

LARGE FILING SEPARATOR SHEET

CASE NUMBER: 15-534-EL-RDR

FILE DATE: 3/30/15

SECTION: 1

NUMBER OF PAGES: 201

DESCRIPTION OF DOCUMENT:

APPLICATION

FILE

BEFORE

THE PUBLIC UTILITIES COMMISSION OF OHIO

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In the Matter of the Application of Duke)
Energy Ohio, Inc., for Recovery of)
Program Costs, Lost Distribution Revenue) Case No.15-534-EL-RDR
and Performance Incentives Related to its)
Energy Efficiency and Demand Response)
Programs.)

APPLICATION OF DUKE ENERGY OHIO, INC.

1. Duke Energy Ohio, Inc., (Duke Energy Ohio or the Company) is an Ohio corporation engaged in the business of supplying electric transmission, distribution, and generation service in Adams, Brown, Butler, Clinton, Clermont, Hamilton, Montgomery, and Warren Counties in Southwestern Ohio to approximately 690,000 electric customers and 420,000 gas customers.
2. Duke Energy Ohio is a "public utility" as defined by Sections 4905.02 and 4905.03, Revised Code, and an "electric distribution company," "electric light company," "electric supplier," and "electric utility" as defined by Section 4928.01, Revised Code.
3. As an Ohio electric distribution utility, Duke Energy Ohio is subject to the mandates set forth in Amended Substitute Senate Bill 221, codified in Revised Code 4928.66, including, *inter alia*, the requirement to implement energy efficiency programs and peak demand reduction programs.
4. Subsequent to the enactment of the mandates contained in Revised Code 4928.66, the Public Utilities Commission of Ohio (Commission) promulgated rules to facilitate the Commission's oversight of compliance with this new energy law. These rules are set forth in Ohio Administrative Code 4901:1-39-01, *et seq.*

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5. Pursuant to the Commission's rules, Duke Energy Ohio submitted an application for approval of an energy efficiency portfolio of programs in Case No. No. 13-0431. The Stipulation that was adopted and approved by the Commission, provided for implementation of Rider EE-PDR (shown in the Duke Energy Ohio electric tariff as Rider EE-PDR and Rider EE-PDRR) to be effective on January 1, 2014. With respect to cost recovery, the Stipulation provided the following:

- Rider EE-PDR true-up shall occur in the first quarter of 2015.
- Cost recovery shall be allocated between distribution and transmission customers based on the allocation of distribution revenues as approved in the Company's most recent electric distribution rate case.
- Duke Energy Ohio is eligible for an incentive for achieving energy efficiency above the statutory mandate. The incentive thresholds are set forth in the Stipulation.
- Duke Energy Ohio shall perform measurement and verification as set forth in the Supplemental Testimony of Roshena Ham. Duke Energy Ohio has hired an independent evaluator for measurement and verification. Costs for the independent measurement and verification shall be capped at five percent of program costs.

6. As stated above, the Commission enacted rules to facilitate oversight and compliance with the requirements for energy efficiency and peak demand reduction set forth in Revised Code 4928.66. Rule 4901:1-39-07, O.A.C., provides for the recovery of costs and specifies what may be included in a cost recovery mechanism. Rule 4901:1-39-07, O.A.C., states that cost recovery may include "costs due to electric utility peak-demand

reduction, demand response, energy efficiency program costs, appropriate lost distribution revenues, and shared savings.”

7. The Company submitted its portfolio of programs in compliance with Revised Code 4928.66 and the Commission’s rules in Case No. 13-0431-EL-POR. In Case No. 11-5905-EL-RDR, the Public Utilities Commission of Ohio approved a distribution decoupling rider, (Rider DDR).

8. In July 2011, in Case No. 11-4393-EL-RDR, the Company requested that the Commission approve a new cost recovery mechanism. The application was approved in August of 2012. In compliance with the Opinion and Order, Duke Energy Ohio submitted an updated portfolio filing, Case No. 13-0431-EL-POR, to align the cost recovery mechanism with the portfolio of programs on April 15, 2013. The portfolio was approved on December 4, 2013. The Company also filed and received approval for a new non-residential program, Small Business Energy Saver.¹

9. Duke Energy Ohio has submitted status reports annually as required by 4901:1-39-05(C), in Case Nos. 10-317-EL-EEC, 11-1311-EL-EEC, 12-1477-EL-EEC, 13-1129-EL-EEC, 14-457-EL-EEC and 15-454-EL-EEC.

10. In support of its request for approval to adjust Rider EE-PDR to recover costs related to compliance with energy efficiency mandates in this Application, Duke Energy Ohio is submitting testimony to provide greater detail about the supporting documentation that will allow the Commission to evaluate the the delivery of efficient and measurable energy efficiency and peak demand reduction.

11. Duke Energy Ohio witness Trisha Haemmerle will provide a historical overview of the energy efficiency and demand response programs and Duke Energy Ohio’s success with these programs.

¹ Case No. 14-964-EL-POR approved on September 10, 2014.

12. Duke Energy Ohio witness Roshena Ham will provide an overview of the methodology used for Evaluation, Measurement and Verification (EM&V) and the processes by which the Company evaluated its programs. Ms. Ham will also provide the load impacts used in the true-up process for Rider EE-PDRR and the total impacts achieved based upon actual participation.

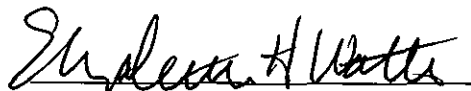
13. Duke Energy Ohio witness James E. Ziolkowski will provide information related to the financial and accounting support for Rider EE-PDR. Mr. Ziolkowski will describe the calculation of the Rider EE-PDRR revenue requirement for the period January 2014 through December 2014 and the procedure utilized for calculating recovery rate. The calculation also includes the expected costs for 2015. Mr. Ziolkowski will sponsor Attachments JEZ-1, JEZ-2, and JEZ-3.

Conclusion

As supported by the testimony of the Duke Energy Ohio witnesses filed herewith, the Company respectfully requests that the Commission approve its Application, subject to the terms outlined herein.

Respectfully submitted,

Duke Energy Ohio



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BEFORE

THE PUBLIC UTILITIES COMMISSION OF OHIO

In the Matter of the Application of Duke)
Energy Ohio, Inc., for Recovery of)
Program Costs, Lost Distribution Revenue) Case No. 15-534-EL-RDR
and Performance Incentives Related to its)
Energy Efficiency and Demand Response)
Programs.

DIRECT TESTIMONY OF

JAMES E. ZIOLKOWSKI

ON BEHALF OF

DUKE ENERGY OHIO, INC.

March 30, 2015

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ATTACHMENTS:

- JEZ-1 Work papers showing the calculation of calculation of Rider EE-PDRR rates
- JEZ-2 Proposed Rider EE-PDRR tariff sheet – redlined
- JEZ-3 Proposed Rider EE-PDRR tariff sheet - clean

I. INTRODUCTION

1 **Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.**

2 A. My name is James E. Ziolkowski, and my business address is 139 East Fourth
3 Street, Cincinnati, Ohio 45202.

4 **Q. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?**

5 A. I am employed by the Duke Energy Business Services LLC (DEBS) as Director,
6 Rates and Regulatory Strategy. DEBS provides various administrative and other
7 services to Duke Energy Ohio, Inc., (Duke Energy Ohio or the Company) and
8 other affiliated companies of Duke Energy Corporation (Duke Energy).

9 **Q. PLEASE SUMMARIZE YOUR EDUCATION AND PROFESSIONAL**
10 **EXPERIENCE.**

11 A. I received a Bachelor of Science degree in Mechanical Engineering from the U.S.
12 Naval Academy in 1979 and a Master of Business Administration degree from
13 Miami University in 1988. I am also a licensed Professional Engineer in the state
14 of Ohio.

15 After graduating from the Naval Academy, I attended the Naval Nuclear
16 Power School and other follow-on schools. I served as a nuclear-trained officer
17 on various ships in the U.S. Navy through 1986. From 1988 through 1990, I
18 worked for Mobil Oil Corporation as a Marine Marketing Representative in the
19 New York City area.

20 I joined The Cincinnati Gas & Electric Company (CG&E) in 1990 as a
21 Product Applications Engineer, in which capacity I designed and managed some
22 of CG&E's demand side management programs, including Energy Audits and

1 Interruptible Rates. From 1996 until 1998, I was an Account Engineer and
2 worked with large customers to resolve various service-related issues, particularly
3 in the areas of billing, metering, and demand management. In 1998, I joined
4 Cinergy Services, Inc.'s, Rate Department, where I focused on rate design and
5 tariff administration. I was significantly involved with the initial unbundling and
6 design of CG&E's retail electric rates. I was appointed to my current position in
7 December 2010.

8 **Q. PLEASE DESCRIBE YOUR DUTIES AS DIRECTOR, RATES AND**
9 **REGULATORY STRATEGY.**

10 A. I am responsible for various rider filings, tariff administration, billing, and
11 revenue reporting issues in Ohio and Kentucky. I also prepare filings to modify
12 charges and terms in retail tariffs of Duke Energy Ohio and Duke Energy
13 Kentucky, Inc., (Duke Energy Kentucky) and develop rates for new services.
14 During major rate cases, I prepare cost of service studies and help with the design
15 of the new base rates. I assisted in the development of the retail electric tariffs in
16 the Company's Case No. 03-93-EL-ATA, which established the Company's
17 market-based standard service offer. Additionally, I frequently work with
18 customer contact and billing personnel of Duke Energy Ohio and Duke Energy
19 Kentucky to answer rate-related questions and to apply the retail tariffs to specific
20 situations. Occasionally, I meet with customers and Company representatives to
21 explain rates or provide rate training. I also prepare reports that are required by
22 regulatory authorities.

1 **Q. HAVE YOU PREVIOUSLY TESTIFIED BEFORE THE PUBLIC**
2 **UTILITIES COMMISSION OF OHIO?**

3 A. Yes. Recently, I provided testimony before the Public Utilities Commission of Ohio
4 (Commission) in support of Duke Energy Ohio's electric distribution base rate case,
5 filed under Case Number 12-1682-EL-AIR. I was also a witness in the Company's
6 Electric Security Plan cases, filed under Case Number 11-3549-EL-SSO and 14-
7 841-EL-SSO and the Energy Efficiency cases, filed under Case Number 13-753-EL-
8 RDR and Case No. 14-457-EL-RDR.

9 **Q. WHAT ARE THE ATTACHMENTS AND SCHEDULES FOR WHICH**
10 **YOU ARE RESPONSIBLE?**

11 A. I am sponsoring the following items:

- 12 • Attachment JEZ-1 – Work papers showing the calculation of Rider EE-PDRR
13 rates
- 14 • Attachment JEZ-2 – Proposed Rider EE-PDRR tariff sheet – redlined
- 15 • Attachment JEZ-3 – Proposed Rider EE-PDRR tariff sheet – clean

16 **Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS**
17 **PROCEEDING?**

18 A. The purpose of my testimony in this proceeding is to: (i) describe the calculation of
19 the Rider EE-PDRR rate update, including the true-up for the year 2014 and (ii)
20 discuss the distribution decoupling mechanism, Rider DDR, as approved in Case
21 No. 11-5905-EL-RDR and its effect on lost margin recovery. The Company's
22 electric tariff contains two shared savings-related sheets. Rider EE-PDR describes

1 the calculations of the shared savings recovery charges, and Rider EE-PDRR
2 contains the results of the calculations, i.e., the retail recovery rates.

3 **Q. WHAT IS THE PURPOSE OF RIDER EE-PDR AND EE-PDRR?**

4 A. Rider EE-PDR is the mechanism through which the revenue requirement and its
5 true-up is recovered from residential and non-residential customers. Rider EE-
6 PDRR contains the results of the calculations, i.e., the retail recovery rates.

7 **Q. WHAT TIME PERIOD DOES THIS TRUE-UP COVER?**

8 A. This true-up analysis addresses the calendar year 2014. The proposed Rider EE-
9 PDRR rate also includes expected 2015 costs. The 2015 results will be trued-up
10 in next year's filing. As part of the true-up calculation, the reconciliation
11 balances from 2012, as filed last year in Case No. 13-753-EL-RDR, and the
12 balances from the pending Case No. 14-457-EL-RDR are carried forward and
13 included in the revenue requirement.

II. CALCULATION OF EE-PDR REVENUE REQUIREMENT

14 **Q. BRIEFLY DESCRIBE THE RIDER EE-PDR INCENTIVE MECHANISM.**

15 A. Traditional energy efficiency regulatory recovery mechanisms allow the utility to
16 recover program costs, lost revenues, and a percentage of shared savings (avoided
17 costs minus program costs). In Case No. 11-4393-EL-RDR, Duke Energy Ohio
18 received approval for a tiered base shared savings cost recovery mechanism based
19 on achievement. The total incentive amount that may be claimed by the Company
20 under Rider EE-PDR is subject to a tiered shared savings incentive based upon its
21 ability to exceed its targets set forth in Revised Code 4928.66.

22 Attachment JEZ-1, page 1 shows the after-tax shared savings incentive

1 based on the percentage achievement of the Company against the energy
2 efficiency mandate.

3 **Q. WHAT LEVEL OF ACHIEVEMENT VERSUS THE SB 221 MANDATE IS**
4 **THE COMPANY CLAIMING?**

5 A. Duke Energy Ohio achieved greater than one hundred fifteen percent of the
6 energy efficiency and peak demand mandates, and is claiming the after-tax shared
7 savings incentive of thirteen percent. The calculation supporting this claimed
8 incentive appears on Attachment JEZ-1, page 1.

9 **Q. IS THE COMPANY INCLUDING CARRYING COSTS ON LOST**
10 **MARGINS IN THIS APPLICATION?**

11 A. No.

12 **Q. PLEASE EXPLAIN HOW DISTRIBUTION LOST MARGINS ARE**
13 **CALCULATED.**

14 A. The DSMore™ model calculates the kWh and kW reductions associated with
15 each program measure. Based upon the units of participation and load reductions
16 per program measure, the Company then applies lost margin rates to these
17 reductions to calculate the lost margin dollars to be recovered.

18 **Q. WHAT IS THE DIFFERENCE BETWEEN LOST REVENUES AND LOST**
19 **MARGINS?**

20 A. In general terms, lost margins equal lost revenues minus variable costs. For
21 example, the lost margin associated with generation would be equal to the total
22 generation revenue minus fuel costs (which are variable) minus any other variable
23 O&M costs. Rider EE-PDR allows for the recovery of distribution lost margins,

1 and the Company requests in this filing to recover distribution lost margins
2 associated with Rider EE-PDR measures.

