



Memorandum

To: Fernando Morales, AIC, and Jennifer Morris, ICC
From: Cadmus and Opinion Dynamics
Date: September 2, 2020
Re: Appliance Recycling Initiative Participant Survey Results

This memorandum presents the results of the evaluation team’s survey of Ameren Illinois Company (AIC) 2019 and 2020 Appliance Recycling Initiative (ARI) participants. The purpose of the memo is to provide updated estimates of conditioned space, part use factor, and freeridership for the initiative’s recycled refrigerators and freezers 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 Volume 3, measure 5.1.8. The part use factor adjusts savings to account for the percentage of time (over an entire year) that units would be plugged in and running had they not been recycled through the ARI. Conditioned space is used to determine increased or decreased usage when units operate in areas exposed to more extreme weather compared to stable temperatures in conditioned, indoor spaces.

Results Summary

Based on the participant survey results and analysis described in this memo, we provide updated planning values for the Appliance Recycling Initiative shown in Table 1. Given the changes in Initiative implementation over time, we have also provided historical values to provide context around the updated results.

Table 1. Future Recommended Planning Values

Measure	Value	2016-2019 Value ¹	Recommended 2019 Value ²	Recommended 2020 Value
Recycled Refrigerator	NTG Ratio	0.52	0.71	0.47
	Freeridership	0.48	0.29	0.53
	Spillover	0.00	0.00	0.00
	Part Use	0.91	0.87	0.86
	Conditioned Space	67%	64%	61%
Recycled Freezer	NTG Ratio	0.62	0.64	0.54
	Freeridership	0.38	0.36	0.46
	Spillover	0.00	0.00	0.00
	Part Use	0.86	0.85	0.81
	Conditioned Space	17%	53%	45%

¹ Source: Opinion Dynamics, February 2016. “Ameren Illinois Company PY9 Net-to-Gross Ratios for the Energy Efficiency Portfolio (8-103/8-104) and IPA Programs (16-111)”
http://ilsagfiles.org/SAG_files/NTG/2016_NTG_Meetings/Final_Documents/AIC_PY9_NTG_Recommendations_Summary_2016-02-18.pdf

² Source: Opinion Dynamics, July 2019. “Appliance Recycling Initiative Participant and Retailer Survey Results”
https://s3.amazonaws.com/ilsag/AIC_2019_ARP_Participant_Survey_Memo_FINAL_2019-07-31.pdf

Measure	Value	2016-2019 Value ¹	Recommended 2019 Value ²	Recommended 2020 Value
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Background

To capture data relevant for updating the initiative’s NTG ratio, the evaluation team developed a follow-up participant survey based on Illinois TRM V7.0 protocols and recommended approaches. The team administered a web-based survey with initiative participants during the summer of 2020.

Evaluation Methodology

Participant Survey

In total, the evaluation team completed surveys with 274 Initiative participants; 171 who had recycled a refrigerator and 103 who had recycled a freezer. The response rate for qualified and completed surveys was 21% based on 1,275 participants invited to take the survey. 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 freeridership analysis if they had recycled the measure and answered all the required freeridership questions necessary to produce a reliable estimate.

The survey instrument can be found in Appendix A: Online Participant Survey.

Freeridership Analysis

The Illinois TRM Version 7, Volume 4 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.”

Following the Illinois TRM Version 7.0 Appliance Recycling NTG protocol, for the freeridership 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 absent the initiative, the team categorized them as a non-freeriders and excluded them from subsequent freeridership analysis.

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 distribution of participating units likely to have been kept or discarded. Actions independent of initiative intervention follow three scenarios:

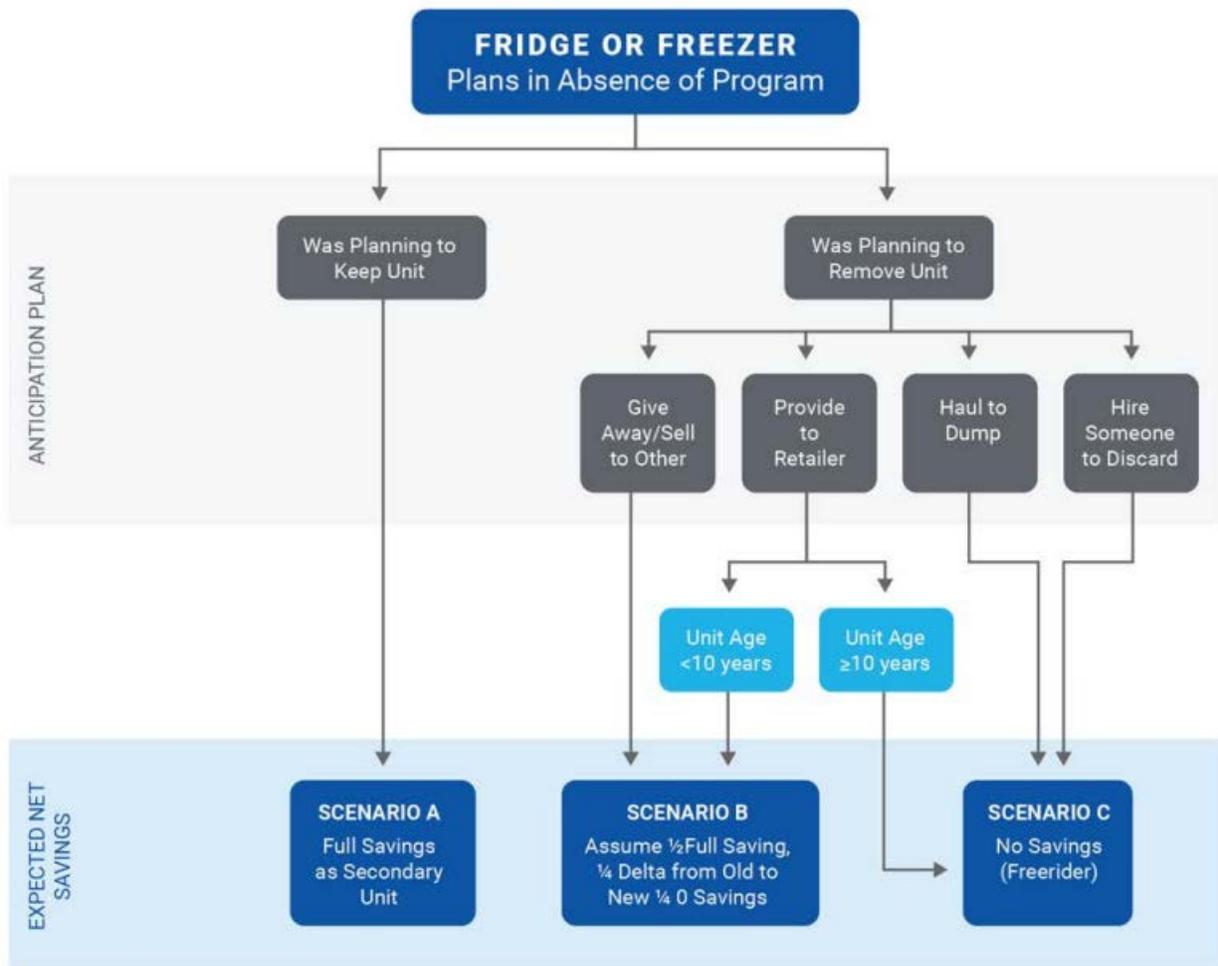
- Unit is kept in the home (Scenario A)
- Unit is discarded and transferred to someone else (Scenario B)
- Unit is discarded and destroyed (Scenario C)

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, Craigslist)
- Sold it to a used appliance dealer
- Gave it away for free
- Gave it away to a charitable organization, such as Goodwill Industries or a church
- Had it removed by the dealer you got your new or replacement appliance from
- Taken it to a dump or recycling center
- Had someone else take it to a dump or recycling center (for example: handyman or local waste management company)

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

Figure 1. Appliance Recycling Initiative Freeridership Decision Tree¹



Source: Adapted from the Pennsylvania Statewide Evaluator Common Approach for Measuring Net Savings for Appliance Retirement Programs, Guidance Memo-026, March 14, 2014.

Based on the responses to the survey, customers are assigned to each of the above scenarios, and after weighting these scenarios for hypothetical consumption of non-discarded or replaced units, an average free-ridership value is determined for the program as a whole.

¹ 2019 IL TRM v7.0 Vol. 4, September 28, 2018

Spillover

The evaluation team did not estimate participant spillover for the ARI given that it does not provide comprehensive energy education likely to influence additional actions on the part of participants. This is consistent with guidance provided in the Illinois TRM, as well as the Uniform Methods Project².

