$20	$507	2%	4%

[1]Estimated Retail Markup uses percentages derived by Department of Energy, published in technical support documents for product standards rulemakings.
[2]Utilities added basic tier incentives for PY2020; $25 for basic tier dryers, and $10 for basic tier freezers.

2.1.4 RETAILER ENGAGEMENT CHALLENGES

While participating retailers generally view the ESRPP program favorably, several specific challenges with the current program set-up and needs of retailers have impaired the program's broader success. Stakeholder interviews and analysis of interviews conducted with retailers provide a snapshot of some of the areas where the national program could better engage with retailers. Connecticut Utilities can also participate in the various ESRPP task force groups to work with Program Sponsors to address some of these issues.

An issue previously discussed in Section 2.1.2 ESRPP Implementation, local implementations of a national program presents challenges for retailers as well. Several retailers felt the program was too localized and wanted more support at a

national level; this reflects some of the program design modifications and incentive approaches individual Program Sponsors have implemented. Interestingly, some retailers wished the opposite – that the national program could be customized based on local geography. Certain products, like freezers are primarily marketed and sold in areas with hunting and fishing cultures, and only at certain times of the year. These challenges again could be addressed by more direct planning and discussion among Program Sponsors and all pertinent staff from retailers.

2.1.4.1 Product Stocking

There is a disconnect between the retailer staff that engage with ESRPP and those making the purchase decisions that impact stocking. Retailer sustainability staff are the primary participants in national ESRPP forums. However, retailer purchasing decisions are made primarily by merchants and marketing staff. While sustainability staff are generally the most knowledgeable about the ESRPP program, their role does not give them final decision-making power about which products to stock in stores. This disconnect between Program Sponsor planning and national retailer operations makes it challenging for the program to impact retailer stocking. Purchasing decisions are made by retailers at a national level, so this impacts all Program Sponsors. Figure 1-1 shows graphically how this issue manifests among the program participants.

There is also a mismatch between the longer timelines of retailer purchasing decisions at the national level and short-term Program Sponsors' budget and incentive determinations. Interviews indicated retailer merchants make their purchasing decisions from product manufacturers eight to twelve months (or more) before each ESRPP program year begins. However, Program Sponsors typically determine budgets and incentives three to five months prior to the program year start. Ideally, Program Sponsors (including Connecticut) would be able to commit incentive values and communicate them to retailers before merchants purchase products from manufacturers to influence those purchasing decisions.

Given retailer decisions are made at a national level, this issue is not unique to Connecticut's implementation, and would require all Program Sponsors to shift their budgeting timelines and keep incentives consistent for two years to alleviate the issue. However, Program Sponsors are often subject to regulatory or corporate timelines which may not allow them to shift or accelerate their budgeting processes. Those that have regulatory flexibility could commit to locking incentives values for two years to provide greater certainty to retailers. We recommend the Connecticut Utilities hold the increased incentive levels implemented in 2020 constant for a minimum of two years or consider aligning with the three-year planning cycle.

2.1.4.2 Marketing Energy Efficient Products

Retailers working at the national level indicated a need for more specific direction on products to promote as well as content for marketing those products. Marketers indicated they rely on specific guidance from manufacturers and other organizations on preferred products to stock and market in stores. While ESRPP provides retailers

with lists of qualified models, the retailers would prefer to know which specific products to promote in accordance with ESRPP's goals and be provided communication about plans to change incentive one year in advance of making those changes.

Interview analysis also indicated that national retailer marketers believe consumers are more interested in advanced product features, like Wi-Fi connectivity or other smart features, rather than energy efficiency. Retailers say most consumers believe all new products are more efficient than the product they are replacing, a view that is partially responsible for the lack of interest in energy efficiency. These results are observations of national consumers, which likely also reflect the preferences of Connecticut consumers. Retail marketers also rely on product descriptions from manufacturers, which typically do not promote energy savings.

Retailers reported it would be helpful for ESRPP to connect key retailer staff members with Program Sponsors to help build a full marketing and merchandising story around the products they wish to promote. Connecticut Utilities could consider this approach if national marketing approaches do not reflect program goals. At least two Program Sponsors have worked with retailers' stores within their service territory to provide customized point-of-purchase marketing materials on ESRPP qualified products. The Connecticut Utilities should consider reaching out to local retail locations to determine what information could be provided to support sales of rebated products.

2.1.5 POLICY AND EVALUATION

External stakeholders noted the ESRPP program design and market transformation approach has the potential to yield sizable, cost-effective energy savings for participating Program Sponsors. However, the lack of support among most Program Sponsors for ESRPP's national market transformation program theory limits each Program Sponsor's long-term prospects for achieving these benefits. This is the case for Connecticut, as the utilities are not actively participating in long-term, program activities.

Interviews and the literature review revealed that all of the Program Sponsors reviewed (including Connecticut), except NEEA, treated the program as a midstream resource acquisition program to deliver on near-term energy savings goals in 2019. Table 2-5 summarizes the policy approach for each of the Program Sponsors. Two Program Sponsors categorized ESRPP as a pilot but noted plans to move these pilots into market transformation portfolios as their pilot phases concluded. NEEA is an organization designed specifically to promote market transformation. Table 2-6 shows that NEEA achieves roughly 25% of its residential lifetime savings from ESRPP, compared to 1 to 2% for the other Program Sponsors. While their overall portfolio is smaller than some other Program Sponsors, this difference is largely driven by NEEA's ability to claim much more significant savings through their market transformation framework. The main challenge for other Program Sponsors (including Connecticut) is the hurdle of developing a market transformation framework that would allow utilities to claim market transformation

savings. Further discussion of policy and regulatory approaches to market transformation programs can be found in Appendix B: Detailed ESRPP Findings.

Table 2-5. Policy Approaches to ESRPP by Program Sponsor

Market Transformation (MT)	Pilot Shifting to MT[1]	Resource Acquisition
NEEA	PG&E Xcel Energy - CO[2]	ConEdison **Connecticut Utilities** Efficiency Vermont Focus on Energy Xcel Energy - MN

[1]Both PG&E and Xcel Energy Colorado had plans to move their ESRPP pilots into Market Transformation portfolios.
[2]Xcel Colorado discontinued their ESRPP program at the end of PY2019.

Stemming from this lack of market transformation framework, nearly all Program Sponsors struggle with how to claim savings. UI did not claim any savings from their ESRPP program in PY2018. Table 2-6 summarizes the savings estimation methodologies used by the various Program Sponsors and the proportion that ESRPP contributes to their portfolio. One Program Sponsor spent several years working with regulators to agree on an acceptable method to determine savings but ultimately could not. Another significantly altered their program implementation after initial savings calculations were not cost-effective. Those that do claim savings, calculate energy savings based on traditional resource acquisition methodologies – multiplying product sales by a deemed value and, often, adjusting gross savings by some factor. Eversource follows this methodology but does not apply any adjustment factors.[33] Program Sponsors have varying approaches to selecting which product categories they will incentivize, often based on the savings and resulting cost-effectiveness.

[33] Additional discussion of NTG adjustment factors can be found in the Net Impacts section.

Table 2-6. Savings Estimation Methodologies and Product Selection by Program Sponsors

Program Sponsor	Claim Savings	Savings Estimation	Portion of Annual Portfolio[1]	Product Selection
CT Utilities	**Eversource**	**[Product sales - Baseline sales] * unit savings**	**<1%**	**Cost-effectiveness**
ConEdison	✓	Product sales * unit savings * adjustment factors	2-5%	Cost-effectiveness
Efficiency Vermont	✓	Product sales * unit savings * adjustment factors	2-5%	All/most categories
Focus on Energy	✓	[Product sales - Baseline sales] * unit savings	0-2%	All/most categories
NEEA	✓	[Product sales - Baseline sales] * unit savings	24%[2]	Low market-share products
PG&E		None	None	All/most categories
Xcel Energy (MN)	✓	Product sales * unit savings	2-5%	Cost-effectiveness
Xcel Energy (CO)[3]		None	None	Cost-effectiveness

[1]Based on lifetime savings data from peer Program Sponsor interviews and reviews of publicly available portfolio/regulatory planning documents.
[2] NEEA's savings were framed as a percent of the organization's 5-year plan: https://tracking.neea.org/public/downloadfile.ashx?ID=+KOygmmaxIg=
[3] Xcel Colorado discontinued their ESRPP program at the end of PY2019.

The downside of this approach to estimating savings is that traditional calculations of gross adjustment factors that are designed around downstream rebate programs may not be entirely applicable for a market transformation program and typically negatively impact the total claimable savings and resulting cost-effectiveness of the program. For example, four resource-acquisition Program Sponsors claimed a minimal amount of savings from the program – generally 2 to 5% of the total EE portfolio (Table 2-6). This is consistent with the Connecticut Utilities as UI is not currently claiming any savings from ESRPP and Eversource is claiming less than 1%. Only NEEA, which approaches savings estimation through a market transformation baseline approach, planned to capture a significant amount of savings from the program, approaching 25% of their total portfolio in coming years. Resource-acquisition program administrators are often left claiming minimal savings

through ESRPP and will face additional pressure to claim substantial residential savings once they can no longer claim savings from lighting projects.

Similar to savings estimation, traditional measures of cost-effectiveness under a resource acquisition framework limit ESRPP product inclusion and reduce the level of incentives that Program Sponsors can pay for qualified products. This in turn limits the impact of the program on retailer stocking and customer purchases of energy-efficient products. As detailed above in Section 2.1.2 ESRPP Implementation, concerns for cost-effectiveness of the program are prompting Program Sponsors to modify their implementation to try to improve cost-effectiveness results. Three of the peer utilities interviewed cited the need to meet cost-effectiveness as a reason to limit product incentives. One Sponsor removed three product categories (sound bars, air cleaners, and gas dryers), while reducing incentives on the remaining products. As previously noted, these reductions in incentives and products categories weaken the ability to influence retailers and achieve the desired outcomes for all Program Sponsors (including Connecticut).

2.2 EVIDENCE OF PROGRAM IMPACTS

Our analysis shows the Connecticut ESRPP is not currently impacting retailer stocking and product assortment of energy efficiency products; however, there has been some significant increase in sales of qualified products, specifically for refrigerators and room air conditioners. This limited program impact is to be expected as Connecticut only recently implemented their ESRPP program in 2018 and long-term impacts of a market transformation program can take seven to ten years to start to impact the market. The evaluation consultant analyzed data on participating retailer stocking and assortment of qualified energy efficient products as well as full category sales data for product categories to identify impacts of ESRPP within the State. The results of these two analyses are detailed in the following sections below: Section 2.2.1 Retailer Stocking Decisions, Section 2.2.2 Retail Sales of Energy Efficient Products, and Section 2.2.3 Net Impacts.

2.2.1 RETAILER STOCKING DECISIONS

The Connecticut Utilities have contracted with a third party to collect on-site data on all models available (qualified and non-qualified) in the program product categories at a sample of retailer stores on a quarterly basis. The on-site data collection includes gathering the model number of each model available in the store, the location within the store of those products (end cap, middle aisle, front, etc.), the regular and sales prices of products, and the presence of signage. The evaluation consultant used these model numbers along with a matching process (described in Appendix A-1 Shelf Assortment Analysis) to analyze the location within store, sale pricing, and signage. We combined the on-site assortment data with qualifying product lists to determine which of the models are qualified and which are not. We then analyzed the trends at an overall product group level, as well as looking separately at each retailer, and across regions of the state.

The Connecticut Utilities ESRPP program is not demonstrating any impact on retailer stocking and product assortment of energy efficiency products. Further, many of the product categories have very few advanced-tier models on the shelves, indicating the program is not currently impacting retailers stocking practices and limiting the ability to draw meaningful conclusions from subsets of the data.

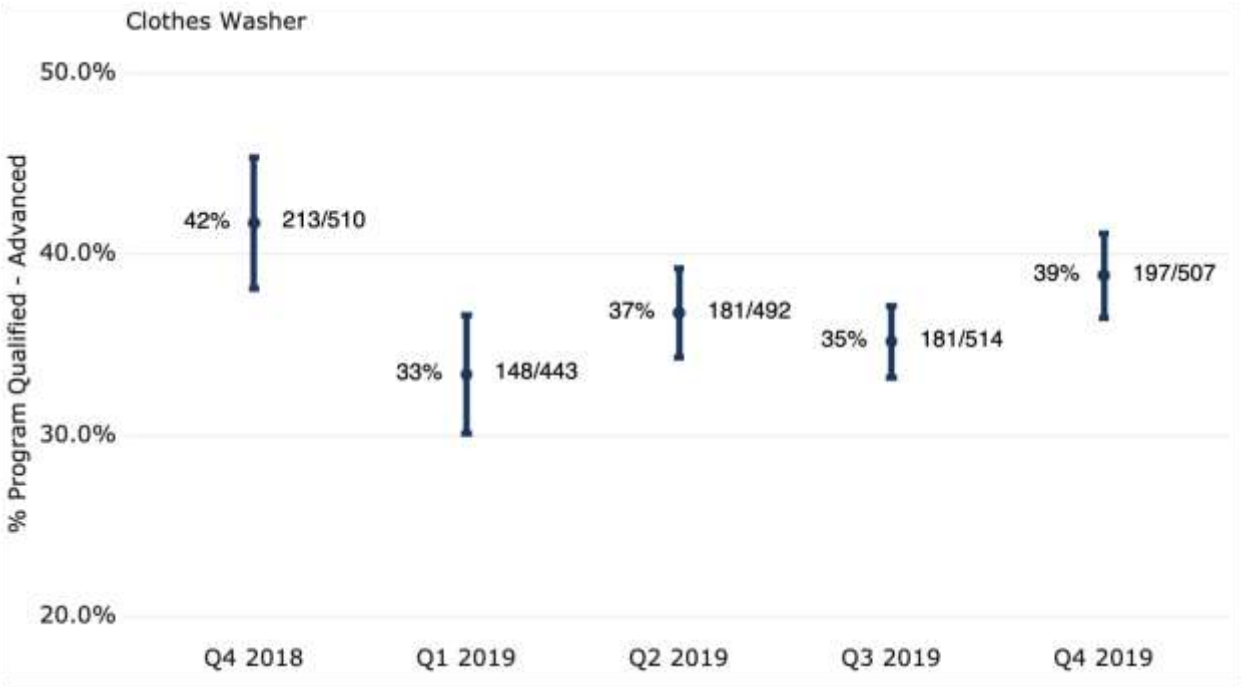
Analysis for each product category shows no significant increase in retailer assortment of product-qualified advanced tier models. Figure 2-2 through Figure 2-6 below shows the quarterly changes in assortment (or stocking) share for the advanced tier products that the Connecticut Utilities incentivized in the 2018-2019 program year. As shown in the graphics, no product category demonstrates an increase in assortment share from Q4 2018 to Q4 2019.[34] Room air conditioners and clothes washers show an already high assortment share for qualified advanced-tier products: 33% to 42% for clothes washers, and 50%-58% for room air conditioners, depending on season. Qualified product assortment shares were low (generally below 10%) for air purifiers, refrigerators, and soundbars, and no advanced-tier products were stocked for clothes dryers, dehumidifiers, and freezers. These low values indicate a significant opportunity for the program to influence stocking in those product categories over coming years. The Connecticut Utilities should continue to watch this metric for changes in these categories over a longer period of time, given the short time-frame for program impacts to occur to-date.

[34] Further analysis was conducted after the development of the draft report to include 2020 Q1 through Q3 data. Despite expanding the timeframe, the shelf assortment analysis did not reveal an increase in retailer stocking of qualified products.

Figure 2-2. Connecticut Program-Qualified Advanced Tier Air Purifier Assortment Share, Q4 2018 - Q42019[1]

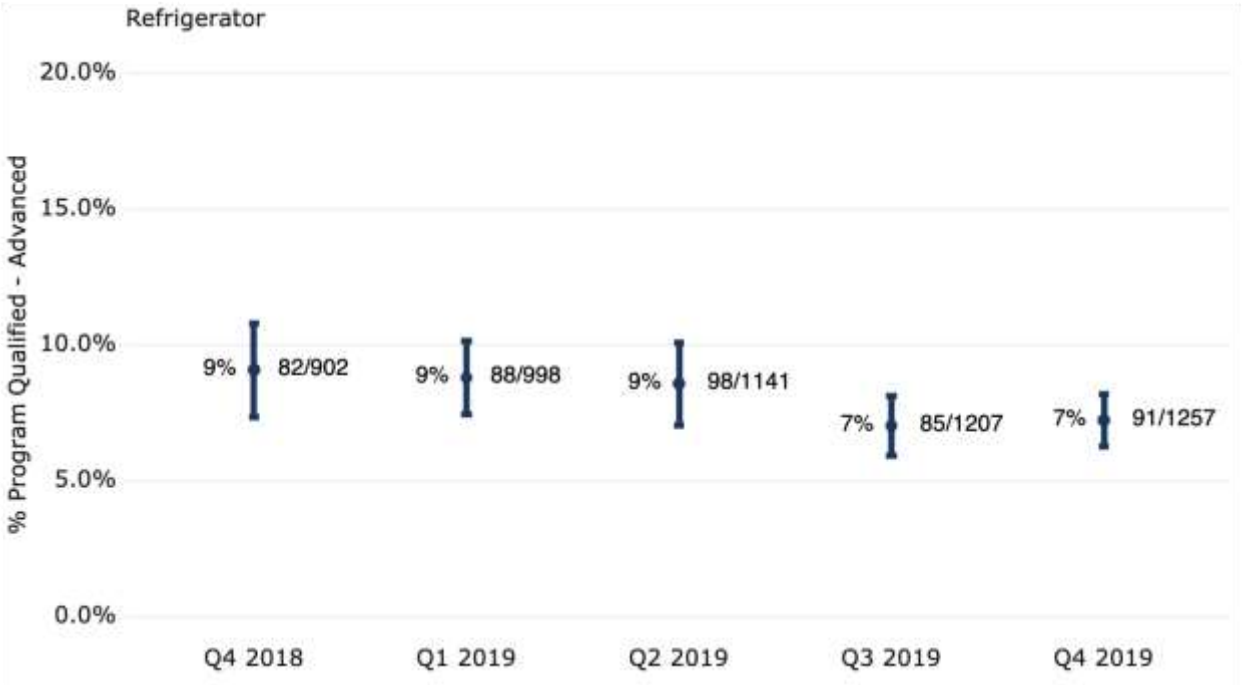
[1]*The assortment share ratio represents the sum of the number of program qualified models divided by the sum of the total number of models offered across all retail locations.*

Figure 2-3. Connecticut Program-Qualified Advanced Tier Clothes Washer Assortment Share, Q4 2018 - Q42019[1]



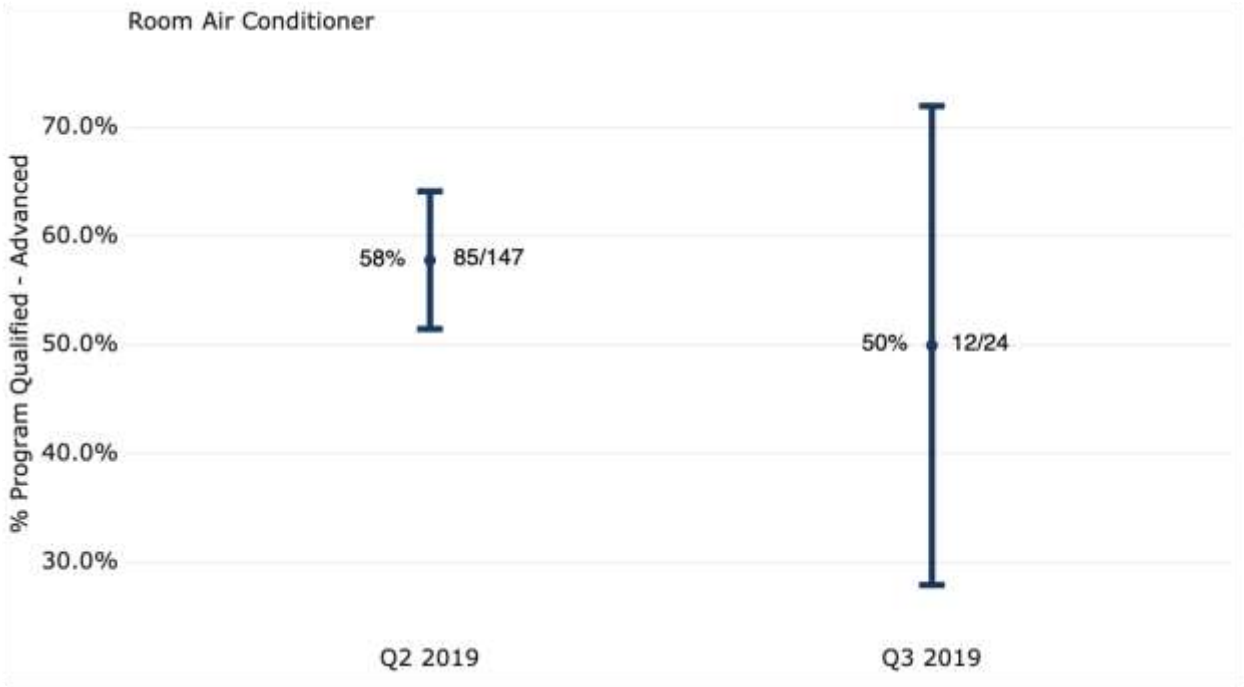
[1]*The assortment share ratio represents the sum of the number of program qualified models divided by the sum of the total number of models offered across all retail locations.*

Figure 2-4. Connecticut Program-Qualified Advanced Tier Refrigerator Assortment Share, Q4 2018 - Q42019[1]



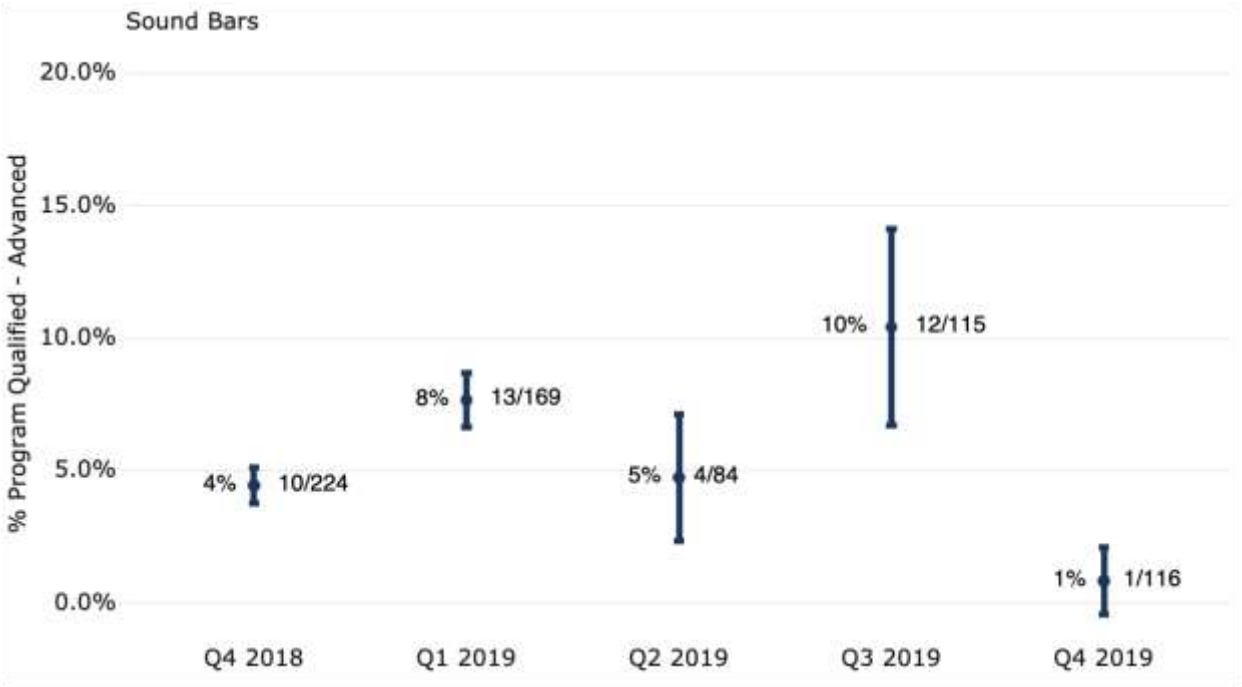
[1]*The assortment share ratio represents the sum of the number of program qualified models divided by the sum of the total number of models offered across all retail locations.*

Figure 2-5. Connecticut Program-Qualified Advanced Tier Room Air Conditioner Assortment Share, Q4 2018 - Q42019[1]



[1]*The assortment share ratio represents the sum of the number of program qualified models divided by the sum of the total number of models offered across all retail locations.*

Figure 2-6. Connecticut Program-Qualified Advanced Tier Sound Bar Assortment Share, Q4 2018 - Q42019[1]



[1]*The assortment share ratio represents the sum of the number of program qualified models divided by the sum of the total number of models offered across all retail locations.*

The evaluation consultant conducted additional analyses to assess different groupings. This included analyses by utility service area (Eversource vs. UI), regional (I-95 corridor vs. non, coastal vs. non) and by retailer. Similar to the product category results, these additional analyses did not identify any significant changes to the trend over time. Additional information on these various analyses is included in Appendix A-1 Shelf Assortment Analysis.

