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Memorandum

To: Fernando Morales, AIC, and Jennifer Morris, ICC Staff
From: Opinion Dynamics and Cadmus
Date: July 31, 2019
Re: Appliance Recycling Initiative Participant and Retailer Survey Results

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This memorandum presents the results of the evaluation team's surveys of the Ameren Illinois Company (AIC) 2018 Appliance Recycling Initiative (ARI) participants and appliance retailers.

The purpose of the memo is to provide updated estimates of conditioned space, part use factor, free-ridership, and net-to-gross ratio (NTGR) for the Initiative's recycled measures as inputs for future planning. Conditioned space and part use assumptions are applied in the gross savings analysis as detailed in the Illinois TRM Version 7.0 (IL-TRM) Volume 3, Measure 5.1.8. The part use factor adjusts savings to account for the percentage of time (over an entire year) units would be plugged in and running had they not been recycled through the ARI. Conditioned space is used to determine whether there is cooling or heating interaction due to heat given off by a unit in a conditioned space. The following measures are evaluated in this memo:

- Recycled Refrigerators
- Recycled Freezers

For this evaluation, the team surveyed initiative participants to revise estimates of conditioned space, part use, and free-ridership. The team also surveyed retailers throughout AIC territory, asking a series of questions about their interaction with potentially recyclable refrigerators and freezers to assess whether there remains a secondary market for used appliances outside AIC's Appliance Recycling Initiative. The results of the participant and retailer surveys are provided below.

Results Summary

Based on the participant survey results and analysis described in this memo, we identified the potential future planning values for evaluation of the Appliance Recycling Initiative shown in Table 1.

Table 1. Future Recommended Planning Values

Measure	Value	Current Value[a]	Recommended Update
Recycled Refrigerator	NTGR	0.52	0.71
	Free-Ridership	0.48	0.29
	Spillover	0.00	0.00
	Part Use	0.91	0.87
	Conditioned Space	67%	64%
Recycled Freezer	NTGR	0.62	0.64
	Free-Ridership	0.38	0.36
	Spillover	0.00	0.00
	Part Use	0.86	0.85
	Conditioned Space	17%	53%

[a] Source: Opinion Dynamics. October 2018. "Ameren Illinois Company Energy Efficiency Portfolio 2019 Net-to-Gross Ratios"

http://ilsagfiles.org/SAG_files/NTG/2019_NTG_Meetings/Final_Values/AIC_2019_NTGR_Recommendations_Summary_FINAL_2018-09-25.pdf

Background

To capture data relevant for estimating a NTGR for the Initiative, the evaluation team developed a follow-up participant survey to assess part use, conditioned space, free-ridership, and spillover using IL-TRM V7.0 protocols and recommended approaches. The team administered this survey with initiative participants via telephone in the winter of 2018 to 2019. Additionally, we surveyed appliance retailers located in AIC territory in the late fall of 2018, to identify initiative awareness among retailers as well as to determine the potential for resale of used appliances.

Evaluation Methodology

In conducting this research, the evaluation team performed the activities outlined below.

Retailer Surveys

In total, the evaluation team collected data from 43 retailer respondents that sold new or used appliances in AIC territory. The purpose of these surveys was to determine if area retailers take possession of used appliances to refurbish and resell, assess program awareness, to understand the extent to which retailers recommend the Ameren Recycling Initiative to customers purchasing new units. The current IL-TRM Appliance Recycling NTG protocol assumes that some consumers looking for a used refrigerator or freezer will still be able to find one for purchase with the program in place. The evaluation team surveys allowed open-ended responses to all questions. The evaluation team encouraged participants to provide thorough responses to each question which were recorded in a database.

The survey instrument can be found in Appendix A.

