

Fishing for Savings: Reducing the Net or Increasing the Catch

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ABSTRACT

This paper discusses the pros and cons of incorporating retailers into the appliance recycling pick-up process and how that might be accomplished without compromising net-to-gross for utility refrigerator and freezer programs. The paper describes a model for collaboration with retailers that is part of an existing program and includes data from surveys of customers who participated in the program. Data from a retailer about the number of pick-ups are also presented.

Introduction

Over the years, managers of refrigerator recycling programs have discussed the possibility of working with retailers to retrieve old refrigerators thereby reducing the cost of refrigerator recycling programs and increasing convenience for customers by having a pick-up combined with a drop-off. There are a number of concerns about retailers supporting utility programs not the least of which is that the net-to-gross for refrigerator recycling program could be negatively influenced in a number of ways:

- Customers that would have a unit removed by the retailer anyway would receive the incentive.
- The number of units retrieved through retailers would remain approximately the same.
- The combined result would be to pay incentives to people who are already disposing of a refrigerator. In other words, free-ridership would increase for very little gain to the program.
- Further, most programs only remove working units and there are concerns about contracted logistics services having the discipline to identify working units.
- Retailers are not anxious to promote or promise an incentive if the incentive might not be granted because a unit is later found not to be working.
- With private contractors involved, there is the potential for tracking problems and the substitution of more valuable units with less valuable or nonworking units during the transfer process thus compromising the chain of custody.
- A retailer program does not address customers who have a second unit and might be willing to have it removed.

There are potentially significant benefits to working with appliance retailers:

- Convenience is a key reason customers participate in appliance recycling programs (ADM, 2007; Reed *et. al.*, 2010; Westberg *et. al.*, 2007)). In a retailer supported program, the drop-off and pick-up occur at the same time so customers only have to be home once.

- With a pick-up program there is a second round trip. The second round trip is not needed in a dealer-supported program. The outbound cost is covered by the delivery of the new appliance and the return trip is covered by the pick-up program.
- While the amount of labor might increase on a delivery and pick-up, the overall labor costs would be reduced by about half.
- There would be reduced fuel costs, fleet costs, and emissions from the second trip
- One-on-one interactions with customers typically result in greater participation in programs. Well-trained retailer sales' staff could potentially increase the number of customers deciding to have the units removed.

A key question is whether a refrigerator recycling program can be designed that includes retailer support so that the positives outweigh the negatives.

How Many Refrigerators Are Disposed Through New Appliance Dealers?

To assess the potential role of appliance dealers, it is important to first understand the used refrigerator market and the role of appliance retailers within that market. These data were developed for California and for the Southern California Edison (SCE) service territory, but it is reasonably clear that other markets have similar dynamics. The one notable difference is that other jurisdictions may not have a recycling program or if they have one the penetration of the program is likely to be much lower.

The used refrigerator market is extremely complex. Refrigerators that are removed from households may travel by numerous intersecting paths to their next destination. The players in the market may have a single role or may play multiple roles. The complexity of the situation is further increased by the fact that the market place is very dynamic. The California market has undergone significant changes in recent years stemming from changes in safety and environmental laws concerned with refrigerator/freezer disposal and repair. Many businesses and organizations that formerly dealt with used refrigerators have gotten out of the business or have begun to steer away from it because the revenue stream has shrunk and/or has become a source of loss. Large retailers are no longer dealing in used refrigerators and are doing volume recycling. This has significantly impacted the used market. Various informants told us that there are businesses and organizations that are operating outside of the common paths further increasing the complexity of the market.

It is estimated that approximately seven percent of all households transfer a refrigerator annually.¹ This percentage may have declined slightly since the recession of 2008. These refrigerators are to be differentiated from the second, third, or more refrigerators that roughly 20 percent of all households or 38 percent of single-family households have.