Although the stocking of program-qualified models in Connecticut did not increase during the study period, retailers are providing larger discounts on program-qualified models, especially for refrigerators, as shown in Table 2-7. Analysis of information on product placement and signage concluded that retailers are also more likely to place dedicated signage promoting models that are program-qualified.

Given the young age of the program, and the long timescale for program activities to impact retailer decision-making, trends may be apparent in the future that are not currently evident. The program theory indicates that mid-term outcome of increases in stocking, and in-turn, qualified sales, may take three to six years, so it is reasonable that the increases have not manifested in the current timeframe for the Connecticut program's product categories. We recommend continuing to collect shelf assortment data to allow additional comparisons over time and to help establish trends for the product categories.

2.2.2 RETAIL SALES OF ENERGY EFFICIENT PRODUCTS

Analysis of product category sales data indicates a statistically significant (90/10) increase in purchases of qualified refrigerators and room air conditioners during the study period which may be due to the ESRPP program. Clothes washers and air cleaners also showed a less significant increase in sales. The other product categories did not display an increase in program qualified sales.

The evaluation determined these program impacts for product-qualified sales through the use of a pre/post model-averaging baseline comparison, described in Section 2.2.2.1 Retail Energy Efficiency Sales Impacts Methodology below. This analysis forecasts a baseline of product sales and attributes any observed sales above that baseline to the program's impact. Similar to the results of the assortment analysis, these impacts take multiple years to develop, and trends for some product categories may become apparent in the future that are not currently evident.

The graphs in Figure 2-7 through Figure 2-12 below show the forecast baseline for each product category in blue dashed line, with the observed product sales as an orange solid line. The vertical black dots indicate the beginning of the program period – data to the left are pre-program intervention, and to the right are post, or during the program period. Where the orange line is above the dashed blue line in the program period, the analysis finds an increase in sales potentially attributable to the program. This is most noticeable in the refrigerator and room air conditioner categories, which were statistically significant (90/10). Results were mixed for the other measures. Clothes washers and air cleaners showed a less significant increase in sales. Clothes dryers and sound bars showed an insignificant decrease in sales. There were no observed sales of advanced-tier freezers or dehumidifiers in the program period; consequently, they were excluded from the modeling process. Air cleaners and sound bars stopped being incentivized in Spring 2019. As a result, they were only modeled through Spring 2019, after which data was no longer available.

Figure 2-7. Observed and Modeled Advanced Air Purifier Sales

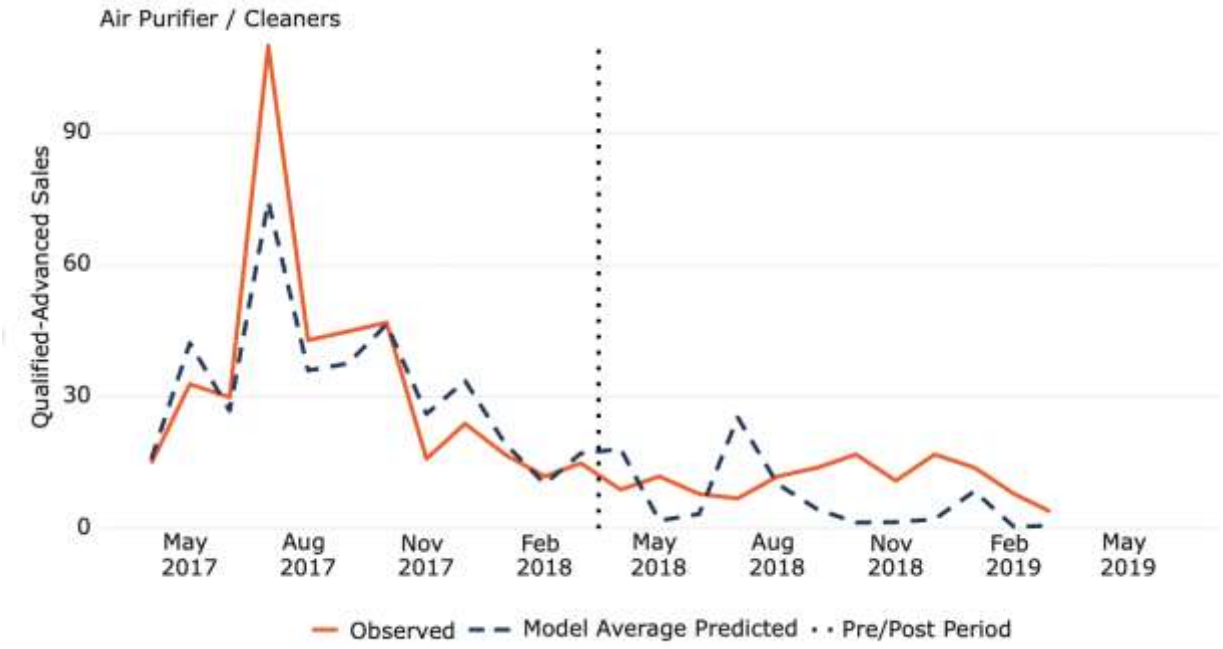


Figure 2-8. Observed and Modeled Advanced Clothes Dryer Sales

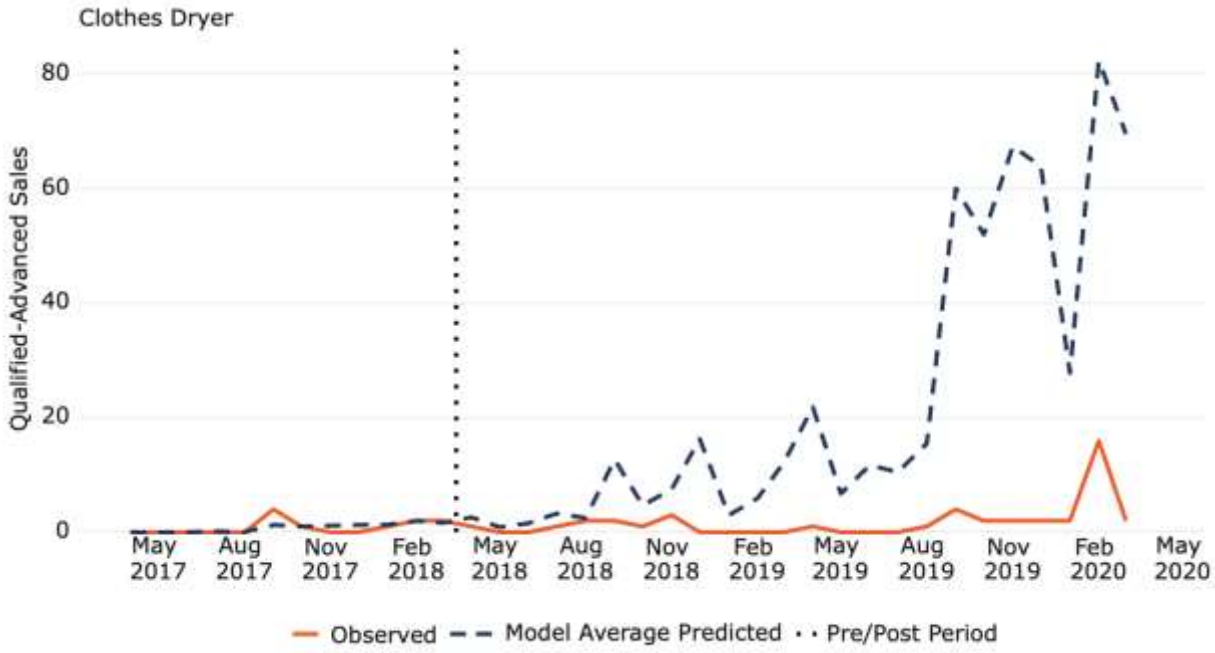


Figure 2-9. Observed and Modeled Advanced Clothes Washer Sales

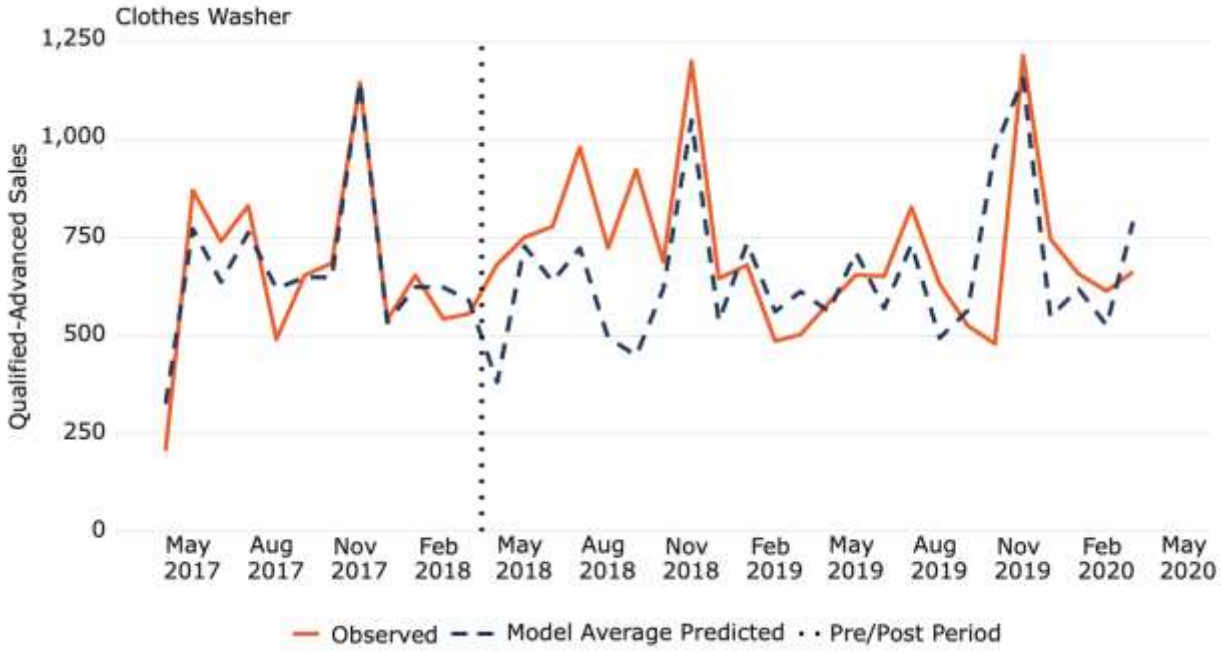


Figure 2-10. Observed and Modeled Advanced Refrigerator Sales

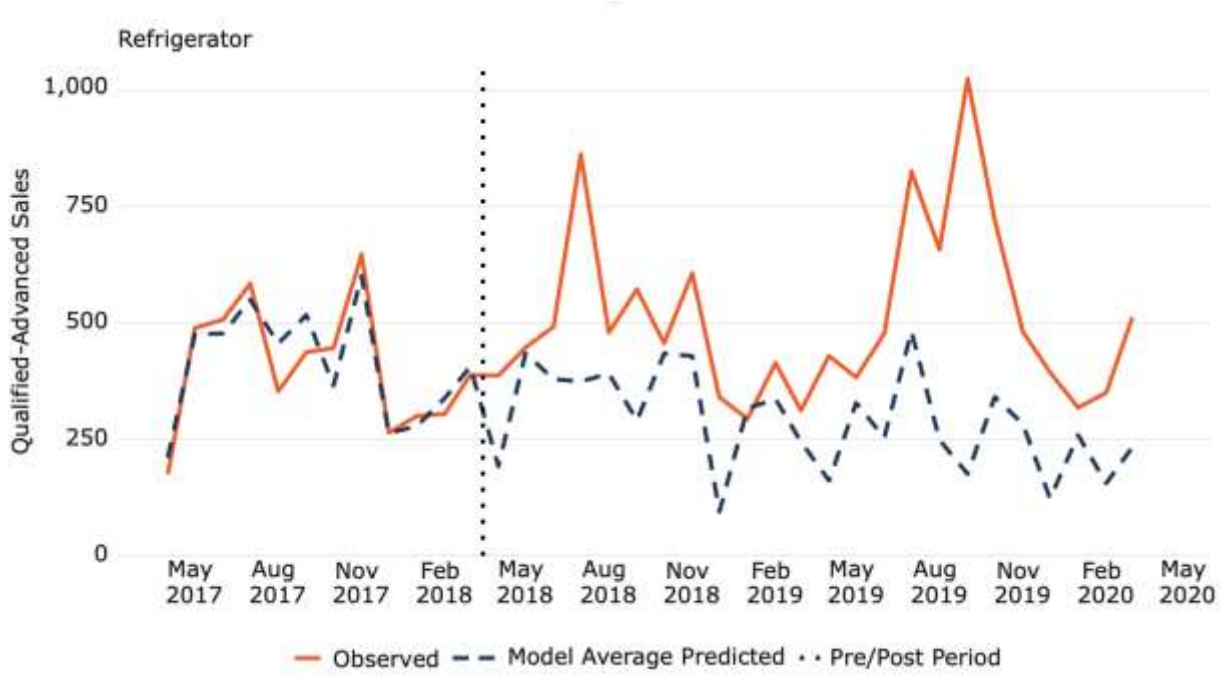


Figure 2-11. Observed and Modeled Advanced Room Air Conditioner Sales

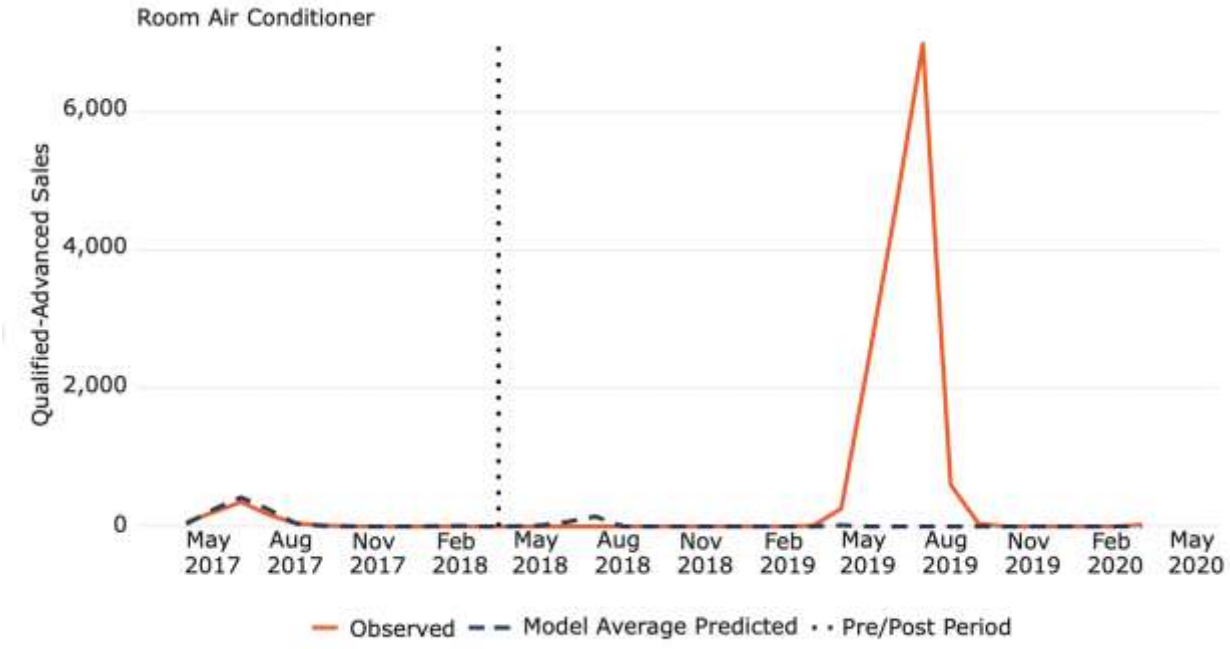
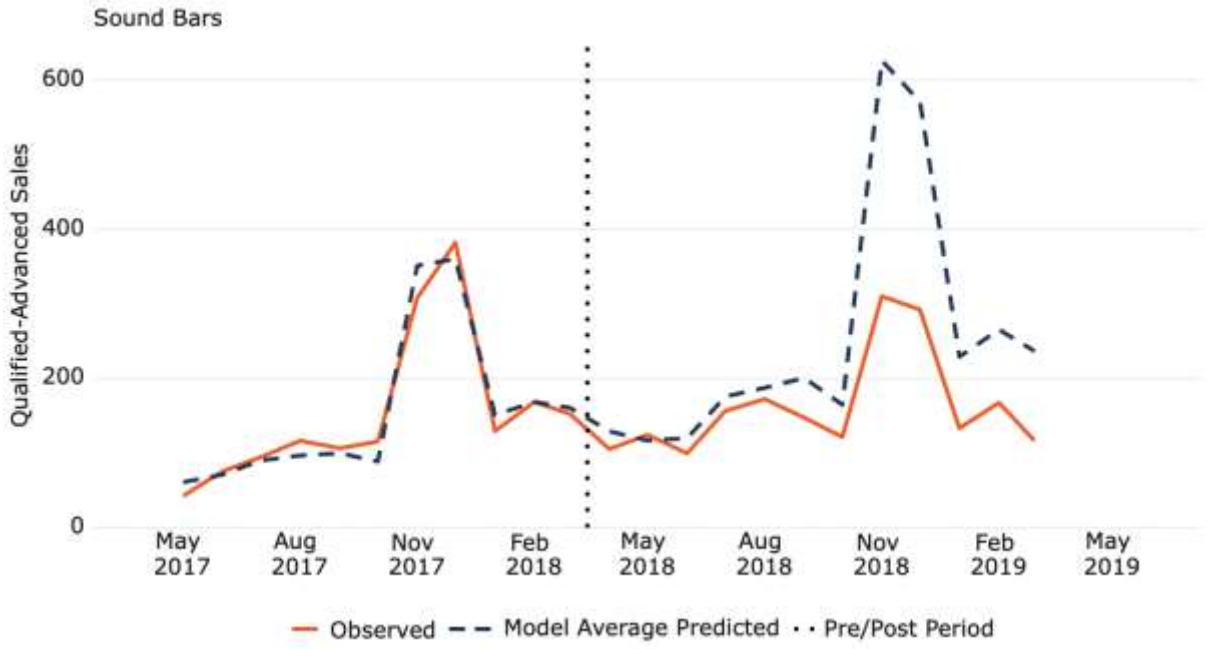


Figure 2-12. Observed and Modeled Advanced Sound Bar Sales



The observed sales increases, due to the program, in refrigerators and room air conditioners are also consistent with retailer's treatment of the sale price for these qualified products. Program qualified refrigerators, freezers, clothes dryers and

clothes washers were more likely to receive larger sales discounts even after controlling for their higher prices, which then leads to increases in product sales. Increased discounts were small and not statistically significant for air cleaners or room air conditioners. Table 2-7 below presents these increases in discounts across product categories. In addition, qualified products were slightly more likely to receive preferential placement or dedicated signage than non-qualified products, though they were slightly less likely to receive a discount.[35]

Table 2-7. Average Discount Differential by Product Category

Product Category	Increased Discount
Air Cleaner	$6.08
Air Conditioner	$1.39
Washer	$36.10*
Dryer[2]	$36.06*
Freezer[2]	$72.70*
Refrigerator	$152.54*

** Difference was statistically significant at the 10% level or greater.*

The size of the ESRPP product incentive, relative to the retailers' estimated mark-up also provides insight into some of the product categories that showed increases in sales due to the program. Dryers, room air conditioners, and freezers each showed the largest incentives, relative to retail markup in 2019. At just 2%, refrigerators were the smaller incentive as a percent of markup. As noted above, refrigerators and air conditioners showed significant increases in product qualifying sales, and clothes washers and air cleaners showed less significant increases in sales due to the program. While these increases in product sales are not necessarily due to changes in retailer stocking, they could be a result of retailers offering promotional pricing for some qualifying products such as refrigerators. For air conditioners, the number of units sold is too small to be able to draw this conclusion. Table 2-8 below compares the product category incentive values over 2019 and 2020 as they relate to estimated retail markups. For air conditioners the incentive is 10% of the retail markup, which could have an impact on the promotion of this product resulting in increased discounts as shown in Table 2-7. However, this trend is not consistent for all products, which indicates that incentive levels relative to retailer markups are not a strong indicator of how retailers will promote these products.

[35] These results were statistically significant taking all product groups together, but not individually.

Table 2-8. Connecticut Utilities ESRPP Incentives as a Percent of Retailer Markups

Product Category	CT Incentive PY2019	CT Incentive PY2020	Retail Markup $[1]	2019 Incentive As % Of Markup	2020 Incentive As % Of Markup
Air Cleaner[2]	$0	-	$70	-	-
Air Conditioner	$10	$20	$105	10%	19%
Washer	$15	$20	$367	4%	5%
Dryer[3]	$45	$45	$335	13%	13%
Sound bar[2]	$0	-	$54	-	-
Freezer[3]	$10	$20	$119	8%	17%
Refrigerator	$10	$20	$507	2%	4%

[1]Estimated Retail Markup uses percentages derived by Department of Energy, published in technical support documents for product standards rulemakings.
[2] Air cleaners and sound bars were included in the first year of the program and then removed.
[3]Utilities added basic tier incentives for PY2020; $25 for basic tier dryers, and $10 for basic tier freezers.

As previously noted, given the program was only launched in 2018, and the long timescale for program impacts, trends may be apparent in the future that are not currently. The program theory indicates that increases in stocking, and in-turn, qualified sales, may take one to three years, so it is not unreasonable that the increases have not manifested in the current timeframe for the Connecticut program for each product category. Further, the increases in incentive values for 2020 may take a similar amount of time to influence retailer decision-making. As a result, the Connecticut Utilities should continue to collect shelf assortment data and track product qualifying sales over time to help establish trends for the product categories.

2.2.2.1 Retail Energy Efficiency Sales Impacts Methodology

The evaluation consultant analyzed estimated changes in unit sales for ESRPP product groups through the use of a pre/post model-averaging baseline comparison. This analysis involved creating a statistical model of sales in the pre-program period, using this model to predict sales during the program period, and then comparing the predictions to the observed sales data. The analysis reviewed sales data for all sales in the product groups incentivized by the Connecticut Utilities across all participating retailers. As part of the national ESRPP program design, each retailer reports monthly sales quantities by model for each product category, including both qualified and non-qualified models. The data include one year prior to the start of the program.