Participant Surveys

In total, the evaluation team collected data from 141 initiative participant respondents; 71 who had recycled a refrigerator and 70 who had recycled a freezer through the Initiative. The surveys were designed to identify participant free ridership through a consideration of disposal intentions and alternatives absent the program, the location of the units in the year prior to removal, and the percent of time in the prior year the units were plugged in and running. The team programmed the survey to not force a response for any question; therefore, we report response samples specific to each question. A respondent was included in a measure's free-ridership analysis if they had recycled the measure and answered all the required free-ridership questions necessary to produce a reliable estimate.

The survey instrument can be found in Appendix B.

Free-Ridership Analysis

The IL-TRM directs that "free ridership is based on participants' anticipated plans had the program not been available, thus classifying a free rider as a participant who would have removed the unit from service regardless of the program."

Spillover

The IL-TRM does not specifically recommend calculating spillover savings for appliance recycling programs, and therefore the evaluation team did not include spillover in initiative net savings estimates. The Uniform Methods Project[1] also does not recommend considering spillover because appliance recycling initiatives do not provide comprehensive energy education.

Evaluation Findings

The following sections highlight the evaluation team's primary research findings.

Retailer Findings

Appliance recycling programs operate under the theory that older appliances are likely to consume substantially more energy than newer models, and as such should be removed from the electric grid. Consumers have multiple options to dispose of an older, yet functioning, refrigerator or freezer. Among these options are removal services provided by retailers who sell new and used appliances. Many of these retailers will pick up old appliances when delivering new appliances, often for a nominal fee, and some of the salable units will be reintroduced to the grid via the second-hand market, in contrast to initiative goals.

The evaluation team conducted a series of surveys with new, used, and rental appliance retailers in AIC territory designed to identify if there is a significant channel for potentially recycled appliances to return to the electrical grid. The team completed 43 surveys from a sample of 122 retailers located throughout AIC territory,

[1] Uniform Methods Project. September 2016. "Chapter 7: Refrigerator Recycling Evaluation Protocol" https://www.nrel.gov/docs/fy17osti/68563.pdf

including a mix of large, national brands, regional chains, and local retailers. Retailer survey details are presented in Table 2 below.

Table 2. Retailer Survey Sample

Chain	Sample Contacts (Locations)	Sample Completes
Local	58	23
Regional	20	4
National	44	16

The team asked retailer staff a series of questions designed to identify the types of equipment the retailer interacted with, if they removed used appliances from customer's homes, what they did with those units, and if they had a removal service. The interviews provided strong evidence that a secondary market for used appliances continues to exist in AIC territory, though interviewees were not able to reliably quantify the number of used units that re-enter the market.

Of the 43 retailers we surveyed, 30 were previously aware of the AIC Appliance Recycling Initiative. Thirty-six retailers offered some sort of appliance removal service, with all but two only offering haul away in conjunction with the delivery and installation of a new appliance. Among those 36 retailers who did remove used appliances, most reported offering a haul away service for many years (11 of which offered this for free, while the remaining retailers charged a separate, though nominal, fee, usually between $15 and $25, or included haul away service in the delivery and installation fees associated with purchasing the new appliance). None of the retailers reported any constraints on the types of refrigerators or freezers eligible for removal, and none reported offering the service in response to AIC's Appliance Recycling Initiative.

Most retailer respondents were not able to identify the average age of the units they pick up, nor were they able to specify the percentage of their units that were manufactured before 1993. Among those willing to offer an estimate, the most common responses suggest that no more than 10% to 20% of all picked up used appliances were older than 25 years. However, most retailers were able to estimate that the clear majority, up to 95% of recycled refrigerators, were larger than 10 cubic feet. Similarly, while not all respondents were able to estimate the share of recycled refrigerators in working condition, among those willing to provide an estimate, most suggested that only a small share (10% to 30%) were still working, though one respondent estimated that 60% of the units they pick up had still been in use.

Among those retailers who did pick up working used appliances, between five and ten perform reconditioning and sell a portion of the newer, working units. These retailers are all categorized as local retailers: none of the large national or regional chains repair and resell used appliances. None of the retailers who reported reconditioning and reselling units reported a preference for particular brands, models, or styles, but some did mention that the unit needed to be in good working order and could not be "too old" or a "dinosaur." All of the retailers reported recycling the units or selling the parts for scrap, as opposed to taking them to a dump or landfill.