Evaluation Findings

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

Freeridership

After the evaluation team made a final assessment of participants’ actions independent of the initiative, we calculated the percentage of refrigerators and freezers kept or discarded (shown in Table 4).

Table 2. Final Distribution of Kept and Discarded Appliances

Stated Action Absent Initiative	Indicative of Freeridership	Refrigerators (n=171)	Freezer (n=103)
Kept	No	57	38
Discarded	Varies by Discard Method	74	36
No Response	N/A	40	29
Total	-	171	103

As shown in Table 4, 74 of 171 respondents would not have kept their refrigerator. Of those, 72 respondents would have discarded it by one of the following means:

- Had the refrigerator removed by the retailer who delivered the new or replacement appliance³
- 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 freeridership. The Illinois TRM assumes that a subset of the units picked up by a retailer are resold and returned to service. Combining potential savings from each channel resulted in 53% freeridership for refrigerators.

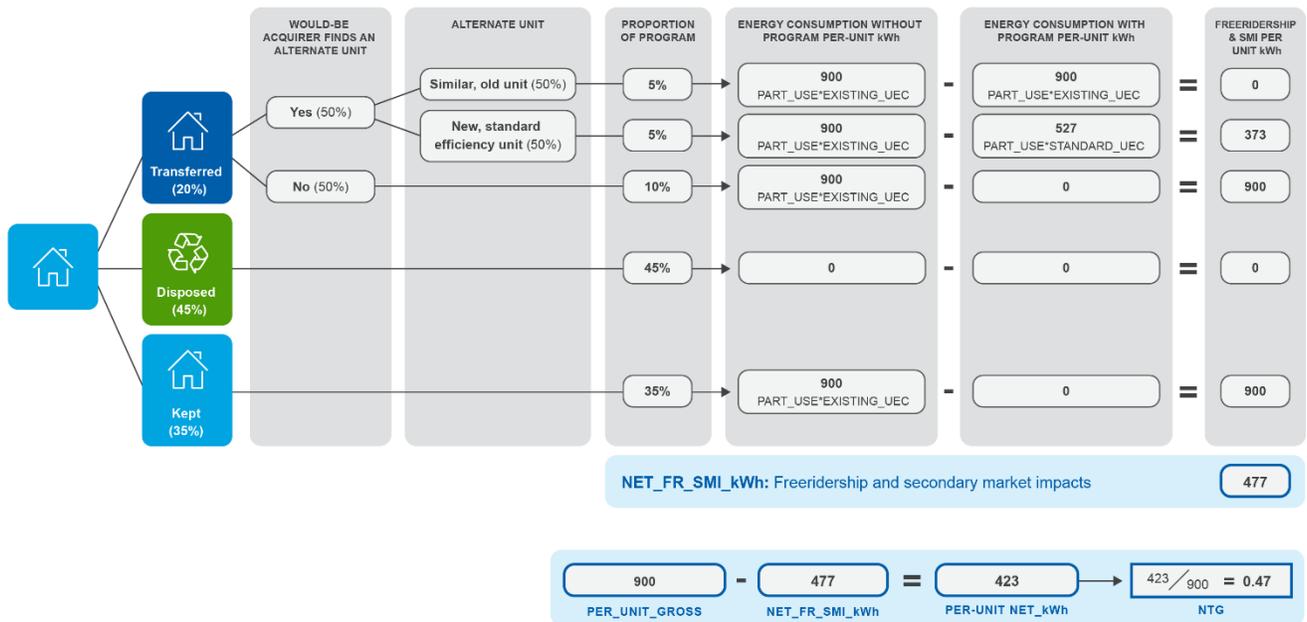
Figure 4 shows the team’s process for determining net to gross for refrigerators. First, the team uses participant responses to determine the quantity of refrigerators that would end up in each final scenario. We then use weights based on appliance energy consumption to ensure that energy use associated with partial

² Uniform Methods Project. September 2016. “Chapter 7: Refrigerator Recycling Evaluation Protocol” <https://www.nrel.gov/docs/fy17osti/68563.pdf>

³ Appliances picked up by retailers are evaluated under the framework established in the Stakeholder Advisory Group (SAG) protocol, which is based on primary research conducted in ComEd territory. For more details, see “Appliance Recycling Protocol of Appendix A: Illinois Statewide Net-to-Gross Methodologies of Volume 4.0 Cross Cutting Measures and Attachments.”

use and replacement with newer appliances are accurately accounted for in each scenario. Note that Scenario A in Figure 3 translates to Kept in Figure 4. Scenario B translates to Transferred and Scenario C translates to Disposed.