3 **Q. WHAT TYPES OF LOST MARGINS ARE INCLUDED IN THIS TRUE-**
4 **UP?**

5 A. The calculated lost margins include only distribution margins associated with
6 non-residential customers taking service under Rate DS, Rate DP, and Rate TS.
7 The lost margins associated with these three non-residential rates are included
8 under Rider EE-PDR since these non-residential customers are not subject to the
9 Company's decoupling rider pilot, Rider DDR (Distribution Decoupling Rider),
10 which was approved in Case No. 11-5905-EL-RDR.

11 **Q. DOES THIS APPLICATION INCLUDE AVOIDED COSTS ASSOCIATED**
12 **WITH THE MERCANTILE SELF-DIRECT PROGRAM?**

13 A. No. The Company included the energy and capacity savings from the Mercantile
14 Self-Direct program in determining its performance against the benchmarks set
15 forth in Section 4928.66, Ohio Revised Code, but it did not include any avoided
16 costs or lost revenues from the Mercantile Self-Direct program in its Rider EE-
17 PDR true-up calculations. The Company is including \$293,395 of Mercantile
18 Self-Direct program costs in its revenue requirement.

19 **Q. DID THE TRUE-UP CALCULATION INCLUDE ANY PRIOR-PERIOD**
20 **TRUE-UP AMOUNTS?**

21 A. Yes. To maintain continuity of the true-up mechanism from one year to the next,
22 the filing includes the net reconciliation balances from the prior years – 2012 and
23 2013 in this case. The Company filed its 2012 reconciliation numbers in Case

1 No. 13-753-EL-RDR. The Company filed its 2013 reconciliation numbers in the
2 pending Case No. 14-457-EL-RDR. In the current filing, the Company carries
3 forward the as-filed 2013 reconciliation balances, pending an order in Case No.
4 14-457-EL-RDR. Upon receipt of an order in Case No. 14-457-EL-RDR, the
5 Company will adjust this filing if necessary to reflect any changes to the as-filed
6 numbers in Case No. 14-457-EL-RDR.

III. RIDER EE-PDR RECONCILIATION RATE CALCULATION

7 **Q. PLEASE EXPLAIN HOW THE COMPANY'S DISTRIBUTION**
8 **DECOUPLING RIDER AFFECTS THE RIDER EE/PDR TRUE-UP**
9 **CALCULATIONS.**

10 **A.** Rider DDR was approved on May 30, 2012 in Case No. 11-5905-EL-RDR. On
11 January 1, 2012, the Company began tracking the authorized distribution revenues
12 for each rate class covered by the rider against the actual revenues for the rate
13 classes covered by the rider. On February 26, 2015, the Company filed an
14 application to update Rider DDR rates for each rate class. The latest Rider DDR
15 filing covers the period January 1, 2014 through December 31, 2014. The
16 updated Rider DDR rates will be effective on July 1, 2015, absent any activity by
17 the Commission. The lost margin dollars in this Rider EE-PDR true-up filing are
18 based on lost kWh and kW for year 2014. Because Rider DDR does not apply to
19 Rates DS, DP, and TS, only those three base rates are subject to lost margin
20 recovery pursuant to Rider EE-PDRR.

21 **Q. PLEASE DESCRIBE IN DETAIL THE RIDER EE-PDRR RATE**
22 **CALCULATIONS CONTAINED IN ATTACHMENT JEZ-1.**

1 A. Attachment JEZ-1 shows the calculation of the Rider EE-PDRR recovery rates.
2 Page 1 shows the calculation of the Company's shared savings achievement tier.
3 Because it exceeded 115% of its annual achievement target, the Company earned
4 an after-tax shared savings rate of 13.0%. This is equivalent to a pre-tax rate of
5 20.37%.

6 Page 2 summarizes the Rider EE-PDRR revenue requirement data from
7 page 3. The total 2014 revenue requirement, using the pre-tax shared savings rate
8 of 20.37%, is \$45,691,640. This figure includes \$293,395 of Mercantile Self-
9 Direct program cost recovery, however, no shared savings incentives are included
10 for the self-direct program.

11 Page 3 of Attachment JEZ-1 shows the 2014 EE/DR program details and
12 results. The sheet shows the kWh and kW impacts, the shared savings
13 calculations, the program cost recovery numbers, and the total revenue
14 requirement associated with each of the residential and non-residential programs.
15 The numbers are summarized on page 2. Consistent with the Company's filing in
16 the pending Case No. 14-457-EL-RDR and the Commission's Order in Case No.
17 13-753-EL-RDR, M&V costs are included in the shared savings calculation.

18 Page 4 of Attachment JEZ-1 shows the lost distribution margins associated
19 with program participants that take service under Rate DS, Rate DP, and Rate TS.
20 As I previously mentioned, customers served under these three rates are not
21 subject to Rider DDR. These customers are, however, subject to lost distribution
22 margin recovery pursuant to Rider EE-PDRR.

23 Page 5 of Attachment JEZ-1 shows the expected 2015 program details and

1 results. The sheet shows the kWh and kW impacts, the shared savings
2 calculations, the program cost recovery numbers, and the total revenue
3 requirement associated with each of the residential and non-residential programs.
4 For 2015, M&V costs are included in the shared savings calculation.

5 Page 6 of Attachment JEZ-1 shows the expected 2015 prior-vintage lost
6 margins associated with program participants that take service under Rate DS,
7 Rate DP, and Rate TS. As stated earlier, customers served under these three rates
8 are not subject to Rider DDR.

9 Page 7 of Attachment JEZ-1 shows the 2014 Rider EE-PDRR revenues by
10 base rate class and month. Total revenue recovery during 2014 was \$42,121,560.

11 Page 8 of Attachment JEZ-1 shows the actual 2014 kWh usage by month
12 for Rate DS, Rate DP, and Rate TS accounts. The total 2014 kWh numbers for
13 these rates are used on page 10 to calculate the lost revenue dollars included in
14 Rider EE-PDRR associated with these three base rates.

15 Page 9 of Attachment JEZ-1 shows the forecasted kWh billing
16 determinants for the period July 2015 through June 2016. These kWh figures are
17 used in the denominators of the final rate calculations that appear on page 10.

18 Page 10 shows the Rider EE-PDRR rate calculations that true-up 2014
19 costs and revenues and recover the 2015 expected costs. The total revenues to be
20 recovered are grossed up by the Commercial Activity Tax factor of 1.0026068.
21 As I previously discussed, the Company carries forward the 2012 and as-filed
22 2013 reconciliation balances, in anticipation of an order in Case No. 14-457-EL-
23 RDR. Upon receipt of an order in Case No. 14-457-EL-RDR, the Company will

1 adjust this filing if necessary to reflect any changes to the as-filed numbers in
2 Case No. 14-457-EL-RDR.

IV. CONCLUSION

3 **Q. HOW DOES THE COMPANY PROPOSE THAT ITS TARIFFS,**
4 **INCLUDING THE PREVIOUSLY DISCUSSED RATES AND CHARGES,**
5 **BE IMPLEMENTED?**

6 A. Duke Energy Ohio proposes that the revised tariffs, including the rates and
7 charges to be issued pursuant to the Commission's Order in this case, be effective
8 for twelve months for all customers on a bills-rendered basis.

9 **Q. WERE THE ATTACHMENTS DISCUSSED ABOVE PREPARED BY YOU**
10 **OR UNDER YOUR SUPERVISION?**

11 A. Yes.

12 **Q. DOES THIS CONCLUDE YOUR TESTIMONY?**

13 A. Yes.

Duke Energy Ohio
2014 True Up
Shared Savings Achievement Tier

Achievement Level		Achievement Tiers	
2014 Achievement from Shared Savings Portfolio		Achievement of	After-Tax
+ Use of Bank, if any	144,060	Annual Target	Shared Savings
= Total Claimed Impacts	78,792	<100	0.0%
/ Mandate excluding Mercantile	222,852	>100-105	5.0%
= Achievement	192,113	>105-110	7.5%
	116%	>110-115	10.0%
		>115	13.0%
Shared Savings Rate Earned and Tax Gross-up			
After-Tax Achievement Rate Achieved	13.0%		
/ Tax Grossup Factor	63.8140%		
= Pre-Tax Achievement Rate	20.37%	rounded to nearest basis point	
Bank			
Starting Bank from Prior Year's True-up Filing	321,625		
- Use of Bank	(78,792)		
= Ending Bank	242,833		

Duke Energy Ohio
2014 True Up
Total Revenue Requirement

	Res	NonRes	Total
Shared Savings Revenue	23,934,305	19,355,832	43,290,137
Lost Revenues	0	2,108,108	2,108,108
Mercantile Self-Direct Cost Recovery		293,395	293,395
Total Revenue Requirement	23,934,305	21,757,335	45,691,640

Source: Pivot of tab Data-UI LR

Sum of 2015 Total Program	Product Code	Rate Class	Transaction Year	Metric Lost Revenue KWH Dollars	Monthly Lost Revenue kW	Monthly Lost Revenue kWh	Grand Total
Non Residential Process Equipment	NRPROC	DS	2014	1.21	-	-	1,211,904
		DP	2012	846.39	-	-	846,391,6947
		DS	2012	-	-	-	0
		DS	2012	2,900.10	-	-	2500,101974
		DS	2013	3,088.19	-	-	3088,189219
		DS	2014	8,036.92	-	-	8036,917127
		TS	2013	-	-	-	0
		DP	2011	-	-	-	0
		DS	2012	15,679.53	-	-	15679,5286
		DS	2013	54,218.76	-	-	54218,75655
		DS	2014	65,927.15	-	-	65927,14688
		DS	2011	-	-	-	0
		DS	2012	96,151.07	-	-	96151,06558
		DS	2013	170,599.56	-	-	170599,5606
		DS	2014	137,822.22	-	-	137822,2203
		TS	2012	-	-	-	0
		TS	2014	-	-	-	0
		DP	2012	261.22	-	-	261,215712
		DP	2013	352.64	-	-	352,6412112
		DS	2014	1,221.81	-	-	1221,81448
		DS	2011	-	-	-	0
		DS	2012	17,602.16	-	-	17602,1571
		DS	2013	8,542.99	-	-	8542,987416
		DS	2014	1,360.46	-	-	1360,455019
		DP	2011	-	-	-	0
		DP	2012	657.37	-	-	657,3742661
		DS	2013	7,262.45	-	-	7262,451676
		DS	2014	9,709.61	-	-	9709,610153
		DS	2011	-	-	-	0
		DS	2012	9,549.22	-	-	9549,222172
		DS	2013	25,009.31	-	-	25009,30632
		DS	2014	14,071.32	-	-	14071,32036
		TS	2012	-	-	-	0
		TS	2013	-	-	-	0
		TS	2014	-	-	-	0
		DP	2011	-	-	-	0
		DP	2012	13,395.93	-	-	13395,935
		DP	2013	22,851.15	-	-	22851,14792
		DP	2014	13,551.12	-	-	13551,12118
		DS	2011	-	-	-	0
		DS	2012	171,706.94	-	-	171706,9444
		DS	2013	354,786.41	-	-	354786,4108
		DS	2014	295,122.97	-	-	295122,9665
		TS	2011	-	-	-	0
		TS	2012	-	-	-	0
		TS	2013	-	-	-	0
		TS	2014	-	-	-	0
		DP	2011	-	-	-	0
		DP	2012	2,621.39	-	-	2621,394596
		DP	2013	16,124.61	-	-	16124,61252
		DP	2014	10,863.79	-	-	10863,7912
		DS	2011	-	-	-	0
		DS	2012	12,577.40	-	-	12577,40164
		DS	2013	52,771.95	-	-	52771,9541
		DS	2014	9,864.02	-	-	9864,021062
		TS	2011	-	-	-	0
		TS	2012	-	-	-	0
		TS	2013	-	-	-	0
		TS	2014	-	-	-	0
		DP	2011	-	-	-	0
		DP	2012	-	-	-	0
		DP	2013	-	-	-	0
		DP	2014	-	-	-	0
		DS	2011	-	-	-	0
Grand Total				1,627,109.35	-	-	1627109,347

DUKE ENERGY OHIO
RIDER EE-PDRR REVENUES

Rider Revenue Rate 2014													
Sum of	RIDER EE Column Labels												
Row Labels	1/1/2014	2/1/2014	3/1/2014	4/1/2014	5/1/2014	6/1/2014	7/1/2014	8/1/2014	9/1/2014	10/1/2014	11/1/2014	12/1/2014	Grand Total
DM	\$70,238.59	\$68,531.27	\$61,188.02	\$55,969.43	\$56,935.43	\$65,823.79	\$79,041.76	\$68,417.92	\$72,447.24	\$57,025.17	\$56,034.54	\$70,719.44	\$776,372.60
DP	\$240,997.16	\$226,875.60	\$227,996.70	\$227,408.13	\$299,808.52	\$334,465.16	\$344,332.86	\$327,972.93	\$344,292.11	\$302,901.61	\$280,565.98	\$305,183.49	\$3,462,800.25
DS	\$743,017.87	\$715,833.84	\$677,310.20	\$656,042.28	\$908,981.06	\$892,732.58	\$1,006,127.95	\$948,692.61	\$1,006,784.26	\$839,761.63	\$798,610.51	\$907,788.86	\$10,101,683.65
EH	\$16,977.33	\$17,842.99	\$14,510.39	\$10,076.59	\$8,412.40	\$722.22	\$101.32	\$13.92	-\$33.71	\$8,363.84	\$9,503.32	\$15,307.12	\$101,797.73
GF	\$3,102.47	\$3,422.93	\$3,261.54	\$3,261.54	\$3,525.18	\$3,525.09	\$3,525.18	\$3,525.18	\$3,525.18	\$2,120.72	\$3,198.78	\$1,794.88	\$37,788.67
OR	\$2,501.72	\$2,535.08	\$1,946.76	\$1,166.31	\$1,288.53	\$1,402.68	\$1,497.59	\$1,351.46	\$1,471.53	\$1,100.09	\$1,679.68	\$2,897.90	\$20,839.33
RS	\$1,932,278.88	\$1,882,077.45	\$1,567,357.09	\$1,176,305.82	\$1,499,423.51	\$1,962,805.87	\$2,335,142.44	\$2,065,452.46	\$2,286,407.48	\$1,495,896.48	\$1,601,598.51	\$2,390,186.86	\$22,194,932.85
SF	\$79.96	\$490.97	-\$444.92	\$125.89	\$153.72	\$80.56	\$80.56	\$7.40	\$7.40	\$7.40	\$7.40	\$7.40	\$603.74
TD	\$2,530.76	\$2,334.91	\$1,982.09	\$1,548.97	\$1,998.46	\$2,599.70	\$3,086.01	\$2,627.96	\$2,921.99	\$1,880.56	\$1,925.34	\$2,615.39	\$28,052.14
TS	\$374,557.59	\$344,366.16	\$384,398.93	\$364,829.38	\$453,643.03	\$521,921.94	\$516,611.39	\$501,969.21	\$532,554.12	\$448,377.28	\$412,632.13	\$540,828.30	\$5,396,689.46
Grand Total	\$3,386,282.33	\$3,264,311.20	\$2,939,506.80	\$2,496,734.34	\$3,234,169.84	\$3,786,075.59	\$4,283,547.06	\$3,920,031.05	\$4,250,377.60	\$3,157,434.78	\$3,165,756.19	\$4,237,325.64	\$42,121,560.42