The team also asked retailers if they were aware of AIC's Appliance Recycling Initiative. The majority (30) were at least somewhat aware of the Initiative. Among those who were aware, there was nearly universal praise for the offering. Retailers thought highly of the Initiative's ability to remove old units from service and encourage customers to buy newer, more efficient units. Several retailers said they referred to the Initiative when trying to sell new appliances, and many thought the incentive was generous. However, when asked if the Initiative had any drawbacks, the only substantive comment was a recommendation to increase the size of the incentive

beyond $50 to entice more participation. Otherwise, respondents felt the Initiative was working very well and did not report any drawbacks.

Sixty-one percent of responding retailers (24 of 39) indicated they sell used appliances, although this did not always refer to refrigerators and freezers. Fifteen of those 24 retailers reported reselling units picked up from other customers, and nine reported utilizing appliance distribution firms as suppliers for resale appliances. Additionally, most respondents did not consider the AIC Appliance Recycling Initiative as a competitor to their appliance resell business.

Among retailers who were aware of the program, approximately two-thirds of retailers (19 of 26) reported sometimes recommending the AIC Appliance Recycling initiative to their customers; usually in response to customer inquiry about appliance removal. Surveyed retailers frequently mentioned the ease of referring to AIC's website to describe and promote the Initiative. In fact, 11 retailers reported recommending the AIC Appliance Recycling Initiative over their own removal services, citing the incentive and ease of participation.

For many of the questions in the survey, at least some respondents were not willing to share or able to estimate a response. In general, it was difficult for respondents to provide concrete numeric data on the number of units they recycled, refurbished, or resold, unless they did not sell used appliances at all. While we did find substantial evidence that a sizeable used appliance market still exists in AIC territory, we were not able to generate a reliable estimate of the size of that market.

Part Use

For the part use methodology, the evaluation team relied on information from surveyed customers regarding pre-initiative usage patterns (months the appliance was plugged in and running prior to recycling) as well as planned usage had the unit not been recycled through the Initiative. For example, a primary refrigerator operated year-round may have been moved to a garage or basement as a secondary unit, absent the program.

The methodology accounts for potential shifts in usage types. Specifically, the team calculated part use using a weighted average of three prospective part use categories and factors:

Appliances that would not have run at all (part use = 0.0)

Appliances that would have run full-time (part use = 1.0)

Appliances that would have operated for a portion of the year (part use = 0.0 to 1.0)

The team first calculated an unweighted average part use factor, representing the three participant usage categories defined by the appliance's operational status during the year before recycling. Participants not using the appliance at all during the previous year received a part use factor of zero. Those indicating the appliance was plugged in for a portion of the year were asked to estimate the number of months the unit was in use. Most units were plugged in and running for the whole year. Only 4% of refrigerators and 9% of freezers were never in use in the prior year. As shown in Table 3, the average recycled refrigerator was in use for 88% of the year, or 10.5 months, while the average freezer was in use 85% of the previous year, or 10.2 months.

Table 3. Historic Part Use Responses for Recycled Units

Part Use Amount	Refrigerator	Freezer
Always in Use	78%	71%

Part Use Amount	Refrigerator	Freezer
Never in Use	4%	9%
In Use Part of the Time	18%	20%

The team adjusted part use factors for respondents indicating their appliance would have been moved or used differently in the future (such as a primary unit being moved from a kitchen to a basement or garage) absent the program. After adjusting for moved appliances, the final part use factor is 0.87 for refrigerators and 0.85 for freezers, as shown in Table 4 below.

Table 4. Recommended Part Use Rates for Recycled Units

Value	Refrigerator	Freezer
Part Use Factor	0.87	0.85

Conditioned Space

An important input in generating unit energy savings for recycled appliances is the percentage of previously used units that were installed in a conditioned space (any location where the unit would have interacted with either heating or air conditioning equipment, resulting in potential heating and cooling interaction effects).