The evaluation consultant modeled sales in the pre-program period using linear regressions that included explanatory variables that would drive sales beyond the impact of the program and seasonal variation: a time trend, cooling degree days, unemployment, housing starts, and disposable income. For each product, the evaluation consultant selected the variables to include in the model based on maximizing the leave-one-out cross-validation criterion. The team then used the

pre-period model to predict sales in the program period. We considered any observed sales volume above the predicted value to be an increase due to the program. Additional description of this methodology is included in Appendix A-2 Sales Data Analysis.

2.2.3 NET IMPACTS

Consistent with the Connecticut Utilities' current approach to treat ESRPP as a resource acquisition program, the evaluation consultant calculated net-to-gross factors based on the increase in observed sales over the baseline. These values represent an estimate of the portion of program volume (i.e., qualified sales) that would not have occurred under the counter-factual case without the ESRPP program and are based on the sales data analysis methodology described in the previous section.

Values for net sales percentage across product categories showed significant variation, from 9% for clothes washers to 98% for air conditioners. Two categories, clothes dryers and sound bars had negative values due to sales data falling below the forecast baseline. Net-to-gross values for all six product categories with reported sales are shown below in Table 2-9.

Table 2-9. Estimated Sales Increases and Net Sales Percentage for ESRPP Products

Product	Program-Period Sales	Estimated Sales Increase[1]	Estimated Standard Error	Estimated Net Sales Percentage	Current NTG Value
Air Cleaners	133	55 ± 76	56	41%	65%
Air Conditioners	14,930	14,676 ± 1,336	1,014	98%	58%
Clothes Washers	17,300	1,504 ± 1,668	1,266	9%	52%
Clothes Dryers	42	-521 ± 10,267	7,791	-1,241%	68%
Sound Bars	1,954	-1,074 ± 1,898	1,400	-55%	84%
Refrigerators	12,255	5,258 ± 951	722	43%	54%

[1]*Sales increase was estimated over the timeframe of April 2018 through March 2020.*

Given the young age of the program, these values are likely to change over time, and are unlikely to constitute a long-term estimate of program attribution. If the Connecticut Utilities continue to treat ESRPP as a resource acquisition program, this is an improved approach for calculating net-to-gross over the existing methodology

which uses the 2018 estimated market penetration from the ENERGY STAR unit shipment data report.[36]

However, If the Connecticut Utilities were to re-categorize ESRPP as a market transformation program, then a new approach to determining program attribution would need to be developed. More broadly, the typical idea of a net-to-gross ratio is ill-suited to a market transformation program, due to the program's long time scale. Actions taken in one year of the ESRPP program may not impact the programs qualifying sales and savings until several years later. The assessment of program attribution under a market transformation framework would allow the Connecticut Utilities to claim savings for these long-term changes in the market through the establishment of a baseline by which to measure program-attributed increases in market share.

2.3 CT PROGRAM SAVINGS DOCUMENT (PSD) UPDATES

TRC reviewed Connecticut's 2020 PSD (Connecticut PSD) and supporting documentation (excel workbooks) that included savings calculations and source references for the measures included in Connecticut's PY2018-PY2019 ESRPP. Measure impact calculations and inputs were compared to Technical Reference Manuals (TRMs) for three other states with ESRPP programs including, New York[37], Vermont[38], and California's Database for Energy Efficiency Resources (DEER)[39,40].

Information was gathered on eight measure categories for ESRPP:

- Refrigerators
- Freezers
- Clothes dryers (gas and electric)
- Clothes washers
- Room air conditioners
- Dehumidifiers[41]
- Air cleaners/purifiers
- Sound bars

Results from the engineering review found several measures that require updates, either to references and data sources, or to overall documentation. Table 2-10 and Table 2-11 outline our recommended updates to electric and gas values for the ESRPP measures (PY2018-PY2019). For five of the eight measures reviewed, Connecticut's approach to determining savings was well documented and verifiable,

[36] ENERGY STAR® Unit Shipment and Market Penetration Report Calendar Year 2018 Summary.
[37] Version 6 of the New York Standard Approach for Estimating Energy Savings from Energy Efficiency Programs was issued on April 16, 2018, and effective as of January 1, 2019.
[38] The Efficiency Vermont Technical Reference User Manual (TRM) was published December 31, 2018.
[39] The DEER 2021 Database was adopted on September 12, 2019.
[40] Although information was collected about California measures, due to differences in climate and geography compared to the other states reviewed (all of which are in close proximity to Connecticut), California was ultimately excluded from the analysis.
[41] Connecticut Utilities did not offer incentives for dehumidifiers; therefore, we did not assess this measure in detail, instead we simply reported what we found.

though references and data sources were out of date. Two measures had insufficient documentation for the evaluation consultant to re-construct or confirm the calculations. No supporting documentation was provided for sound bars. For most measures we recommend adopting the energy savings methodology and estimates included in Vermont's Technical Resource Manual (TRM) due to the clarity and simplicity of Vermont's methodology, and included references. Additional details on measure level review and comparisons can be found in Appendix D: Detailed PSD Findings.

Table 2-10. Summary of 2021 ESRPP PSD Updates – Electric Savings[1]

Measure[2]	Existing Gross Value (kWh)	Updated Gross Value (kWh)[3]	Source for Updated Value (with Year[4,5])
Refrigerator Tier I	64	64	PSD, 2017
Refrigerator Tier II	96	96	PSD, 2017
Freezer, Upright	45	50	Supplemental PSD documentation, 2017
Freezer, Chest		32	Supplemental PSD documentation, 2017
Clothes dryer, Gas	93	36	VT TRM, 2015
Clothes dryer, Electric		194	VT TRM, 2015
Clothes Washer, Tier I	66	88.1	VT TRM, 2018
Clothes Washer, Tier II	117	120.3	VT TRM, 2018
Room Air Conditioner	77.5	10.7	VT TRM, 2015
Dehumidifier[6]	214	214	PSD, 2017
Air Cleaner/Purifier	227	214	VT TRM, 2004
Sound Bars[7]	45	24	VT TRM, 2013

[1]The table represents gross values, a discussion of NTG values can be found in Section 2.2.3 Net Impacts.
[2]Detailed measure specific recommendations are in Appendix D: Detailed PSD Findings.
[3]Existing values are pulled from the 2020 Connecticut PSD.
[4]Year represents the date of the source information, not the date the respective TRM was updated.
[5]The evaluation consultant has no reason to believe that a clothes dryer would operate differently in VT than in CT.
[6] Connecticut Utilities did not offer incentives for dehumidifiers; therefore, we did not assess this measure in detai.
[7]A follow-up email was sent on 6/25/20 to confirm there is no additional documentation not shared with the evaluation consultant. To date no additional documentation has been received for sound bars.

Vermont and New York TRMs include gas savings values for gas clothes dryers. For gas dryers, New York uses a calculated deemed approach with an equation and assumed inputs, whereas Vermont includes a single deemed value. The New York TRM also uses the more recent ENERGY STAR® 2017 while Vermont uses the 2014 specification. Due to the more recent ENERGY STAR® specification and flexibility achieved through a calculated deemed approach, we recommend the Connecticut Utilities adopt the New York approach and gas savings values (Table 2-11).

Table 2-11. Summary of 2021 ESRPP PSD Updates – Gas Savings[1]

Measure	Updated Gross Value	Existing Gross Value[2]	Source for Updated Value (with Year[3])
Clothes dryer – gas[4,5]	1.2 therms	NA	New York, 2017

[1]The table represents gross values, a discussion of NTG values can be found in Section 2.2.3 Net Impacts.
[2]Existing values are pulled from the 2020 Connecticut PSD.
[3]Year represents the date of the source information, not the date the respective TRM was updated.
[4]The evaluation consultant has no reason to believe that a clothes dryer would operate differently in NY than in CT.
[5]The evaluation consultant is aware that gas clothes dryers are not currently offered through the ESRPP program in Connecticut.

While it was possible to verify savings, the lack of clear methods, such as savings equations and inputs made the PSD documentation less clear than other peer TRMs reviewed. The evaluation consultant recommends the Connecticut PSD be amended to include:

- The measure type (such as upright or chest freezers)
- All equations used in calculating savings values
- All assumptions used in calculating savings values such as operating hours
- Baseline equipment or energy use (such as the associated federal standard and date it became effective)
- Efficient equipment or energy use (such as the associated federal standard and date it became effective)

Overall, the 2020 Connecticut PSD document lacked the information required for understanding how measure savings were calculated and limits any comparison to other states' deemed savings measures when only referencing the PSD document. This documentation was provided, for some measures, in the supporting documentation provided by the Connecticut Utilities. However, we recommend this information be moved to the PSD.

Connecticut's PSD could also be improved by using a clearer calculation approach that is consistent across measure types. Some examples would be the online interactive ENERGY STAR® calculators (the ENERGY STAR® Flip your Fridge Calculator[42] is one example), or a consistent calculation methodology developed in an Excel workbook. These have been implemented in Vermont and New York. Additional details on the methodologies used in other states can be found in Appendix D: Detailed PSD Findings.

Finally, Connecticut should move measures to a calculated deemed approach. The Connecticut Utilities have already gathered most of the information needed to take

[42] ENERGY STAR. Flip your Fridge Calculator. 2021. https://www.energystar.gov/products/appliances/refrigerators/flip-your-fridge

this approach; however, it is currently located in the supporting documentation and not directly in the PSD. This approach would allow for fluid baseline, as inputs to the calculations (and not the calculations themselves) that would be updated as the baseline information changes. Implementing this approach would also make it easy to update the PSD as newer information becomes available, helping to reduce the amount of effort to maintain qualified product lists. This approach also creates ease of review and comparison to other states savings values.

2.4 ESRPP RECOMMENDATIONS

Based on the research and findings described above, the evaluation consultant presents the following recommendations for the Connecticut Utilities' ESRPP programs.

2.4.1 ESRPP DESIGN & IMPLEMENTATION

Engage DEEP and other Connecticut stakeholders to develop a market transformation framework.

- Treating the Connecticut program with a focus on resource acquisition serves to undermine ESRPP's program theory and design.
- Establishing a market transformation framework that takes a long-range view of program activities and outcomes will allow ESRPP to effectively transform the market. This, in turn, will bring greater savings to each Program Sponsor, including the Connecticut Utilities. Establishing a framework will also enable the Connecticut Utilities to consider implementing other market transformation initiatives and programs.
- While developing a market transformation framework is potentially a long process, establishing such a framework will allow the Connecticut Utilities to more effectively track and monitor the success of ESRPP and other market transformation programs. Without a framework in place, the Connecticut Utilities are potentially missing an opportunity to both support the development of the ESRPP program and claim the energy savings that result from its overall impact on the market. The Connecticut Utilities are in the process of developing a Codes & Standards Plan that would address attribution from a market transformation effort. However, assessing cost-effectiveness for market transformation initiatives is an important challenge that should be addressed under a broader market transformation framework. Additional details related to cost-effectiveness can be found in Section 2.1.2 ESRPP Implementation and Section 2.1.5 Policy and Evaluation.
- The elements of a market transformation framework would include – agreements on evaluation, mechanism for claiming savings, and cost-effectiveness methodology. Some components, such as baselines and program tracking, will need to be established ahead of time.

Implement the recommended ESRPP market transformation indicators (MTIs) to track Connecticut's market transformation progress.

- Recommended ESRPP market transformation indicators (MTIs) are listed below in Table 2-12.
- These MTIs can be developed using data that is already being collected by the Connecticut Utilities or other ESRPP stakeholders.
- Given the long timescale of market transformation efforts, tracking market transformation indicators can help provide early indication of the Connecticut program's success.

Table 2-12. Market Transformation Indicators

Metric Description	Metric Calculation	Data Collection Activity
Program-Qualified Sales Share (PQS)	Number of program-qualified sales / total sales, for participating retailers by product category	ICF sales data portal
Program-Qualified Model Assortment Share (PQAS)	Number of program-qualified models on sales floor / total number of unique models, by retailer and within each product category	Quarterly in-store shelf assortment data

Monitor key performance indicators (KPIs) to help identify where the Connecticut ESRPP program is having success in the shorter-term and where it is lagging.

- Tracking KPIs over time will allow the Connecticut Utilities to better understand the impact of the program on retail markets, as well as monitor the outcome of adjustments to program administration (e.g., increased incentive levels).
- Table 2-13 below outlines our recommended ESRPP key performance indicators. These KPIs can be developed using data that is already being collected by the Connecticut Utilities or other ESRPP stakeholders.

Table 2-13. Key Performance Indicators for ESRPP

Metric Description	Metric Calculation	Data Collection Activity
Total Deemed Savings	Monthly deemed savings overall, and by product category	ICF sales data portal
Net Benefit	Total program spend ($) per kWh or kW saved	Program data
Number of Participating Store Locations	Number of unique store locations participating in utility territory, by retailer	Program data

Number of Product Categories	Count of product categories incented overall	Program data
Efforts to recruit retailers	Documentation of efforts to recruit new national or regional retailers	Program documents
Total incentive dollars paid	Total incentive amount, by retailer and product category	Program data

Begin tracking upright and chest freezer purchases separately (if Connecticut Utilities are not doing so already) to allow the freezer type-specific savings estimates to be applied for upright and chest types.

- Results from our engineering review of ESRPP impact parameters indicate the amount of potential energy savings is different for these specific products; therefore, this level of product tracking will allow for more specific savings claims (which may result in higher overall savings for the Connecticut program depending on the distribution of sales).

2.4.2 ENGAGEMENT WITH ESRPP

Participate actively with ESRPP national partners specifications and standards tasks, such as providing data and engaging in comment process for standards.

- These activities take place within the national ESRPP Products Workgroup but have historically been conducted primarily by ESRPP's west coast Program Sponsors. The Connecticut Utilities should more actively engage in the ESRPP Products Workgroup.
- Changes to federal appliance standards and ENERGY STAR® specifications lock in large market transformation savings over the long term. Therefore, active engagement in this process will support greater savings for the Connecticut Utilities ESRPP program.

Work with the national collaborative to recruit regional peer utilities into the program.

- Recruiting additional, regional Program Sponsors will enhance the impact of the program on retailer stocking and support greater savings for the Connecticut Utilities ESRPP program. It is a low cost way to boost the impact of the Connecticut program by expanding the penetration of retailer incentives in the region.

Provide specific directions to national retailer partners on purchasing and promoting specific products (e.g., marketing strategies and content) and establish relationships with local retailers to ensure national guidance is implemented.

- Engaging local Connecticut retailer locations on why customers would be interested in different energy efficient (rebated) products could help retail staff better understand why it is important to stock high-efficiency products and how to actually market these products to customers. Connecticut should engage with the Connecticut-specific locations of participating national retailers to ensure they have the information they need to market rebated products.
- Some Program Sponsors have also had success expanding the scope of the program by signing up local retailers in addition to the national retailers. Connecticut should consider if there are local retailers they could target to sign up for the program.

2.4.3 INCENTIVES

Incorporate a structured assessment of incentive levels.

- Establishing a market transformation framework would allow the Connecticut Utilities more flexibility in selecting measures and incentive levels, as they would not be held to the more narrowly defined benefit-cost screening as other resource acquisition programs.
- Adoption of a market transformation framework, recommended above, would allow the Connecticut Utilities to develop a more robust method of selecting products and incentive levels that incorporates the potential impact to the market of long-term increased sales of high-efficiency products and improved product standards over time (long-term benefits).
- The Northwest Energy Efficiency Alliance (NEEA) provides a compelling, strategic framework for selecting product incentive categories and incentive values that incorporates long-term benefits such as shifting the energy-efficient market share over time.

Institute two-year or more incentive levels and budgets for the Connecticut ESRPP programs instead of current annual process, even if other Program Sponsors are budgeting annually.

- Retailers make purchasing and marketing decisions at a national level, and retailer merchant staff often make purchase decisions 1 year in advance of stocking products.
- Establishing two-year or three-year incentive levels for the Connecticut ESRPP will help to send a stronger signal to retailers which will likely encourage increased stocking of rebated products. Planning for incentive levels could also be aligned with Connecticut's three-year planning cycle.
- This would also send a positive signal to peer Program Sponsors to also address this common issue.

3 E-COMMERCE FINDINGS AND RECOMMENDATIONS

This section provides an overview of E-commerce platform findings based on a review of the Connecticut Utilities and peer E-commerce platforms. The review included in-depth interviews with E-commerce platform managers, augmented with a review of their product websites, literature review of relevant research, an engineering desk review of the Connecticut PSD impact parameters, and interviews with Connecticut platform managers. TRC spoke with program managers at four peer utilities operating in New York, Massachusetts, Rhode Island, Ohio, and California, each operating different iterations of E-commerce platforms. The evaluation consultant also spoke with the Connecticut program managers and reviewed their respective E-commerce platforms. The section is organized by findings for platform implementation, program design, Connecticut PSD updates, a comparison of peer programs, and recommendations for the Connecticut Utilities.

3.1 PLATFORM DESIGN & IMPLEMENTATION

Utilities are using E-commerce platforms in a variety of ways to serve and educate customers, extend the reach of existing rebate products, and deliver energy savings for their residential portfolios. As retail E-commerce sales continues to gain market share from traditional brick-and-mortar retail, utilities are wisely looking to E-commerce platforms to meet engaged customers where they want to shop for home products.[43] The Connecticut Utilities E-commerce platforms are still in the early stages as the UI platform ("Smart Solutions") launched in 2019, and the Eversource platform ("Eversource Savings Center") launched in 2020.

3.1.1 E-COMMERCE PLATFORM DESIGN

In designing an E-commerce platform, utilities should establish clear goals and desired outcomes that can inform the product functionality and design. Peer utilities were split between 1) viewing the E-commerce platform primarily as an additional channel to increase the reach of existing downstream programs within their Energy Efficiency portfolio versus 2) more broadly educating customers about efficient products to influence purchasing decisions. Our results outline the best practices for each approach. Establishing a clear goal for the Connecticut Utilities individual E-commerce platforms will help to drive decisions on platform design. The Connecticut Utilities could also consider combining their platforms into a single platform, similar to how the Mass Save platform covers multiple utilities.

The platforms we reviewed had differing levels of functionality that, in turn, provided different capabilities to the utility regarding program design and claiming savings. Utilities are using three primary platform vendors, Enervee, Uplight, and EFI. Some E-commerce platforms offer products for purchase directly through the site, typically fulfilled by a third party. Some allow users to apply rebates directly at

[43] U.S. Department of Commerce, Quarterly Retail E-Commerce Sales – 1st Quarter 2020. May 19, 2020. https://www.census.gov/retail/mrts/www/data/pdf/ec_current.pdf

time of purchase, while others have a separate rebate application. Others only allow for product comparisons and direct users to other retailer sites for purchasing. Table 3-1 compares these features across the peer E-commerce platforms we reviewed. Eversource recently incorporated information on product energy savings into their platform. UI's platform still focuses on product rebates.

Table 3-1. Features of Utility E-Commerce Platforms

Utility	Sells Products	Offers Rebates	Claims Energy Savings	Rates Products by Energy Usage	Energy Efficiency Education
Eversource	✓	✓	✓		✓
UI	✓	✓	✓		
National Grid (NY/RI)	✓	✓	✓		
MassSave	✓	✓	✓		
AEP Ohio[1]	✓	✓	✓	✓	✓
PG&E		✓		✓	✓

[1]*At the time this research was conducted, AEP Ohio both sold products directly in its E-commerce site and offered rebates. However, the product has since changed to no longer feature any rebated items or product sold directly through the site: https://aepohiomarketplace.com/.*

Rebates offered through E-commerce platforms were not unique to the program. All of the utilities that offered rebates through their E-commerce platform noted the rebates were also offered in downstream or prescriptive incentive programs. The E-commerce platform was simply a newer channel to sell rebated products and was viewed as an extension of other programs. For those that offered rebates, the E-commerce platform was complementary to in-store offerings, and a way to meet customers where they wanted to shop for products.

3.1.2 CUSTOMER EXPERIENCE

Customer experience is essential to driving savings for E-commerce platforms. Peer utilities are focused on creating an engaging customer experience to drive new and returning visits to the site to explore, learn about, and eventually purchase efficient products. As a best practice, peer platforms provide information (such as buyers guides) on both rebated and non-rebated products. As customers benchmark the utility platforms against other online retailers where they shop, including product information is key to providing a comparable shopping experience. Two peer program mangers spoke to the importance of creating a seamless, positive customer experience through the E-commerce platform. Rebates are an important element of the platform for all but one of the utilities interviewed.

3.1.3 PRODUCT CATEGORIES

Peer utility product offerings varied widely and the best platforms offered a wide array of rebates as well as non-rebated efficient products. Robust platforms offered customers more products to purchase and detailed information on the energy savings potential for these products. However, all E-commerce platforms reviewed rebate smart thermostats, and several interview respondents mentioned this product category as one that delivered significant savings. In AEP Ohio's recent evaluation of the Marketplace platform, thermostats provided 35% of gross first-year savings, and clothes washers and pool pumps were around 15% of gross first-year savings among rebated products.[44] AEP Ohio's website links to 3rd party retailers for many products and estimates the rebated product sales attributable to the Marketplace by surveying downstream rebate participants to identify the percentage that recalled visiting the Marketplace website. Another respondent noted recently adding portable battery power stations[45] to their marketplace as customer interest in these products had increased. The Connecticut Utilities should consider more tailored offerings that specifically address the needs of their local customer base. A full comparison of product categories offered by peer utilities is summarized in Table 3-6 below.

All peer utilities included non-rebated efficient products and product categories on their E-Commerce platforms. There is little incremental cost to adding more product categories to the platform, so program managers use the platform to educate customers about efficient products, even if they do not offer direct incentives for them. Several now include "connected home" type devices (including home security cameras, Wi-Fi routers, and smart locks) that had no direct energy savings aspects but may be tangential to customer purchases of smart thermostats. Many also included electric vehicle chargers on their sites, and some included resources on solar energy.

The Connecticut Utilities originally offered limited product categories on their E-commerce platforms but are starting to expand. Upon launching their platform, Eversource only offered smart thermostats and lighting, but recently added non-rebated products including power strips, home electronics, appliances, connected home devices, and electric vehicle chargers. UI offers a few more products including lighting, smart thermostats, power strips, low-flow showerheads and faucets, air filters, smart home devices, and electric vehicle chargers. See E-Commerce Platform Comparisons for a detailed comparison of the products offered at the start of PY2020.

For customers, the platform is viewed through the lens of other E-commerce sites they frequent (e.g., Amazon). Therefore, limiting the platform to only a select set of rebated products creates a limited online shopping experience. Several interview respondents indicated including as many efficient product categories as possible,

[44] Malinick, Todd, "Online Marketplace Assessment AEP Ohio," Prepared by Opinion Dynamics, October 16, 2019.
[45] https://marketplace.pge.com/portable-power-stations/

given additional categories could only offer a better, more integrated customer experience. One respondent noted they filtered out categories that were not relevant to their business, for example natural gas equipment for an electric utility.

3.1.4 PLATFORM MARKETING

Program managers focus on driving web traffic to the platform. When interviewed in early 2020, the Connecticut Utilities' indicated they did not have a structure for tracking specific performance metrics and were in the process of determining which metrics to track. All peer program managers indicated that driving customer web traffic to the site is of paramount importance, as customers cannot discover, or eventually purchase efficient products unless they first arrive at the utility's E-commerce website. To track marketing strategies and platform performance, the program managers who manage the most robust sites mentioned using metrics that are commonly tracked for websites in general. Visitors and page views are key performance indicators across all platforms. Additional metrics tracked by robust platform managers include:

- Monthly unique users (overall and by product categories)
- Clickthrough rates
- Number of pages visited per customer visit
- Referral sources (e.g., email campaign, utility website, web search)
- Net-promoter scores

Peer utility marketing tactics focused on direct email marketing as a successful tactic. Two program managers stated that direct-email campaigns to utility customers were their primary marketing channel. They also used social media and banner advertising online. Other marketing channels mentioned included promotion on the utility's home page, collateral at public events, and paid search promotion. One interviewee noted that paid search promotion was often costly per referral, compared to other channels. The Connecticut Utilities indicated using direct-to-customer marketing but did not have a structured marketing campaign in place.