DUKE ENERGY OHIO
KWH BY MONTH AND RATE FOR RATES DS, DP, AND TS
JANUARY 2014 - DECEMBER 2014

Sum of	USAGE	Column Labels	DS	TS	Grand Total
Row Labels	DP				
1/1/2014	180,657,529		556,961,722	280,777,791	1,018,397,042
2/1/2014	170,071,620		536,669,786	258,145,536	964,886,942
3/1/2014	170,912,092		507,284,453	288,155,133	966,351,678
4/1/2014	170,470,855		491,473,652	273,485,290	935,429,797
5/1/2014	179,522,896		544,312,861	273,928,517	997,764,274
6/1/2014	200,278,490		534,286,214	312,528,102	1,047,092,806
7/1/2014	206,187,358		602,289,487	309,348,135	1,117,824,980
8/1/2014	196,391,994		568,135,851	300,580,358	1,065,108,203
9/1/2014	206,162,974		602,634,855	318,894,673	1,127,692,502
10/1/2014	181,427,429		502,720,063	268,438,688	952,586,180
11/1/2014	168,003,550		478,068,851	247,085,118	893,157,519
12/1/2014	182,744,620		543,795,459	328,796,488	1,055,336,567
Grand Total	2,212,831,407		6,468,633,254	3,460,163,829	12,141,628,490

Duke Energy Ohio
Energy Efficiency and Peak Demand Response Rider
Summary of Billing Determinants

Year	July 2015 - June 2016
Projected Annual Electric Sales KWH	
Residential Rates RS, ORH, TD, RS3P, RSLI, TD-13	7,897,028,320
Non-Residential Rates DS, DP, DM, GS-FL, EH, SP, SFL-ADPL, TS, RTP, & CUR	13,177,350,195
Non-Residential Rates DS, DP, & TS	12,397,936,895

(d) M&V costs are included in the Shared Savings calculation per the order in Case No. 13-753-EL-RDR

Duke Energy Ohio
139 East Fourth Street
Cincinnati, Ohio 45202

P.U.C.O. Electric No. 19
Sheet No. 119.43
Cancels and Supersedes
Sheet No. 119.1
Page 1 of 1

**RIDER EE-PDRR
ENERGY EFFICIENCY AND PEAK DEMAND RESPONSE RECOVERY RATE**

The EE-PDRR rate shall be determined in accordance with the provisions of Rider EE-PDR, Energy Efficiency and Peak Demand Response Recovery rider, Sheet No. 120 of this Tariff.

The EE-PDRR rate to be applied to residential service customer bills beginning with the May-July 2014-2015 revenue month is \$0.003443814 per kilowatt-hour.

The EE-PDRR rate to be applied to non-residential service customer bills, other than service under Rates DS, DP, TS, and RTP, beginning with the May-July 2014-2015 revenue month for distribution service is \$0.001405-002681 per kilowatt-hour.

The EE-PDRR rate to be applied to non-residential service customer bills, for service under Rates DS, DP, TS, and RTP, beginning with the May-July 2014-2015 revenue month for distribution service is \$0.001670-002766 per kilowatt-hour.

Filed pursuant to an Order dated April 2, 2014 in Case No. 1315-753534-EL-RDR before the Public Utilities Commission of Ohio.

Issued: April 10, 2014

Effective: May 1, 2014

Issued by James P. Henning, President

Duke Energy Ohio
139 East Fourth Street
Cincinnati, Ohio 45202

P.U.C.O. Electric No. 19
Sheet No. 119.3
Cancels and Supersedes
Sheet No. 119.1
Page 1 of 1

**RIDER EE-PDRR
ENERGY EFFICIENCY AND PEAK DEMAND RESPONSE RECOVERY RATE**

The EE-PDRR rate shall be determined in accordance with the provisions of Rider EE-PDR, Energy Efficiency and Peak Demand Response Recovery rider, Sheet No. 120 of this Tariff.

The EE-PDRR rate to be applied to residential service customer bills beginning with the July 2015 revenue month is \$0.003814 per kilowatt-hour.

The EE-PDRR rate to be applied to non-residential service customer bills, other than service under Rates DS, DP, TS, and RTP, beginning with the July 2015 revenue month for distribution service is \$0.002681 per kilowatt-hour.

The EE-PDRR rate to be applied to non-residential service customer bills, for service under Rates DS, DP, TS, and RTP, beginning with the July 2015 revenue month for distribution service is \$0.002766 per kilowatt-hour.

Filed pursuant to an Order dated April 2, 2014 in Case No. 15-534-EL-RDR before the Public Utilities Commission of Ohio.

Issued:

Effective:

Issued by James P. Henning, President

BEFORE

THE PUBLIC UTILITIES COMMISSION OF OHIO

In the Matter of the Application of Duke)
Energy Ohio, Inc., for Recovery of)
Program Costs, Lost Distribution Revenue) Case No. 15-534-EL-RDR
and Performance Incentives Related to its)
Energy Efficiency and Demand Response)
Programs.

DIRECT TESTIMONY OF

ROSHENA M. HAM

ON BEHALF OF

DUKE ENERGY OHIO, INC.

March 30, 2015

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ATTACHMENTS:

RMH-1	Appliance Recycling Process and Impact Evaluation May 15, 2014
RHM-2	Residential Smart \$aver HVAC Process Evaluation May 16, 2014
RMH-3	Power Manager 2013 Impact Evaluation May 30, 2014
RMH-4	Power Manager 2013 Process Evaluation June 16, 2014
RMH-5	Power Share Process and Impact Evaluation July 16, 2014

I. INTRODUCTION

1 **Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.**

2 **A.**My name is Roshena M. Ham and my business address is 550 South Tryon Street,
3 Charlotte, North Carolina.

4 **Q. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?**

5 **A.**I am employed as Manager, Measurement and Verification for Duke Energy
6 Carolinas, LLC (“Duke Energy Carolinas” or the “Company”). In this role, I
7 provide Evaluation, Measurement and Verification (“EM&V”) services for Duke
8 Energy affiliates, including Duke Energy Ohio.

9 **Q. PLEASE SUMMARIZE YOUR EDUCATION AND PROFESSIONAL**
10 **EXPERIENCE.**

11 **A.**I have a Bachelor’s degree in engineering from Vanderbilt University and a
12 Masters of Business Administration from Georgetown University.
13 From 1999-2001, I was in the management associate rotation program at Enron.
14 From 2001-2004, I was co-founder and partner of Liberty Power Corporation, a
15 retail electric provider in deregulated markets. From 2004-2008, I was a
16 consultant on various energy projects including energy efficiency, renewable
17 energy and energy procurement, and also during that time I taught business
18 courses at Central Piedmont Community College. From 2006-2009, I worked for
19 Duke University Nicholas School of the Environment as the Energy and
20 Environment program manager. In 2009, I began working for Duke Energy as an

1 energy efficiency program manager, managing the implementation of Non-
2 Residential Smart Saver Custom Incentives. In 2013, I assumed my current role
3 as Manager, Measurement and Verification.

4 **Q. PLEASE DESCRIBE YOUR DUTIES AS MANAGER, MEASUREMENT**
5 **AND VERIFICATION.**

6 **A.** As Manager, Measurement and Verification, I have responsibilities for a variety
7 of analytical functions in support of product development and operations,
8 including managing impact and process evaluation studies, market research data
9 collection and analysis, marketing design testing, energy load analysis, cost-
10 effectiveness analysis, and product design research. In this role, I provide EM&V
11 services for Duke Energy affiliates, including Duke Energy Ohio.

12 **Q. HAVE YOU PREVIOUSLY TESTIFIED BEFORE THE PUBLIC**
13 **UTILITIES COMMISSION OF OHIO?**

14 **A.** Yes, I submitted testimony in support of Duke Energy Ohio's application for
15 recovery of program costs, lost distribution revenue and performance incentives
16 related to its Energy Efficiency ("EE") and Demand Response ("DR") programs,
17 Case No. 14-457-EL-RDR.

18 **Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS**
19 **PROCEEDING?**

20 **A.** My testimony supports the Duke Energy Ohio's Application to update its Energy
21 Efficiency cost recovery rider, EE-PDRR. In particular, my testimony: (1)
22 provides an overview of the programs on which Evaluation, Measurement and
23 Verification (EM&V) activities were performed or for which EM&V results were

1 applied in 2013, (2) provides the current findings from the Company's EM&V
2 work, and (3) demonstrates how the results from the EM&V process will be used
3 in the true-up.

II. OVERVIEW OF EVALUATION, MEASUREMENT, AND VERIFICATION

4 **Q. WHAT PROGRAMS RECEIVED EVALUATION, MEASUREMENT &**
5 **VERIFICATION THAT APPLY TO THIS TRUE-UP?**

6 **A.** RMH Attachments 1 through 5 provide the detailed, completed EM&V reports
7 that apply to this true-up:

RMH Attachment	Program	Evaluation Type	Report Date	Effective Date
1	Appliance Recycling	Process & Impact	5/15/2014	6/1/2014
2	Residential Smart \$aver®: HVAC	Process	5/16/2014	N/A
3	Power Manager®	Impact	5/30/2014	5/1/2013 ¹
4	Power Manager®	Process	6/16/2014	N/A
5	PowerShare®	Impact	7/16/2014	6/1/2013

8 Additionally, the Company provided the reports presented here as Attachments 1 -
9 5 as appendices in its annual energy efficiency status report, Case No. 15-454-EL-
10 EEC, filed on March 15, 2015.

11 **Q. HAVE THESE REPORTS BEEN REVIEWED BY THE PUBLIC**
12 **UTILITIES COMMISSION OF OHIO'S INDEPENDENT THIRD-PARTY**
13 **EVALUATOR?**

¹ May 1 is the beginning of the program year for Power Manager® and June 1 is the beginning of program year for PowerShare®.

1 **A.** The Public Utilities Commission of Ohio's independent third-party evaluator has
2 access to the reports filed in the Company's March 15, 2015 filing, and now has
3 access to the reports filed herein as RMH Attachments 1 through 5.

4 **Q. HOW WERE THE EVALUATION, MEASUREMENT, AND**
5 **VERIFICATION RESULTS UTILIZED IN DEVELOPING ESTIMATES**
6 **OR TRUE-UPS FOR THE EE RIDER?**

7 **A.** The original projection of program cost-effectiveness utilized projected numbers
8 for participants in the programs and estimates of the load impacts per participant,
9 derived either from initial estimates or previous EM&V results. The Company has
10 measured actual participation and uses this actual participation information as the
11 basis for annual true-ups of estimated incentives for the rider by multiplying the
12 actual participation by the current estimates of load impact per participant, which
13 reflect all applied EM&V results.
14 For those programs on which EM&V has been conducted and finalized, the
15 evaluated estimates of energy efficiency impacts and net-to-gross ratio are applied
16 prospectively to adjust subsequent impact assumptions until superseded by new
17 EM&V results, if any. The evaluated impacts identified in the EM&V report for a
18 program are applied to the rider in the month following the completion of the
19 EM&V report. These results will also be used to estimate future target
20 achievement levels for development of estimated incentives and in future cost-
21 effectiveness evaluations².

² For demand response programs, the contracted amounts of kW reduction capability from participants are considered to be components of actual participation.

Participant Survey Results

This survey focused on customers who, according to program tracking records, recycled a refrigerator and/or freezer through the Appliance Recycling program. Surveys with a total of 131 participants who recycled 77 refrigerators and 67 freezers (including thirteen participants who recycled multiple units) were completed via telephone by TecMarket Works' staff. The distribution of units recycled by survey respondents for each state and overall is shown in Table 19.

Table 19. Units Recycled by Surveyed Customers

Units	All survey respondents (N=131)
Recycled one refrigerator	48.9%
Recycled one freezer	41.2%
Recycled two refrigerators	1.5%
Recycled two freezers	1.5%
Recycled one refrigerator and one freezer	6.9%

Characteristics of Recycled Units: Refrigerators

Customers who recycled refrigerators were asked whether the unit(s) they recycled through the program were their primary (main) or secondary (spare) units. Three-quarters of the refrigerators recycled by Ohio customers were secondary or spare refrigerators, as seen in Table 20: Out of 77 refrigerators recycled by survey respondents, 19 (24.7% of 77) were main units and 58 (75.3% of 94) were secondary units. There is no equivalent question about freezers, since all freezers are considered secondary units to the household refrigerator (i.e., almost every home has a refrigerator, and some have a stand-alone freezer in addition to the refrigerator, but it is assumed that no one has a freezer without a refrigerator).

Table 20. Use of Refrigerators Recycled by the Program

Units	All respondents who recycled refrigerators (N=75)		Number of units recycled	
	N	%	Main	Secondary
Main refrigerator (kitchen)	18	27.2%	18	0
Spare/secondary refrigerator (not in kitchen)	55	70.7%	0	55
Recycled primary and secondary refrigerator	1	1.1%	1	1
Recycled two secondary refrigerators	1	1.1%	0	2
Totals:			19	58

As seen in Table 21, nearly half (48.3% or 28 out of 58) of the secondary refrigerators recycled by survey respondents were kept in the basement, while another 41.4% (24 out of 58) were kept in garages.

Recommendations

- Duke Energy may be able to increase its collections by exploring a retailer-utility partnership for recycling refrigerators and freezers at the time of new unit delivery, such as its new relationship with participating Sears stores in the greater Indianapolis area that launched in the fourth quarter of 2013. If the effort is successful there, it may be advantageous to implement a similar arrangement in Duke Energy's Ohio territory. Details of such a partnership would necessarily need to address the potential for reducing Duke Energy's net to gross ratio through the collection of non-working unit.

In theory, the potential for such an arrangement exists among all new appliance dealers who collect older units, with the greatest opportunity lying in those companies that sell the largest number of units. Retailers who are already participating in the EPA's RAD program, such as Home Depot, and Best Buy may be ready partners for joint promotions and coordinated collections. While midsize companies that collect older units as a service to their customers may also represent possible partners. The program may be a more challenging "sell" at firms, such as Lowes, Menards, HH Gregg and others, which generate revenue from the used units that they collect.