Surveyed participants were asked where recycled units were installed and used in the year prior to recycling. For refrigerators, the most common response was the kitchen (41%), followed by the garage (35%) and the basement (17%). In total, 64% of units were installed in spaces that were likely to be conditioned, while 36% were installed in likely unconditioned spaces (garages and porches or patios). By comparison, just 53% of freezers were reported to be in a conditioned space (basements, pantries, kitchens, utility rooms, and laundry rooms) in the year prior to recycling, while 47% were reported to be installed in garages, on porches or patios, and on breezeways. Figure 1 and Figure 2 present the most common responses for location of recycled refrigerators and freezers in the prior year, respectively.

Figure 1. Location of Recycled Refrigerators in Prior Year

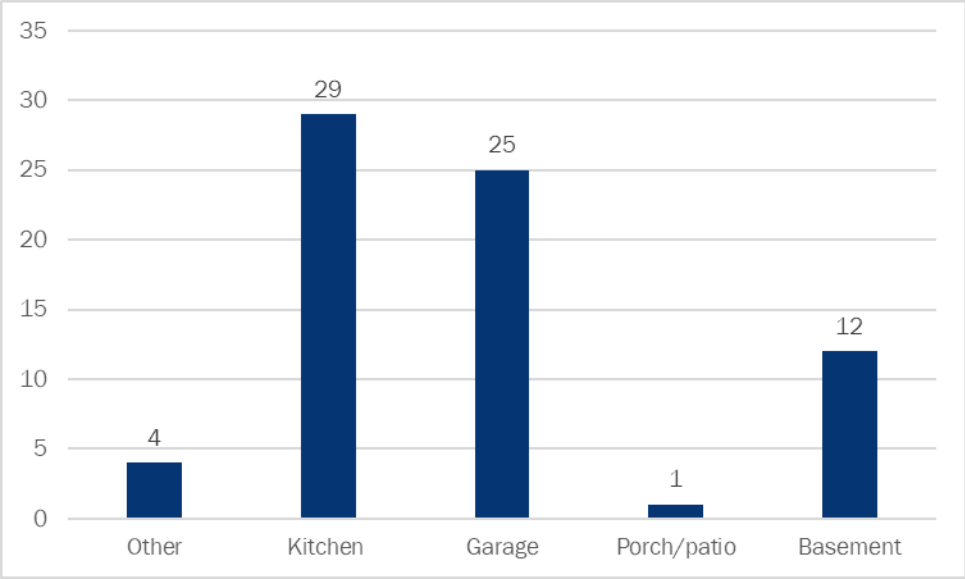
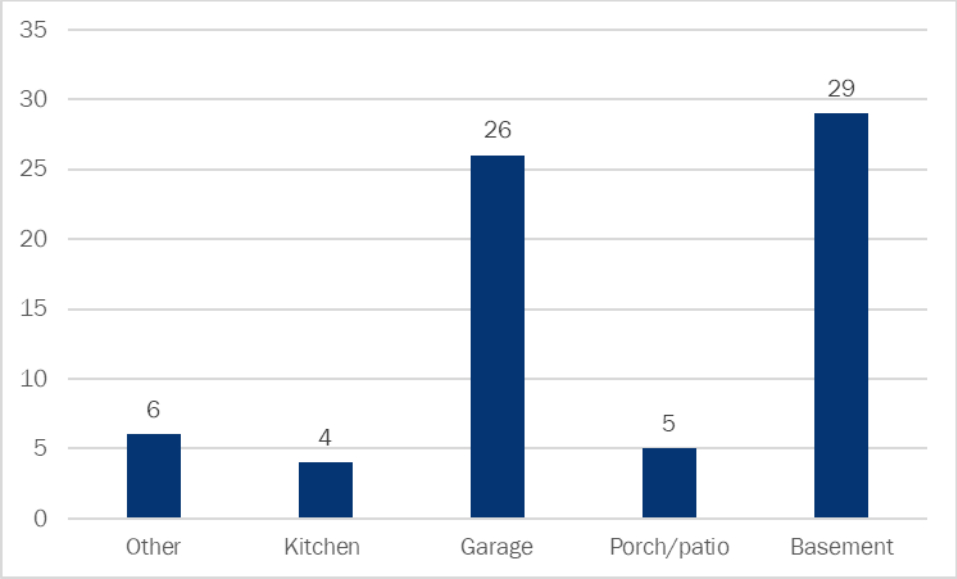