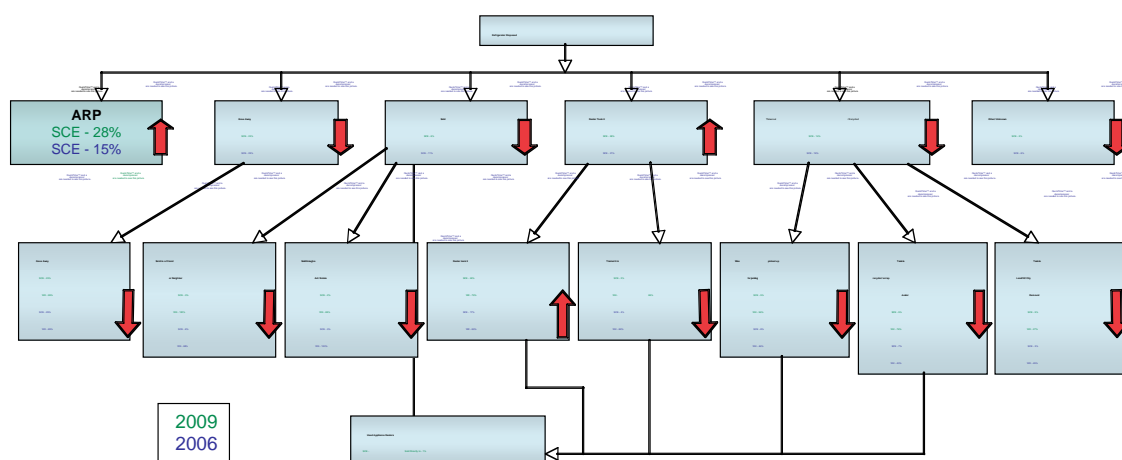
To illustrate where refrigerators go, a flow diagram that presents an overview of the flows and the volumes of used refrigerators is presented. The analysis is based on two evaluations of refrigerator recycling programs in California: the 2004-5 Residential Appliance Recycling Program (RARP) that was administered by SCE, PG&E, and SDG&E; and the 2006-8 Appliance Recycling Program (ARP) administered by SCE. For this paper, the SCE data were extracted from the 2004 – 05 IOU data. The analysis for the 2004-5 study, was based on a acquirer/disposer survey, program records, interviews with charitable organizations, interviews with appliance deal-

¹ The word transfer was chosen in preference to dispose because dispose connotes permanent removal where as a transfer may result in a disposal or the sale or giving of a machine.

ers, a survey of used appliance dealers, a survey of recycling organizations, and information gained from other interview activities such as those with RARP contractors. The information for the 2006-8 program comes primarily from a 2009 disposer survey, which was very nearly the same as the disposer portion of the 2004-5 survey and other similar surveys.

Figure 1 represents best estimates for paths refrigerator transfers take. The first row describes the general type of transfer. The cells in the second and third row provide more specific information about the paths. The five boxes or nodes in the first row contain three pieces of data: the percent of units in the SCE territory following that path in 2009 (green); the percent of units in the SCE territory following that path in 2006 (blue); and a red arrow indicating whether there was an increase or decrease in the percent in the SCE service territory between the two studies. At the second level there are seven path nodes. These contain the same percentages as in the first row but also present the percentage of working units for each of the two years. Finally, the third row, contains one box, used (not new) appliance dealers, which shows the estimated percent of units that are sold directly to this source by customers and an estimate for the total number of units processed.

Figure 1 Used Refrigerator Transfers in California



For the purposes of this paper, the key finding is that in 2009, roughly 26 percent of refrigerators that were disposed by households went to new appliance dealers (Dealer Took It). This number increased by about a fifth from the 2004-05 survey. The other key finding is that the percentage of units captured by ARP between the 2004-05 study and the 2006 - 08 study has almost doubled. In other words, ARP has significantly increased its market share. Clearly dealers and the program are taking more used refrigerators, units that otherwise would be likely given away or sold. The number of units being given away to friends and neighbors has declined by about 20 percent (29 to 23 percent) and the number of units being sold has dropped by about 60 percent (11 to 6 percent). The percentages that are being junked, being taken by a recycler or being taken to the landfill have also declined.

How Major Retailers Dispose of Refrigerators that They Remove

A few larger national retailers and large regional retailers sell most of the refrigerators in the United States. According to EPA's most recent market profile for refrigerators, "In 2007, Sears and the home improvement sector [Home Depot and Lowe's] each accounted for 33 percent of sales, independent retailers for 22 percent, and mass merchants [Best Buy, Fry's, and other] for 11 percent. The remaining four percent went through other channels (Refrigerator, p4, 2009)."² Put slightly differently, 77 percent of retail refrigerator sales are handled by a half dozen national and some very large regional retailers.

Perhaps 25 years ago, you could go to an appliance retailer and purchase a used refrigerator. Except for some independent retailers, that is typically no longer the case. The large retailers no longer carry used refrigerators with the exception of the occasional scratch and dent or out-of-box unit from the floor³. Retailers do continue to remove old refrigerators (and other appliances) from customer households. These appliances are usually removed for free although there may sometimes be a charge or a charge that is then rebated. The typical charge is between \$60 and \$75.

The general pattern now is for large retailers to use logistics services to handle appliance deliveries and remove old appliances although some of the larger independents have their own delivery fleets. The dealer will contract with a logistics service and the logistics service will likely subcontract some of the volume to other logistics services. This allows the prime logistics contractor to manage rapid changes in volume but maintain a steady and predictable volume.