Interviewees also mentioned that special promotions were particularly useful in driving customer interest and engagement with the site. Two interviewees noted success with special limited-time offers like Black Friday or Earth Day sales. The Connecticut Utilities included Black Friday deals during November 2020. These special promotions typically featured smart thermostats, and in some cases, peer utilities indicated manufacturers were willing to offer accompanying discounts. One program manager added that they work with the platform vendor to set up these special promotions.

3.2 CLAIMING SAVINGS

Most but not all peer utilities claimed savings associated with products purchased through their E-commerce platform. In Connecticut, United Illuminating (UI) is claiming savings through their E-commerce platform; however, Eversource just

recently launched their platform in the Spring of 2020. There are two primary methods used to estimate or claim savings:

1. A simple, rebated sales approach (currently used by UI)
2. A more complex approach to estimate product sales induced by the platform based on surveying

The second method, while detailed in product evaluations for PG&E[46] and AEP Ohio[47], has not been used to formally claim savings[48], though one interviewee noted that the methodology received positive feedback when presented to regulators and stakeholders. However, it has not been formally approved by regulators of either utility that estimated savings with this method.

Rebated sales: Under this approach, utilities claim savings for each product sold through the E-commerce platform and apply the unit energy savings and gross adjustments factors for that product as listed in the utility's TRM. The savings are treated the same as if the product were bought in a store.

An example of the adjustment factors used when claiming E-commerce platform savings is shown in the Table 3-2 and Table 3-3 below. Utilities are able to verify that products are purchased by qualifying customers either through account number verification or by the address users enter for billing and shipping. Currently the Connecticut Utilities are not including any adjustment factors into their estimates of energy savings.

Table 3-2. Example Gross Savings Adjustment Factors - Advanced Power Strips

Advanced Power Strip	MassSave	National Grid (RI)	Efficiency Vermont
In-service Rate	0.76	0.81	1.00[1]
Realization Rate	0.92	0.92	-
Net-to-gross	1.00	1.00	1.00

[1]*Efficiency Vermont In-service rate for advanced power strips is assumed to be 1.00 for direct install or in-market purchases, 0.63 for free giveaways.*

Table 3-3. Example Gross Savings Adjustment Factors - Room Air Conditioners

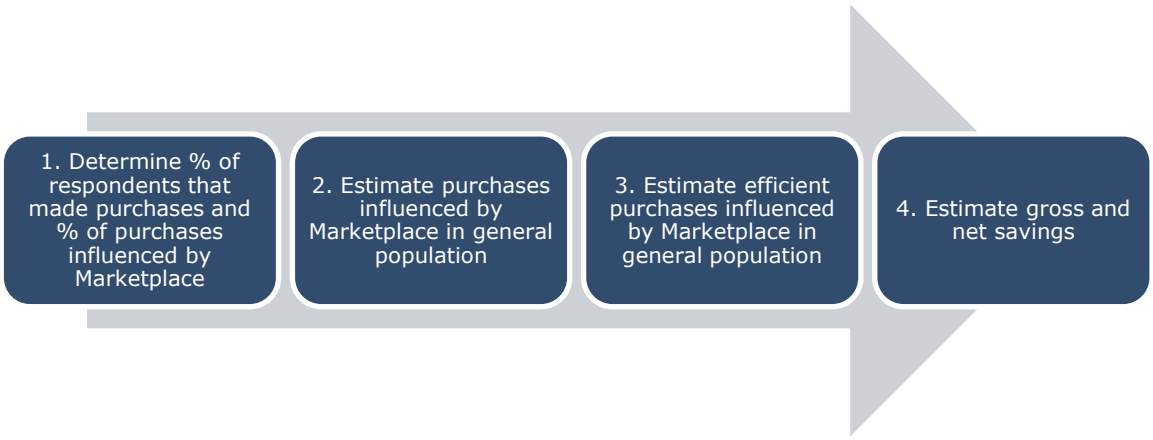
Room Air Conditioner	MassSave	Efficiency Vermont
In-service Rate	1.00	-

[46] Malinick, Todd, Research Into Action (2018). *Assessment of PG&E's Online Marketplace.*
[47] Malinick, Todd, Opinion Dynamics (2019). *Online Marketplace Assessment, AEP Ohio.*
[48] Based on interviews with product managers.

Realization Rate	1.00	-
Net-to-gross	0.63	1.00

Estimated sales: This method attempts to estimate sales of non-rebated efficient products that occurred through a 3rd party retailer, as a result of the customer's use of the E-commerce platform. This method involves using surveys to estimate a purchase rate, representing the number of visitors that made a purchase of an efficient product after visiting the E-commerce platform. Then applying that purchase rate to the number of site visits for a given product category to estimate the savings associated with the efficient products purchased outside the platform compared to a non-efficient model.[49] The methodology, which is detailed in PG&E's pilot evaluation[50], is outlined in Figure 3-1.

Figure 3-1. PG&E Marketplace Savings Estimation Methodology



Special offers and rebates can serve as a "gateway" to bring customers to the E-commerce platform, where they can explore other energy efficient products. One product manager noted that promotions and incentives can be a strong draw to bring customers to the site but to also potentially achieve additional savings. For example, a customer may receive a special promotion email advertising a smart thermostat rebate. The customer comes to the site interested in the smart thermostat rebate, but once on the site will research a number of other products and may end up purchasing additional energy efficient products, either through the

[49] For both utilities implementing this method, the evaluators had concerns with using product-level response rates for efficient purchases and influence due to small sample sizes and high variability. As a result, one evaluation used the aggregate values across categories, which is more robust but may be less relevant for some product categories. The other evaluation calculated population weighted percentages by product category.
[50] Malinick, Todd, "Assessment of PG&E's Online Marketplace," Prepared by Research into Action, April 6, 2018.

site, or elsewhere, as a result of the education received from the E-commerce platform.

This spillover effect from the rebated and non-rebated products could be valuable and may be worth further investigation by the Connecticut Utilities. In AEP Ohio's recent evaluation of the Marketplace platform, thermostats provided 40% of gross first-year savings for non-rebated[51] products.[52] Power strips, electric water heaters, and refrigerators each contributed between 11% and 18% of non-rebated savings. Notably, AEP Ohio's assessment found that the estimated savings from non-rebated products (which were not claimed toward EE goals) were more than four times higher than rebated savings. These non-rebated savings are estimated in a manner similar to the methodology shown above in Figure 3-1.

The Connecticut Utilities are not currently capturing any spillover savings but should consider a similar effort to estimate either rebated or non-rebated spillover impacts as a way to make a case for potentially claiming these savings in the future. This would require defining a methodology and conducting customer research to estimate the influence of the platform on broader consumer purchase decisions.

3.3 CT PROGRAM SAVINGS DOCUMENTATION (PSD) UPDATES

TRC reviewed Connecticut's 2020 PSD (Connecticut PSD) and supporting documentation (excel workbooks) that included savings calculations and source references for the measures included in Connecticut's PY2019 E-commerce platforms. Measure impact calculations and inputs were compared to Technical Reference Manuals (TRMs) for five other states including, Massachusetts[53], Rhode Island[54], New York[55], Vermont[56], and California's Database for Energy Efficiency Resources (DEER).[57,58]

Information was gathered on two measures categories for E-commerce:

- Wi-Fi/smart thermostats
- Advanced Power Strips

[51] In addition to claiming savings from rebated products, the utility estimates savings from "non-rebated" product sales that were determined to be influenced by customers' use of the E-commerce platform.
[52] Malinick, Todd, "Online Marketplace Assessment AEP Ohio," Prepared by Opinion Dynamics, October 16, 2019.
[53] The Massachusetts Technical Reference Manual (TRM) is regularly updated, the most recent measure update was published in January 2020.
[54] The National Grid Rhode Island TRM was published in November 2018.
[55] Version 6 of the New York Standard Approach for Estimating Energy Savings from Energy Efficiency Programs was issued on April 16, 2018, and effective as of January 1, 2019.
[56] The Efficiency Vermont Technical Reference User Manual (TRM) was published December 31, 2018.
[57] The DEER 2021 Database was adopted on September 12, 2019.
[58] Although information was collected about California measures, due to differences in climate and geography compared to the other states reviewed (all of which are in close proximity to Connecticut), California was ultimately excluded from the analysis.

For the purposes of our review, we used the following definitions of communicating thermostats:

- **Wi-Fi thermostat** – a programmable thermostat which allows remote set point adjustments and control.
- **Smart thermostat** – a programmable thermostat which allows remote set point adjustment and control and also includes behavioral learning capabilities to perform automatic adjustment and control.

Table 3-4 and Table 3-5 summarize our recommended updates to electric and gas values for the E-commerce measures (PY2018-PY2019). Our updates align the savings approach with regional TRMs and provide for updated inputs. The Connecticut PSD does not currently include smart thermostats. Therefore, we recommend adopting the calculated deemed methodology in the Vermont TRM as this would align the methodology and sources with the ESRPP sources and would provide consistency and continuity between the CT ESRPP and E-commerce programs.

Table 3-4. Summary of 2021 E-Commerce PSD Updates – Electric Savings

Measure	Updated Gross Value (kWh)	Existing Gross Value (kWh)[1]	Source for Updated Value (with Year[2,3])
Wi-Fi Thermostats	104	25[4]	MA, 2018[5]
Smart Thermostats	Calculated Deemed		VT TRM, 2018
Advanced Power Strips, Tier I	48	48	PSD, 2016
Advanced Power Strips, Tier II	179		MA TRM, 2018

[1]Existing values are pulled from the 2020 Connecticut PSD.
[2]Year represents the date of the source information, not the date the respective TRM was updated.
[3]The evaluation consultant has no reason to believe that a clothes dryer would operate differently in VT than in CT.
[4] The Connecticut PSD deemed savings for Wi-Fi/smart thermostats distributed through ESRPP or E-commerce is for cooling savings only.
[4]The savings for WiFi thermostats found in the 2018 MA TRM was determined based on the 2018 Navigant Home Energy Rebate Impact Evaluation Report.

Table 3-5. Summary of 2021 E-Commerce PSD Updates – Gas Savings

Measure	Updated Gross Value	Existing Gross Value[1]	Source for Updated Value (with Year[2])
Wi-Fi Thermostats, gas	62.4 therms	NA	MA, 2018[4]
Wi-Fi Thermostats, delivered fuel[3]	5.7 MMBtu	NA	MA, 2018[4]

[1]Existing values are pulled from the 2020 Connecticut PSD.
[2]Year represents the date of the source information, not the date the respective TRM was updated.
[3]MA (and other state's TRMs) do not have a value for propane savings. Connecticut could either conduct primary research to determine the propane savings or assume the 5.7 MMBtu for the instance where a residence has propane heat.
[4]The savings for WiFi thermostats found in the 2018 MA TRM was determined based on the 2018 Navigant Home Energy Rebate Impact Evaluation Report. MA is also currently conducting two studies related to these measures which should produce additional robust estimates of savings.

Similar to the ESRPP measure review, the lack of clear documentation of methods, inputs and assumptions made the PSD documentation less clear than other peer TRMs reviewed. For example, the Connecticut PSD does not document whether the advanced power strips deemed savings values are for Tier I or Tier II. The evaluation consultant recommends the Connecticut PSD be amended to include:

- The measure type (such as smart or communicating thermostats)
- All equations used in calculating savings values
- All assumptions used in calculating savings values such as operating hours
- Baseline equipment or energy use (such as the associated federal standard and date it became effective)
- Efficient equipment or energy use (such as the associated federal standard and date it became effective)

When possible, Connecticut should move measures to a calculated deemed approach.[59] This approach would allow for fluid baseline, as inputs to the calculations (and not the calculations themselves) that would be updated as the baseline information changes. Implementing this approach would also make it easy to update the PSD as newer information becomes available, helping to reduce the amount of effort to maintain qualified product lists. This approach also creates ease of review and comparison to other states savings values.

3.4 E-COMMERCE PLATFORM COMPARISONS

Table 3-6 compares the product categories featured on the peer sites and which products included rebates. The Connecticut Utilities were on the lower end of sites reviewed at the beginning of PY2020 for both product categories and rebated products. However, the Connecticut Utilities have expanded product categories for

[59] A calculated deemed approach does not provide a specific savings value, instead a deemed equation is provided, and baseline and efficient usage are documented for input into the savings equation.

the end of PY2020. Smart or Wi-Fi Thermostats were rebated by all utilities, and lighting by most.

Table 3-6. Product Categories Featured and Rebated by Peer Utilities[1]

Product	Ever-source	UI	Nat'l Grid (NY/RI)	Mass-Save	AEP Ohio	PG&E
Smart T-stat	$	$	$	$	$	$
Lighting	$	$	$	$	$	✓
Power Strip	✓	✓	$	$	✓	
Washer/ Dryer	✓				✓	✓
AC/Air Cleaner	$	✓		$	✓	✓
Water heater	✓				$	$
Shower/Faucet	✓	✓	$	$		
Pool Pump	✓				$	✓
Fridge/Freezer	✓				✓	✓
Dishwasher	✓				✓	✓
Dehumidifier	$			$	✓	✓
Smart Home	✓	✓	✓	✓		✓
Electronics	✓				✓	✓
EV Charger	✓	✓	✓	✓	✓	✓

✓ = product is included on E-commerce site.
$ = product is included on E-commerce site and customers receive a rebate.
[1]Table was updated to reflect the 2020 product additions for the CT Utilities platforms.

3.5 E-COMMERCE RECOMMENDATIONS

Based on the research and findings described above, the evaluation consultant presents the following recommendations for the Connecticut Utilities' E-commerce platforms. After presenting our program planning results and recommendations in July 2020, the Connecticut Utilities have implemented some of our recommendations. We call specific attention to these instances and describe where further improvements could be made.

3.5.1 PLATFORM DESIGN

Continue to improve the design and user experience of E-commerce platforms.

- The Connecticut Utilities' should continue to use non-utility E-commerce platforms that customers are familiar with as a benchmark for platform design. The literature review indicates utilities are "competing" with other online retailers like Amazon.com or Home Depot's website, which customers

use with increasing frequency. For example, the Pacific Gas & Electric E-commerce site allows customers to filter and sort based on features, price, and energy savings.

- The Connecticut Utilities should also consider the possibility of offering a single, combined E-commerce platform as a way to streamline the user experience. A single platform could be administered similarly to the Mass Save E-commerce site that serves customers across six different Massachusetts utilities.[60]
- Eversource has recently shifted to using Enervee to support their platform and greatly increased the number of products offered, as well as product information on their site.
- United Illuminating utilizes UpLight to host their platform. The recently added air quality measures to their site, as well as expanded the number of products offered in each product category to include both rebated and non-rebated efficient products.

Create a dashboard of tracking metrics to gauge monthly platform performance.

- Our initial discussion with the Connecticut Utilities' indicated they did not have a structure for tracking performance metrics and were in the process of determining which metrics to track.
- Work with E-commerce platform developers to gather regular insights into customer engagement through tracking monthly unique visitors, product category page views, clickthrough rates, and customer satisfaction.
- Other metrics to consider are the number of pages customers visit, referral sources (how the customer found the site), and customer net promoter scores.
- Tracking metrics over time will allow PAs to understand the platforms success (or challenges) with engaging customers, as well as monitor the impact of adjustments to platform design and implementation.

Continue to add educational information to help customers understand the benefits of buying efficient products.

- Eversource has recently incorporated product information on energy savings and efficiency ratings; however, UI's platform remains focused on product prices and rebates.

Utility E-commerce sites should clearly show users:

- Which products receive incentives
- Product information such as energy efficiency scores and buyers guide information (e.g., how the Advanced Power Strips have higher power surge protection for your devices)
- Customer ratings and reviews to give products more credibility

[60] https://www.poweredbyefi.org/masssave.

3.5.2 PLATFORM MARKETING

Leverage direct email for effective marketing outreach (if not already doing so).

- Peer utilities noted this was their primary and most successful marketing channel to drive traffic to their sites. At the start of 2020, the Connecticut Utilities' indicated they did not have a marketing structure in place, although they did indicate using direct-to-customer marketing.
- The Connecticut Utilities could consider either separate engagement or partnering with other program outreach such as Home Energy Reports.

Continue to offer special-promotions to drive customer engagement.

- Work with E-commerce platform vendors and product manufacturers to continue to develop special, limited-time promotions on rebated or high-savings products. Customers are interested in and expect deals around holidays. Eversource and UI recently offered Black Friday deals.

3.5.3 PRODUCT SELECTION AND TRACKING

Continue to increase the number of product categories available on E-commerce platforms.

- Any products that have existing prescriptive rebates that can be sold through the E-commerce platform should be included. Further, non-rebated efficient products should be featured to allow for customer education about efficient products.
- Eversource has expanded the number of products offered, but UI still offers limited product categories. Both utilities have updated offerings to include both rebated and non-rebated efficient models.

Track Wi-Fi and Smart (learning) thermostat purchases separately, as well as Tier I and Tier II purchases separately (if not doing so already).[61]

- Results from our engineering review of E-commerce impact parameters indicate the amount of potential energy saved is different for these specific products; therefore, this level of product tracking will allow for more specific savings claims (which may result in higher overall savings depending on the distribution of sales).
- We recommend tracking WiFi and smart thermostats separately to better understand their impacts. Massachuset's PAs are also currently conducting two studies related to these measures which should produce additional robust estimates of savings.

3.5.4 ADDITIONAL PROGRAM IMPACTS

Conduct additional research to identify if E-commerce platforms are leading to additional savings from purchases outside of the platform.

[61] Smart thermostats are WiFi enabled thermostats that "learn" from the behavior of the user and automatically adjusts the heating and cooling temperature settings for optimal performance.

- As an educational tool, E-commerce platforms may help steer customers toward buying an efficient product, even if they buy it from a different retailer. These savings may be claimable but would require defining a methodology and customer research to estimate the influence of the platform on broader consumer purchase decisions.

Additional information on measure-specific findings related to PSD updates for both E-commerce and ESRPP measures can be found in the R1973 Retail Non-Lighting Evaluation Appendices.

APPENDIX A: DATA ANALYSES & METHODOLOGY

This Appendix documents the detailed methodology, assumptions, and analysis results related to the following evaluation tasks:

- Shelf Assortment Analysis
- Sales Data Analysis (only methodology - all results are in the report)

A-1 SHELF ASSORTMENT ANALYSIS

This section details the methodology underlying the shelf assortment survey analysis, as well as detailed measure level findings. Eversource and United Illuminating staff conducted in-store shelf assortment surveys at participating retailer stores to count the number of unique models. This provides the share of qualified models that retailers choose to stock on their shelves, as well as data on placement within the store, and both posted and purchase price.

DATA COLLECTION

Eversource and UI contracted with Lockheed Martin to conduct quarterly in-store visits to gather data on product assortments at a sample of participating retailer stores. Field staff record the brand and model number of all models within the targeted product categories available at each store. For this research the analysis utilized shelf assortment data from Q4 2018 through Q1 2020.[62,63]

SAMPLE

To establish the collection of shelf assortment data for ESRPP, TRC developed a sample plan in November 2018 for the Connecticut utilities. The sample design accepted by the program utilities is shown below in Table A-1 provides enough sample to achieve a minimum 90/5 confidence and precision level at the program level. Within each sample stratum, this scenario includes sufficient sample to conduct the shelf survey analysis with a minimum 90/10 confidence and precision level. The Connecticut utilities began collecting shelf assortment data in Q4 2018 and continued to collect this data every quarter through the evaluation period. The Connecticut utilities plan to continue the collection of quarterly shelf assortment data to ensure adequate comparisons with future evaluations and tracking against a baseline.

[62] TRC believes it is important to include one store visit during the peak shopping period for many appliances during December, as well as one during the summer period when room air conditioners and dehumidifiers are commonly stocked, either June, July, or August.
[63] The shelf survey was not conducted in Q1 2020 because of COVID-19; however, shelf survey data was continued in Q2 of 2020.

Table A-1. In-Store Visit Sample Design

Sample Stratum	Population	Recommended Sample Size
Home Depot	30	13
Lowe's	17	8
Best Buy	12	6
Sears[2]	5[1]	2
Kmart[2]	5[3]	3
Overall	**69**	**32**

[1]While the total number of Sears stores in the sample frame was seven, two of these stores closed at the end of the 2018. These two stores were excluded from our proposed sample scenarios.
[2]Sears and Kmart left the ESRPP program beginning in PY 2019 and are not included after March of 2019.
[3]At least one of these Kmart stores had closed around the time that the first shelf surveys were conducted. The field collection team did not have any additional Kmart stores to replace it.

METHODOLOGY

The following sections outline the process of preparing the data for analysis (fuzzy matching) and the methodology for calculating the program qualified share (PQS). The PQS of incentivized products is assessed over the evaluation period (Q4 2018 to Q4 2019) to determine if the proportion of efficient models is increasing over time indicating a program impact.

FUZZY MATCHING

To prepare the shelf survey data for analysis, the research team first matched models reported in shelf survey data to models listed in the ICF products report from the ESRPP Portal in order to determine ESRPP qualification status and program tier (basic or advanced) through the method outlined below:

1. Shelf survey models were matched to ICF models based on model number.
2. Unmatched shelf survey models were matched to ICF data based on an ID number from the California Energy Commission's (CEC) model database.
3. Still unmatched shelf survey models were matched to ICF data based on DOE ID number.
4. Any remaining unmatched shelf survey models were matched to ICF data based on a "fuzzy match" method, which allowed minor variability between the ID variables.
5. The models that were "fuzzy matched" were then examined by hand to determine if they were a true model match.
6. All remaining models that were unmatched were classified as non-qualified (neither basic nor advanced) models.

Once shelf survey models had been matched to ICF data, the research team identified the number of unique models (within a product category) that were program-qualified (by tier) and the number that were non-qualified. The program-

qualified assortment share (PQS) is calculated as the sum of the number of unique program-qualified models on the shelf at each store divided by the sum of the total number of unique models at each store. The evaluation consultant defines "program-qualified" as models that were eligible to receive incentives from program utilities. In calculating the basic and advance PQS, we only include basic tier or advanced tier in addition to non-qualified models in the denominator, dropping out the other tier.[64] TRC analyzed the data across several iterations:

- Product Category, Year, Quarter
- Product Category, Year, Quarter, Utility
- Product Category, Year, Quarter, I-91 Corridor vs Noncorridor County[65]
- Product Category, Year, Quarter, Coastal vs Noncoastal County[66]
- Product Category, Year, Quarter, Retailer

The following section provides additional detail on the program qualified share methodology and assumptions.

Program Qualified Share (PQS)

The calculations for the program qualified share (PQS) in the shelf assortment analysis are based on the number of unique combinations of product model and store locations. By looking at the unique combinations of store and model number, we are effectively calculating a weighted average of the store-level PQS, where the number to total models available at each store is the weight. The equation for the overall PQS value is:

$$PQS = \frac{\sum_{s=1}^{S} Advanced_s + Basic_s}{\sum_{s=1}^{S} Advanced_s + Basic_s + Non-qualified_s},$$

where *s* indexes stores, *S* is the number of stores in the sample, $Advanced_s$ is the number of unique advanced-tier qualified models in store *s*, $Basic_s$ is the number of unique basic-tier qualified models in store *s*, and $Non-qualified_s$ is the number of unique non-qualified models in store *s*.