Figure 2. Location of Recycled Freezers in Prior Year



Free-Ridership

Following the IL-TRM protocol for the free-ridership analysis, the evaluation team first asked participants if they considered discarding the participating appliance prior to learning of the Initiative and whether they would have kept their unit if the program was not available. If a participant did not previously consider appliance

disposal or would have kept their appliance, the team categorized them as a non-free-riders and excluded them from subsequent free-ridership analysis (Scenario A).

Next, the team asked all remaining participants (those who would not have kept their appliance) a series of questions to determine, in the Initiative's absence, the likely distribution of recycled units (Scenario B or C). Actions independent of initiative intervention follow three scenarios:

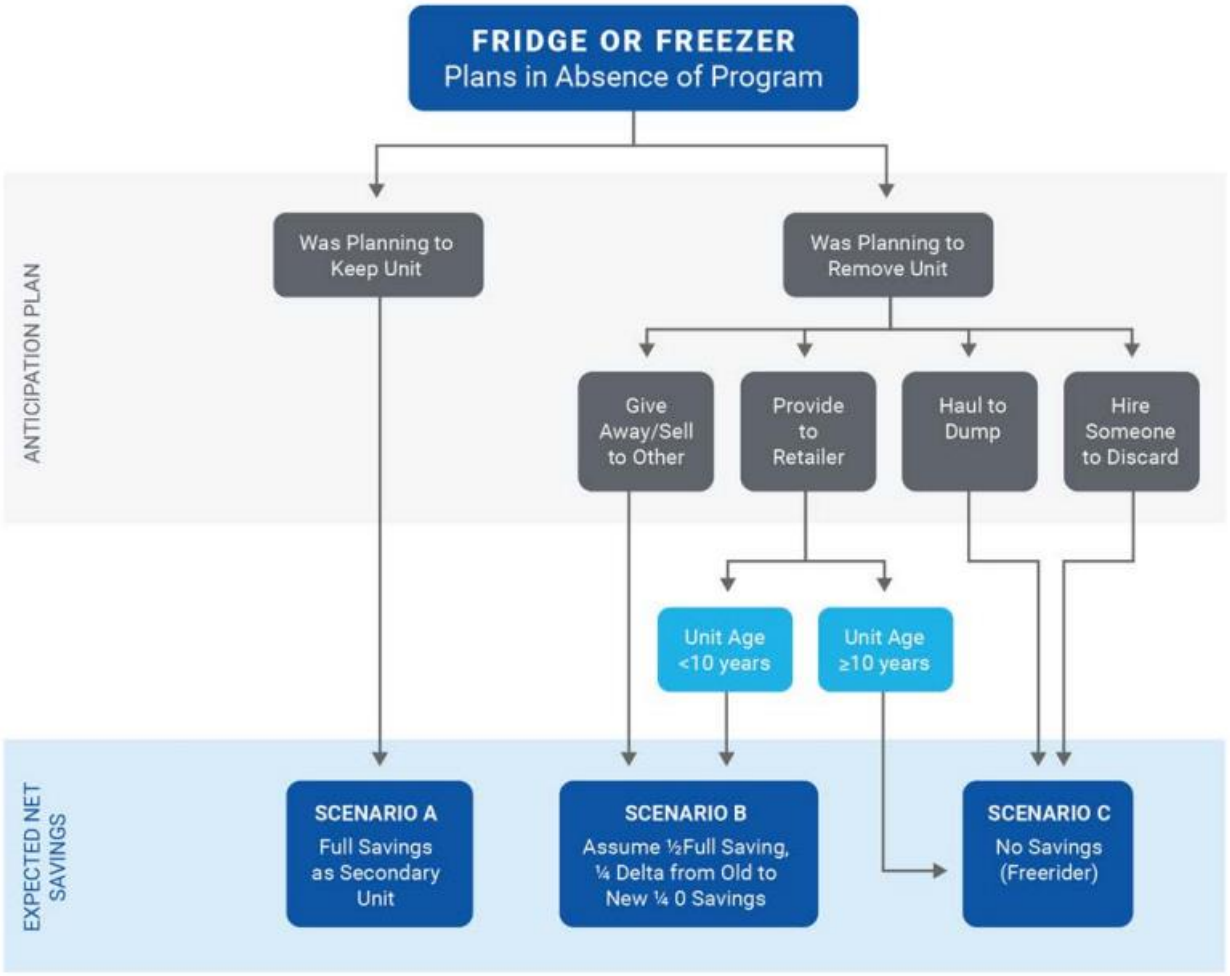
- Unit is kept in the home (Scenario A)
- Unit is discarded and transferred to someone else (Scenario B)
- Unit is discarded and destroyed (Scenario C)