- Duke Energy may also be able to increase its collection numbers by new appliance dealers with point of sale promotion materials to encourage them to mention the program to customers shopping for new units.
- Also consider accepting units from and paying incentives to used appliance dealers who are willing to recycle working units via the program instead of reselling them.
- The market for used appliances is influenced by a wide number of factors and continues to change with time. Thus it may be helpful to plan a follow up study of the marketplace within a few years in order to understand and appreciate how those changes are influencing customer expectations, willingness to participate, and satisfaction with the program.

TecMarket Works

- *We like them working, but mostly buy nonworking units and fix them up for resale.*
- *We buy working and nonworking units and fix whatever we need to.*
- *We sell units that are 10 years and newer. Prefer white working top mount units, but we take and fix all types.*
- *We buy, fix, and sell what we can get.*

While the actual repairs on any given unit naturally depend upon its condition, the steps that dealers take to prepare used units for sale are fairly consistent: They assess the working and ascetic condition of the unit, make necessary mechanical repairs, clean, disinfect, and occasionally kill any insects that might be in, on, or under the unit.

As business people, the dealers expressed consistent confidence that if they placed a unit on the sales floor then they could sell it. The primary reason for not selling units had to do with the cost of repairs prior to placing it up for sale. If the units could not be sold, dealers opted for one of three paths. The first is to save the unit for spare parts. Selection of this option tended to depend upon the dealer business model and upon the amount of warehouse space available for storing nonworking units. The second option is to sell the non-functioning unit for scrap metal. Dealers reported that nonworking units typically brought them \$10-15 dollars at current prices. The third option is to give the nonworking unit away, typically to scrap collectors willing to pick up the unit. Only one used appliance dealer we spoke with indicated that he recycled non-working units.

Among the new appliance dealers we spoke with all offered to collect old refrigerators and freezers when dropping off new appliances at customer homes. When asked what they did with the units that they'd collected, three returned working units to the marketplace, one sold the units for scrap metal, and three said the units were dismantled and recycled.

Evaluation and Recommendations

Evaluation

While new and used appliance dealers were reluctant to discuss the quantitative aspects of their businesses, they did offer well-informed insights into the state of the market for used refrigerators and freezers and varied opinions on the affect that the Duke Energy program was having on their businesses.

Drawing upon their collective feedback and supplemental research, TecMarket Works concludes that market volume for used refrigerators has been declining for a number of years due to a number of factors including the practices of national retailers, federal programs, and scrap metal prices. Having collected 2,608 used units in Ohio since starting in 2012, the Duke Energy program is helping to accelerate changes set in place by these other market forces.

Taken together, these myriad factors have served to greatly cut supplies of used refrigerators and freezers to the point that prices for used units and replacement parts are rising and customers who desire to purchase used units are being turned away. Despite this, the program appears to be having little or no noticeable effect on new unit sales.

With this in mind we suggest the following ideas to help increase program enrollments.

TecMarket Works

- *Not much effect. Other factors are more influential. Mostly it's an issue with the big suppliers changing their policies. Now if you'd have a contract with a store like HH Gregg or Lowes you can't get any units, but that's not because of Duke.*
- *No effect.*
- *No. The incentive is too low to influence our customers.*
- *It's a small positive for new sales.*

These responses ran in close parallel with their observations about ARP's impact on the supply of used units. Those dealers who purchased from individuals noticed a scarcity of available units, while those who obtained theirs from other sources were less affected. Their comments included:

- *We only have a fraction of units that we used to get.*
- *There are fewer out there and more dealers are looking for them.*
- *You just can't get used units anymore.*
- *There are fewer units all the time.*
- *There are probably fewer used units, but mostly our sister store deals with that. They prefer newer ones that people are not likely to get rid of anyway.*
- *No, our supply is steady. I can get what I want. People call me 5-7 times a day wanting to sell (all types of) appliances. Plus I can buy on Craigslist. Plus I can buy from wholesalers.*
- *We have a contract with 15 Lowes stores so we get all the used appliances we need.*

Dealers of new appliances agreed the program was having little influence on new unit sales.

The used dealers we spoke with felt demand for used refrigerators and freezers remains steady or is rising. Only one dealer felt there were enough used units available to meet demand. The others agreed they could sell more used units if they were available. Replies are shown below.

- *Demand is steady. (4)*
- *Demand is high. I could sell many times more.*
- *Demand might be up slightly, but that is probably due to the economy and not to the program.*
- *Demand is the same.*
- *Poor people still need refrigerators. That's not going to change.*

Appliance Dealer Business Practices

Among the appliance dealers who sell used units, all were willing to accept units in a variety of conditions, ranging from needing minor hardware fixes to more involved electrical and mechanical repairs. As may be expected in any business, the dealers must weigh the unit's purchase price and eventual sales price against the cost of used replacement parts and the amount of labor involved. While that arithmetic varies, virtually all dealers agreed that it was not economical to repair failed compressors or leaking refrigerant systems. Actual comments about the condition of units that they'll accept are shown below.

- *We buy working units mostly. If the repair is minor we might see it as good investment.*

find fewer and fewer units available and thus consider Duke Energy's program to be having more of an effect on their business. Yet even among those dealers who buy predominantly from individuals, the impacts attributed to the program appear to vary based upon whether the dealers sell older, inexpensive units or more costly units that are only a few years old. The higher the prices these dealers pay for the units and sell them for, the less effect Duke Energy's ARP appears to have on their businesses. Conversely, smaller businesses are being adversely affected by a variety of market factors, of which the Duke Energy program is one. These businesses find themselves facing a need for additional capital, a change in business model, or the prospect of going out of business. However, because customer demand for less-expensive used units remains high, the net effect appears to be that as the market continues to shift, fewer companies will be selling used units in the future.

State Specific Dealer Comments

Among the 17 appliance dealers that we spoke with in Ohio, more than half (53%) of them sold only used units. Among those that sold new units, the percentage of new unit sales to used unit sales varied from an unspecified percentage (such as the occasional new scratch and dent that was obtained inexpensively) to 100% new units (no used appliance sales at all).

Effect on Dealer Businesses

Among the appliance dealers, all were aware of the Duke Energy program. Their opinions about the program ranged from those who felt positively about its environmental effects to those who saw it as detrimental to their businesses. Their verbatim comments are shown below.

- *It's good for people buying new.*
- *It's fine. (2)*
- *No opinion.*
- *It might be good for environment but it's bad for businesses and people who can't buy new.*
- *It sounds like cash for clunkers.*
- *It hurts us.*
- *They're screwing us.*

When it came to the program's impact on their businesses dealer opinions were likewise split between those who felt that the program had little influence on their businesses to those who felt acute shortages of used units available for their resale. Among the dealers, a similar number of respondents felt the Duke Energy program was having a negative effect on their businesses as those who felt the program's effect was negligible. One retailer felt it helped their new unit sales. Their verbatim responses include:

- *They're eating our lunch.*
- *Yes, a big effect.*
- *Fewer used units are available to us.*
- *Anything that takes things out of the market hurts us.*
- *It might have a small effect.*

I was competing against teams of a half a dozen guys from the same store. I managed to mark just a few units while they grabbed the rest.”

- **Buy from appliance auctions.** These events are held on a periodic basis and offer dealers the opportunity to inspect and bid on a wide array of units, specifically selecting what they want, such as a stainless steel French door unit, or an Amana side-by-side with water dispenser. Some auctions provide a seven day warranty on their units to give dealers time to inspect them thoroughly upon returning to their places of business. However, with fewer used units available in general, auctions are becoming somewhat less common.
- **Buy by the truckload.** Many used appliance dealers reported receiving sales calls from “guys out of state” offering to sell them a “grab bag truckload” of working and nonworking units. One dealer described the arrangement: “In the last three loads I paid \$9,500, \$10,800, and \$12,000 per truckload. A few in each load worked. About two thirds were repairable in the first and only about half in the other loads. The rest I use for parts or sell for scrap metal.” While another dealer complained, “Their prices keep going up and my profits are going down as they try to pass off more of their junk on unsuspecting dealers.” Reliable quality or not, this option is only available to businesses with sufficient capital and the resources to purchase and repair nonworking units.
- **Obtain more used units from individuals.** This was the most common strategy used among dealers we spoke with. It had three variations: charging people to pick up units, accepting or collecting units at no charge, and paying people for their working or nonworking units. Increasingly, people are recognizing the value of their used appliances and are charging accordingly. Craigslist.org was the most frequently cited source of individual transactions.
- **Shift revenue streams to focus less on sales of used units and more on repair services.** This was another common strategy, particularly among those dealers who indicated that their supplies of used units had been reduced by 80 percent or more. However, this option was not without its challenges since the price of used parts has also risen as fewer used units from which to draw upon have been available.
- **Switch to sales of new units.** A number of dealers indicated that they sold both new and used units. For them, shifting sales attention was fairly straightforward. However, this option appeared to be unattractive or unviable to the majority of dealers who only sold used units.
- **Buy from other used appliance dealers that are going out of business.** One business’s demise is another’s opportunity. More than one dealer we spoke with said he looked for others dealers who wanted to liquidate their stocks.

How Dealer Business Models Influence Perceived Effect of the Program

The choice of business model seemed to affect the level of impact that the changing market is having upon their businesses, and hence the perceived effect of Duke Energy’s program as well. Those dealers who have supply contracts with Lowes or HH Gregg, with wholesalers who buy from these larger chains, and those dealers who have sufficient capital to buy in large quantities, generally continue to do well. While dealers who depend upon single purchases from individuals

merchants like Best Buy and Costco. A smaller percentage are sold by regional companies like Menards and HH Gregg or by independent retailers who often operate a single location.⁷

Our market research revealed no national firms that are selling *used* refrigerators in retail stores. While these high volume national retailers do not directly sell used appliances, they nonetheless influence the market for used refrigerators and freezers because their delivery drivers (employees or subcontractors) frequently collect used units from customers at the time they drop off new units. In previous years, a sizeable number of these used units were collected and resold at wholesale prices to local used appliance dealers. This practice provided a steady supply to local dealers in order meet market demands for less expensive units.

In recent years the supply of used units for resale in local markets has diminished as the largest market actors have adopted new policies. Some national firms, including Sears, Best Buy, and Home Depot, have joined the U.S. Environmental Protection Agency's Responsible Appliance Disposal (RAD) program, and thus follow specific guidelines for the dismantling and recycling of all units they collect. Another national firm, Lowes, has taken a more measured approach, recycling some units, donating some units to charity groups for individual resale, and bundling others for resale to U.S. wholesalers or in foreign markets. Collectively these individual corporate actions have cut the number of used units available for resale in local markets by between 50 to 85 percent, according to estimates among the smaller dealers that we spoke with.

Duke Energy's collection of 2,608 units has been a contributing factor to this decline. However, several appliance dealers we spoke with indicated that they had noticed a reduction in supply prior to 2009. This decline was accelerated in 2010 by the federally funded Cash for Clunkers appliance rebate program. Since that time, virtually all parties we spoke with agreed that supplies of used refrigerators and freezers have continually diminished.

How Local Dealers Obtain Used Appliances for Resale

As ready supplies of secondhand refrigerators and freezers have dwindled, used appliance dealers have adopted different business strategies for obtaining and reselling units:

- **Continue to buy used units from retailers who'll sell them, and then mark up the units for resale.** This option appeared to be available via Menards chain stores and individual new appliance stores that also sell used units directly to retail customers.
- **Buy from wholesalers.** Lowes and HH Gregg continue to sell the used units that they collect when they drop off new units at customers' homes. But these are only sold to a select few wholesalers. Those wholesalers in turn sell to smaller dealers. Dealers in Indiana, Kentucky, and Ohio spoke of one such wholesaler near Indianapolis who opens its doors twice per month to dealers from many states, who drive large trucks to its warehouse and literally race down the aisles when the doors open, marking units they want. "I went one time," complained a small dealer from Ohio, "but I was by myself and

⁷ US Department of Energy, New Opportunities Multiply Savings: Energy Star Refrigerator Market Profile, Washington, DC: US Department of Energy, December 2009., source: http://apps1.eere.energy.gov/states/pdfs/ref_market_profile.pdf

Appliance Dealer Interview Results

This section presents the results from interviews with new and used appliance dealers in Ohio. These instruments can be found in Appendix C: Used Appliance Dealer Survey Instrument and Appendix D: New Appliance Dealer Survey Instrument.

Survey Overview

By removing 2,608 refrigerators and freezers from the market in Ohio during the first ten months since program inception, Duke Energy's Appliance Recycling Program is unquestionably reducing the number of used units that are connected to its power grid. However, the program represents only one of a number of factors that are affecting the number of used units for sale in the marketplace. To better understand the market in which the program is operating, TecMarket Works sought to interview dealers of new and used refrigerators and freezers about the state of the market, the ARP program, and its effect on their businesses. The objective was to contact as wide a survey sample population as possible, including: national or regional retail chains, companies with multiple locations, small dealers operating from storefronts and repair shops, and charitable groups that sell donated items.

Between August 2 and 23, 2013, TecMarket Works completed telephone interviews with 56 owners or representatives from new and used appliance dealers selling to customers within Duke Energy's service territories in North Carolina, South Carolina, Kentucky, Ohio, and Indiana. Of those, 17 operated in Ohio. Conversations ranged from less than five minutes to more than 30 minutes. Interview guides are shown in Appendix C: Used Appliance Dealer Survey Instrument and Appendix D: New Appliance Dealer Survey Instrument.

The sample list for the survey was collected via a geographic-area-specific internet search using Google, Craigslist, Yelp, YellowPages.com, CitySearch.com and other web resources. Using readily identifiable contact information provided on the internet, we contacted approximately 10-15 new and used dealers operating in each of Duke Energy's service territories. We also contacted representatives from national and regional firms operating in multiple states, such as Home Depot, Lowes, Sears, Best Buy, Menards, and HH Gregg.

On the whole, the appliance dealers that we spoke were reluctant to provide numbers regarding their businesses, although they were more forthcoming regarding operations and their perceptions of the supply and demand for used appliances. As a result, the survey sample obtained did not lend itself to reliable quantitative analysis. The interviews do, however, provide an insightful qualitative look at the state of the market from their perspective. Overall remarks from these interviews are combined below to render a big picture view, while state-specific comments are provided to increase understanding about each individual territory. Nonetheless, it is important for the reader to note the relatively small sample sizes for this portion of the study.

How National Market Actors Effect Local Used Refrigerator Markets

Across the United States, the majority of *new* refrigerators are sold via national department stores like Sears, home improvement centers such as Home Depot and Lowes, and mass

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increase the energy savings of the program, while providing landlords with cash offsets to replace inefficient refrigerators, making their rental units more attractive to tenants.