The advanced-tier PQS and basic-tier PQS are calculated similarly, except that the other tier is removed from the calculation. That is,

[64] This is done to ensure the basic PQS is assessing the percent of basic tier models, rather than all models, that are program qualified. Also, so that fluctuations in basic tier don't influence the view of advanced tier, and vice versa. For example, if advanced tier sales increase by 20% and basic tier by 30%, that would be an improvement, but if we include both in the denominator, it will look like advanced tier has actually gone backward.
[65] Fairfield, New Haven, and Hartford Counties were considered to be in the I-91 corridor, Litchfield, Middlesex, New London, Tolland, and Windham Counties were considered outside the I-91 corridor.
[66] Fairfield, New Haven, New London, and Middlesex Counties are coastal counties, Hartford, Litchfield, Tolland, and Windham Counties are non-coastal counties.

$$PQS_{advanced} = \frac{\sum_{s=1}^{S} Advanced_s}{\sum_{s=1}^{S} Advanced_s + Non-qualified_s},$$

and

$$PQS_{basic} = \frac{\sum_{s=1}^{S} Basic_s}{\sum_{s=1}^{S} Basic_s + Non-qualified_s}.$$

The other tier is removed from the denominator in addition to the numerator in order to avoid cases where an increase in the number of qualified models in the one tier makes it look like the other tier is performing poorly. Note that during the evaluation period, only advanced-tier models received incentives in the Connecticut ESRPP program. It is also important to note that none of the specifications for product tiers changed during the study period. If they had, we would have grandfathered products in to ensure an apples to apples comparison.

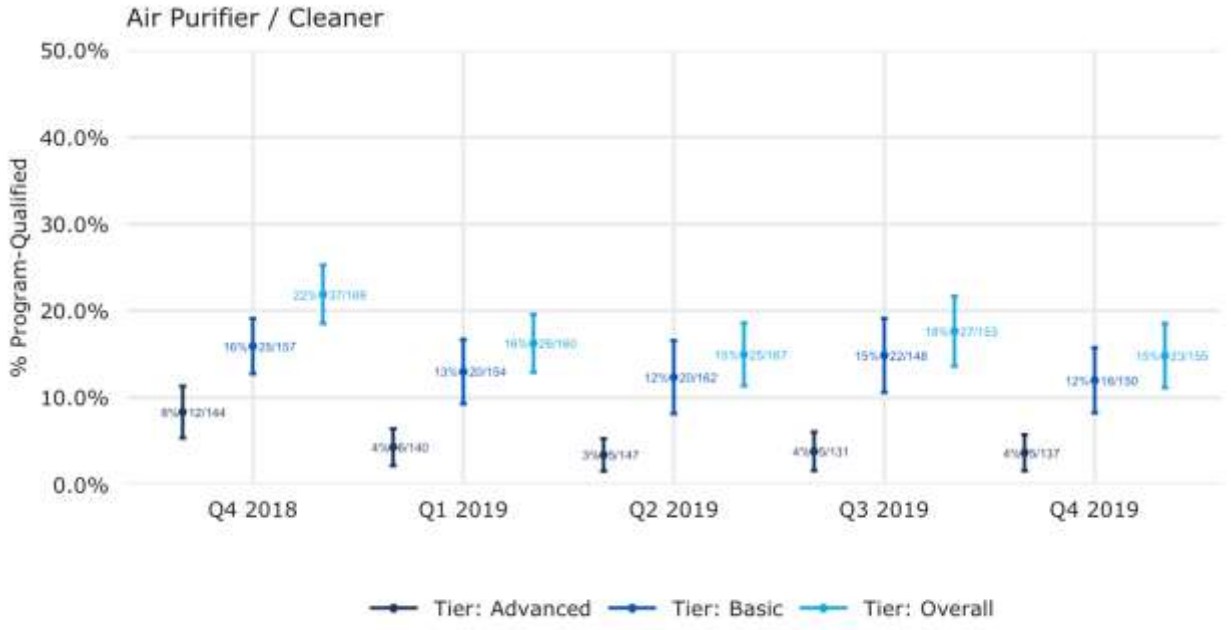
SHELF SURVEY RESULTS

This section provides additional detailed findings from the evaluation consultant's analysis of the Connecticut shelf survey data. Analysis for each product category shows no significant increase in retailer stocking of product-qualified advanced tier models. Further analysis was conducted after the development of the draft report to include 2020 Q2 and Q3 data. Despite expanding the timeframe, the shelf assortment analysis did not reveal an increase in retailer stocking of qualified products.

AIR PURIFIER / CLEANERS

Figure A-1 below displays the program-qualified share (PQS) of air cleaners by tier. The figure shows that the advanced-tier, basic-tier, and overall program-qualified assortment shares are decreasing over time from Q4 2018 to Q4 2019; however, the quarterly trend in 2019 appears to be relatively constant. Since the number of unique advanced-tier models on the shelves ranged from 5 to 12, the research team was unable to segment the results across the additional iterations to draw meaningful conclusions.

Figure A-1. Assortment Share of Air Purifiers/Cleaners by Tier



Clothes Washers

Figure A-2 through Figure A-6 below displays the PQS of clothes washers across several iterations. Basic-tier and overall program-qualified clothes washers show an increasing trend over time. Advanced-tier clothes washers are decreasing over time from Q4 2018 to Q4 2019; however, the quarterly trend in 2019 appears to be increasing. The advanced-tier results by year, quarter, and utility, year, quarter, and coastal vs noncoastal, and year, quarter, and corridor vs noncorridor all show the same trend – decreasing over time but increasing in 2019 for both groups. The results by retailer show slightly different results. Home Depot and Lowe's appear to be relatively constant over time, Sears/Kmart show a slight increase over time, and Best Buy appears to decrease overall but remain relatively constant in 2019.

Figure A-2. Assortment Share of Clothes Washers by Tier

Figure A-3. Assortment Share of Clothes Washers by Utility

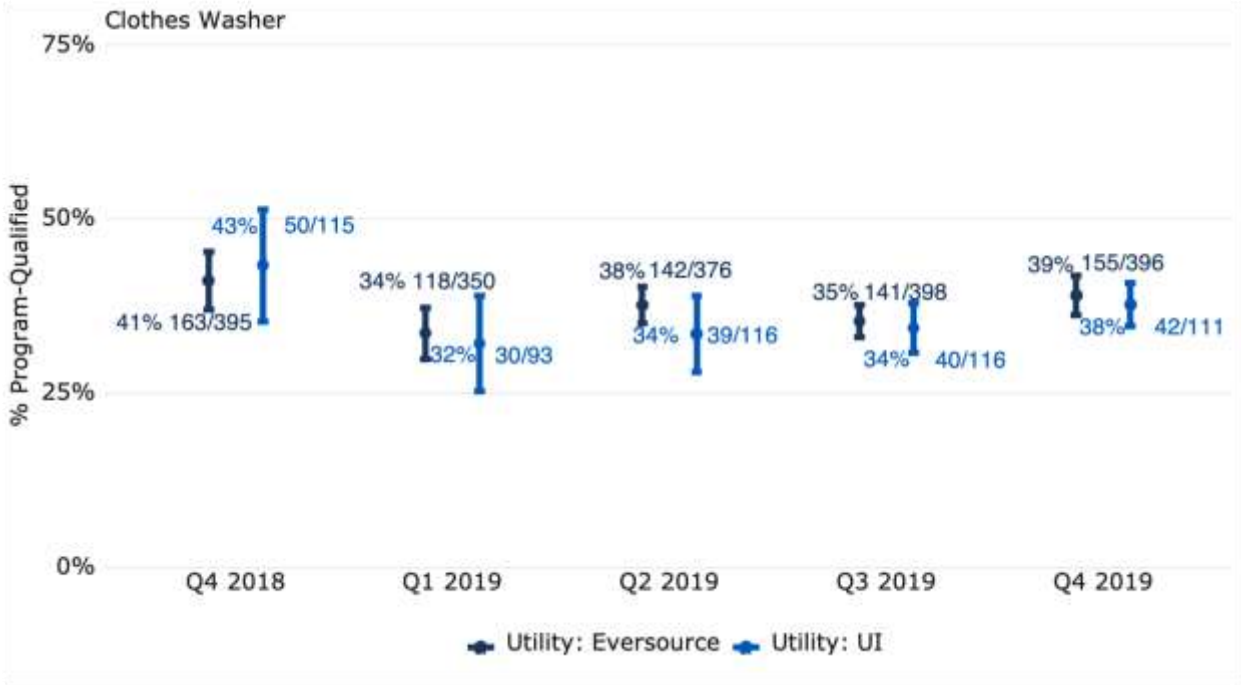


Figure A-4. Assortment Share of Clothes Washers by Coastal vs Non-Coastal

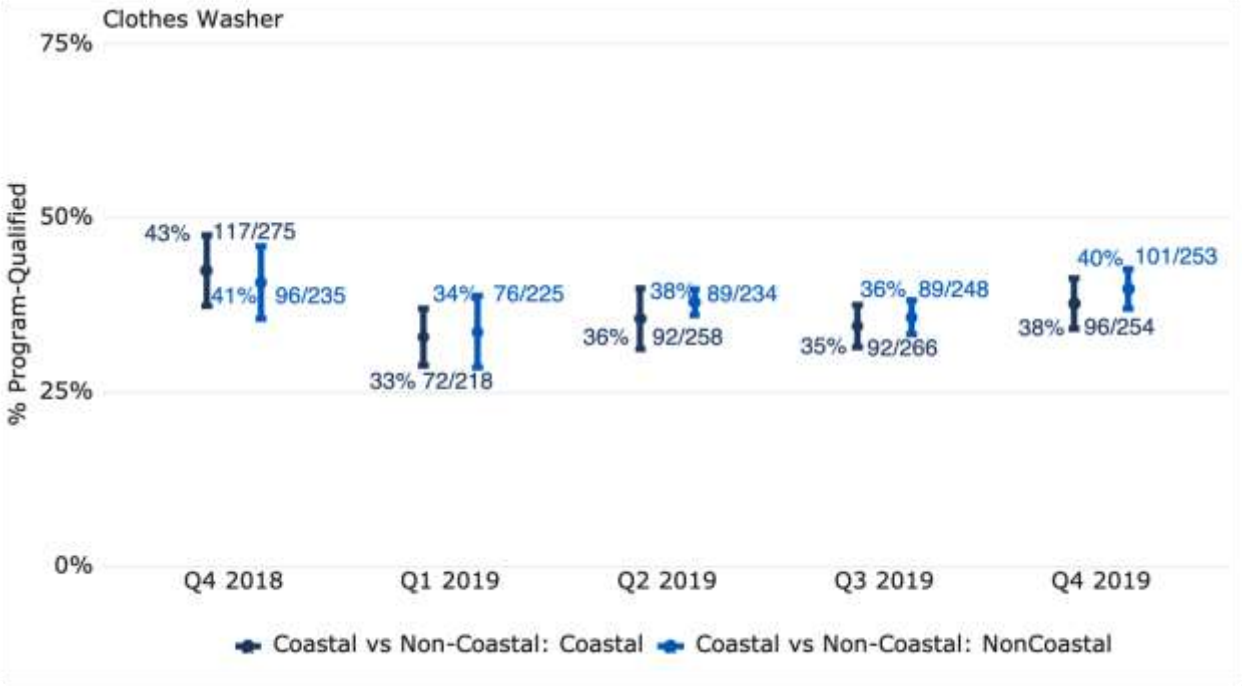
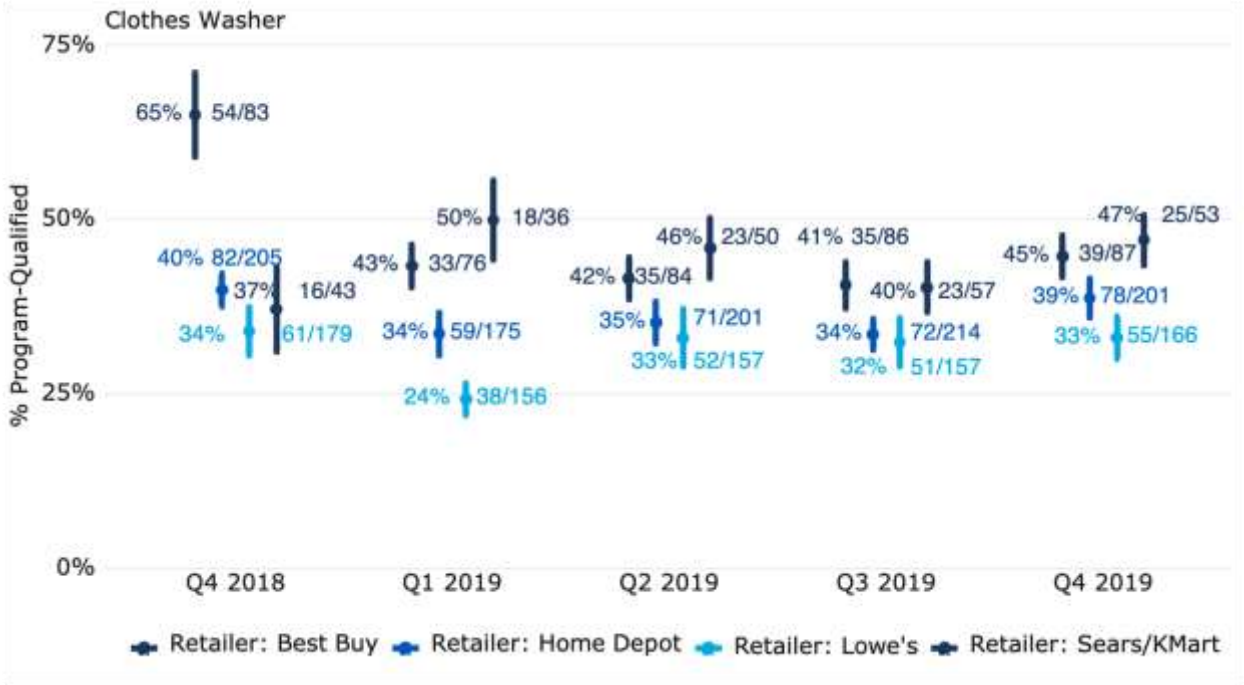


Figure A-5. Assortment Share of Clothes Washers by Corridor vs Non-Corridor

Figure A-6. Assortment Share of Clothes Washers by Retailer



Refrigerators

Figure A-7 through Figure A-10 below displays the PQS of refrigerators across several iterations. Basic-tier and overall program-qualified assortment share of refrigerators show a decreasing trend over time. Advanced-tier refrigerators still show a decreasing trend, but at a smaller rate. The advanced-tier results by utility show the same trend. Advanced-tier results by year, quarter, and coastal vs noncoastal show that coastal counties decrease slightly whereas noncoastal counties appear relatively constant over time. The results by retailer show different results as well. Home Depot appears relatively constant over time, Lowe's and Best Buy show a decrease over time, and Sears/Kmart show a slight increase over time. The increasing trend shown in Sears/Kmart has too few observations to make meaningful inferences.

Figure A-7. Assortment Share of Refrigerators by Tier

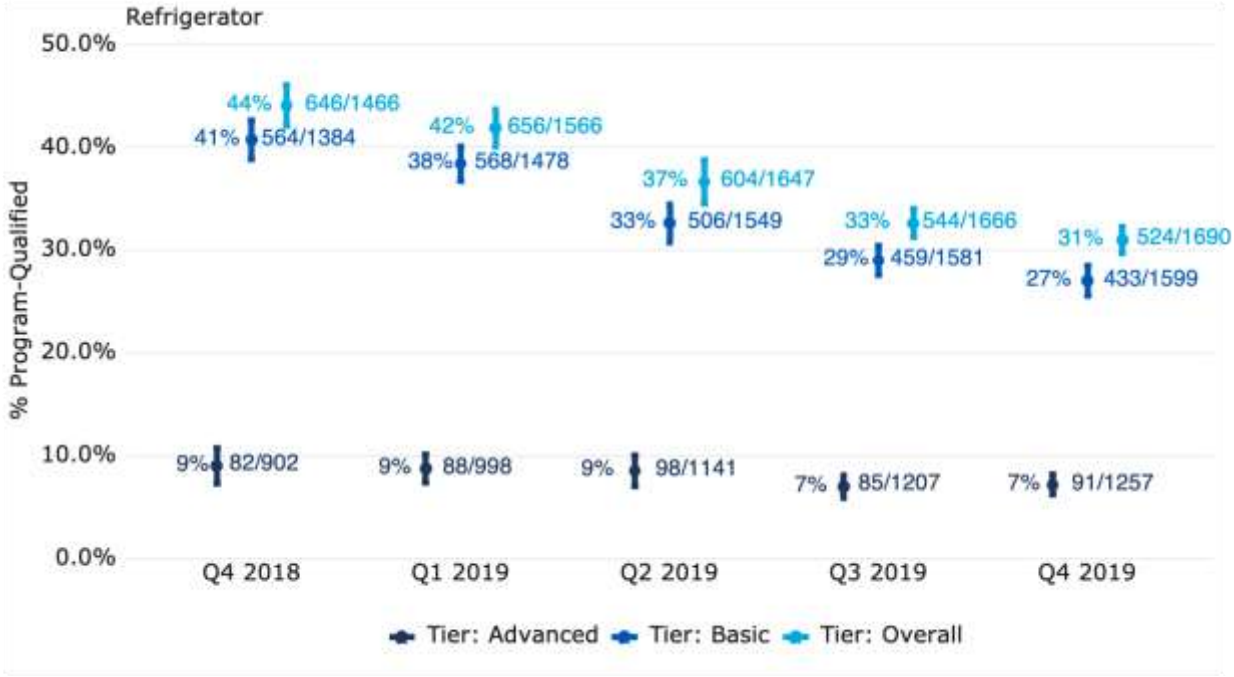


Figure A-8. Assortment Share of Refrigerators by Utility

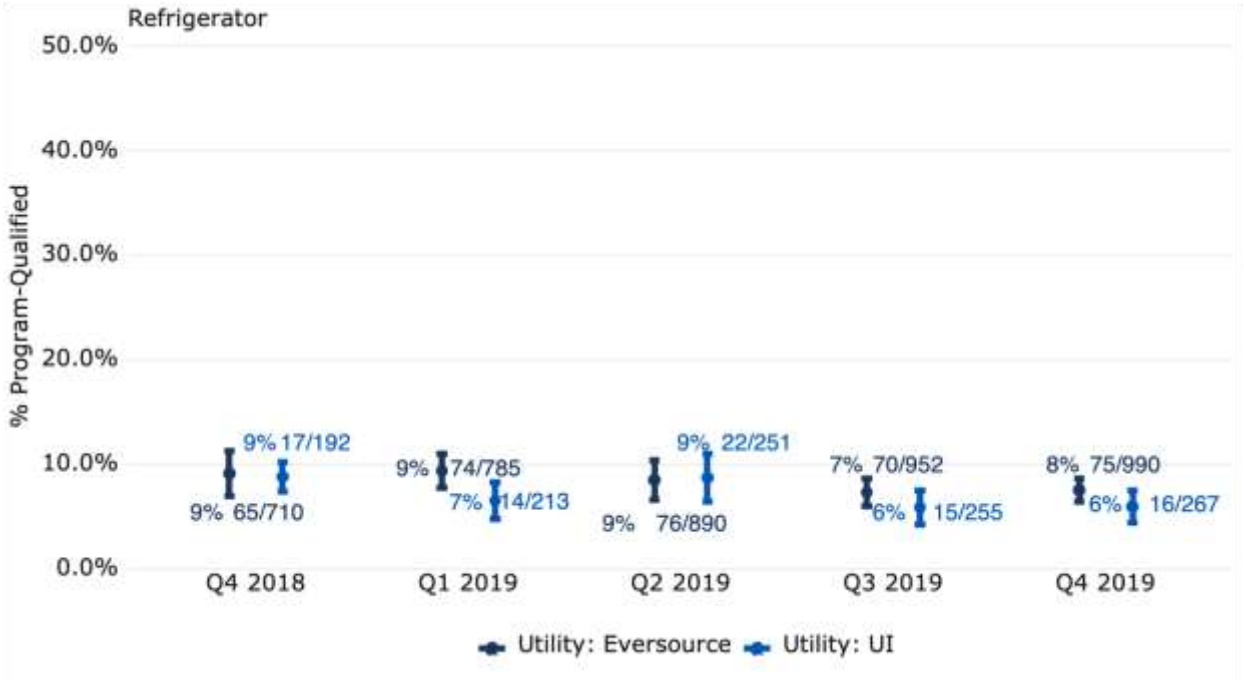


Figure A-9. Assortment Share of Refrigerators by Coastal vs Non-Coastal

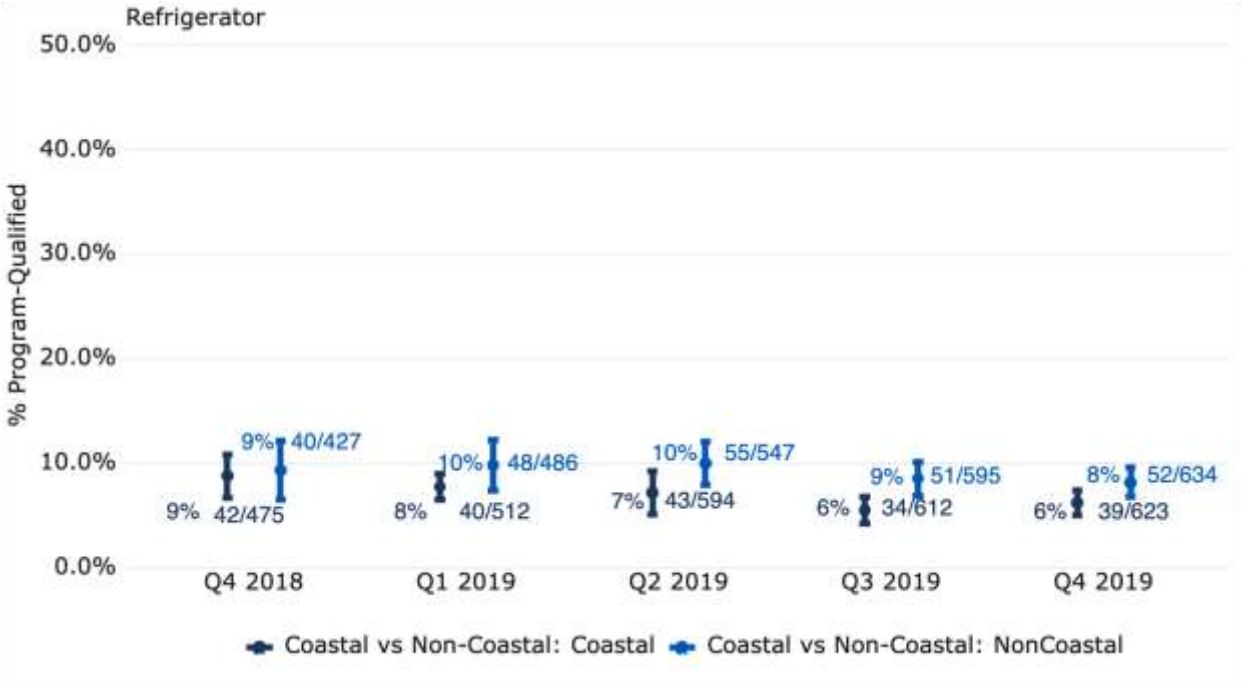
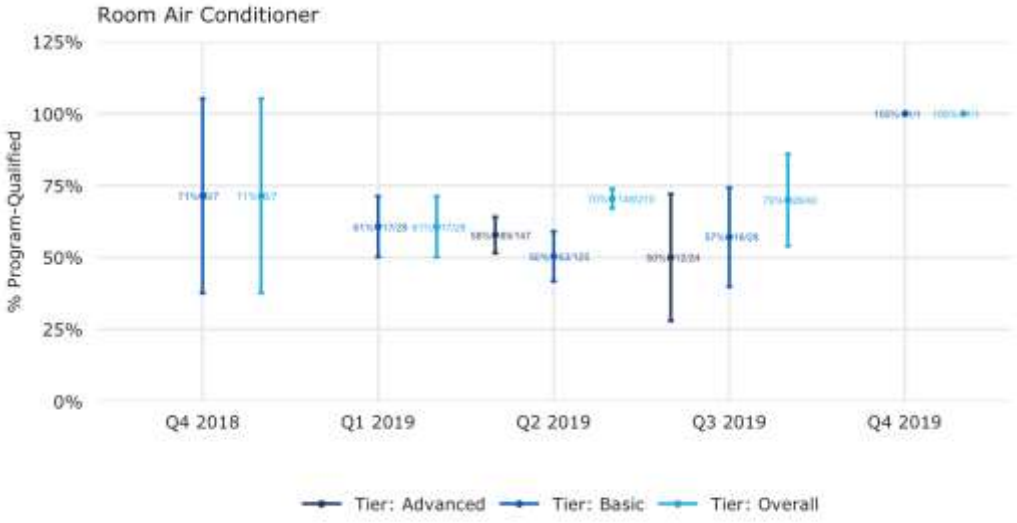


Figure A-10. Assortment Share of Refrigerators by Retailer

Room Air Conditioners

Figure A-11 below displays the PQS of room air conditioners by tier. Air conditioners are generally purchased in warmer months, leaving only Q2 as a robust point estimate so we are unable to establish a clear trend at this time. There are also too few advanced-tier models to segment the analysis (counts are provided alongside point estimate of PQS in the figure below).