To determine the percentage of participants following each scenario, the team asked surveyed participants about the likely fate of their recycled appliances, had they not been decommissioned through the Initiative. The team categorized their responses as follows:

- Kept the appliance
- Sold the appliance to someone directly (friend, family member, a stranger from Craigslist)
- Sold or gave the appliance to a used appliance dealer
- Gave the appliance away to someone for free or left it on a curb with a "free" sign
- Gave the appliance to a charity organization
- Had the appliance removed by the dealer supplying the new or replacement appliance
- Took the appliance to a dump or recycling center by themselves (or with the help from a friend or family member)
- Had someone take the appliance to a dump or recycling center (such as a handyman or local waste management company)

Figure 3 shows the scenarios outlined above and how each one results in potential program savings.

Figure 3. Appliance Recycling Initiative Free-ridership Decision Tree[a]



[a] Adapted from the Pennsylvania Statewide TRM and found in the 2019 IL TRM V7.0 Vol. 4, September 28, 2018

After the evaluation team determined the final assessments of participants' actions independent of the Initiative, we calculated the percentage of refrigerators and freezers kept or discarded (shown in Table 5).

Table 5. Final Distribution of Kept and Discarded Appliances

Stated Action Absent Initiative	Indicative of Free-Ridership	Refrigerators (n=71)	Freezer (n=70)
Kept	No	38	30
Discarded	Varies by Discard Method	28	32
No Response	N/A	5	8
Total	-	**71**	**70**