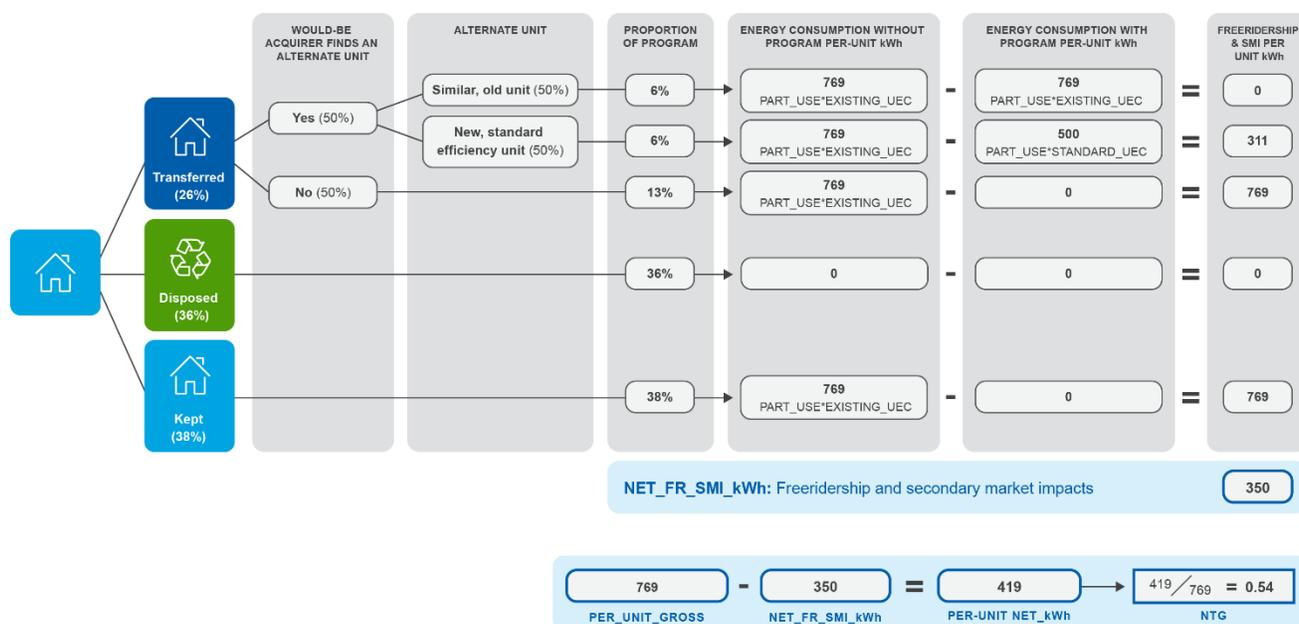
Figure 2. Refrigerator NTG Survey Response Decision Tree*



* Percentages may not add to 100% due to rounding.

Freeridership for recycled freezers was slightly lower than for recycled refrigerators. Of the 36 respondents who would not have kept their freezer absent the initiative, 35 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, the team determined freezer freeridership at 46%. Figure 5 shows how we arrived at the NTG value for freezers.

Figure 3. Freezer NTG Survey Response Decision Tree*



* 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 Illinois 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).⁴

As discussed, definitively estimating this distribution proves difficult. The Illinois TRM recommends adopting a midpoint approach when primary research is unavailable, in which evaluators should assume that one-half

⁴ It is also possible that the would-be acquirer would select a new ENERGYSTAR 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).

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.

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. As shown in Table 2, only 2% of refrigerators and 4% of freezers were never in use in the prior year, while 89% of refrigerators and 77% of freezers were always in use during the previous year. After combining those units who were either always or partly in use, the average recycled refrigerator was in use for 93% of the year, or 11.2 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	89%	77%
Never in Use	2%	4%
In Use Part of the Time	9%	19%

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 0.86 for refrigerators and 0.81 for freezers, which is generally consistent with part findings (see Table 3).