When one of the larger retailers sells a new appliance, the order is electronically sent to a distribution warehouse where a printed delivery order is generated. If a used appliance is to be picked-up in conjunction with the delivery, the need for the pick-up is indicated on the driver's delivery order. The driver then delivers the new appliance and removes the old unit. Customers can arrange for or cancel a used appliance pick-up subsequent to the sale and before the delivery. As noted above, the logistics contractors will sometimes take it upon themselves to remove a unit at the request of a homeowner. This may be particularly true of valuable units.

The used appliance is returned to the warehouse. In the case of one operation that we viewed, the appliances were immediately moved from the delivery truck to the recycler's trailer. When the trailer is full, the retailer calls the recycler who brings an empty trailer and removes the trailer with the used appliances. The trailer contains a mix of refrigerators, washers, dryers, dishwashers, and other appliances.

The recycler takes the trailer to their warehouse where the appliances are sorted. Refrigerators are sorted for those that are functional, white, of a size that is in demand, have economic value, and are less than ten years old. These are set aside for resale to used appliance dealers or for shipment out of the country. For the remaining refrigerators, the refrigerant is drained (a requirement in California), components with hazardous materials removed (also a requirement), and then the refrigerators are de-manufactured or sent to a scrap dealer. The scrap is sold into different markets. This is nearly identical to the procedure used by the utility recyclers. The key difference is that refrigerators removed by utilities are not returned to use.

At least one retailer told us that they do not track the number of refrigerators that they remove but rely on the recycler for an accounting.

² There is a slight discrepancy in the total. It appears that for Sears might be closer to 32 percent and home improvement centers closer to 31.

³ New units taken from the carton and used on the sales floor or taken to a household and then returned

Why Recycling Programs Should Consider the Retailer Removal Option

Remembering that slightly more than a quarter of the units are going to a new appliance dealer, we can focus more on the units being transferred to dealers and what happens to them.

From our disposer surveys and other interviews, we know that approximately 20-30 percent of the units going to new appliance dealers are non-working working units. Approximately, 10-15 percent are working; are white; are less than ten years old; are in good condition; and therefore kept and resold by recyclers. The remaining units, 55 to 75 percent, work but are not desirable because they are older than ten years; are brown, green, or yellow; or are damaged in some way.

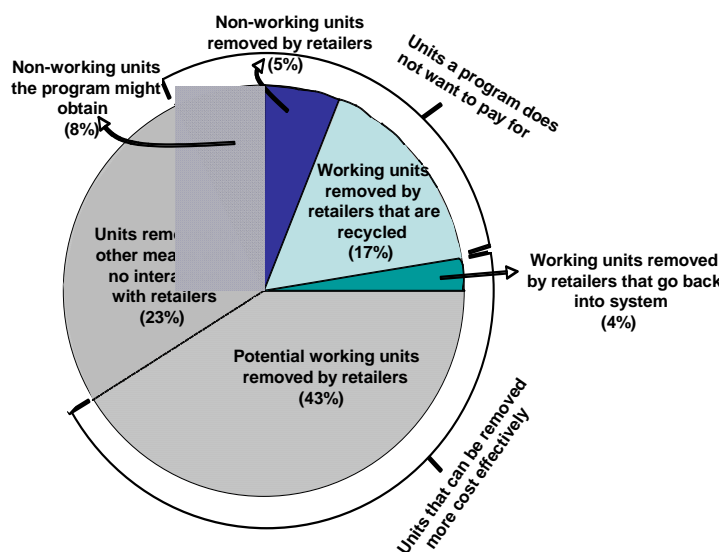
An appliance recycling program clearly does not want to pay for units that are non-working since they are not eligible for the program. The program also does not want to pay for units that are removed that are working but would otherwise be recycled. Units that are working and are resold are the only units removed by the new appliance retailer for which the program would be willing to pay. As noted above, this is the range of 10 to 15 percent of the units recycled by new appliance dealers or roughly two and a half to four percent of all units that are transferred annually.

Thus, if a new appliance retailer continues to remove the same number of units but is now paid for those units, 85 to 90 percent of the payment produces no benefit for the program. The program only captures the savings from the 10 to 15 percent of units that would have been sold as used but would now be recycled.

It is assumed, however, that a retailer removal option would also pick up units that otherwise would go through the program. We know from one study that 66 percent of participants who replace their unit bought from a single retailer and 75 percent bought from two (Reed and Bailey 2010b). A well-run partnership would hope to capture nearly all of these units with the retailer removing the unit for the program. The option likely would also get units that would otherwise be sold, given away, or kept. Increasing retailer removals is attractive because an extra trip to the customer as well as the required logistics planning is not required, making the removal much more cost effective.