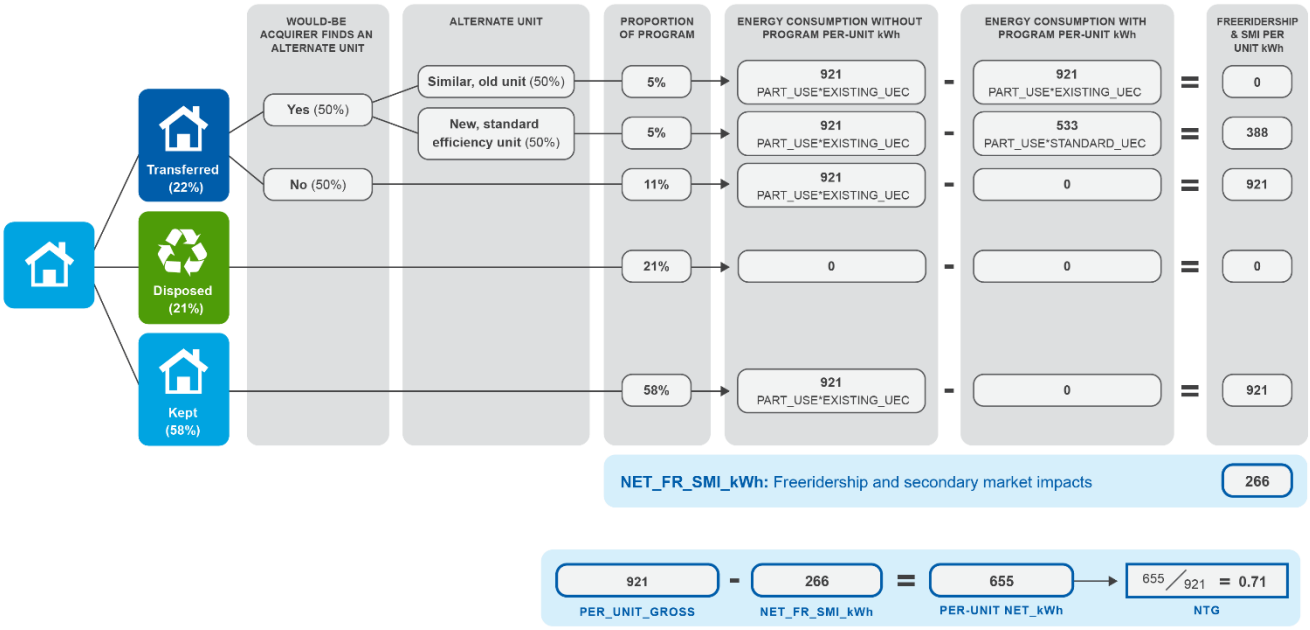
As shown in Table 5, 28 of 71 respondents would not have kept their refrigerator. Of those, 14 respondents would have discarded it by one of the following means:

- Had the refrigerator removed by the retailer who delivered the new or replacement appliance[2]
- Taken the refrigerator to a dump or recycling center themselves (or with help from a friend or family member)
- Had someone take the refrigerator to a dump or recycling center (such as a handyman or local waste management company)

Having the retailer pick up the refrigerator was not necessarily indicative of free-ridership. The IL-TRM assumes that a subset of the units picked up by a retailer are resold and return to service. Combining potential savings from each channel resulted in 29% free-ridership for refrigerators.

Figure 4 shows how we arrived at net to gross for refrigerators. As respondents answer questions in the survey, the team uses the responses to determine which share of refrigerators would end up in each final scenario. We then use weights based on appliance energy consumption to ensure that partial use and replacement with newer appliances are accurately accounted for in each scenario. Scenario A in Figure 3 translates to Kept in Figure 4. Scenario B translates to Transferred and Scenario C translates to Disposed.