- To better reach its goals the program team may also explore expanding the regulatory filing to extend eligibility beyond residential customers to other types of buildings, including schools, offices, and industrial locations. Such an expansion would of course need to comply with cost-effectiveness tests and regulatory filing requirements.
- Duke Energy may be able to generate leads for the program by adding a question about secondary refrigerators and freezers to future customer surveys, such as the Home Energy House Call survey.
- Consider taking advantage of Duke Energy's internal customer satisfaction and net promoter scores to develop an initiative that encourages program participants to refer their families and friends.
- Arranging joint promotions with municipal and private recycling firms to promote environmentally appropriate recycling may be a way to increase awareness at fairly low cost.

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A portion of this may be ascribed to higher than desired cancellation rates of 19.3% since each appointment cancellation diminishes the program's marketing and scheduling effectiveness. However, given that some cancellations are rescheduled this accounts for a few hundred collections at most, and thus does not appear to be a primary driver.

A successful program operates optimally when it targets the most appropriate customers with a carefully designed marketing message and a compelling offer. Since the program's targeting and marketing efforts are operating well, the most apparent area for change seems to be the financial incentive offered for each unit collected. At \$30 per unit, the offer does not appear to be high enough to compel customers to relinquish their still-working refrigerators and freezers. Therefore, the program may need to consider raising the incentive level.

TecMarket Works commends Duke Energy's on its testing of different incentive levels with its Carolina System customers in September of 2013 that demonstrated that incentives of \$40 and \$50 result in greater participation rates. We encourage the utility and JACO to carefully consider the results of those tests and their applicability in its Ohio service territory in order to weigh the merits of increasing the incentive level versus investing additional program dollars in improved targeting and increased marketing spend per unit.

These steps and the suggestions noted below may help to increase program collections. However, we also ask Duke Energy to reconsider its original harvest projections in light of the program's performance during the initial months of operation. It may be that current performance appears to be underperforming because the initial goals were overly optimistic or because they were based on outdated study projections by the time of the launch of the program.

With these thoughts in mind we offer the following recommendations for improvement.

Recommendations

- It seems logically sound that cancellation rates will diminish with a greater number of appointment time slots and with shorter time intervals between customer calls and pick up dates. However, that will remain an indirect effect until more customers begin making appointments. Therefore, Duke Energy and JACO should also take multiple actions to increase program enrollments and direct steps to reduce cancellations wherever possible.
- One means of decreasing missed appointments could be to collect email addresses from customers when the appointment is scheduled and then send email reminders in addition to the reminder phone calls.
- Raising incentive amounts from \$30 to \$40 or \$50 per unit will likely increase participation and help the program to reach its targeted goals. This should be studied and compared with the effectiveness of increasing marketing spend per unit to make a wider audience aware of the program and its benefits.
- Because landlords represent the largest group of appliance purchasers, consider developing an aspect of the program that targets property management companies to encourage their participation either with collections of individual refrigerators that require replacement or via large scale replacements at one time. Such a move could

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work with.” Furthermore, he indicated that JACO was meeting its service level agreements, despite appliance collection levels being lower than targeted.

For its part, JACO and its subcontractors described their Duke Energy counterparts as “able to see the big picture and handle details,” “willing to try out and fund promising ideas” and even “they’re my golden client.” Of Duke Energy’s product manager in particular they stated, “He’s so dedicated that he even works on resolving issues when he’s on his day off.”

Program Changes Interviewees Would Like to See

We asked those we interviewed to suggest the changes that they would like to see made to the program. While managers are generally satisfied with the program, they are continually looking for opportunities for improvement. Their suggestions are noted below.

Based upon their experiences with many utilities around the nation, all parties that we spoke with from JACO and RSE expressed that incentive levels will need to be increased in order to meet projected goals. Duke Energy representatives also felt this would probably be necessary, but waited on the outcome of the incentive level testing in the Carolina System prior to making that determination.

While no challenges or issues with refrigerator collection were reported, two people suggested that customer expectations may be better managed by adding language about collection trucks being limited by accessibility of their properties.

Although no problems with data tracking or reporting were identified, a methodological approach was causing cancellation metrics to appear worse than they actually were because customers who cancelled their initial appointment were assigned a new ATO number when they rescheduled, thus making the numbers appear to be referring to different customers rather than the same person. A correction was underway at the time of our interviews.

Evaluation and Recommendations**Evaluation**

Overall Duke Energy’s Appliance Recycling Program is a well-conceived and well-managed energy efficiency program. Its marketing implementation successfully combines Duke Energy customer communications with paid advertising and creative public relations events that are effectively generating customer awareness and sign-ups for the program. Aside from a temporary, minor slip in call center answering times, phone-based customer support and scheduling are operating smoothly. Likewise, unit collections and dismantling operations are also functioning well with no reported issues. Moreover, the program managers and implementation teams communicate regularly and collaborate effectively as they work toward shared goals.

Yet despite this laudable performance, the program lags in its projected pick up rates, bringing in 2,608 units in Ohio toward a targeted amount of 4,934 units. This represents 53% of the program’s combined goals for 2012 and 2013.

and what needed improvement. A similar call-back process remains available if the mail-in surveys or other quality assurance measures reveal a volume of complaints or otherwise draw scrutiny.

Data Tracking and Reporting

As noted in the section titled "Marketing" above, the team uses unique URLs and "how heard questions" to track marketing effectiveness. These metrics are then compared with the numbers of appointments and units collected to provide an overall picture of the program's effectiveness.

Equally important to Duke Energy is the customer's participation in the program. To manage this, JACO tracks all interactions from the date customers first make contact to the day their unit is collected to the day they cash their incentive payment.

Appliance tracking is similarly robust. Once an appointment is scheduled, JACO consistently tracks all activities based upon the associated unique ATO number, so it can report on the unit's status from before it comes into the company's possession until it has been fully dismantled into its constituent parts.

For reporting purposes, JACO's call handling metrics, scheduled appointments, cancellations, and collections are all automatically uploaded to an internet accessible database that can be accessed by Duke Energy managers at any time. This customer experience dashboard provides a multitude of ways for viewing data and reporting metrics, ranging from call handling times and available dates for appointments to reasons for cancellations and uncashed incentive payments.

No problems with data tracking or reporting were identified. However, Duke Energy and JACO indicated their respective IT departments had experienced challenges in aligning their computer systems to ensure fully functional data transfer and displays. Such challenges are to be expected during program start up, and while they caused some delays, they did not result in concerns regarding data integrity.

At the time of this report, the IT teams were focused on improving the reporting system to resolve an issue that was causing cancellation metrics to appear worse than they actually were. Under the original system, each new customer appointment resulted in a unique ATO number. While appropriate for tracking the appliance, this meant that if a customer called to reschedule, then a new ATO would be issued, which in turn made reschedules appear as cancellations if tracked by the ATO number. A system correction was underway at the time of our interviews.

Management Coordination and Communication

Each week the Duke Energy product manager, JACO's program manager, and RSE's account manager meet to discuss marketing performance, operations, strategy, and tactical changes. Specialists and other parties from each firm participate as appropriate. All parties consider their business relationships to be strong and positive with effective communication and a shared sense of teamwork toward a common set of goals.

Duke Energy expressed appreciation for the turnkey nature of JACO's programs. The product manager characterized JACO as "highly knowledgeable, open, fair, professional, and easy to

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offer being made (consisting of the incentive amount and other attributes, such as timing, free collection, etc.). As discussed in the earlier sections above, the program management team is currently targeting those customer segments most likely to be interested in recycling their appliances, and the team has implemented a coordinated, multi-pronged marketing effort that is demonstrably generating customer awareness. While these two factors can and should be enhanced, increased program enrollments will also depend upon the amount of the financial incentive. Therefore, as the team considers how to best achieve its annual harvest goals, they may do well to consider the relative cost effectiveness of increasing the marketing spend per unit in order to reach more customers and improve awareness versus increasing the incentive paid per unit to make the offer more attractive to people who are aware of the program.

To assess the effectiveness of increased incentive levels, Duke Energy conducted a controlled test of 240,000 North Carolina and South Carolina customers, who were to be sorted into three groups of 80,000 customers each. The first group received a \$50 incentive. The second group received a \$40 incentive; while the third group continued to receive the offer for a \$30 incentive and thus serve as the control. All other aspects of the program remained consistent for all three groups. The program test applied to all collections for the month of September 2013. Analysis of the results demonstrated that compared to the \$30 incentive control group which had 377 participants, the \$40 incentive group drew an additional 612 participants with an associated 162% lift in response. The \$50 incentive group performed even stronger with 867 more participants than the control group and an associated 230% lift compared to response rates in the control group. Such results demonstrate that with all other aspects of the program remaining consistent, higher incentive levels can lead to greater participation rates and therefore increased energy savings associated with the additional units collected. With this in mind, TecMarket Works encourages Duke Energy to consider the applicability of these results in its Ohio territory and to take steps to adjust incentive levels there if deemed cost-effective and appropriate. In these decisions, JACO's experience with similar utility programs may provide guidance as well.

Quality Assurance

As discussed previously in this evaluation, the call center representatives and collection crews are subject to random and scheduled reviews for quality assurance. JACO managers provide similar inspections at their recycling facilities to ensure protocols are followed, to assess tracking of captured materials, and to confirm metrics for compliance with all regulations.

Because Duke Energy places considerable stock in the importance of customer experience, JACO collection crews provide each home they visit with a mail-in, 10-question survey to ascertain customer satisfaction. While response rates are low, feedback is positive. According to customer satisfaction figures collected by Duke Energy, 88% of customers rate their overall program satisfaction as equal to or greater than 8 on a scale of 1 to 10. Likewise, the program enjoys a net promoter score of 91 out of 100, with 93% of participants rating the program as 9 or 10, meaning that they would recommend it to their friends and family. Net promoter scores above 50 are considered strong.

When the program was first starting, Duke Energy also conducted a call-back survey with the first 10 percent of customers to join the program. After these customers finished the program, JACO made outbound phone calls to ask them to provide feedback about what was working well

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When all steps in the dismantling process have been completed, the warehouse technician confirms that the unit has been recycled on a pocket PC. This signals JACO and Duke Energy that all requirements have been met and the incentive check can be processed for the unit associated with that specific ATO number.

Incentive Payments

The financial incentive levels for the program are currently set at \$30 per unit for customers in Ohio. JACO is contractually required to send payments to customers within four to six weeks. This is the timeframe mentioned in program's promotional materials, but, in practice, most checks are mailed within two to four weeks. JACO handles payment processing and includes incentive documentation in its monthly billing to Duke Energy, whose product manager reviews the monthly data, reconciles any discrepancies with JACO, and approves the invoice.

No challenges or issues were reported with incentive processing or accounting. However, all parties that we talked to indicated that the incentive amount may need to be raised in order to help the program meet its collection goals. At \$30 per unit, Duke Energy's incentive amount is at the low end of the "typical" financial range; the higher end being \$50 per unit.

TecMarket Works considers introducing the program with a \$30 incentive level to be a fiscally prudent step because it captures "the low hanging fruit" of willing customers and establishes a baseline for customer response levels. Moreover, as the correlation between response rates and marketing effectiveness is clarified, it becomes possible to identify market barriers to participation. However, the lower incentive amount also limits the number of people willing to part with their working refrigerators and freezers.

According to those we interviewed, the two most prevalent barriers to increasing customer participation appear to be financial. The first involves the cost of a customer's time. If a prospective customer is earning \$10 per hour and the program requires them to miss four hours of work in order to be home to recycle the unit, then a \$30 incentive will not cover the cost of their time. Thus even if they want to recycle the unit, it may not make financial sense to do so.

The second barrier involves a psychological hurdle arising because some prospective customers cannot or do not distinguish between replacement costs and operating costs. Even if they can afford to stay home to recycle the unit, they may be more likely to hold onto it because they reason that it costs them less to keep it than to buy a replacement should they decide they want one; this despite the fact that the program marketing copy tells them that getting rid of the unit could save them up to \$150 per year.

For both barriers, the larger the financial incentive, the more enticing the offer will be.

Another advantage of increasing the incentive is the potential reduction of freeridership, since the larger payments shift the ratio away from those who would have recycled their units anyway toward those customers now participating because they will receive the compensation.

As Duke Energy and JACO are aware, successful program participation levels are reached when three factors come into alignment: appropriate customers, effective marketing, and a desirable

Crew Training and Quality Assurance

Because program participation in the Appliance Recycling Program waxes with warm weather and wanes with cooler weather, a greater number of employees are needed during the busy season. JACO adjusts its staffing levels accordingly. Its drivers and navigators must pass background and motor vehicle record checks. New staffers receive several days of training with a manager to learn the specific tasks involved and to competently explain the particulars of the Duke Energy program when interacting with customers. New employees are then paired with a more experienced partner to ensure that protocols are clear and followed consistently. Senior JACO managers hold weekly webinars with the location managers for each region to discuss operations, policies, and safety practices. The location managers, in turn, meet with their crews to pass along the information.

As one of the nation's leading appliance recycling firms, JACO holds its collection crews to high standards. To confirm that quality is maintained, every few weeks the location managers secretly shadow their crews, driving behind them to ensure that they are following traffic laws, parking appropriately, wearing designated gear and ID badges, and walking to the door together. After three or four customers, the manager retraces the route to speak with customers about their experiences with the crew. Employees are scored and managers discuss any necessary improvements. Duke Energy maintains the option to participate in the quality control efforts, but has not felt the need to engage in such field inspections.

Dismantling and Recycling

All dismantling and recycling activities are specific to JACO and not the responsibility of Duke Energy. Nonetheless they are briefly documented here to demonstrate Duke Energy's compliance with its voluntary participation in the U.S. Environmental Protection Agency's (EPA) Responsible Appliance Disposal (RAD) program.

Once units have been checked into the warehouse, the dismantling process begins. Doors are disconnected; hardware and glassware is removed; refrigerants are collected; oils are drained; sheet metal is peeled off; and insulating foam is stripped and bagged. In all, JACO's recycling process recovers up to 95% of all refrigerator components for reuse, and it ensures that 100% of hazardous components—including the refrigerants, PCBs, mercury, and other toxic elements—are properly broken down and disposed of. Most of the remaining 5% of elements are also put to good use. For instance, while the fiberglass insulation inside the doors can't be recycled, it is shredded and used as fluff material to provide an air gap between landfill layers to create avenues for methane to escape.

All of JACO's processes are conducted to meet or exceed state and federal laws, as well as the more stringent RAD program guidelines. Furthermore, the program is designed so that while the recycling effort is conducted under the auspices of Duke Energy, the utility never comes into legal possession of the units. The units—and more importantly their hazardous elements—remain in JACO's custody from the time the customer signs the release until the constituent components have been broken down, sold, or dispersed to their upstream or downstream destinations. JACO uses revenues received from these sales to reduce program costs for Duke Energy.