Using a retailer removal option has the potential for increasing program participation for two reasons: convenience and marketing. From a number of appliance recycling program evaluations, we know that convenience is one of, if not the most important factor in customers having an appliance removed (Westberg, *et.al.* 2007). We also know from these evaluations that many of the customers who sign up for the program, but decide to cancel, due so because they don't

Figure 2 Used Refrigerator Market in Retailer Removal Terms



want to wait for the recycling company to get there. Retailer removal options represent the highest convenience option since the old unit is removed at the same time the new one is received.

Marketing with a retailer removal option also can be more cost effective than other types of marketing. The program information is easily delivered to a small, targeted subset of customers most likely in need of the program. The information is delivered by established salespersons so the marketing cost is very low. Finally, one-to-one contacts are a very effective form of marketing. This will be discussed in greater detail later in the paper.

There are two important points from this discussion. There is no benefit in paying for units that would be removed anyway, which is approximately 85 percent or more of the units now taken by new appliance retailers. In order for a retailer program to be viable, dealers would need to capture many more units. The question is how many potential units can be captured.

The Proportion of Units a Retailer Removes — A Case Study

As part of an evaluation, a large retailer allowed the delivery orders given to the drivers at a distribution center to be examined. This was a regional distribution center that serviced more than 70 retail locations. The data were not available electronically, so a researcher examined every delivery order and recorded data for those that included a refrigerator delivery. The goal of the study was to determine what percentage of new refrigerator deliveries had an associated refrigerator removal.

The original intent of the study was to review a year's worth of orders but it quickly became clear that the cost of obtaining such a large amount of data would be prohibitive. The modified data collection plan was to collect data for a random sample of eight days between May 9, 2009 and August 23, 2009. The data collection period was determined by the paper orders that had not been transferred to long-term storage. This period coincides with the period during which refrigerator sales are at their peak during the year. In addition, one hundred twelve days of data were collected for two stores to see how stores might vary from the overall norm.

This distribution center dispatched 887 refrigerators to a total of 871 customers on the eight sample days. There were 14 orders that had two refrigerators delivered and one that included three refrigerators.

As noted above, the orders came from more than 70 retail locations and on-line orders. The largest number of refrigerators sold from any one retail location was 39. Some locations sold one unit. Three stores sold 30-39 units. Another six locations sold between 20 and 29 units, 31 locations sold 10 to 19 units, and remaining stores sold the balance of the units.

The orders included instructions to remove refrigerators at 286 (33 percent) of the 871 sites. However, 111 (13 percent) of these orders were cancelled before the removal took place so that refrigerators were removed at 175 sites (20 percent). There were 12 orders where it was not possible to determine if the item being removed was a refrigerator or some other appliance (1 percent).

For the two sites where complete data was gathered, there were a total of 556 refrigerators delivered based on 555 orders. A total of 174 (32 percent) showed that a refrigerator was to be removed but 71 orders were cancelled (13 percent) and no removals were scheduled at 369 sites (65 percent). Thus, the retailer removed 103 refrigerators (19 percent of the sites). There were 12 orders that were ambiguous with respect to whether a refrigerator was to be removed.

These data demonstrate three things. When purchasing a new refrigerator, roughly a third of customers initially arrange to have the refrigerator removed by the retailer. Before the delivery

occurs 40 percent of the customers arranging a removal (13 percent of the deliveries) decide not to have a unit removed. For this retailer, about 20 percent of orders resulted in removals.

This can be compared with the results of one of the surveys where we have the number of customers who purchased a new refrigerator (243) and the number (77) who said that they disposed of a unit through a new appliance dealer. In the survey data approximately 32 percent said that they disposed of a unit through a new appliance dealer.

So, now we can account for the difference in the percentage of units removed between the retailer percentage (about 20 percent) where we counted orders and the new appliance dealer percentage from the survey (about 32 percent). The base of the percentage of retailer deliveries includes households that did not have a refrigerator and were purchasing a new unit for the first time. The retailer data are from a national chain and do not include independent retailers who survive on service and may promote appliance removal as a service. These two factors are likely to reduce the base number thereby increasing the percentage of removals.

Finally, it is notable that retailers have a cancellation rate that is about double (an average of 33 percent) the cancellation rate for the appliance recycling program (about 17 percent). In other words, people change their minds about having a unit removed more often when dealing with the dealer than when dealing with the appliance recycling program. People who have the dealer remove the unit clearly have second thoughts. This may be because their decision is not irrevocable and they may think of other ways to dispose of the unit. Appliance recycling participants may already have gone through the thought process about disposing of the unit, taking the behavioral step of calling the program, and may be influenced to maintain their decision by the incentive.

The important point to take away from this discussion is that dealers capture only a fraction of the total units and there are opportunities to increase the number of units removed through dealers. Also, dealers are having a larger percentage of removals cancelled than the program. These removals are likely to return to use and to be removals that the program would like to capture.