Table 4. Recommended Part Use Rates for Recycled Units

Value	Refrigerator	Freezer
Part Use Factor	0.86	0.81

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 (47%), followed by the garage (36%) and the basement (14%). In total, 61% of units were installed in spaces that were likely to be conditioned, while 39% were installed in likely unconditioned spaces (garages and porches or patios). By comparison, just 45% 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 55% 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 4. Location of Recycled Refrigerators in Prior Year

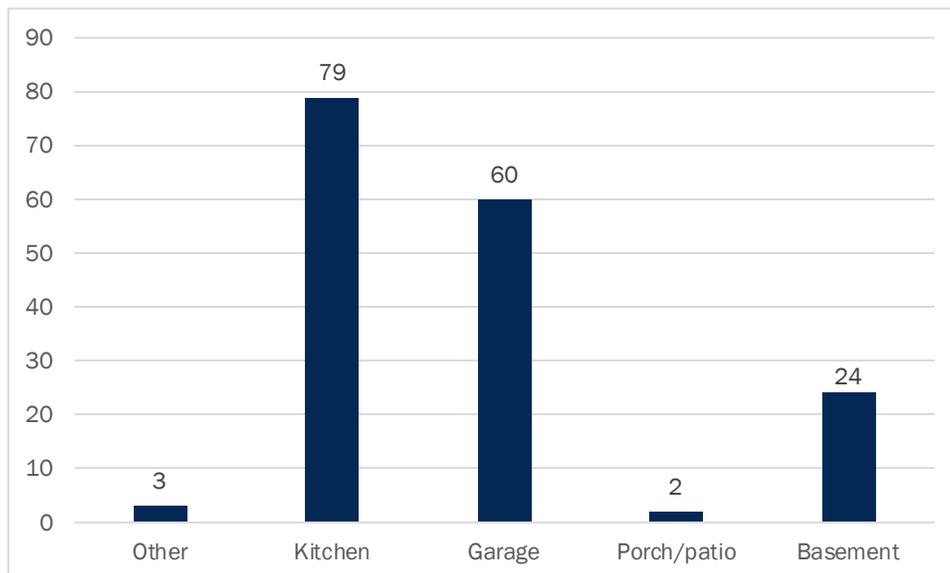
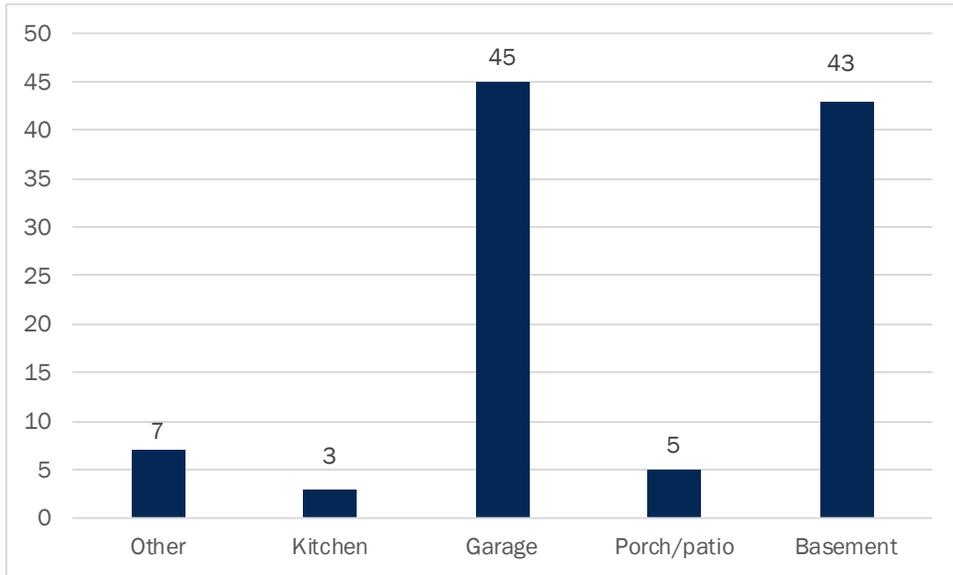


Figure 5. Location of Recycled Freezers in Prior Year



Appendix A. Online Participant Survey

The team surveyed participant households to determine freeridership, 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.



PY19 ARI Online
Survey 14July2020.doc