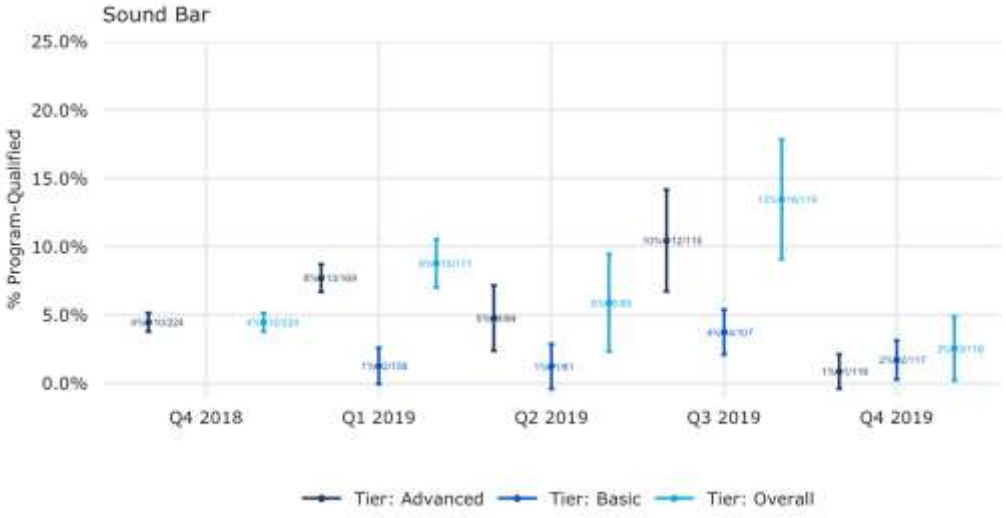
Figure A-11. Assortment Share of Room Air Conditioners by Tier



Sound Bars

Figure A-12 below displays the PQAS of sound bars by tier. The point estimates are highly variable and there are not enough points of comparison to establish a clear trend and there are too few advanced-tier models to segment the analysis.

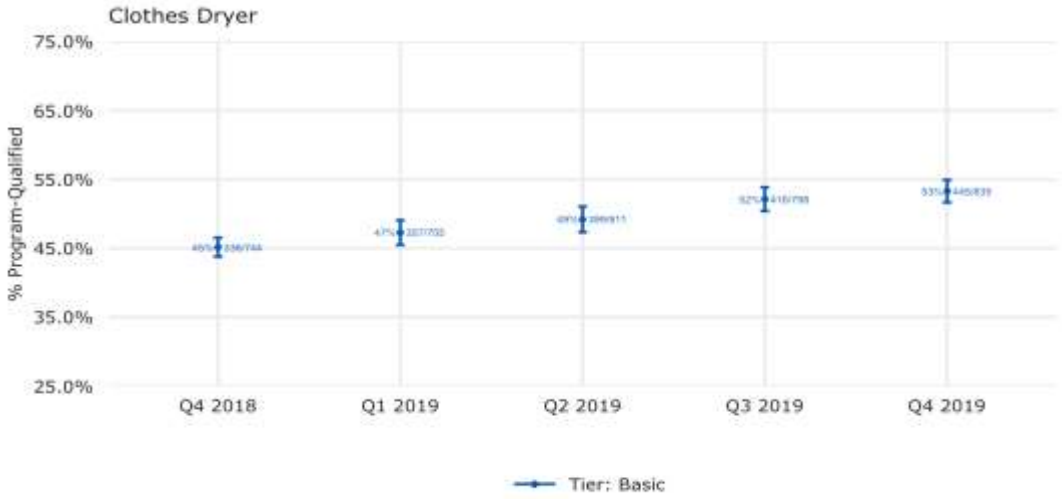
Figure A-12. Assortment Share of Sound Bars by Tier



Electric Clothes Dryers

Figure A-13 below displays the program-qualified assortment share of basic-tier clothes dryers. The basic tier appears to be increasing over time from 45% to 53%. There were no advanced-tier clothes dryer observed on the shelves at this time.

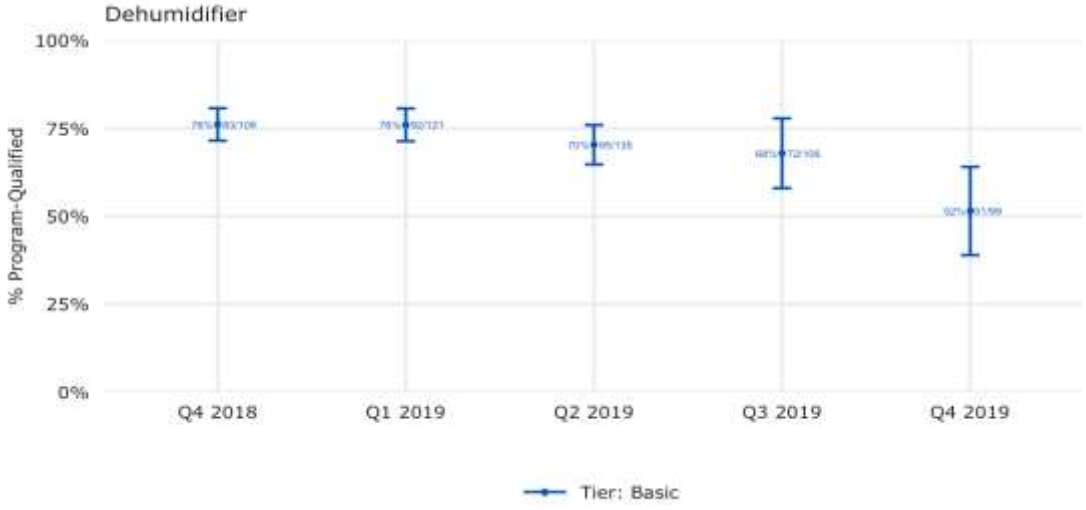
Figure A-13. Assortment Share of Clothes Dryers by Tier



Dehumidifiers

Figure A-14 below displays the program-qualified assortment share of basic-tier dehumidifiers. The basic tier appears to be decreasing over time from 76% to 52%. There were no advanced-tier dehumidifiers observed on the shelves at this time. The Federal standard and ENERGY STAR® specifications were updated in 2019, which could have influenced the slight downward trend in assortment share seen that year.

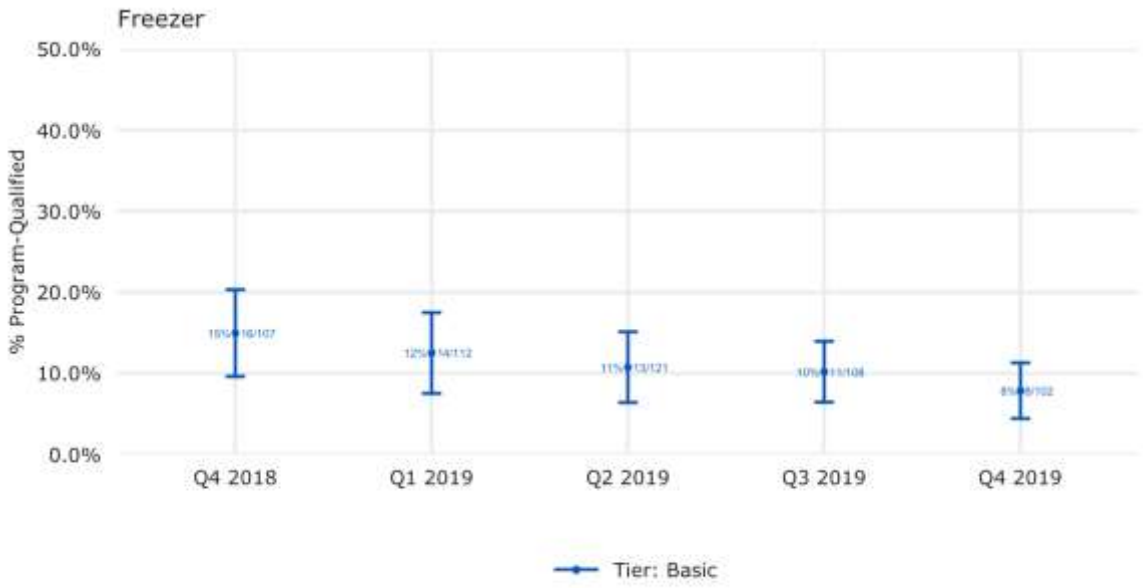
Figure A-14. Assortment Share of Dehumidifiers by Tier



Freezers

Figure A-15 below displays the program-qualified assortment share of basic-tier freezers. The basic tier appears to be decreasing over time from 15% to 8%. There were no advanced-tier freezers observed on the shelves at this time.

Figure A-15. Assortment Share of Freezers by Tier



In summary, analysis for each product category shows no significant increase in retailer assortment (or stocking) of product-qualified advanced tier models. The Connecticut Utilities ESRPP program is not demonstrating any impact on retailer stocking and product assortment of energy efficiency products. Further, many of the product categories have very few advanced-tier models on the shelves, indicating the program is not currently impacting retailers stocking practices and limiting the ability to draw meaningful conclusions from subsets of the data. Further discussion of the results from the shelf assortment analysis can be found in Section 2.2.1 Retailer Stocking Decisions within the body of the report.

A-2 SALES DATA ANALYSIS

The following sections outline the detailed methodologies and assumptions for the sales data analysis.

METHODOLOGY

The primary approach taken by TRC to estimate increases in sales rates for qualified products is based on modeling sales rates in the pre-program period (April 2017 to March 2018), using the model to predict sales into the program period (April 2018 to March 2020), and then comparing the predictions to the observed sales rates. This process involved normalizing sales for seasonality, developing three models of sales in the pre-program baseline period, predicting program-period sales using the baseline model, and averaging results from the three models.

NORMALIZE SALES FOR SEASONALITY

Because sales vary significantly throughout the year, models of sales levels must account for seasonality. The approach taken by TRC was to normalize sales levels and develop models based on the normalized sales models. Because overall sales levels are potentially different in the pre-program period and the program period, we treated the calculated the normalized level separately for the pre-program period and the program period. We did this by summing up all qualified product sales by product group in each month and dividing each monthly sales value by the overall average annual share for that calendar month, and then taking the average across all instances of that calendar month to get a normalization factor. We then divide the sales by the normalization factor to calculate normalized sales. That is, the normalized sales value is the sales value relative to the average sales for that month. For example, for product (*p)* in month *m* of year *y*, the normalized sales value is calculated as:

$$Normalization\ factor_{pmy} = \frac{Sales_{pmy}}{{}^{1}/_{Y}\left(\frac{Sales_{p,m,y0}}{\frac{1}{12}\sum_{n=1}^{12} Sales_{pn,y0}} + \frac{\sum_{z=1}^{Y1} Sales_{pmz}}{\sum_{z=1}^{Y1}\sum_{n=1}^{12} Sales_{pnz}}\right)}$$

$$NormalizedSales_{pmy} = \frac{Sales_{pmy}}{Normalization\ factor_{pmy}}$$

Where *Y* is the total number of years of data, *y0* is the pre-program year, *Z1* is the number of years of the program, *n* indexes over months, and *z* indexes over years. This uses the variation in sales over the full time series of data to normalize sales values so that months that had relatively high sales in both periods will have high seasonal sales, while months with low sales in both periods will have low seasonal value, and months that varied between the periods will have a moderate seasonal value. Normalized penetration rates are then calculated as the ratio of normalized program-qualified sales to normalized total sales. We normalize qualified and non-qualified sales separately to allow for different patterns between the qualified and non-qualified products.

Fit Baseline Models

Based on the normalized sales numbers, the research team developed three statistical models of the baseline sales behavior. The first modeled the normalized monthly sales values, under the assumption that the effect of the program is to increase the sales of qualified products. For each product category, model one takes the form,

$$NormalizedSales_{month} = \beta_0 + \beta_1 Timetrend_{month} + \beta_2 X_2 + \varepsilon_{month}$$

Where β_0 is an intercept, β_1 is the average increase over time, $Timetrend_{month}$ is the number of months since the beginning of the data, β_2 is a vector of slopes for the included external factors, X_2 is the vector of included external factors, and ε_{month} is an error term.

The second model used the monthly penetration rate, under the assumption that the effect of the program is to increase the market share. The third model used a transformation of the market share, based on the assumption that the effect of the program would have a smaller absolute impact on the market share when the market share is very small or very large, and a larger impact when it is modest. The second and third model take the same form, except that $NormalizedSales_{month}$is replaced by the normalized penetration rate for the second model and the normal cumulative distribution function of the penetration rate for the third model. For each product group and each model, we used leave-one-out prediction model fit to select between a full model that uses all three coefficients (β_0, β_1, and β_2) and models that set any of the elements of β_1 and β_2 to zero. Leave-one-out prediction model fit is a measure of how well the form of the model is able to predict each observation in the model without using it. So, for each observation, the sub-model parameters were estimated with all the other data but leaving the target observation out of the data. That observation was then compared to the predicted value for the sub-model that was estimated without it. Between the full sub-model and any of the constrained sub-models, the sub-model that gave better prediction fit was selected within each model grouping. The variables included were allowed to vary between the three different model types.

Predict Sales

For each product and each product group we used each of the three models to predict sales levels during the program period. For the first model, this involved taking the predicted normalized sales and de-normalizing the data to get predictions of actual sales, multiplying the predicted normalized sales by the normalization factor. For the second model, predicted qualified sales are equal to the predicted qualified market share (to get predicted normalized sales) multiplied by the normalization factor. For the third model, the predicted market share value calculated as the inverse cumulative distribution function of the predicted output. This is then used to calculate sales as in the second model.

The three models were averaged based on their prediction model fit during the pre-program period to develop a predicted sales value for each program group. TRC used a model averaging approach to combine the results from three different prediction models in order to adjust for uncertainty in what the true model is. The model averaging relied on the same leave-one-out prediction error process as described above. The relative weight for each model was inversely proportional to the sum of the squares of the difference between the observed sales and the predicted sales based on the leave-one-out predictions. Estimated increases in qualified product sales were calculated as the difference between the observed sales and the predicted sales. If observed sales were larger than predicted sales, then that constituted an increase in the sales level during the program period.

APPENDIX B: DETAILED ESRPP FINDINGS

This Appendix documents the methodology for our ESRPP Peer and Stakeholder Interviews, as well as detailed results on ESRPP Implementation and EM&V Best Practices.

B-1. PROGRAM SPONSOR AND STAKEHOLDER INTERVIEWS

TRC conducted in-depth interviews to identify how other Program Sponsors are successfully implementing their ESRPP programs. These consisted of hour-long discussions with four peer Program Sponsors and two ESRPP stakeholders that coordinate with the program on a national level. TRC developed a detailed interview topic guide, based on a literature review of prior Program Sponsor evaluations, which contained interview questions to guide discussions with program managers at peer utilities and energy efficiency organizations.

After conducting interviews, the evaluation consultant aggregated information across four main topic areas:

- ESRPP program structure and retailer involvement
- Program design and impacts
- Claiming savings and methodology
- Cost-effectiveness and program regulatory treatment

The evaluation consultant analyzed common themes and notable or unique findings from peer and stakeholder interviews. This comparison of responses was used to identify evaluation and implementation improvements and best practices aimed to help meet portfolio needs and relevant policy findings.

B-2 ESRPP IMPLEMENTATION

ESRPP was envisioned as a national market transformation initiative, with long-term outcomes designed to shift retailer offerings, and in turn manufacturer portfolios, toward more efficient products.[67] The ESRPP program intends to build market share for residential high efficiency products over time through impacting both retailer's sales and increasing the stringency ENERGY STAR® specifications. For some Program Sponsors, the program is treated as a market transformation program, while for others, ESRPP is viewed as a mid-stream resource acquisition program to deliver on near-term energy savings goals.

This section outlines the role that market transformation plays in ESRPP program regions. These results are the output from our peer Program Sponsor and

[67] https://www.energystar.gov/sites/default/files/asset/document/ESRPP%20Program%20Overview_6_23_2020.pdf

stakeholder interviews, literature review, and review of regulatory documents related to each of the ESRPP program regions.

Four Sponsors, NEEA, PG&E, ComEd, and Xcel Energy (CO)[68], have or are currently developing market-transformation frameworks. In these contexts, ESRPP is not necessarily managed annually for cost-effectiveness under traditional utility cost tests. NEEA was established explicitly as a regional market transformation organization, and, by design, takes a long-term view on ESRPP and program outcomes. As NEEA aggregates funding from multiple regional utilities and members, it is able to take this longer-term view and spread its risks across more entities. NEEA appears to be most involved in these market-transformation aspects of ESRPP, including participation in national product specifications, standards advocacy, and product testing.

Xcel Energy (CO) has the regulatory ability to designate programs as market transformation programs that support or enhance the delivery of other elements of the energy efficiency portfolio. Colorado defined and established its approach to Market Transformation for DSM programs more than a decade ago. The Colorado PUC notes that "The objective is to overcome barriers within a market through coordinating tactics such as education, training, product demonstration and marketing, often conducted in concert with rebates or other financial incentives."[69] Regulators in Colorado have required Xcel Energy to include market transformation programs in its DSM plan in support of the utility's long-range DSM strategy. In its latest DSM plan, Xcel Energy notes that the "Company believes that market transformation and customer education are some of the lowest cost ways to influence customer decisions and behaviors for the long term." These programs can claim energy savings if a methodology is approved by regulators, however, Xcel Energy has not elected to do so yet. Instead, the program is assumed to have a cost-effectiveness of 1.0 under the state's mTRC cost test, so as not to negatively or positively impact the overall portfolio.

Illinois recently added a Framework for Counting Market Transformation Savings to the state's Technical Resource Manual published for 2020 to provide utilities with greater certainty and ensure more consistency statewide on evaluation for market transformation initiatives.[70] Illinois notes that market transformation initiatives differ from resource acquisition in that market transformation takes long-term approach to impact the market in ways that can't be undone – citing interaction with ENERGY STAR® on specifications and test procedures, specifically. Illinois also clearly recognizes that "markets are very dynamic, and the program administrators are only one set of actors. If, how, where, and when the impacts occur are usually

[68] Xcel Colorado discontinued their ESRPP program at the end of PY2019.
[69] Colorado PUC, Decision C11-0442.
https://www.swenergy.org/Data/Sites/1/media/documents/news/news/file/Xcel%2010A-554EG%20PUC%20order.pdf

[70] https://s3.amazonaws.com/ilsag/2020_IL-TRM_Version_8.0_dated_October-17-2019_Final_Volumes_1-4_Compiled.pdf

beyond the direct control of the program administrators," unlike resource acquisition, where activities are more directly attributable to specific programs.

The Illinois TRM outlines a sales-above-baseline framework for calculating market-transformation energy savings, similar to that used by NEEA. It notes that any overlap of savings from same-market resource acquisition activities should be accounted for and netted out of market transformation savings. While the document doesn't specifically address cost-effectiveness for market transformation, it notes that unlike resource acquisition that happens on an annual or multi-year basis, market transformation is planned and implemented over a 10-20 year timeframe, and savings measurement and cost-effectiveness may be viewed in alignment with that timeline.

In California, the CPUC defined market transformation over a decade ago as:

> *Long-lasting, sustainable changes in the structure or functioning of a market achieved by reducing barriers to the adoption of energy efficiency measures to the point where continuation of the same publicly-funded intervention is no longer appropriate in that specific market. Market transformation includes promoting one set of efficient technologies, processes or building design approaches until they are adopted into codes and standards (or otherwise substantially adopted by the market), while also moving forward to bring the next generation of even more efficient technologies, processes or design solutions to the market.*"

Regulators only recently adopted a new market transformation framework[71], which outlines three core principles that initiatives must support:

- Driving incremental savings to achieve state EE, equity, and GHG reduction goals
- Cost-effective management at the portfolio level
- Managed with a stage-gate process[72] for development and deployment.

The framework proposes a single statewide administrator for market transformation, similar to NEEA's role in administering market transformation initiatives for the Northwest, with funding split across state IOUs, similar to how statewide EE programs are funded. Finally, the CPUC did not impose a specific cost-effectiveness measure to the portfolio of market transformation initiatives that utilities will be developing. The framework is established with an initial five-year program period, and regulators note that while cost-effectiveness is important, they will assess the need for specific targets or cost-effectiveness methodologies as they gain more experience from market transformation initiative deployment in coming years.

[71] CPUC Decision Regarding Frameworks for Energy Efficiency Regional Energy networks and Market Transformation. December 2019. D.19-12-021.
[72] High-level stages include concept development, program development, and market deployment.

After several years of treating ESRPP as a pilot within its Energy Efficiency portfolio, PG&E was unable to establish a methodology to claim savings with regulators. California only recently approved a new market transformation framework,[73] under which the utility plans to establish ESRPP and eventually claim cost-effective savings, in addition to other market transformation activities.

Program Sponsors in Minnesota, New York, Vermont, and Wisconsin did not consider ESRPP under a market transformation framework, though one Sponsor noted that their organization does internally consider the program's impact on market transformation when planning products and incentive levels. In these regions, ESRPP is treated and managed as a resource acquisition program, with a more concerted focus on annual energy savings, program spend, and resulting cost-effectiveness measures. Sponsors without a market transformation framework were less likely to indicate interest in activities like advocacy on federal specifications, standards and testing procedures.

The main challenge for other Program Sponsors is developing a market transformation framework that would allow utilities to claim much larger market transformation savings.[74] The savings claimed under a market transformation framework would be substantially greater due to the ability to claim savings for increasing the market share of program qualified products over time. Overall, NEEA is the only Program Sponsor that operated ESRPP under a market transformation framework for the evaluation period (2018-2019). While three other Sponsors (PG&E, ComEd, and Xcel Energy- CO), are currently developing, or have recently implemented, a market-transformation framework, all other Program Sponsors (including Connecticut), operated the program under a resource acquisition framework during the evaluation period. Table B-1 summarizes the difference between those Sponsors operating ESRPP as a resource acquisition program and those operating it under market transformation. The lack of focus among most Program Sponsors for ESRPP's national market transformation program theory limits each Program Sponsor's long-term prospects for achieving these benefits.

[73] CPUC Decision Regarding Frameworks for Energy Efficiency Regional Energy networks and Market Transformation. December 2019. D.19-12-021.

[74] While the Connecticut Utilities can use different frameworks for different programs, establishing a market transformation framework for ESRPP would require support from stakeholders and regulators, and would include agreements on evaluation, mechanism for claiming savings, and cost-effectiveness methodology. Some components, such as baselines and long-term program attribution, will need to be established ahead of time and may be particularly challenging to determine given the current benefit-cost framework. Even without this framework the Connecticut Utilities can take actions that have a long-term view of the program. These actions include participating in code and standards discussions, collaboration with participating retailers, and promotion of the program to other utilities.