Case Study 2 — Removal of Units through Major Retailer and Other Retailers

As part of another evaluation, Energy Trust of Oregon's (ETO) 2008-9 Refrigerator Recycling Program, Innovologie collected survey data from a retailer pick-up pilot program. The pilot program pairs ETO with a major appliance retailer, which we will refer to as Retailer A. From January (start of pilot program) through June of 2009, the program removed 425 used refrigerators (9 percent of total ETO removals) through their partnership with Retailer A. The units were removed as part of the delivery of a new unit and transferred to JACO, ETO's contract recycler for disposal (Table 1).

The pilot program is operated in the following manner. Sales staff for Retailer A promote the ETO refrigerator recycling program. When a customer indicates that they want a refrigerator or freezer removed by the program, a Retailer A sales person gives the participant an orange sticker to be attached to the appliance so that the appliance will be identified for transfer to JACO and the ETO program. The sales person also includes information in the delivery order for the driver that a program unit will be removed. At the sales desk or at a later time either the sales person or the participant places a call to the ETO (JACO) recycling call center. Instead of generating a pick-up order, the operator gives the participant a tracking number to be written on the orange sticker. The participant then affixes the orange tag to the refrigerator or freezer that is to be removed. The

sticker pinpoints the unit as belonging to the program. The order number ties it to a particular house. There is a chain of custody. The program subsequently pays the customer the incentive.

The driver of Retailer A's delivery truck (remember this is a contract logistics driver) receives a delivery order that indicates that a refrigerator is to be transferred for recycling. When delivering the new refrigerator, the driver removes the tagged refrigerator. The driver then delivers the tagged appliance as well as any other used appliances to the retailer's distribution warehouse. The program refrigerators are separated from any non-program refrigerators or appliances. JACO picks up the recycle units and takes them to their recycling center where they are logged into the tracking system using the order number on the orange sticker and then disassembled.

A participant survey was conducted with 300 ETO refrigerator recycling participants. The participant survey contained various questions regarding retailers and how participants may have had appliances removed. Each customer who replaced an appliance was asked where the replacement unit was purchased and the Retailer A respondents were asked whether they disposed through the retailer program or through the regular program. Thus, we have three groups. Participants who purchased from Retailer A and used the ETO/Retailer A removal program, participants who purchased from Retailer A and disposed of their units through the regular ETO program, and participants who purchased from other retailers and disposed of their unit through the regular program.

Of the 200 respondents who purchased a new replacement unit, 66 percent (133) bought a new unit at Retailer A. This percentage of units is approximately double this retailer's national share. It is unclear why the percentage is so large for this retailer. Survey participants who purchased a replacement unit from Retailer A were asked about their interactions with the retail representative. Customers were asked if the retailer removed the old unit when they purchased the new one or if JACO came to their home to pick up the old unit. Seventy-one percent of Retailer A purchasers had the retailer's delivery truck take their old unit (Table 1).

For the participants who purchased a new unit from Retailer A and used the ETO program, 25 percent asked the dealer about the recycling program while seventy-two percent said that the dealer raised the subject of the retailer removing the unit through the program. In other words, the sales staff sold the program in seventy-two percent of the cases where the dealer removed the unit. It is unclear whether these respondents would still have used the program or kept or disposed of the units some other way.

Eighty-six percent of those who had the program dispose of their unit made arrangements to have the old unit removed when purchasing the new unit while the remainder arranged for the transfer at a later time. Ninety-one percent said that they received the orange tag, which was required by the Energy Trust. No one reported any trouble getting the order number for the orange tag.

Nearly 19 percent of respondents said that the fact that Retailer A promoted the recycling program influenced their decision to purchase a new appliance. About the same percentage of respondents stated that the recycling program influenced them to make their purchase at Retailer A.

We also discussed the removal options with survey participants that purchased a new unit from Retailer A but had ETO/JACO remove the unit separately. Of the 39 (23 percent from above table) participants who bought a replacement unit from Retailer A but did not have Retailer A remove the old one and later participated in the program, a little more than half (54 percent) talked to the salesperson about how to remove their old unit (Table 43). Of these participants, half (7 participants) were told about Energy Trust's program and half were not. If you combine the 21 respondents who did not talk about the options with the sales person and the seven persons who did not talk about the ETO retailer option then 72 percent of those who did not use the ETO retailer dis-

posal option were not presented with the ETO option at the time of sale. Four of the participants who were not told about the program were told that the retailer would remove the unit for free, while three were told there would be a charge.