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This signature releases the refrigerator into the legal custody of JACO. As filed, the program allows customers 18 years or older to leave a signed note releasing the unit to JACO. This enables JACO crews to retrieve the unit if the customer cannot be home during the collection, but this method is rarely used since leaving the unit unattended outside the customer's home places it a risk of being stolen by roving scrap collectors.

When the paperwork is complete, the crew begins to dismantle the unit while still at the customer's home in order to demonstrate to the customer that it is indeed being rendered inoperative. To do that, the crew knocks a hole in the side of the refrigerator with a hammer, cuts the power cord and the door gasket, and physically breaks the thermostat control switch.

Once everything has been completed at the customer's home, the crew continues on to the next address on the route, gradually working their way back to the central JACO warehouse. When the trucks arrive at the JACO central dismantling facility the units are offloaded, counted, and checked in to ensure that all are accounted for. First, the bar codes stickers on each unit are scanned. This calls up the digital photo of the unit so the technician can confirm the ATO numbers on the refrigerators and in the JACO computer system. The physical units are also cross checked with 1) the end-of-day reports generated by the pocket PCs and 2) the route update reports to ensure that final counts are accurate. For instance, if a crew sets out to collect 20 units in a day and only returns with 18, the remaining two items will show as customer-cancelled appointments. If discrepancies arise, the units are set aside and the technician goes back through the extensive documentation process to verify the chain of custody to find the error.

No challenges or issues with collection were reported by any of the parties we interviewed. Two people did, however, make similar suggestions for process improvement. While JACO makes every effort to pick up all scheduled units, in rural areas some houses may occasionally be difficult or impossible to reach in the collection trucks due to their large size relative to height limitations caused by tree branches, weight restrictions on small bridges, and narrowness of country lanes and driveways. Therefore, those we spoke with requested that additional language be added to the FAQs or program requirements to better manage customer expectations about the accessibility of their properties. While a minor change perhaps, it may nonetheless help to improve customer satisfaction with the program.

In an interesting augmentation to their residential collection practices, Duke Energy and JACO indicated that they were in the process of establishing a retail partnership with Sears stores in the greater Indianapolis area to begin during the fourth quarter of 2013. Under this partnership, when Sears representatives deliver new refrigerators and freezers they will collect qualifying used units from eligible customers and bring the units to a central secure collection point, from which JACO can retrieve the units. All tracking details regarding the units are to be collected as if JACO representatives had originally picked up the units from customers. No units yet had been retrieved by JACO as of the time of this evaluation in November of 2013. Nonetheless, TecMarket Works considers this an innovative addition to the overall program design. We encourage Duke Energy to monitor progress in Indiana and if the effort proves effective there to consider expansion of the Sears partnership into the utility's Ohio territory.

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usually have between four and six stops within a four hour time window. They call the next home on the route when they are 30 minutes away in order to provide one final reminder. If they are less than 30 minutes away from the next home on the route, such as when two pick-ups are in nearby neighborhoods, they call as soon as possible. If they call ahead and no one answers, they leave a voice mail and proceed to the house. If no one is home when they arrive, they wait 15 minutes and then leave a "Sorry we missed you" door hanger that provides the mobile phone number of the crew and invites the customer to phone them. Depending upon the route, it may or may not be possible to revisit the customer later the same day to complete the collection. The crew also takes a photo of the house to document their visit and calls their supervisor to report the missed appointment.

If crews happen to finish their time window early, they can call the first customer in the next time window to see if they're available early. Otherwise, they need to wait until the time window opens. Once crews complete their time window, they call to update their location manager. They also inform their managers about delays. The location manager updates the call center twice daily to ensure that CSRs have updated information.

Collection Practices

Upon arrival, crew members introduce themselves and show their Duke Energy photo identification cards. They also confirm they're in the correct location and then ask the customer to lead them to the unit so they can assess the best way to remove it from the home. Once they reach the unit, they visually inspect it to confirm that it is plugged in and cooling, emptied and defrosted, and that any water lines have been disconnected.

Although program requirements specify that collection crews will not move or alter items in customers' homes, crews can remove the doors from refrigerators if necessary to transport the item outside. Normally, however, they prefer to take the unit outside before they begin cataloging and dismantling it.

When the unit is loaded on the truck, the crew uses a pocket PC to record the:

- Unique appliance tracking order (ATO) number,
- Refrigerator model number,
- Unit color,
- Unit type (top or bottom freezer, side by side, etc.),
- Unit's amperage (located on model info plate),
- Unit location,
- Whether the unit's location was in air conditioned space,
- Whether unit was used 12 months per year or periodically, and
- Whether unit is to be replaced or not.

Next they write the ATO directly onto the unit, along with the date, their personal initials, and the program ID for Duke Energy. Then they attach a sticker with a bar code that is scanned by the pocket PC. Lastly, they take a photograph of the refrigerator. Once everything is entered into the system, they ask the customer to verify the information and sign the pocket PC.

CALL CENTER	90	Cancel admin	Order removed from system. This occurs for multiple reasons, although usually when an order is marked incorrect. This typically happens during the QA process when a manager decides to remove the customer for customer service reasons.
	91	Cancel decided to keep	Customer changes mind - decides to keep unit
	92	Cancel reschedule customer to new date	Customer cancels due to schedule conflict.
	93	Cancel unit quit working	Non-working units are not qualified
	94	Cancel sold or gave the unit away	Customer sells or gives away
	95	Customer unable to be rescheduled	Re-schedule dates do not work for customer
	99	Customer found to be ineligible	Customer was found to not have service with the participating utility

The most common reasons for cancellation are because the customer missed the appointment (#42), the customer decided to keep the unit (#91), and the customer sold or gave the unit away (#94). According to JACO, the Duke Energy program's cancellation rates in these areas are higher than they typically see for other utility clients.

JACO attributes these higher cancellation rates to the length of time that customers have between the day they make the appointment and the day the unit is actually collected. Having two or three weeks is enough time to 1) sell the unit on Craigslist for more than the incentive amount, 2) decide to give the unit away, 3) decide to keep it, or 4) have the desire to get rid of it fade in importance. "We're probably not going to keep them from changing their minds directly, but decreasing the time interval would help to improve those numbers," explained one JACO representative. But the time interval is a function of the number of trucks that JACO can cost-effectively roll, and that depends on the number of units available on the collection route. "So, one way to lower the cancellation rate is to make the phone ring with a more attractive incentive. As we schedule more appointments, we roll more trucks, and have closer appointment dates available," he said. Duke Energy and JACO are exploring this and other possibilities as a means of decreasing their cancellation rates.

TecMarket Works identifies these cancellation rates as an important area for improved program performance; not least because the marketing and scheduling teams have already effectively executed their assigned roles and obtained the customers' commitment to program participation.

Appliance Collection

JACO locates its primary collection facilities in the most populous and centrally located areas that it serves. Its collection facilities are based in Columbus, OH. Collection routes are optimized for efficiency and are finalized 48 hours in advance so that JACO's automated dialing system can provide customers with their four hour time window.

Trucks typically collect between 20 and 30 units in a day, depending upon the number of stops, missed or cancelled appointments, size of the units, and the distances to be covered. Crews

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One issue that arose early in the Duke Energy program was that customers would complete the online scheduling form but fail to click the submit button. Without clicking submit, none of the information is saved or sent to JACO. As a result, the customer would not receive a confirmation, but they would erroneously believe that they had made an appointment. Then later they would phone the call center to ask why the collection truck never arrived. To mitigate this problem JACO implemented clear language on the last page of the scheduling form and a pop up message warning customers that they must click the submit button. JACO indicates that these steps greatly reduced the number of such errors.

While this technological fix appears to have alleviated the issue regarding unfinished online scheduling, integration between the web scheduling module and appointments made the call center remains imperfect simply due to human nature. A joint Duke Energy-JACO review of cancellation rates indicates that some customers who successfully complete an online enrollment subsequently decide to phone the call center to make an appointment that way as well. This results in a double booking and necessitates a cancellation of the extra pick up request. While not problematic from a customer service or an operational point of view, the extra cancellations are reflected in the cancellation rates discussed below.

Cancellation Rates

According to tracking records provided by JACO, the program had an overall cancellation rate of 15% in Ohio during 2012, and a slightly higher rate of 19.3% during 2013. Both JACO and Duke Energy felt that these rates were higher than desired and expressed a preference for rates in the low teens or less.

To better understand the overall cancellation rate, JACO records nine different reasons for pick up cancellations via its call center. An additional eleven types of reasons are tracked for driver-reported cancellations as shown in the table below.

Table 18. Reasons for Customer Cancellation

	#	Code Name	Definition
DRIVER	40	Non-working unit	Non-working units are not qualified
	41	Non-qualifying size requirement	Unit does not qualify due to being too small or large
	42	Missed appointment, customer not home	Customer missed appointment
	43	Cancel customer request	Driver informed by customer at home or on phone to cancel; no reason
	44	Emergency cancelation	Crew cancels due to illness, personal issue.
	45	Unable to arrive due to road conditions	Crew cancels due to weather, construction or other road blockage
	46	Reschedule appointment with operator	Customer tells driver they want to re-schedule
	48	Crew couldn't locate customer home, called and no answer	Crew could not find & could not reach customer for directions
	50	Cancel no clear path for removal of unit	Unit access blocked by materials or structure.
	51	Cancel due to safety risk	Removal risks injury

JACO's quality assurance practices are another factor. CSR calls are monitored regularly, at random, monthly, and quarterly intervals. The Duke Energy product manager also monitors live calls with JACO supervisors on a monthly basis. Calls are evaluated to ensure that CSRs follow scripts, collect all necessary information, answer questions, and provide effective customer service. Any problems are discussed with the employee and rapidly addressed, followed by monitoring to ensure the correction is in place.

Periodic training sessions and updates about program activities also help ensure that the call center remains appropriately informed. Despite these periodic updates, call center representatives indicate that they are still occasionally surprised by spikes in call volume. They request that JACO management, RSE, and Duke Energy strive to communicate more frequently and fully about planned marketing activities so that CSRs can be as fully ready as possible.

Scheduling via the Program Website

Customers can also make appointments for the program via Duke Energy's website. The internet scheduling tool is an embedded JACO web module that appears to the customer to be on the Duke Energy website. Scheduling works similarly to the call center, except that customers must enter all information themselves.

As with the call center, the first page of the scheduling module begins by asking for the customer zip code. This is what helps determine the dates available for collection. The first page also lists the requirements for program participation (see section titled "Eligibility" above) and reasons why customers may want to participate. Page two presents customers with a choice of collection dates. One of which must be selected to continue. The program requirements are also reiterated on this page and a box must be checked to confirm that the rules are understood. This step helps in preventing future misunderstandings.

The third page of the module collects relevant customer data such as account information, service address, and information regarding the refrigerator. The fourth page provides a summary of information and offers an opportunity to return to editing or click to submit the request. A final confirmation page confirms the collection date and customer information. It also provides an ATO number, which is unique to the appliance. This ATO number is used for tracking the specific appliance during its presence throughout the collection and recycling process. Screenshots of the online scheduling process are provided in "Appendix F: Online Scheduling Module".

One notable difference between the web scheduling module and the call center is that web customers receive a confirmed collection date without being formally validated as Duke Energy residential customers with active and open accounts. That validation happens later behind the scenes through JACO's verification department. If a customer is not eligible, someone from JACO contacts them to explain the situation and to collect additional information as necessary. Typically eligibility issues arise based on typos or confusion about account names and addresses. Although it is possible that someone may think they are a Duke Energy customer when they are not. In those cases, people are redirected to their appropriate utility.

incentive checks must be made out and mailed to the name and address associated with the account. With all this clarified, scheduling begins based upon the zip code at the collection address.

JACO's service level agreements require that customers be offered at least one collection date within 14 days of the call. In many cases, JACO will have several dates available to provide customers with a choice of day of the week, although some of these additional options may be beyond the two week window. Because of the way that pick up routes are scheduled for cost-effectiveness, fewer dates tend to be possible for customers in outlying areas, while more options are possible for customers who live closer to the collection hubs since they can be a part of a greater number of routes. Nonetheless, JACO strives to offer all customers a number of options, including Saturday pick up, although not necessarily within the two week window. If customers can't make any available date, they can be placed on a waiting list and notified when new options become available. The waiting list is not for any specific day.

When customers select a date, they are initially told that their pick up will occur between 7 am and 7 pm on that day. Then 48 hours prior to the collection day, they will receive an automated phone call and email if provided by customer specifying a four hour time frame for the collection appointment to help them finalize the arrangements they need in order to be home when necessary. The call also reminds customers of size requirements, and that the unit must be plugged in, running, and disconnected from all waterlines. The four hour time slots cannot be provided earlier because JACO needs to know all the collection addresses on the given route and calculate the most efficient travel plan prior to informing customers of the specific time window. Because actual pick up times vary, drivers also call customers 30 minutes prior to arrival as a further courtesy to help ensure they are ready.

JACO has a service level agreement to answer 80 percent of calls from Duke Energy customers within 20 seconds. During slow times its initial staffing was adequate to the call volume, but as the 2013 busy season ramped up the call center had challenges with this metric. To ensure it meets standards, the company added employees to the Duke Energy-dedicated team. Performance has since improved. JACO now provides 15 CSRs to assist Duke Energy customers from among its staff of 60 representatives, plus supervisory staff and managers who can provide additional coverage if necessary. All Duke Energy-dedicated CSRs receive additional training beyond JACO's basic requirements in order to ensure that the utility's specific protocols and scripts are followed.

Calls typically take between three and seven minutes to complete. JACO indicates that this is slightly longer than for other utility clients and can be attributed to Duke Energy's more rigorous call handling requirements. Approximately one in three phone calls to the call center end in a new customer appointment, according to the JACO call center spokesperson we interviewed. The purposes for the other calls include: cancelations, time window changes or questions, collection issues, general questions, and wrong numbers. The JACO representative indicated that Duke Energy's 1:3 appointment ratio is better than most other utility clients. She attributed the strong performance to Duke Energy's requirement for strict script adherence, which helps to ensure that important messages are clearly and consistently conveyed.