Table B-1. ESRPP Program Key Considerations Under Resource Acquisition and Market Transformation Approaches

Component	Resource Acquisition Approach	Relevant Section(s) Discussing Challenges	Market Transformation Approach
Incentive Structure	Short-term cost-effectiveness and budget impacts	Section 2.1.3 Incentives Comparison	The need to drive retailer stocking and assortment decisions
Product and Intervention Selection	Offer incentives in line with short-term cost-effectiveness	Section 2.1.3 Incentives Comparison and Section 2.1.5 Policy and Evaluation	Target the intervention to the needs of the specific market, including incentives, code support, retailer engagement, and market monitoring
Cost-effectiveness	Limited to short-term view of program costs and associated benefits from measures purchased through the program	Section 2.1.5 Policy and Evaluation	Ability to include long-term benefits of increasing market share
National Working Groups	Only passive participation, such as signing on to letters for advancement of codes	Section 2.1.2 ESRPP Implementation	Active participation in discussions to advance specifications, active recruitment of peer program sponsors
Savings Claims[1]	Currently limited to 1 to 5% of Portfolio	Section 2.1.5 Policy and Evaluation	Potential to expand savings up to 25% of Portfolio[2]

[1]Eversource ESRPP made up <1% of its residential portfolio in 2018. UI did not claim any savings.
[2]NEEA achieves roughly 25% of its residential savings from ESRPP.

B-3 EM&V BEST PRACTICES

This section summarizes the detailed findings from our EM&V best practices comparison of the program sponsored ESRPP programs from across the country. Specifically, we present the methods used by Program Sponsors to claim energy savings as well as the challenges associated with a market transformation program.

ENERGY SAVINGS

Program Sponsors have employed two methodologies to estimate and claim savings from retailer sales of qualified ESRPP products. The first follows a more traditional approach, similar to those used for many resource acquisition programs to estimate gross and net energy savings. The second uses a baseline methodology to estimate energy efficient sales absent Program Sponsor interventions, and then claim

savings on sales that occur over that baseline. We describe these approaches below.

Resource Acquisition Energy Savings Methodology

For Program Sponsors that calculate energy savings based on traditional resource acquisition methodologies, the process is generally as follows:

Equation B-1. Resource Acquisition Savings Methodology

Equation	Program qualified product sales	✖	Unit energy savings	✖	Gross adjustment factors[1]	=	Claimable energy savings
Source	ESRPP data portal		ENERGY STAR® values[2] or local TRM		Prior ESRPP evaluation or existing TRM values		

[1]Not all Program Sponsors include adjustment factors in their methodologies. Xcel Energy in MN claims savings based on gross calculated savings.
[2] ENERGY STAR® has worked with national evaluator Cadmus to aggregate calculated national energy savings values for ESRPP products, including product unit consumption, lifetimes, and incremental costs, with detail on sources and methodologies. Values are confidential and only available for use by Program Sponsors.

This methodology has the benefit of being a generally accepted practice in many regulatory environments, used for existing down and mid-stream program designs. Additionally, Program Sponsors may already have accepted unit energy savings values or gross adjustment factors within their technical resource manuals that can be applied. In some cases, Program Sponsors conducted initial evaluation studies of ESRPP to determine gross adjustment factors (e.g., realization rates).

One potential downside of this approach is that traditional calculations of gross adjustment factors that are designed around downstream rebate programs may not be entirely applicable for a market transformation program. This may negatively impact the total claimable savings and resulting cost-effectiveness of the program.

At least one Program Sponsor offered additional downstream rebates on certain products incentivized through ESRPP. This Program Sponsor had developed a standardized process for backing-out savings associated with those downstream incentives from the values claimed through ESRPP.

Sales above baseline savings methodology

At least two Program Sponsors estimate program savings by developing a baseline forecast of product sales, which assumes the efficient product's market performance absent the interventions from ESRPP program participation. Savings are then calculated based on any actual product sales that exceed the baseline:

Equation B-2. Baseline Sales Savings Methodology

Equation	**(Program qualified product sales − Baseline product sales)**	**✖**	**Unit energy savings**	**=**	**Claimable energy savings**
Source	ESRPP data portal		Developed internally	ENERGY STAR® values or local TRM	

This methodology, employed by NEEA and Focus on Energy, has the potential to account for broader program interventions, such as product specifications and standards advocacy, over time.[75] However, it is only as useful as the accuracy of the of the baseline forecast. NEEA, with its focus on longer-term market transformation, forecasts 15-20 years forward, defining initial conditions, market events (e.g., specification or standard changes, adoption of emerging technologies), event periods, and end points. This approach requires historical market data to develop baseline market-share. A recent process evaluation of NEEA's approach suggested using a 24-month moving average forecast. Further, there is often a lag time of approximately one year between when Sponsor interventions first occur and when retailers purchase and stock products; Sponsors can and should use this lag period as additional "historical" data to inform baseline conditions. The evaluation also notes that Sponsors should also factor in seasonality expected for certain products (such as room air conditioners during summer months, or TVs in Q4).[76]

A second baseline modeling approach, employed by TRC (previously EMI Consulting) in analyses for ConEdison, Xcel Energy, and PG&E, uses an average of three market models (sales, market-share, and probit models) to fit models to historical values of up to 18 months.

Interviews and the literature review revealed that all of the Program Sponsors reviewed (including Connecticut), except NEEA, treated the program as a midstream resource acquisition program to deliver on near-term energy savings goals in 2019. The programs focused on resource acquisition, claim savings based on traditional resource acquisition methodologies – multiplying product sales by a deemed value and, often, adjusting gross savings by some factor. NEEA is an organization designed specifically to promote market transformation. By operating under a market transformation framework, NEEA achieves roughly 25% of its residential savings from ESRPP[77], compared to 1 to 2% for the other Program

[75] The ex-ante baselines build in expected changes in standards. However, the logic of the program is that it will be helping push future changes. NEEA will assess whether they can make a claim to having influenced those changes.
[76] Apex Analytics. Retail Product Portfolio Evaluation – Final Report, Prepared for NEEA. July 11, 2019. https://neea.org/img/documents/RPP-Evaluation-Final-Report.pdf
[77] NEEA's residential portfolio covers a wide array of products and programs, including lighting controls. While their total portfolio is smaller than some large utilities, it is comparable.

Sponsors. The assessment of program attribution under a market transformation framework would allow the Connecticut Utilities to claim savings for these long-term changes in the market. Further discussion of the policy framework and the implications for claiming savings can be found in Section 2.1.5 Policy and Evaluation in the body of the report.

APPENDIX C: ESRPP RETAILER DECISION-MAKING

This Appendix summarizes the retail interviews conducted by Cadmus as part of the national evaluation of ESRPP. The interview results reveal internal factors that guide marketing and purchasing/stocking decisions as well as what impacts national retailers' participation in the ESRPP program.

C-1. RETAILER INTERVIEWS ANALYSIS

TRC analyzed interview data, collected by Cadmus, to gain insight into how retailer interacted with the ESRPP program and impact the program has had on retailer stocking decisions. Since ESRPP is a national program, evaluating the impact the program has on retailers is also nationally coordinated. The agreement between participating retailers and utilities specifically does not allow individual program administrators or their evaluators to individually engage in soliciting feedback from retailers. Therefore, this is the best data available to gain insight into retailer decision-making.

DATA COLLECTION

Table C-1 provides a summary of the retailer interview data collected by Cadmus. The 2019 interviews was the third round of interviews conducted since 2016. The first round of 2016 interviews was conducted with retail merchants (responsible for retailer purchasing decisions), marketing staff, and sustainability specialists from Best Buy, Sears/Kmart, and The Home Depot. Cadmus followed up in 2018 with a single interview per retailer focused on high-level corporate engagement with the program. The third round of 2019 interviews were targeted short interviews with key national retailer staff. Our research draws upon the results from the most recent (2019) round of national interviews.

Table C-1. National Retailer Interview Topics – Collected by Cadmus

Interview Topic	Question Examples
Current business practices for each product	• What are the primary considerations when choosing which [products] to offer your members? (Probe for price, consumer demand, profit margin, marketing/advertising, technology features, energy efficiency) • How frequently do you bring new models of [product] into your assortment? • How often do you take old models out? • How do you work with manufacturers when you are purchasing products? (probe for ordering decisions, marketing placement, leveraging of incentives)
Influence of product energy efficiency on retail operations	• What impact do local energy efficiency incentives have on purchasing decisions and marketing approach? [If not at all probe as to why] • What impact, if any, will ESRPP have on your members to the extent it will influence ESRPP supported product purchases and assortments?
The importance of ESRPP-provided information on stocking and assortment practices	• Are there other types of information that would be helpful in informing you of ESRPP supported products to consider for sourcing and assorting that you are not currently receiving?
Influence of non-information ESRPP elements on retailer stocking	• Are there tools or other resources ESRPP can provide to [retailer] to help its staff make informed business decisions for considering assorting support ESRPP products?
Product specific buying cycles	• Have there been any changes to sales & promotional cycles for [product]? [If so] What factors are driving those changes?

SAMPLING

Cadmus' sample approach has evolved over the multiple rounds of interviews. For the first round of 2016 interviews, the approach was to interview multiple staff at each participating retailer including one staff for each category of staff (merchants, advertising, and sustainability staff). Then in 2018, Cadmus only interviewed one person at each participating retailer, but the results turned out not as fruitful. For the 2019 interviews Cadmus returned to the original 2016 sample strategy but developed targeted interview guides for each group of staff.

ANALYSIS

TRC analyzed the 2019 interview data Cadmus collected from participating national retailers. This interview data has not been previously analyzed and represents new information. Cadmus provided TRC with raw interview data for the 2019 retailer interviews. Each of the 8 interviews were with sustainability staff, marketing staff, or merchants from one of four national retailers, with some interviews conducted jointly with multiple staff members.

Since ESRPP is a national program, evaluating the impact the program has on retailers is also nationally coordinated. Given the retailers' participation in ESRPP is at a national level, the interviews are conducted from that perspective and not specific to individual program sponsors. While the interviews were not specific to Connecticut's ESRPP implementation, the insights from these national interviews are applicable to the decisions Connecticut utilities make relevant to their participation in the national ESRPP program.

C-2 RETAILER INTERVIEW RESULTS

The following sections summarize the detailed results from our analysis of the 2019 retailer interview data (described above). While participating retailers generally view the ESRPP program favorably, several specific challenges with the current program set-up and needs of retailers have impaired the programs broader success. Our results are broken out into internal factors that guide marketing, purchasing and stocking decisions, retailers' perception of specific markets, and customer experience considerations.

MARKETING PATTERNS

Retailer interviews addressed marketing strategies and patterns both related and unrelated to ESRPP participation. Retailer marketers reported that they generally attempt to market certain products based on time of year; air conditioners are generally marketed in the warmer months and freezers during hunting and fishing season. One marketer reported they occasionally increase marketing around Earth Day for energy efficient products, but do not otherwise have a specific strategy around marketing ESRPP or other energy efficient products.

According to retailer marketing staff, reasons for not marketing energy efficiency are two-fold:

- **Retailers reported that consumers do not see energy efficiency as a feature** in the same way that they see wi-fi connectivity or smart capabilities as appliance features. Without an existing, easily communicable story around energy efficiency as a feature in itself and with sufficient profits from appliances that do not qualify for ESRPP, marketing staff do not generally feel motivated to market energy efficiency equipment.
- **Retailers do not feel they have sufficient understanding of the benefits of energy efficiency** needed to successfully build marketing materials around it. Marketing staff reported that oftentimes, manufacturers or other suppliers provide them with information about new features included in their products, and that this information is easy to integrate into marketing campaigns. Despite sustainability staff acknowledging a trend toward promoting sustainability and energy efficiency among upper management, the lack of clear messaging around how to promote efficient products does not always reach purchasing or marketing staff members who ultimately make decisions about what customers see on shelves.

STOCKING DECISIONS AND ESRPP PROGRAM

The interviews Cadmus completed indicated that while sustainability managers are generally the most knowledgeable about the ESRPP program, their role within their organizations does not generally give them final decision-making power about which products to stock in stores. Instead, sustainability staff work with merchants to provide them with information about sustainability programs, and merchants make the final decisions.

Participating retailers also discussed their interactions with the ESRPP program, including feedback about how the current program structure does and does not work for their needs. At a high level, retailers were satisfied with the ESRPP program, and reported that they plan to continue to participate in it. However, retailers also reported that the ESRPP program can pose challenges because it is structured differently from other sustainability and marketing efforts they implement. Specifically, stocking decisions are made approximately 8 to 12 months in advance, while the Program Sponsors establish program-qualified products and incentives three to five months before the program-year launches.

Stocking Decisions

While sustainability managers may be knowledgeable and educated about the program, merchants may or may not be, and marketers do not generally focus on sustainability or energy efficiency unless manufacturers provide them with that information. Just one sustainability manager mentioned differentiating between different product tiers, and no merchants or marketers discussed these differences. Retailers reported it would be helpful for ESRPP to help connect key staff members with one another and to help build a full marketing and merchandising story around the products they wish to promote.

Product Support

Not all retailers understood the structure of the ESRPP program; some believed that it is a national program but wished they could customize it based on local geography, while others felt it was too localized and wanted more support at a national level. Because retailers make decisions about which appliances to stock at a national level, they felt that they needed more centralized guidance around which appliances to be marketing in their stores. Retailers reported manufacturers and other organizations they work with to determine which appliances to carry in their stores often provide them with guidance about their preferred models and information about how to market their products. Retailers then make decisions about which items to market in their stores and when, using guidance provided from manufacturers to help make those choices. Though the ESRPP program does provide guidance around which appliances are eligible for the program, retailers reported they would like additional support in understanding which products are preferred, and how best to market around those particular products.

RETAILER APPLIANCE DECISIONS

This section summarizes findings from retailer interviews related to markets that retailers perceived to be most interesting: refrigerator/freezers and washer/dryers.

Though these markets were perceived to be the most interesting, retailer interviewees worked across multiple appliance types. When making purchasing and stocking decisions, retailers take a number of factors into account, heavily weighting customer preferences, purchase data, and cost.

Refrigerator/Freezers

Retailer marketing and merchandising staff reported that over the course of the last few years, developments in refrigerators have outpaced developments in other ESRPP-eligible product areas. These developments have come primarily in the form of smart technologies, including wi-fi connectivity and smart fridges. These developments have increased interest in new refrigerators among customers, leading retailers to focus on stocking and marketing them. It is notable, however, that while there are an increasing number of features on newer refrigerators, these products are not necessarily ESRPP-eligible. While some sustainability managers did acknowledge that some consumers see energy efficiency as a feature, marketing staff reported that connectivity and smart-home features drive equipment purchases more reliably.

While the refrigerator market is changing rapidly, retailers noted that the freezer market remains relatively stagnant. Consumers most commonly purchase french-door refrigerators with integrated freezers, while stand-alone freezers sales are generally limited to particular geographic areas with strong hunting and/or fishing cultures. Within those geographic areas, stand-alone freezers are most commonly sold during hunting and fishing season, with low sales throughout the rest of the year.

Clothes Washers/Dryers

Like refrigerators and freezers, clothes washers and dryers are often purchased in tandem, but technological and energy efficiency developments are different between the appliances. Specifically, while there have been recent developments in the clothes washer market in terms of consumer preference, available features, and energy efficiency, retailers feel the same developments in marketable features have been limited in the dryer market.

Retailers reported having seen a trend toward top-loading clothes washers, which are generally less efficient than front-loading washers, in recent years. Marketing staff reported this is primarily due to performance issues with front-loading washers, including mold forming on the washer seal. Along with the return to top-loading washers that use agitators, retailers reported other features, such as tilting forward for easier loading and unloading, are driving sales.

While features have been slow to develop, heat pump clothes dryers was a major innovation in the type of dryers available to consumers. While retailers acknowledged that heat pump dryers are more efficient than other options, they also reported consumer perception and reality that these dryers do not work as well and are only available at a significantly higher price point. In part because there is little new innovation in the dryer market, retailers often market washers and dryers together. However, because most affordable dryers are not energy efficient and

because of recent trends away from the most efficient versions of clothes washers, retailers reported that marketing based on energy efficiency can pose challenges.

CUSTOMER EXPERIENCE CONSIDERATIONS

The customer experience and perspective have an important influence on retailer stocking decisions. Retailer staff emphasized that customer satisfaction drives many of the decisions they make. Customer preferences drive both sales and profits, and retailers often prioritize those considerations over energy efficiency. Retailers also value or prioritize energy efficiency, but the driving reason for doing so has to do with customer preferences. Interviews focused on the importance of connecting customer experiences to stocking and marketing decisions.

The majority of their customers supplement in-store shopping with online research. In some cases, this research happens prior to visiting the store, while in other cases customers conduct online research on products while they are in the store. For those customers conducting research in-store, marketers reported they aim to direct customers towards a particular model or item with signs or stickers. This strategy allows customers to stay in control through online research, while also allowing retailers to highlight particular products in their stores. Some marketers brought up challenges related to participating in ESRPP when customers who research and make their purchases online, as the current program structure does not allow these customers to participate.

Retailers also reported that customers are becoming more interested in energy efficiency and sustainability, but that this interest is not at the same level as interest in other features. For the most part, customers assume that newer appliances are both newer and more efficient than older ones. Therefore, customers to assume that any appliance will be more efficient compared to the appliance they are replacing.

KEY RESULTS

Analysis of retailer interview data indicates several specific challenges retailers have with the current program as well as barriers to the program's ability to influence stocking decisions. Retailer staff believe consumers do not see energy efficiency as a feature and assume that newer appliances are more efficient than older ones. Retailers also do not feel they have sufficient understanding of the benefits of energy efficiency to market the incented products. Retailers also reported the program is structured differently from other sustainability and marketing efforts they implement. Specifically, stocking decisions are made approximately 8 to 12 months in advance, while the Program Sponsors establish program-qualified products and incentives three to five months before the program-year launches.

APPENDIX D: DETAILED PSD FINDINGS

This section includes additional detail regarding the review of Connecticut's 2020 PSD (Connecticut PSD) measures related to ESRPP and E-commerce programs. Our recommended updates to the ESRPP and E-commerce measures are the result of a detailed review of the content outlined in the Connecticut PSD as well as additional documentation of savings calculations provided by the Connecticut Utilities, complemented with findings from peer savings calculations approaches.

D-1 ESRPP PROGRAM MEASURE RECOMMENDATIONS

This section outlines the measure specific recommendations related to the ESRPP measures rebated over PY2018 and PY2019, including refrigerators, freezers, clothes washers, clothes dryers (electric and gas), room air conditioners, dehumidifiers, air cleaner/purifiers, and sound bars.

This section is organized based on the following recommendation categories:

- Methodology and values are well-documented, but references need to be updated
- Methodology is well-documented, but input values need to be updated
- Methodology should be modified
- PSD documentation was insufficient to support current value

MEASURES WITH A WELL-DOCUMENTED METHOD AND VALUES

TRC determined both the approach and values were well-documented for the three measures outline in Table D-1. Therefore, we have not recommended changes to deemed savings values but instead recommend that references to the inputs be updated and that documentation be included in the PSD document instead of the supporting documentation outside the actual PSD.

Table D-1. Deemed Savings Value Recommendations

Measure	Recommended Value (kWh)	Existing Value (kWh)	Reason for Recommendation	Source for Recommended Values
Refrigerator, Tier I	64	64	Approach and values well-documented, update references	PSD, 2017
Refrigerator, Tier II	96	96	Approach and values well-documented, update references	PSD, 2017

Dehumidifier	214	214	Approach and values well-documented, update references	PSD, 2017[78]

Specific recommendations by measure type are included below.

Refrigerator: Update the qualified product list used in the savings calculations; the product list included in these calculations is from 2017.

Dehumidifier: Update references included for this measure.

MEASURES WITH A WELL-DOCUMENTED METHOD BUT OUT OF DATE INPUT VALUES

For the three measures outlined in Table D-2, TRC determined the approach was well-documented but the sources of the inputs to the savings calculations were out of date. Therefore, we recommend updating in the input values to more recent sources found in the VT TRM. Updating the input values results in changes to deemed savings values. We also recommend the documentation be included in the PSD document instead of the supporting documentation outside the actual PSD.

Table D-2. Deemed Savings Value Recommendations

Measure	Recommend-ed Value	Existing Value	Reason for Recommend-ation	Source for Recommended Values[1,2]
Clothes dryer – gas[3] (kWh)	36 kWh	93 kWh	Input sources out of date	VT TRM (2018), High Efficiency: ENERGY STAR Version 1.0 specification, effective January 1, 2015
Clothes dryer – gas[3] (therms)	1.215 therms	NA	Currently not included in the PSD	New York (2018), ENERGY STAR Program Requirements Product Specification for Clothes Dryers, Eligibility Criteria Version 1.1, May 2017
Clothes dryer – electric	194 kWh	93 kWh	Input sources out of date	VT TRM (2018)[4], High Efficiency: ENERGY STAR Version 1.0 specification, effective January 1, 2015
Room air conditioner	10.7 kWh	77.5 kWh	Input sources out of date (2002, 2008)	VT TRM (2018)[4], High Efficiency: ENERGY STAR Version 4.0 specification,

[78] The 2019 change in the federal standard changed the testing protocols and, thus, capacity ratings of dehumidifiers. TRC does not believe this impacts the efficiency of dehumidifiers. https://www.energystar.gov/products/dehumidifier_testing_and_capacity

			and calculator no longer available	effective October 26, 2015

[1]For all measures, the source for the baseline efficiency was the post recent federal standard.
[2]Recommended sources referenced the most recent available information as of July 2020.
[3]The research team is aware that gas clothes dryers are not currently offered through the ESRPP program in Connecticut.
[4]The research team has no reason to believe that a clothes dryer or room air conditioner would operate differently in Vermont than in Connecticut. While there may be minor differences between CDD in CT and VT, the EIA defines them as the same region and uses the same CDD days for the Northeast region. Therefore we expect impact on total energy saving to be relatively low. https://www.eia.gov/energyexplained/units-and-calculators/degree-days.php

Specific recommendations by measure type are included below.

Clothes Dryer: Update the references included for these measures; the current approach uses references from 2014. For gas clothes dryer, we recommend including the calculated deemed gas savings value included in the New York TRM, as the New York TRM uses more up to date inputs than the Vermont TRM (2017 vs. 2014). The equation and assumptions included in the New York case are outlined below in Equation D-1.

Room Air Conditioner: Update the references and input sources for this measure; input sources are from 2002 and 2008, and the ENERGY STAR® calculator used for this measure is no longer available.

Equation D-1. New York TRM Clothes Dryer – Gas Equation

- $\Delta therms = units \times Cycles_{annual} \times Load \times \left[\frac{F_{gas,baseline}}{CEF_{baseline}} - \frac{F_{gas,ee}}{CEF_{ee}}\right] \times \frac{3{,}412}{100{,}000}$

Where:

- Units = Number of measures installed under the program
- $Cycles_{annual}$ = Number of dryer cycles per year (assumed to be 283 for a vented gas dryer)
- Load = Average total weight (lbs.) of clothes per drying cycle (assumed to be 8.45 for a vented gas dryer)
- F_{gas} = Percentage of energy consumed that is derived from gas (assumed to be 0.95 for both the baseline and efficient case)
- CEF = Combined energy factor (lb./kWh) (assumed to be 3.3 for the baseline case and 3.48 for the efficient case for a vented gas dryer)
- 3,412 = Conversion factor, one kWh equals 3,412 BTU
- 100,000 = Conversion factor (BTU/therm), one therm equals 100,00 BTU

RECOMMEND MODIFYING METHOD

TRC recommends splitting freezers into upright and chest categories, as the savings values are significantly different (Table D-3). Existing calculation methodology provided in the supporting documentation already includes the input data required

to split freezers into the two categories. In doing so, the values for upright and chest categories will then align with other TRMs. Disaggregating freezers will also allow for greater transparency into future changes in the installation mix and better represent actual savings.