Table 1 Participant Questions about Retailer A

Interactions with Major Retailer	Yes	No	DK	Total	N
Did you have the retailer remove the old unit when they dropped off the new one? (No=ETO rep came at another time)	71	23	6	100	133
Asked of respondents who had the retailer remove the unit through the program:					
When purchasing the new appliance, did you ask about Energy Trust's recycling program? (No=sales rep brought it up)	25	72	4	100	94
At the time of purchase, did you make arrangements to have the old unit removed? (No=arrangements at a later date)	86	14	0	100	94
Did you receive an orange tag with the stick-on label?	91	7	1	100	94
Did you have any problems getting the order number that you had to write on the orange tag?	0	99	1	100	94
Did the fact that the retailer promoted Energy Trust's recycling program influence you to purchase a new appliance?	19	81	0	100	94
Did the fact that the retailer promoted Energy Trust's recycling program influence you to purchase a new appliance from that specific dealer?	18	79	3	100	94

Table 2 Responses of Retailer A Buyers That Did Not Use The Retailer Program for Removal

Interactions with Retailer A where the partnered retailer did not pick up unit	Yes	No	DK	Total	N
Did you talk to the salesperson or dealer about how to remove your old appliance or did they offer to remove the appliance?	36	54	10	100	39
Responses to questions for those who had a discussion with the sales person:					
Did they tell you about Energy Trust's Recycling Program?	50	50	0	100	14
Did the sales person or dealer offer to remove the old appliance for free?	71	29	0	100	14
Did they tell you they would remove the appliance for a charge?	21	79	0	100	14

Respondents that purchased from other retailers that did not offer the retailer removal options were asked about their experiences (Table 3). Sixty-three percent said that they did not talk with the sales person about removing the old appliance. This is somewhat higher than the percent that bought from Retailer A but did not use that retailer to pick-up and did not speak with a sales person about removal (54 percent). About 58 percent who talked about removal were told about

Energy Trust's recycling program and 42 percent were not. If we take those who did not talk about the removal of their appliance and those who did but did not discuss the Energy Trust program (75 percent), then about 25 percent of this group were told about the recycling program. Almost 80 percent of these respondents received an offer for removal and only about five percent were told that there would be a charge for removal.

From the disposer survey we know that 72 percent of the respondents who used the Retailer A removal option, 28 percent of respondents who bought from Retailer A and used the regular program for removal, and 25 percent of respondents who bought from other retailers and used the regular program, were told about the ETO program by the sales person. What these data suggest is that Retailer A sales staff sold the retailer removal program. Our take away from this is that the salesperson needs to talk about removal with customers. When this was done, about 50 percent of the customers remembered the discussion about the recycling program. Of course, we don't know about the experience of customers who purchased new units and were not program participants. Those customers may not have discussed removal and the subject of the recycling program may not have been presented to them.

Table 3 Participant Questions for Other Retailers

Interactions with non-partnered appliance dealers	Yes	No	DK	Total	N
Did you talk to the salesperson or dealer about how to remove your old appliance or did they offer to remove the appliance?	30	63	8	100	67
Did they tell you about Energy Trust's Recycling Program?	58	42	0	100	19
Did the sales person or dealer offer to remove the old appliance for free?	79	21	0	100	19
Did they tell you they would remove the appliance for a charge?	5	95	0	100	19

This evidence is reinforced by findings from the SCE disposer survey that having the retailer tell the customer influences the customer to participate in the program. Disposers who purchased a new refrigerator were asked if the retailer told them about the SCE refrigerator recycling program. Table 3 compares how those who heard about the program from the retailers and those who did not disposed of their old refrigerators. When the dealer presents the program to the respondent it appears that the percent that use ARP increased by 15 percent.

However, in this instance, most of the increase comes from households that would have disposed of the unit through the retailer. If as we asserted, that only the newer units taken by retailers remain in the market, then the net improvement for those who heard about the program through the dealer is at most a few percent.

Table 4 How Respondents Who Purchased a New Refrigerator Disposed of Their Old Refrigerator Compared with Whether the Dealer Told about the Program

	Percent Who Said Dealers Told Them about the Program	Percent Who Did Not Hear about the Program From the Dealer
Disposed through the ARP	33	18
Disposed through the retailer	50	63
Disposed by other means	17	19
Total	100	100
N	54	59

There is also evidence that the retailer removal program may have influenced the dropout rate. Various studies suggest that the dropout rate (people who schedule and appointment but then cancel) in refrigerator recycling programs is between 15 and 25 percent of people who initially sign-up.

We calculated the dropout rate for the regular ETO program. There were 1188 unique households that dropped out of the regular program. Of these, 411 had a unit picked up at a later time (we assumed that it was the same unit). Thus, there were 777 households that dropped from the program after signing up. Originally, there were 5202 participants who signed up for the regular program. Thus, the drop out rate in the regular program was right at 15 percent (777/5202).