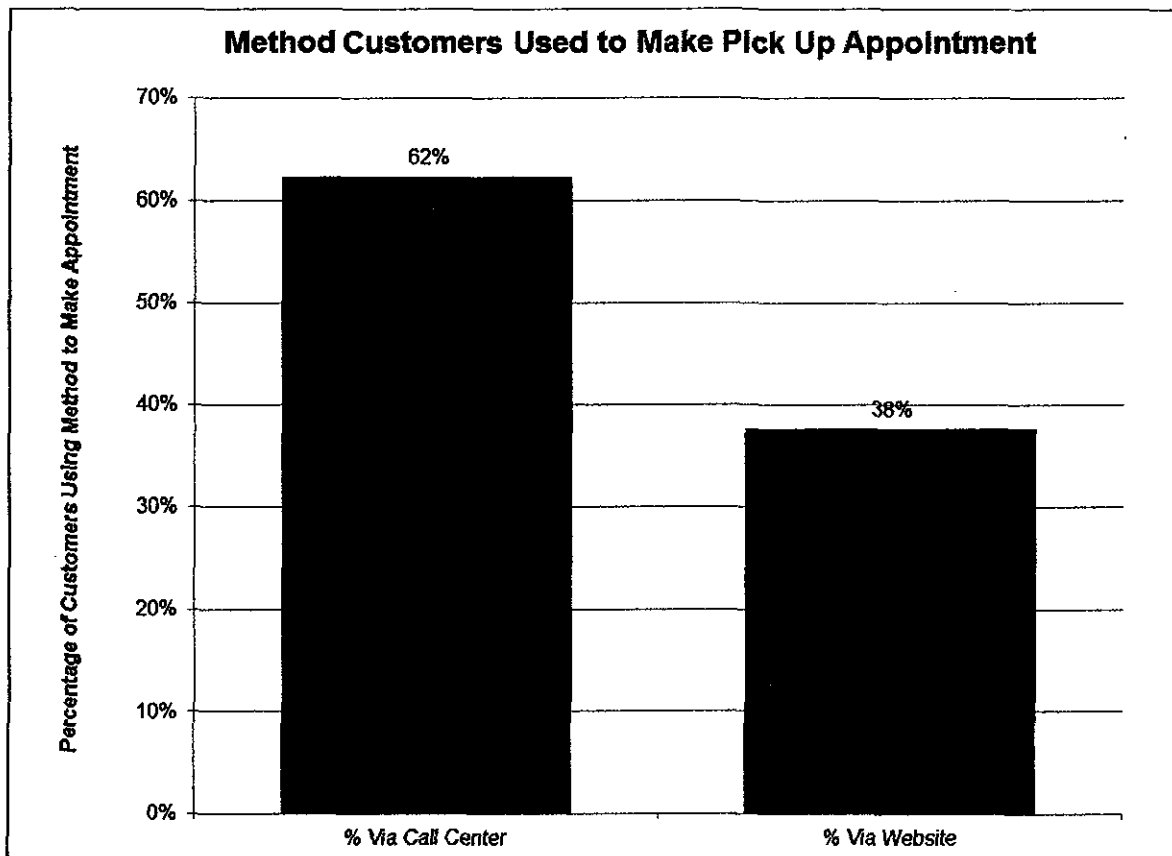


Figure 8. Customer Appointment Methods

Call Center

JACO's call center provides telephone support for Duke Energy's ARP operations in North Carolina, South Carolina, Kentucky, Ohio, and Indiana.⁶ Customer appointments and questions are all routed through a single toll free phone number to JACO's call center, which is staffed Monday through Friday from 7 am to 8 pm, and on Saturdays from 10 am to 5 pm. A brief intercept message welcomes callers to the Duke Energy Appliance Recycling Program and then asks them to press a specific number to specify their state for tracking purposes. Calls are then routed to the call center and answered by JACO's customer service representatives (CSRs) who follow specific scripts to greet the callers, answer questions, verify customer information, and schedule appointments for appliance collection.

The CSRs cross check the information provided by callers with an internet-accessible Duke Energy database to confirm their status as residential customers with open and active accounts. In the rare event the customer cannot be verified, the CSR refers the matter to JACO's verification department, which maintains a confirmation request list that is reviewed by the Duke Energy product manager. Once the customer's account has been verified, the CSRs use JACO's collections database to confirm unit eligibility requirements. They also review customer ownership of the appliance and discuss program guidelines, including Duke Energy's rule that

⁶ Former Progress Energy customers are served by a separate program not discussed in this evaluation.

Table 17. How Participants Heard About the Program as of July 31, 2013

Tactic	% How Heard
	OH
Utility bill insert	44.3%
Television advertising/news	13.0%
Friend/neighbor	10.0%
Newspaper advertising	9.7%
Utility company web site	8.4%
Web Advertisement/Search	7.2%
Appliance retailer	3.4%
Utility newsletter	1.9%
Electric utility office	0.6%
Truck sign	0.5%
Magnet mailer	0.5%
Repeat customer	0.4%
Total	100%

RSE compares these “how heard” metrics with overall weekly program enrollment numbers to better understand the effectiveness of each marketing channel and then adjusts marketing spend and mix as appropriate.

Scheduling and Customer Inquiries

Customers have two ways to make an appointment for collection of their units: via the call center or via a scheduling module on the Duke Energy website. According to JACO records, appointments placed via the call center outnumber web appointments by approximately two to one, as shown in Figure 8. Between program inception in October of 2012 and August 15, 2013, Duke Energy customers placed a total of 4,150 orders, with 2,586 arriving by phone and 1,564 via the web. Each ordering method is discussed separately below.

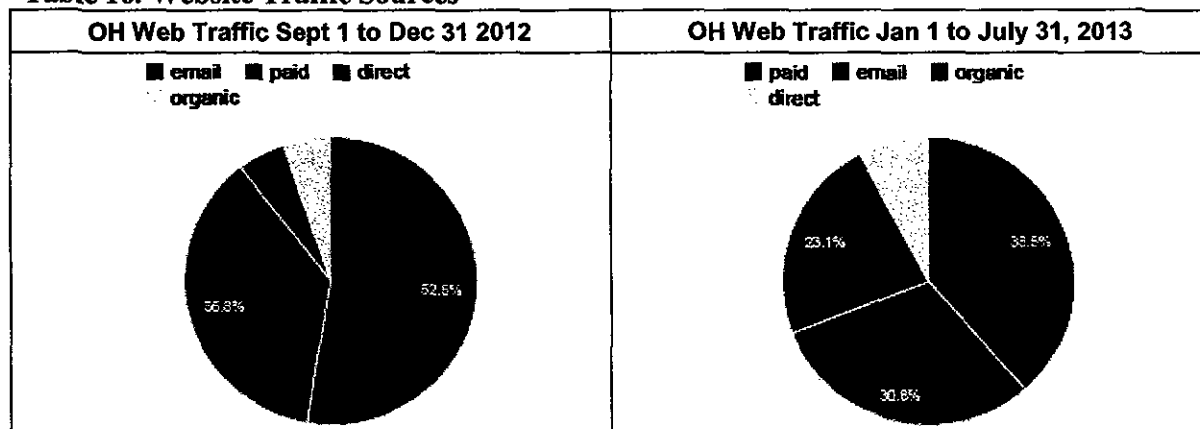
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people can use to determine how much money and energy they will save by removing or replacing their old refrigerator.

The Duke Energy marketing campaign manager uses Google Analytics to track all website traffic for the program, including the volume of visits, time on page, inbound sources of traffic, and exits to other destinations within the program or elsewhere on the Duke Energy website. Each month, inbound traffic is analyzed by referral source to assess the relative cost effectiveness of the program's various marketing efforts, including direct access, email links, social media, pay-per click ads, banner ads, Pandora ads, and organic search engine sources. Advertising expenditures and other resources are then adjusted as appropriate.

According to the web tracking data, the Ohio website had 1,235 visitors during 2012 and an average time on page of 1:09 minutes. These numbers increased in 2013, with Ohio customers making 2,465 web page visits for an average time of 1:14 minutes on page. During 2012, email drove the largest amount of site visitors, representing nearly 53% of traffic. In 2013, paid advertising became the largest driver, accounting for more than one third (39%) of site's traffic. The table below provides a graphic comparison of traffic sources.

Table 16. Website Traffic Sources



Traffic was tracked by visits directly to the individual state's website. Visitors could have also come in from the state landing page where they could choose their state and then enter the website. That data is not included in the above analysis because it was not available at the time of this review. The traffic to the state landing pages would be additive to the above numbers.

Marketing Effectiveness

To track the effectiveness of the many marketing channels used by the program, RSE and Duke Energy use unique URLs for each promotion that refers people to the online program sign up process. In a similar fashion, to measure the effectiveness of each channel in driving participants to the call center, all callers are asked how they heard about the program. According to these measurements, bill inserts are the most effective marketing vehicle by far, drawing 44% of program participants in Ohio (Table 17). Television news and word of mouth via friends and neighbors rounded out the top three marketing vehicles. Other traffic sources accounted for somewhat less; their contributions can be measured in single digit percentages.

The earned media component of the marketing strategy utilizes press releases and interesting media events. The center piece of JACO's public relations component is a media and public demonstration event called "Filet of Fridge" at which a JACO spokesperson displays a partially deconstructed refrigerator along with samples of the various materials that are reclaimed during the recycling process, including metal, plastic, glass, foam, oils, and refrigerants. The events make interesting television topics, garnering mentions, brief segments, and even lengthier interviews on local and regional news programs. JACO plans at least one Filet of Fridge event per year in a media market in each of Duke Energy's service territories. For 2103, it was held at the Duke Energy Queensgate District Office in Cincinnati, OH on May 30, 2013 and generated media coverage by WXIX-CIN, WPCO-CIN, NPR Radio WXVU, and the *Cincinnati Inquirer*. A sample of the components displayed is shown in Figure 7.

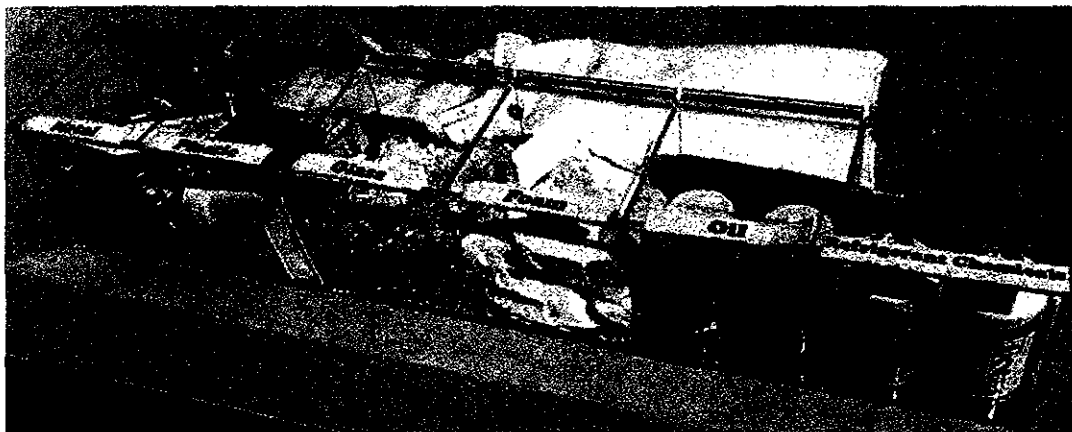


Figure 7. Filet of Fridge Recycling Samples

For another prolonged media campaign, Duke Energy partnered with three other JACO client utilities in Ohio to encourage its customers to participate in a JACO-sponsored Ohio's Oldest Fridge contest, which rewarded one customer from each utility with a \$250 gift card for turning in the oldest refrigerator, which the overall oldest refrigerator earned a \$1000 gift card to be used toward the purchase of Energy Star appliances. This campaign helped the program to generate its highest participation rates to date during June of 2013.

Duke Energy Website

The program's primary online presence is hosted on the Duke Energy website. The program is regularly promoted on the home page via a rotating ad with a direct link to the program's main web page. It is also reachable within two clicks of the home page via standard website navigation. The program's main page is simple, with graphics and brief messages that replicate those seen in other marketing vehicles. The page offers four links for additional action. The first link takes web visitors to an online scheduling module, which is discussed under "Scheduling and Customer Inquiries" below. The second link is to an embedded video of a humorous advertisement showing a refrigerator stealing money from a family. The third link leads to frequently asked questions that cover topics including: benefits of the program, how to find out if your appliance qualifies, how to schedule a pickup, what happens to old refrigerators, and incentive questions. The fourth link takes site visitors to an online appliance calculator that

Marketing

Duke Energy and JACO used the interval between contract agreement and regulatory approval to prepare operational infrastructure, customer handling procedures, geographic maps, reporting tools, data transfer methods, and security protocols. Such efforts helped ensure the program was prepared to enter the market as swiftly as possible. Nonetheless, because the program launched during October of 2012, it started after the high season was over and the number of potential units available for collection was dropping from its summer peak. This meant that the program had relatively little time to build awareness and momentum before year end. This was accounted for when planning to meet the 2012 collection goals, according to Duke Energy, JACO, and RSE.

Program marketing is coordinated between Duke Energy, JACO, and RSE, which also provides marketing services for nearly 200 of JACO's utility clients in 25 states. Representatives from all three firms meet weekly and communicate regularly to plan strategies, coordinate efforts, review results, and make adjustments as necessary.

Once per year, RSE prepares a comprehensive marketing plan for each of Duke Energy's program service territories. The plan has three primary components: 1) utility marketing efforts, 2) paid media buys, and 3) earned media via public relations activities. Each of the three components consists of multiple marketing channels that are scheduled to overlap, reinforce, and sustain the annual marketing plan as it ramps up in the spring for the busy summer season, makes its push toward annual goals in the autumn, and goes into maintenance mode during the slower winter months.

Duke Energy's utility marketing efforts for Ohio consisted of two on-bill messages, two bill inserts, two email blasts to customers who've agreed to them, and a year round presence via the Duke Energy website and OLS promotions. Media buys included twice weekly newspaper ads in the *Cincinnati Enquirer* and 15 and 30 second ads on Cincinnati metro radio for 10 weeks during the high season. Targeted digital ads included Google pay-per-click ads and Yahoo banners. These geo-demographically targeted ads collectively generated approximately 75,000 impressions per week in high customer count, high participation zip codes.

RSE's creative team works closely with their marketing counterparts at Duke Energy to develop collateral and ads that tout the program's benefits, while also complying with the utility's specific branding requirements. Marketing messages use positive motivations by discussing benefits, and negative consequences by discussing results of non-action. Brief marketing formats, such as web ads and bill inserts, focus on convenience (Free pick up), the incentive (Earn \$30), and energy savings (Save \$150 a year on energy). Longer marketing formats, such as emails and newspaper ads, also focus on the environmental attributes (Keep harmful materials out of landfills). Samples ads are shown in Appendix E: Marketing Samples.

The RSE team also generates a social media contact calendar and drafts two Twitter tweets and one Facebook message about refrigerator recycling for Duke Energy to send out via its social media accounts each month.