Table D-3. Deemed Savings Value Recommendations

Measure	Recommended Value (kWh)[1]	Existing Value (kWh)	Reason for Recommendation	Source for Recommended Values
Freezer, Upright	50	45	Split upright and chest to more accurately represent savings	Supplemental PSD documentation, 2017
Freezer, Chest	32	45	Split upright and chest to more accurately represent savings	Supplemental PSD documentation, 2017

[1]The recommended values were calculated using the inputs provided to the evaluation consultant in the supporting documentation.

Specific Freezer Recommendations:

- Update the qualified product list used in the savings calculations; the product list included in these calculations is from 2017.
- Calculate deemed savings values for upright and chest freezers separately, as separating chest and upright freezers brings deemed savings values in line with those included in other TRMs.

MEASURES WITH INSUFFICIENT DETAIL OR DOCUMENTATION

Table D-4 below outlines recommended deemed savings values for measures where the evaluation consultant was unable to reconstruct the calculation methodology, or where insufficient detail was provided to sufficiently compare Connecticut's deemed savings values to those included in other states' TRMs. For these measures, TRC recommends adopting the energy savings methodology and estimates included in Vermont's TRM due to the clarity and simplicity of Vermont's methodology, and included references.

Table D-4. Deemed Savings Value Recommendations

Measure	Recommended Value (kWh)	Existing	Reason for	Source for Recommended Values[1]

		gValue (kWh)	orRecommendation	
ClothesWasher,TierI	88.1	66	Insufficientdocumentationin PSDtos	VT TRM (2018), High Efficiency: ENERGY STAR Version 8.0 specification, effective February 5, 2018

			upportcurrentvalue	
ClothesWasher,TierIII	120.3	117	Insufficientdocumentationin PSDt	VT TRM (2018), High Efficiency: ENERGY STAR Version 8.0 specification, effective February 5, 2018

			os upport curr ent val ue	
Air Cleaner/ Purifier	214	227	Insufficient documentation in PS	VT TRM (2018), High Efficiency: ENERGY STAR Version 1.2 specification, effective July 1, 2004

			Dt osupportcurrentvalue	
SoundBars[2]	24	45	Insufficientdocumentationin	VT TRM (2018), 50% more efficient than ENERGY STAR Version 3.0 specification, effective May 1, 2013

			PSD to support current value	

[1]Recommended sources referenced the most recent available information as of July 2020.
[2]A follow-up email was sent on 6/25/20 to confirm that there was no additional documentation not shared with the research team.

D-2 ONLINE E-COMMERCE RECOMMENDATIONS

This section outlines the measure specific recommendations related to the E-commerce, including Wi-Fi/smart thermostats and advanced power strips.

THERMOSTATS

TRC recommends the Connecticut PSD include separate measure categories for Wi-Fi thermostats and smart thermostats as the savings methodology (i.e., deemed versus calculated deemed) and the resulting savings are different for Wi-Fi and smart thermostats. Smart thermostats are WiFi enabled thermostats that "learn" from the behavior of the user and automatically adjusts the heating and cooling temperature settings for optimal performance.

WI-FI THERMOSTATS

As the other states' TRMs utilize the same methodology and have updated sources of data for Wi-Fi thermostat savings (2019 for Rhode Island), we recommend adopting the savings approach utilized in other TRMs. This would mean adopting the 104 kWh deemed savings value for Wi-Fi thermostats, and 6.6 MMBtu deemed

gas savings value or 5.7 MMBtu for oil[79], that control heating and cooling applications without a distinction for heating system or fuel type. This makes sense, as it is difficult to confirm the type of heating system when customers are purchasing a thermostat through an E-commerce platform.

Smart Thermostats

We recommend the PSD adopts the calculated deemed methodology in the Vermont TRM[80] as this would align the methodology and sources with the ESRPP sources and would provide consistency and continuity between the Connecticut ESRPP and E-commerce programs. Where Connecticut specific assumptions are unavailable, we recommend the PSD adopt Vermont assumptions as well. The equations and assumptions included in the Vermont TRM are:

Equation D-2. Smart Thermostat Electric Energy Savings

$$\Delta kWh = \Delta kWh_{cooling} + \Delta kWh_{heating}$$

Where:

Equation D-3. Smart Thermostat Cooling Savings

$$\Delta kWh_{cooling} = \%AC\ x \left(\frac{EFLH_{cool} \times Capacity \times \frac{1}{SEER}}{1000} \right) \times Cooling_{Reduction}$$

Equation D-4. Smart Thermostat Heating Savings

$$\Delta kWh_{heating} = \%Electric\ Heat \times Elec_{Heating_{Consumption}} \times \%Controlled \times Heating_{Reduction} + \Delta MMBtu \times F_e \times 293$$

Equation D-5. Smart Thermostat Fossil Fuel Savings[81]

$$\Delta MMBtu = \sum \left(\%FossilHeat \times Heating_{Consumption} \times \%Controlled \right) \times Heating_{Reduction}$$

And:

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[79] Savings for propane or other delivered fuels were not specified in other states' TRMs. [4]The savings for WiFi thermostats found in the 2018 MA TRM was determined based on the 2018 Navigant Home Energy Rebate Impact Evaluation Report.

[80] Efficiency Vermont (2018). Technical Reference User Manal, Advanced Thermostats, Efficient Products Program. Retrieved from https://puc.vermont.gov/sites/psbnew/files/doc_library/Vermont%20TRM%20Savings%20Verification%202018%20Version_FINAL.pdf

[81] Specific input values could be updated for Connecticut based on information reported in RASS.

- %AC = the fraction of customers with central air-conditioning
- %Controlled = Assumed percentage of total heating load being controlled thermostat (69% for existing buildings and 53% for new construction)
- %ElectricHeat = Percentage of heating savings assumed to be electric (where unknown, 25% for existing buildings and 61% for new construction)
- %FossilHeat = Percentage of heating savings assumed to be fossil fuel (assumed to be 27% oil and 48% propane for existing buildings and 0% oil and 39% propane for new construction where heating system unknown)
- Capacity = Capacity of AC unit (assumed to be 41,400 Btu/hr.)
- Cooling_Reduction = Assumed percentage reduction in total cooling energy consumption due to installation of advanced thermostat (assumed to be 8%)
- $EFLH_{cool}$ = Estimate of annual full load cooling hours for air conditioning equipment (assumed to be 755)
- Elec_Heating_Consumption = Estimate of annual heating consumption for heat pump heated buildings (assumed to be 8,273 for existing buildings and 6,416 for new construction)
- Heating_Consumption = Estimate of annual heating consumption (assumed to be 82 for existing buildings and 67 for new construction where heating system unknown)
- F_e = Furnace fan / boiler pump energy consumption as a percentage of annual fuel consumption (assumed to be 3.14%)
- Heating_Reduction = Assumed percentage reduction in total heating energy consumption due to advanced thermostat (assumed to be 8% for existing buildings and 5.6% for new construction)
- SEER = the cooling equipment's Seasonal Energy Efficiency Ratio rating (kBtu/kWh) (assumed to be 11.7 for existing buildings and 20.2 for new construction)

ADVANCED POWER STRIPS

TRC recommends splitting advanced power strips into Tier 1 and Tier II savings to better align the approach and savings values to other states' TRMs. Connecticut's current savings value, 48 kWh, is appropriate for Tier I savings. We recommend adopting the Massachusetts TRM values, 179 kWh, for Tier II savings as this study is robust and occurred in close proximity to Connecticut (Table D-5).

Table D-5. Advanced Power Strip Deemed Savings Value Recommendations

Measure	Recommended Value (kWh)	Existing Value (kWh)	Reason for Recommendation	Source for Recommended Values
Advanced Power Strips, Tier I	48	48	Values reasonable, update sources and references	PSD, 2016
Advanced Power Strips, Tier II	179		Insufficient documentation in	MA TRM (2019), NMR Group, Inc. (2018).

			PSD to support current value	Advanced Power Strip Metering Study

D-3 ENGINEERING REVIEW FINDINGS

This section provides additional detailed findings from the engineering review of the Connecticut 2020 PSD.

TRM COMPARISON FINDINGS

The savings estimation methodologies of the TRMs reviewed fell into three broad approach categories:

Deemed UES only: where only a savings value was included.

Deemed UES with supporting documentation: where both a savings value and the equation(s) and assumptions used to calculate the deemed value were documented.

Calculated deemed: where a savings value was not included. Instead, a deemed equation was provided, and baseline and efficient usage were documented for input into the savings equation.

Table D-6 below summarizes these savings methodologies by state. Connecticut is the only state that included deemed values without supporting calculations or detailed references.

Table D-6. ESRPP Measure Savings Methodology by State

Savings Methodology				
CT	MA	RI	VT	NY
Deemed UES	Deemed UES with Supporting Equations	Deemed UES with Supporting Equations	Deemed UES with Supporting Equations	Calculated Deemed

The most common approach, employed by Massachusetts, Rhode Island, and Vermont, was to include a single deemed savings value for each measure category in addition to documenting equations, assumptions, and detailed references. For example, Vermont's TRM included a simple equation ($\Delta kWh = kWh_{Base} - kWh_{EE}$) as well as assumptions for each measure's baseline and efficient energy usage as outlined in Figure D-1 below. In addition, the Vermont TRM included documentation of these assumptions (e.g., ENERGY STAR® 5.0 specification, effective September 15, 2014).

Figure D-1. Example of Vermont's TRM Inputs for Deemed Savings Calculation

Product	kWh_{BASE}	kWh_{EE}	ΔkWh	ΔkW
ENERGY STAR +50% Sound Bars	48.7	24.7	24.0	0.00274
ENERGY STAR Freezers (Upright)	438.6	394.8	43.8	0.00516
ENERGY STAR Freezers (Chest)	239.3	215.3	24.0	0.00283
ENERGY STAR Freezers (Unknown Type)[10]	312.5	281.3	31.2	0.00368
ENERGY STAR +5% Freezers (Upright)	438.6	375.1	63.5	0.00749
ENERGY STAR +5% Freezers (Chest)	239.3	204.6	34.7	0.00409
ENERGY STAR Freezers +5% (Unknown Type)[10]	312.5	267.2	45.3	0.00534
ENERGY STAR/CEE Tier 1 Refrigerators	592	533	59	0.0070
CEE Tier 2 Refrigerators	592	503	89	0.0105
CEE Tier 3 Refrigerators	592	474	118	0.0140

New York is the only state, of the five we reviewed, that followed a calculated deemed approach. While the New York equations are similar to those in the other TRMs reviewed, their equations also included heating, cooling, and ventilation (HVAC) interactive effects for each measure. For example, Equation D-6 was used to calculate annual electric energy savings from refrigerator and freezer replacement.

Equation D-6. Annual Electric Energy Savings (Refrigerators)

$$\Delta kWh = units \times (kWh_{baseline} - kWh_{ee}) \times (1 + HVAC_c) \times F_{occ}$$

Where:

- $HVAC_c$ = HVAC interaction factor for annual electric energy consumption
- F_{occ} = Adjustment factor to account for the number of occupants.

Additionally, the TRMs for Massachusetts, Rhode Island, Vermont, and New York clearly documented the assumed measure type, relevant assumptions (e.g., hours of use), baseline and efficient case energy usage, and all supporting equations in their TRMs. An example of Vermont's TRM documentation of their baseline and efficient case assumptions are illustrated in Figure D-2 below.

Figure D-2. Vermont TRM Documentation of Baseline and Efficient Case Assumptions

Product	Baseline Efficiency	High Efficiency
ENERGY STAR Sound Bars	Weighted average of electric energy consumption[1] for both non-ENERGY STAR and ENERGY STAR models	50% more efficient[2] than ENERGY STAR Version 3.0 specification, effective May 1, 2013
ENERGY STAR Freezers	Federal standard, effective September 15, 2014	ENERGY STAR Version 5.0 specification, effective September 15, 2014 and 5% more efficient than ENERGY STAR
ENERGY STAR and CEE-Qualified Refrigerators	Federal standard, effective September 15, 2014	ENERGY STAR Version 5.0 specification, effective September 15, 2014/CEE Tier 1, CEE Tier 2, and CEE Tier 3

ESRPP PROGRAM MEASURE FINDINGS

This section describes TRC's findings relative to the measures included in the PY2018-PY2019 ESRPP program. Summary recommendations are presented in Section D-1 ESRPP Program Measure Recommendations. Our detailed measure-level comparison of the additional documentation found:

- **Measures with a well-documented, verifiable approach:** For six of the nine measures, Connecticut's approach to determining savings was well documented and verifiable, though references and data sources were out of date.
- **Measures with insufficient documentation:** For two measures, the documentation did not have enough detail for the research team to re-construct or confirm the calculations.
- No supporting documentation was provided for sound bars.

WELL DOCUMENTED AND VERIFIABLE APPROACH

The evaluation consultant was provided adequate documentation to compare the methodology and savings calculations to measures in other states for six of the nine Connecticut PSD measures analyzed. These measure categories were:

- Refrigerators
- Freezers
- Clothes dryers - electric
- Clothes dryers - gas

- Room air conditioners
- Dehumidifiers

However, in many cases references such as evaluation reports and data sources (e.g., ENERGY STAR® workbooks) were out of date. Table D-7 provides an overview of the savings values included in Connecticut's PSD alongside those savings values included in the Massachusetts, Rhode Island, Vermont, and New York[82] TRMs. This comparison shows that Connecticut's refrigerator, freezers, and dehumidifier values were in line with measure savings values in other states, while the values for clothes dryers (electric and gas) and room air conditioners were very different from the other states. Importantly, these other states included sufficient documentation for the research team to determine that measure savings values were based on reasonable methodologies and sources. For example:

- The data for **clothes dryers** in the supporting documentation for the PSD is from "Q4 2014 Ecova," and is only a single number in a table titled "Tier 2 and above Clothes Dryers – LAB TESTED WITH SUPPLEMENTAL (real clothing) TEST PROTOCOL without any further documentation of sources or calculations. The Massachusetts numbers are based on 2018 baseline load shape modeling conducted by Navigant.
- The data for **room air conditioners** in the supporting documentation for the PSD is from a version of ENERGY STAR® earlier than 2013. In Massachusetts numbers are based on the 2018 ENERGY STAR® calculator and the 2018 baseline load shape modeling conducted by Navigant.

The data sources for the other states are based on studies conducted in close proximity to Connecticut and were considerably more up-to date sources than those currently used in the Connecticut PSD.

[82] New York follows a calculated deemed approach where detailed equations are included in the TRM in lieu of a single deemed value. For the deemed values included in Table D-7 for New York, the research team calculated these values using assumptions included in the New York TRM as well as inputs from the Vermont TRM where needed.

Table D-7. Savings (kWh) for Measures with Well-Documented PSD Approach

Measure	Measure Savings (kWh)				
	CT	MA	RI	VT	NY
Refrigerator Tier I	64	N/A	N/A	59	52
Refrigerator Tier II	96	N/A	N/A	89	78
Freezer	45	N/A	N/A	31.2	27.4
Clothes dryer – gas	93	N/A	N/A	36	18.4
Clothes dryer – electric	93	160	160	194	N/A
Room air conditioner	77.5	36	N/A	10.7	N/A
Dehumidifier	214	167.6	N/A	229	N/A

Vermont and New York TRMs also include gas savings values for gas clothes dryers. These measure savings values are outlined in Table D-8 below. For gas dryers, New York uses a calculated deemed approach (similar to other measures) with an equation and assumed inputs, whereas Vermont includes a single deemed value. This difference in methodology, combined with a slight variation in inputs (NY TRM uses ENERGY STAR® 2017 while VT TRM uses the 2014 specification), account for the substantial difference in savings values between the two states.

Table D-8. Savings for Gas Clothes Dryers

Measure	Measure Savings (therms)				
	CT	MA	RI	VT	NY
Clothes dryer – gas	Not Included	N/A	N/A	5.2	1.215

Measures with Insufficient Documentation

The additional supporting documentation did not provide enough detail for the research team to reconstruct or confirm calculations for two of the nine measure categories reviewed. These measures were clothes washer Tier I, clothes washer Tier II, and air cleaner/purifier. No supporting documentation was provided for sound bars.

Therefore, it was challenging to make a direct comparison of the methodology and deemed values for these measure to those included in other states. While Table D-9 below provides an overview of the savings values included in Connecticut's PSD alongside those savings values included in the Massachusetts, Rhode Island, Vermont, and New York TRMs, not enough information was available for the research team to fully understand if the savings values are for the same equipment, similar treatment, or if the calculations used similar or different assumptions. Conversely, the approach in other reviewed states, especially Vermont, provided a clear, well documented methodology in enough detail for the evaluation consultant

to understand the type of equipment, measure treatment, input assumptions, equations used, and up-to-date data sources, to confirm the reasonableness and relevance of included measure savings values.

Table D-9. Savings for PSD Measures with Unclear Approach or Insufficient Detail

Measure	Measure Savings (kWh)				
	CT	MA	RI	VT	NY
Clothes Washer[1], Tier I	66	N/A	N/A	88.1	109.9
Clothes Washer, Tier II	117	N/A	N/A	210.3	116.35
Air cleaner/purifier	227	391	N/A	213.9	214
Sound bars	45	N/A	N/A	24	N/A

[1]The documentation received did not allow the evaluation consultant to verify the approach used in the 2020 Connecticut PSD. Other states' TRMs do not provide separate values for delivered fuel or fuel mix.

The below sections summarize results of TRC's review of engineering inputs for savings claiming from the Connecticut utilities' E-commerce platforms, and the insights collected from interviews of four peer utilities that operate E-commerce platforms.

E-COMMERCE PROGRAM MEASURE FINDINGS

This section outlines the evaluation consultant's findings relative to the E-Commerce measures. For the E-commerce platform the evaluation consultant reviewed communicating thermostats and advanced power strips. The findings for each are discussed below. Recommendations are presented in Section D-2 Online E-Commerce Recommendations.

TYPES OF COMMUNICATING THERMOSTATS

For the purposes of our review we used the following definitions of communicating thermostats:

- **Wi-Fi thermostat:** a programmable thermostat which allows remote set point adjustments and control.
- **Smart thermostat:** a programmable thermostat which allows remote set point adjustment and control and also includes behavioral learning capabilities to perform automatic adjustment and control.

All of the TRMs we reviewed included one or two types of communicating thermostats on their E-commerce platforms.[83] However, not all states included both Wi-Fi thermostats and smart thermostats in their TRMs. All states, with the exception of Vermont, included Wi-Fi thermostats in their TRM. However, only Vermont and New York included smart thermostats.

Table D-10 below outlines which measures were included in each state's TRM, as well as which savings estimation methodology was used in each case. States varied in which savings estimation methodology was used for each measure. As with the ESRPP measures, the savings estimation methodologies we reviewed fell into three broad categories: deemed UES, deemed UES with supporting equations, and calculated deemed. Only one state, New York, included both Wi-Fi thermostats and smart thermostats in their TRM; different savings methodologies were employed for each.

Table D-10. Thermostat Savings Methodology

Measure	Savings Methodology				
	CT	MA	RI	VT	NY
Wi-Fi Thermostat	Deemed	Deemed	Deemed with Supporting Equations	Not Included	Deemed with Supporting Equations
"Smart" Thermostat	Not Included	Not Included	Not Included	Calculated Deemed	Calculated Deemed

Smart Thermostats

The Connecticut PSD does not include smart thermostats. Therefore, we did not include findings specific to smart thermostats. However, recommendations related to smart thermostats are provided in Section D-2 Online E-Commerce Recommendations.

Wi-Fi Thermostats

Connecticut's PSD includes savings values for Wi-Fi thermostats when:

- The heating fuel or cooling system is known (Direct Install program)
- The heating fuel is unknown (midstream and E-commerce programs)

The savings for each case is provided in Table D-11.

[83] At least one utility within each state included Wi-Fi thermostats and/or smart thermostats on their E-commerce platforms. However, this does not mean that every utility in every state included products in both categories on their E-commerce platform.

Table D-11. Connecticut Wi-Fi Thermostat Deemed Savings Values

	Wi-Fi E-Commerce	Wi-Fi Direct Install			
	Cooling only, heating fuel or cooling system unknown	Cooling	Heating (electric resistance)	Heating (heat pump)	Heating (ground source heat pump)
Electric Savings[1] (kWh)	25	64	637.5	318.7	212.5

[1]The 2020 Connecticut PSD did not provide values for fossil fuel or non-electiric heating systems.

Unlike the Connecticut PSD, there are not separate savings values by heating system type in other states' TRMs. The other states (MA, RI, and NY) also predominantly assume the Wi-Fi thermostat is used to control both heating and cooling, as opposed to Connecticut's assumption of cooling only.[84] The exception is Massachusetts which does provide a deemed savings value for a Wi-Fi thermostat that controls cooling only (Table D-12).

Table D-12. Wi-Fi Thermostat Deemed Savings Values Compared to Connecticut

Savings Type	Wi-Fi Thermostat Savings (kWh)			
	CT	MA	RI	NY
Cooling only savings (any fuel type/fuel type unknown)	25	46	n/a	n/a
Cooling and heating savings (gas)	n/a	104[1]	104	104

[1]Savings value based on Navigant (2018) Home Energy Services Impact Evaluation. The savings values are based on a literature review of over a dozen thermostat studies, not primary research.

The electric savings values for Wi-Fi thermostats in other states are identical as shown in Table D-13 below; deemed gas savings values are identical for Massachusetts and New York as well; however, differ for Rhode Island (Table D-14). Rhode Island uses a different methodology that breaks out MMBtu savings by fuel type, whereas the other states (MA and NY) include a single value.

[84] Other state's TRM values are given in MMBtu. MA and RI include savings values for other fuel types. However, these are associated with other program types that do not appear to be compatible.

Table D-13. Wi-Fi Thermostat Deemed Savings Values

Savings Type	Thermostat Controlling Cooling Only	Thermostat Controlling Cooling and Heating (Gas)		
	MA	MA	RI	NY
Annual Gross Electric Energy Savings (kWh)	46	104	104	104

Table D-14. Wi-Fi Thermostat Deemed Gas Savings Values

Savings Type	Wi-Fi Thermostat Savings (MMBtu)		
	MA	RI	NY
Cooling and Heating savings (Gas)	6.6	3.11	6.6

Advanced Power Strips

All of the TRMs we reviewed included advanced power strips on their E-commerce platforms. Additionally, most states included both Tier I and Tier II advanced power strips on their E-commerce platforms, except Rhode Island which only included Tier I advanced power strips. The Connecticut PSD does not document whether the deemed savings values are for Tier I or Tier II advanced power strips. Additionally, the research team was not able to obtain the referenced citation for advanced power strip savings.

The states we reviewed followed different methodologies for determining savings. Only Connecticut included deemed values without supporting equations; Massachusetts, Rhode Island and New York all include deemed values but provide supporting equations and assumptions. Vermont follows a calculated deemed approach for determining savings for both Tier I and Tier II power strips (Table D-15).

Table D-15. Advanced Power Strip Savings Methodology

Measure	Savings Methodology				
	CT	MA	RI	VT	NY
Tier I	Deemed UES (unspecified tier)	Deemed UES with Supporting Equations	Deemed UES with Supporting Equations	Calculated Deemed	Deemed UES with Supporting Equations
Tier II		Deemed UES with Supporting Equations	Deemed UES with Supporting Equations	Calculated Deemed	Deemed UES with Supporting Equations

Table D-16 below outlines the deemed savings value in each states' TRM. While Tier I savings values varied, Connecticut's value falls within the range of Tier I savings from the Rhode Island and New York TRMs. The Tier II savings for Massachusetts and New York were fairly similar.

Table D-16. Advanced Power Strip Deemed Savings Values

Measure	Measure Savings (kWh)				
	CT	MA	RI	VT	NY
Tier I	48 (unspecified tier)	117	21.6	N/A	57.5
Tier II		179	Not Included	N/A	158.9