Five hundred and five orders for removals were placed through Retailer A. Eighty-two of these orders were cancelled leaving a total of 423 orders. Two of the 82 respondents rescheduled leaving 425 households that had a refrigerator removed through the retailer program. Of the 80 remaining dropouts, 17 had units removed through the program at a later time. The remaining 53 households dropped out of the program or had not returned at the time we obtained the participant data. Thus, the dropout rate for customers who initially signed up to have a unit removed through the retailer was 10.5 percent.

On the basis of this, it appears that there were roughly a third fewer dropouts in the retailer program than in the regular program. This would be consistent with the idea that the interpersonal contact is the glue that sustains participation in the program. In other studies we have seen that the dropout rate for people signing up through an operator at a call center is less than for those signing up over the web. This is a situation where a social contact as opposed to an anonymous sign-up may make a difference. There could be other reasons such as psycho-social differences or demographic differences that explain the different drop out rates.

Can Retailer Help Penetrate the Market

We know from the SCE disposer survey that about 64 percent of the units disposed of annually involve the purchase of a replacement unit. That means sixty four percent of respondents are therefore potentially exposed to a new appliance dealer.

We also know that new appliance dealers in the SCE Service Territory already collect a used unit in about 26 percent of the cases. We estimate that slightly more than four/fifths of those or 80 - 85 percent are working units. Therefore, the estimate of working units that are either not working or would be disassembled by recyclers is approximately 22 percent. Subtracting the 22 percent from the 64 percent of working units means that the additional portion of the market that could potentially be captured by new dealers is 43 percent.

This 43 percent includes the 28 percent that the program is currently capturing. If the current program continues as is then the additional units that would be available for capture through the retailers would be about 15 percent. However, with an effective retailer program in place, the number of units taken by the program could decline and the efforts of the program focus on households with second units that would not be captured by retailers.

Table 4 Replacement of Disposed Units

Disposition of working units and percent of nonworking units	Percent
Has a working unit and bought a new unit	64.0
Had a working unit and bought a used unit	4.8
Had a working unit that they got rid of	18.2
Nonworking unit	13.0
Total	100.0

Estimated Costs and Expenses of Retailer Pilot Program

Based on the discussion in this paper and other available information, the following costs for refrigerator and recycling programs are estimated assuming the program can remove a few thousand units. These cost estimates do not represent the costs of any specific recycler but represent an estimate based on what new dealers charge for removal and some rough understanding of the costs of recycling programs. Costs vary depending on the expanse of the service area, the density of traffic and other variables. These costs are generally in the right ballpark. The critical costs, the logistics costs and the incentive, are consistent with actual costs.

In this table logistics have been separated into outbound logistics and inbound logistics. In the case of a pick-up program or the delivery of a refrigerator, the program contractor or the new appliance dealer would pay both the inbound and outbound costs. In a retailer program, the retailer could reasonably be expected to pay for the delivery (outbound costs) and the program recycler could reasonably be expected to pay for the inbound costs. The call center costs and the de-manufacturing costs could reasonably be expected to remain about the same. Likewise, the administrative costs are not likely to change. However, the marketing costs for the dealer program might be less than for the recycling program because the retailer is now bearing some of the cost of the marketing. For the purposes of this example, a marketing cost of \$25 is assumed for the standard recycling component of the program and a \$10 cost for the retailer component.

Thus, the cost of the retailer program is approximately 25 percent less than the direct recycling program. At present, the 26 percent of the units removed by the retailer cost the program nothing. In other words they are free riders. If you institute the retailer program, there is no easy way to distinguish units that would be taken by the retailer in the absence of the program so the program will have to pay for those units.

Using this information, the number of units that would have to be removed for the retailer option to be as cost effective compared to direct program removal can be estimated. The break-even point can be calculated with a bit of algebra. The basic algebraic expression to calculate the break even point is $\$173X = \$128X + .26(\$128)$.

The \$173 is the cost of removing a unit directly, the \$128 is the cost of removing a unit under the retailer program, and the .26 is the proportion of the units that would go to a retailer in

the absence of the program and would represent a cost to the program. Following through the percentage of units that would have to be captured is calculated as follows:

$$\begin{aligned} \$173X &= \$128X + \$33.28 \\ X &= .74 \end{aligned}$$

In other words, the program would essentially have to capture all remaining units (74 percent) in order for the program to be as cost effective as the current direct delivery program. However, as noted above there may only about 43 percent of units that are available for capture by the program. Thus, under these assumptions a retailer program may not be cost effective compared to the direct removal program.