Figure 4. Refrigerator NTG Survey Response Decision Tree



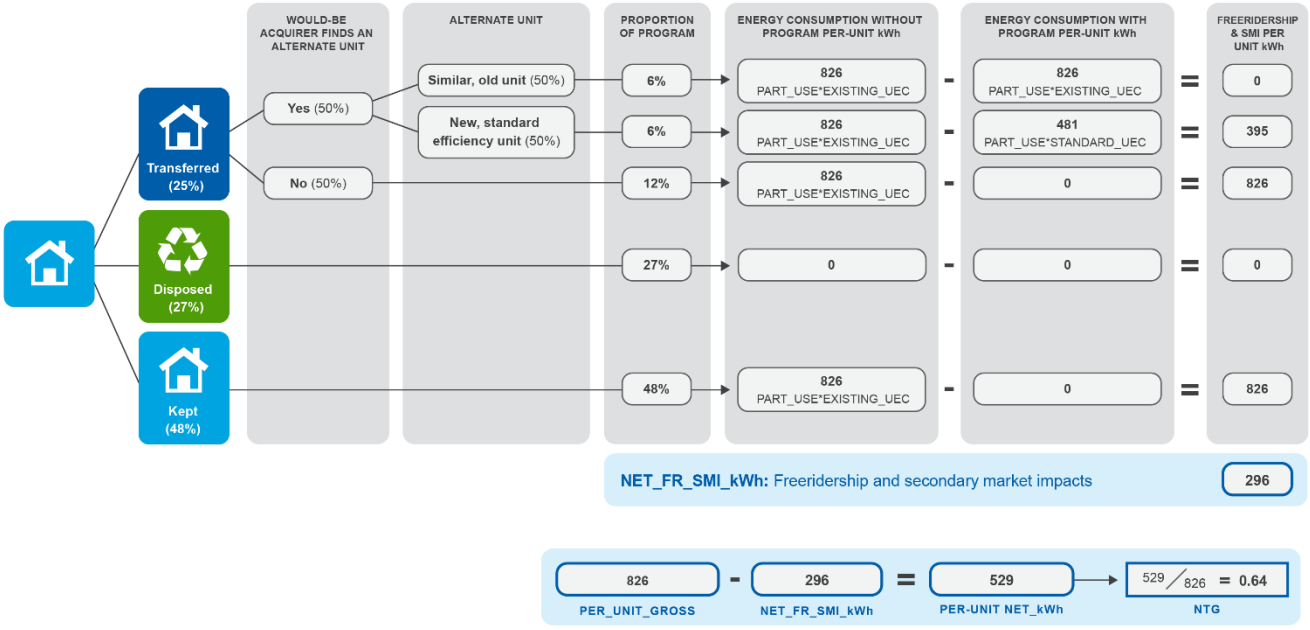
Note: Percentages may not add to 100% due to rounding

Free-ridership for recycled freezers was slightly higher than for recycled refrigerators. Of the 32 respondents who would not have kept their freezer absent the Initiative, 17 would have taken one of the three above-mentioned actions that would have led to the freezer's removal from the grid. After accounting for resold units,

[2] Appliances picked up by retailers are evaluated under the framework established in the IL-TRM V7.0 Appliance Recycling NTG Protocol which is based on primary research conducted in ComEd territory.

the team determined freezer free-ridership at 36%. Figure 5 shows how we arrived at the NTG value for freezers.

Figure 5. Freezer NTG Survey Response Decision Tree



Note: Percentages may not add to 100% due to rounding

Secondary Market Impacts

If, in the Initiative's absence, a participant would have directly or indirectly (through a market actor) transferred the initiative-recycled unit to another customer, the evaluation team estimated what actions the would-be acquirer might have taken, given that the unit would have been unavailable without the Initiative.

Some would-be acquirers in the market for a refrigerator or freezer would find another unit, while others would not and would only take the unit opportunistically. Difficulties arise in trying to quantify the change in the total number of refrigerators and freezers (overall and used) in use before and after initiative implementation and in determining what effect the Initiative had on that total. Without this information, the IL-TRM recommends assuming that one-half of would-be acquirers would find an alternate unit.

Next, the team determined whether the alternate unit would likely have been another used appliance (such as those recycled through the Initiative) or a new standard efficiency unit (presuming fewer used appliances would be available due to initiative activity).[3]

[3] It is also possible that the would-be acquirer would select a new ENERGY STAR unit. However, the team assumed that most customers in the market for a used appliance would upgrade to the next-lowest price point (a baseline, standard efficiency unit).

As discussed, definitively estimating this distribution proves difficult. The IL-TRM recommends adopting a midpoint approach when primary research is unavailable, in which evaluators should assume that one-half of would-be acquirers who would have acquired an alternate unit would find a similar used appliance and one-half would acquire a new, standard efficiency unit.

Appendix A. Retailer Telephone Survey

The team surveyed local retailers in AIC territory who would have potentially interacted with recyclable appliances. The embedded document below is the survey guide the team used to collect information.

Appendix B. Participant Telephone Survey

The team surveyed participant households by phone to determine free-ridership, spillover, part use, and conditioned space for the appliances recycled through the Initiative. The embedded document below is the survey guide the team used to collect information.