However, the assumptions can be adjusted. The one sixth of units captured by the dealers that are returned to service can be considered removed from service so in fact the percent of freeriders is not .26 but really .22. The incentive can be adjusted downward for units retrieved through the dealer assuming that the convenience factor would encourage most buyers to use the program rather than arranging a removal through the program at a different time. For example, the incentive through dealers might be \$25 instead of \$50. Finally, dealers currently receive about \$10 per unit from recyclers. Instead of paying the full cost of retrieval (\$30) \$20 might be offered. Using these assumptions in various combinations produces the results shown in Table 6.

The percentages represent the additional units that retailers would have to acquire to make a program with these assumptions cost effective compared to the current direct removal program. The items in green are less than the 43 percent of units that might be available to a retailer program and are probably achievable. Those in yellow are marginal at best, and those in white are probably not realistic. Thus, the bottom line is that a retailer refrigerator removal program appears to be cost effect under assumptions of reduced incentives and slightly reduced return trip costs.

One of the potential benefits of refrigerator recycling programs is the value of refrigerant capture and destruction in a carbon trading market. The value of 1 pound of refrigerant is equal to 2,300 pounds of carbon dioxide and a pre-1983 refrigerator contains 0.6 pounds of refrigerant. Older units contain up to three pounds. As a result, one pre-1983 refrigerator contains the equivalent of 1,380 pounds of carbon dioxide. With the existence of such a market, the value of obtaining all units, working or not working, increases and that potentially change the cost structure and dynamics of the program.

Table 5 Estimated Costs for Two Recycling Programs

Potential Costs	Refrigerator Program Recycling Program
Call Center Operations	3
Outbound Logistics	30
Inbound Logistics	30
De-manufacture	20
Administration other	15
Marketing	25
Incentive	<u>50</u>
Total Cost	173

Conclusions and Recommendations

There is wide spread interest in utility sponsored retailer based appliance removal programs. Our research suggests that under certain assumptions such programs can be cost effective. Carefully controlled pilot programs do need to be conducted.

- A retailer pick-up option can be made to work and can be cost effective.
- There is evidence that the retailer program in Oregon increased recycling program participation although that evidence is inconclusive. It appears that the increase was substantial but in the absence of a disposer survey in the pilot program area it is not possible to estimate the effects.
- There is evidence that the ETO program influenced customers to make the purchase of a new appliance (and obviously a more efficient one) and that the retailer benefited through increased sales.
- There is also evidence from the ETO pilot and data collected from SCE that having the retailer promote the program increases the use of the program but in the case of the SCE ARP program retailer promotion (where the units were still removed directly by the program) retailer information mostly shifted removals that would have occurred anyway.
- A retailer option may make the best sense in situations where there have not been pre-existing programs.

Table 6 How Varying the Assumption Changes the Percentage of Units that Need to be Captured by Retailers to Break Even with a Direct Removal Program

Reduce freeriders to 22 percent	Assume the incentive is \$25	Assume return trip costs of \$20	Percentage that would have to be removed to break even with direct removal
	√		38
		√	51
	√	√	29
√			63
√	√		32
√		√	43
√	√	√	24

What a Retailer Pick-Up Options Should Look Like

The following some of which was borrowed from the ETO represents a workable model that might be used to implement a retailer program:

- Start with a single retailer and expand to additional retailers if evaluation results warrant.
- Conduct baseline studies before implementing the program with the retailer to understand levels of sales and the number of sales resulting in the removal of an existing unit (see Case Study 1).

- Conduct a baseline study to determine the number of units that are working in the baseline population. The working status of these units should be tested at the distribution warehouse.
- The program cannot be effectively assessed if this is not done.
- Develop a marketing strategy that promotes important themes (convenience, energy cost savings, the incentive, free removal, the environment) and point-of-sale collateral.
- Develop a circuit rider program that has a representative go from participating store to participating store to train sales staff. This can be done in conjunction with other programs. Make at least quarterly or half yearly visits to every store. Check the stock of program information, marketing collateral, and deliver new materials during the visit.
- Train the staff on how the program works and program requirements such as the unit must be operational.
- Make sure that sales staff know how to place an order for a program removal and can explain it to customers. The sales staff also need to make sure that the customer understands that the incentive will not be forthcoming if the unit is not removed or the unit is not working at removal.
- If possible, work with the retailer to incorporate the order removal process into their logistics process so that it is automatic.
- Use a sticker system to maintain chain of custody. Require the purchaser to place the sticker on the unit. Make sure that the order number is on the sticker and inform the customer that the unit will not receive an incentive unless the order number is on the sticker and attached to the unit.
- Train logistics personnel to identify working units.
- Capture the units belonging to the program at the distribution warehouse. Enter the characteristics at that point. It would be desirable to use PDAs to capture information about the units as they are removed from the households although this might not be possible.
- Sample the units at the distribution warehouse to determine the percentage of working program and nonprogram units.
- The program should make frequent random checks at distribution centers, and the appliance recycler to make sure program processes are followed.

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