Program Operations and Oversight

The Duke Energy Appliance Recycling Program is a turnkey refrigerator and recycling program provided by JACO Environmental of Bothell, WA. Duke Energy provides the overall administration of the program, including strategic guidance, vendor oversight, customer eligibility confirmation, utility-based marketing, website administration, incentive payment auditing, and overall quality assurance.

Meanwhile, day-to-day implementation is contracted to JACO, which handles all operational functions including: call center activities, scheduling, pick up and collection, environmentally appropriate dismantling and recycling, incentive payments, and quality assurance. JACO-provided marketing services for the program are subcontracted to Runyon, Saltzman, and Einhorn of Sacramento, CA.

After completing a successful RFP process, including a thorough review of JACO's operations and environmental protocols, Duke Energy and JACO signed their contract in January of 2012. The agreement calls for operations in North Carolina, South Carolina, Kentucky, Ohio, and Indiana. The Indiana program launched on May 25, 2012, making it the first service territory to begin collecting units. Formal operations in the Carolina system began on August 1, 2012 after regulatory approval in North Carolina and South Carolina. Ohio and Kentucky collections began on October 4, 2012.

Eligibility

While open to all Duke Energy residential customers in Ohio who wish to recycle their refrigerators and freezers, the program particularly targets homeowners who are empty-nesters, people whose children are grown and who are replacing or have replaced their approximately 20 year old units with new ones. The program attempts to preempt these customers from using their second units as backup coolers. It also seeks to intercept the older primary units from entering the used market or going directly to scrap dealers and landfills. Renters represent a smaller percentage of potential customers since they are less likely to own their refrigerators.

The program's customer eligibility, unit eligibility, and removal stipulations are shown below.

- Customer must have an active residential electric account with Duke Energy at the address where the pickup is to occur.
- The unit must meet the size requirement of 10 - 30 cubic feet.
- There is a limit of two units per customer address within a 12 month period. Any numeric combination of refrigerators or freezers is acceptable.
- An adult, 18 years of age or older, must be present to sign and release the unit at the time of the pickup.
- The unit must be emptied and defrosted.
- The unit must be plugged in and cooling on the day of the pickup.
- The unit must be disconnected from waterlines prior to the pickup crew's arrival.
- There must be a clear and safe removal path since crews cannot risk injury, move personal effects, modify the home (e.g., remove doors or railings) to remove units.

Management Interview Results

Overview of Refrigerator Recycling

Utility-sponsored refrigerator recycling programs first arose in the 1970s along with early demand side management programs. In the ensuing decades, numerous utilities and public benefit programs have initiated collection efforts. Although the details of program design vary, the general purpose of the programs has consistently focused on reducing electric energy demand by removing less efficient refrigerators and freezers from residences and businesses.

What happens to the units after removing them from customer homes has changed over time. In some cases, units were simply sent to landfills. In others, working units were resold on the secondary market, dismantled and parted out, or sold for scrap metal. Such activities are now far less common as increasingly stringent environmental regulations have been enacted to ensure that refrigerants and other toxic elements are properly handled.

According to the U.S. Environmental Protection Agency (EPA), a typical refrigerator contains approximately 140 pounds of metal, 20 pounds of plastic, and 3 pounds of glass, most of which can be recycled and reused. Perhaps more importantly, a typical refrigerator may contain half a pound in refrigerants, another pound of CFC-laced foam insulation, PCPs, mercury containing components, and contaminated motor oils, as shown in Figure 6. As a result, measures for safe disposal and procedures for the legal transfer of custody of the units must now be included in program design. Duke Energy and its implementation partner JACO Environmental, exceed these requirements through voluntary participation in the EPA's Responsible Appliance Disposal (RAD) program.

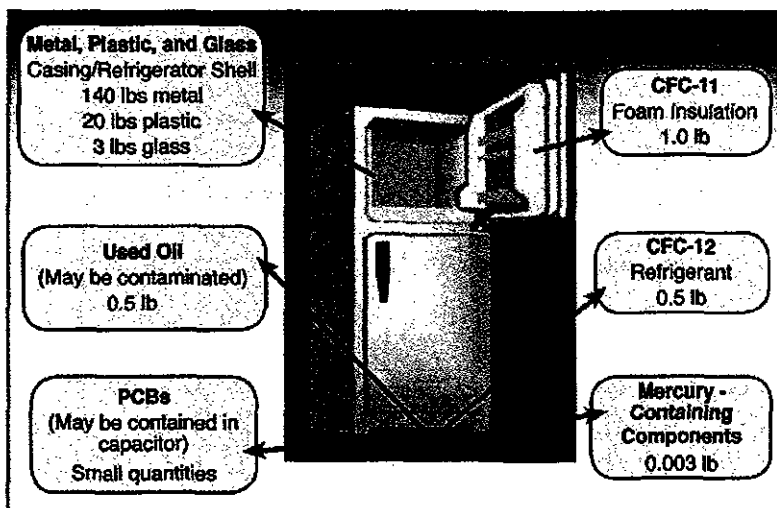


Figure 6. Constituent Elements within a Refrigerator (source US EPA)⁵

⁵ US Department of Environmental Protection, Safe Disposal of Refrigerated Household Appliances: Frequently Asked Questions (FAQ), Washington, DC: Accessed on August 5, 2013, source: <http://www.epa.gov/spdpublic/title6/608/disposal/household.html>

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and managers to see the energy impacts associated with each market path for both new and used units that are affected by the program and to more completely understand the energy effects of the program on the individual paths. Calculating gross savings is not necessary for this approach. An appropriate way to calculate gross savings would be to compare the average annual weather normalized and ISR adjusted kWh consumption of a unit recycled through the program (684 kWh for refrigerators and 831 kWh for freezers) to the average ISR adjusted wattage of a replacement unit (420 kWh for refrigerators and 368 kWh for freezers).

Knowing that 47% of refrigerators were replaced, gross savings and the net to gross ratio for refrigerators can be calculated as follows:

$$\text{Refrigerator Gross Savings} = 684 * 0.53 + (684 - 420) * 0.47 = 487 \text{ kWh}$$

$$\text{Refrigerator NTGR} = 403 / 487 = 82.8\%$$

Where:

- 684 = consumption of a recycled refrigerator
- 420 = consumption of a replacement refrigerator
- 0.47 = fraction of refrigerators replaced
- 0.53 = fraction of refrigerators not replaced

Knowing that 30% of freezers were replaced, gross savings and the net to gross ratio for freezers can be calculated as follows:

$$\text{Freezer Gross Savings} = 831 * 0.7 + (831 - 368) * 0.3 = 721 \text{ kWh}$$

$$\text{Freezer NTGR} = 337 / 721 = 46.7\%$$

Where:

- 831 = consumption of a recycled freezer
- 368 = consumption of a replacement freezer
- 0.3 = fraction of freezers replaced
- 0.7 = fraction of freezers not replaced

Total Program Savings Extrapolation

As seen in the *Program Goals and Participation* section, from August 1, 2012 through July 31, 2013, there were a total of 2,608 appliances recycled through ARP, 1,945 refrigerators and 663 freezers. Table 15 shows how net unit energy savings (UES), from Figure 3 and Figure 4, is extrapolated to program savings.

Table 15. Program Level Net Savings Extrapolation

Total Program Net Savings Extrapolation	Refrigerator		Freezer	
	Count	UES	Count	UES
Measure data	1,945	403	663	337
Total net measure savings	783,835 kWh		223,431 kWh	
Total net program savings	1,007,266 kWh			

- $P(x)$ = probability that the appliance is still in use at age x
 x = appliance age
 α = scale parameter; corresponds to decay length in an exponential distribution
 = 13.91
 β = shape parameter; determines the way in which the failure rate changes through time
 = 1.68
 θ = delay parameter; allows for a delay before any failures occur
 = 5

The delay parameter (θ) is included to account for equipment failure within the first five years of an appliance purchase. This is assumed to be the warranty period, wherein a unit would be replaced free of charge if it were to fail.

To calculate an RUL schedule from the survival probability curve, the integral values are normalized by the survival probability at each age resulting in the curves in Figure 5.⁴ In this study, the average age of a recycled unit is 34 years, as seen in Table 12. This corresponds to a program wide average RUL of 5 years. This value appears in *Appendix L: DSMore Table* and functions as the EUL of program savings for cost effectiveness calculations.

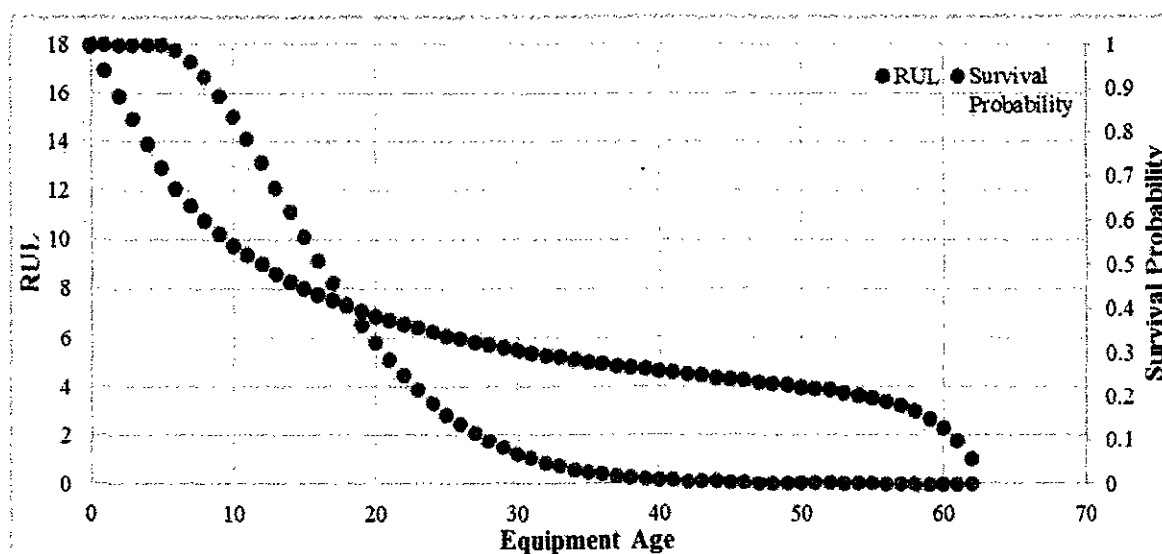


Figure 5. Survival Probability and RUL Curves

Net to Gross Analysis

The engineering analysis used the sixteen path market impact analysis approach to calculating net savings from raw consumption data. This approach is an enhanced (expanded) approach from USDOE's Uniform Practices Protocol for residential programs and allows program designers

⁴ Mohit Singh-Chhabra, Parmigan Research and Angie Lee, Navigant Consulting, Inc. "Savings from Appliance Recycling Programs: Think Outside the Grid." 2013 International Energy Program Evaluation Conference, Chicago. Page 3.

Table 13. Size of Units in Metering Study

Size	Refrigerator		Freezer	
	Count	Percent	Count	Percent
5 to 10 cubic feet	2	15%	0	0%
11 to 15 cubic feet	5	38%	1	33%
16 to 20 cubic feet	4	31%	2	67%
21 to 25 cubic feet	1	8%	0	0%
26 + cubic feet	1	8%	0	0%
Average cubic feet	17 ft ³		16 ft ³	
Overall average	17 ft ³			

The majority (89%) of recycled units participating in the metering study were located in either a basement or a garage (48% in a basement, 41% in a garage). This includes 90% of refrigerators and 83% of freezers as shown in Table 14. Overall, twelve (40%) units were located in a conditioned space. This matches up well with the overall participation figures where 38% of units were in conditioned spaces.

Table 14. Location of Units in Metering Study

Location	Refrigerator		Freezer	
	Count	Percent	Count	Percent
Basement	8	38%	5	83%
Garage	11	52%	0	0%
Outside	1	5%	0	0%
Other	1	5%	1	17%

Remaining Useful Life

The remaining useful life (RUL) of the recycled appliance is the period over which energy savings are realized. The US Department of Energy (DOE) developed a technical support document (TSD) in 2009 to establish a survival probability curve for appliances. Mortality trends for technologies tend to follow a Weibull distribution. This allows for a “time-to-failure” calculation and it provides a distribution for which the failure rate is proportional to a power of time, eliminating the need for estimating RUL as a function of a deemed EUL value.

In this TSD, the DOE fitted mortality data collected through the Residential Energy Consumption Survey (RECS) to a cumulative Weibull distribution of the form:

$$P(x) = e^{-\left(\frac{x-\theta}{\alpha}\right)^\beta} \text{ and } P(x) = 1 \text{ for } x \leq \theta$$

Where:

Tmax = maximum daily average temperature for each weather city
kWh/day = daily consumption predicted from regression model
LSAF = load shape adjustment factor

ARP achieved gross coincident peak demand reduction of 0.0510 kW for refrigerators and 0.1015 kW for freezers. To compute net peak demand reduction, the net to gross ratios from the *Net to Gross Analysis* section are applied, yielding 0.0422 kW for refrigerators and 0.0474 kW for freezers.

Metered Unit Characteristics

In most cases, field technicians were able to determine the age, size, and location of the metered units. As seen in Table 12, there was a wide range of ages among the sampled units recycled *through the program. The youngest unit was just seven years old while the oldest was 61 years old.* The average age of the sampled units was 31 years for refrigerators, 44 years for freezers, and 34 years overall for refrigerators and freezers combined. The sampled units' average age is considerably higher than that of the data from the overall participation database where the average refrigerator is 24.2 years old, the average freezer is 26.1 years old, and the combined average is 24.7 years old.

Table 12. Age of Units in Metering Study

Age	Refrigerator		Freezer	
	Count	Percent	Count	Percent
5 to 10 years	1	6%	0	0%
11 to 15 years	2	12%	0	0%
16 to 20 years	0	0%	0	0%
21 to 25 years	7	41%	1	20%
26 to 30 years	2	12%	1	20%
31 to 35 years	5	29%	3	60%
Average age	31 years		44 years	
Overall average	34 years			

Table 13 shows that the average size of a sampled unit was 17 cubic feet for refrigerators, 16 cubic feet for freezers, and 17 cubic feet overall for refrigerators and freezers combined. Sizes ranged from eight to 34 cubic feet. Note that the eight cubic foot refrigerator's capacity is below the minimum 10 cubic feet required for program eligibility. Nevertheless, since the unit was selected at random to be part of the metering study, it is assumed to be representative of other ineligible units recycled through the program. According to the EIA Residential Energy Consumption Survey (RECS) from 2009, the average refrigerator size was approximately 19 cubic feet and the average freezer size was about 17 cubic feet.

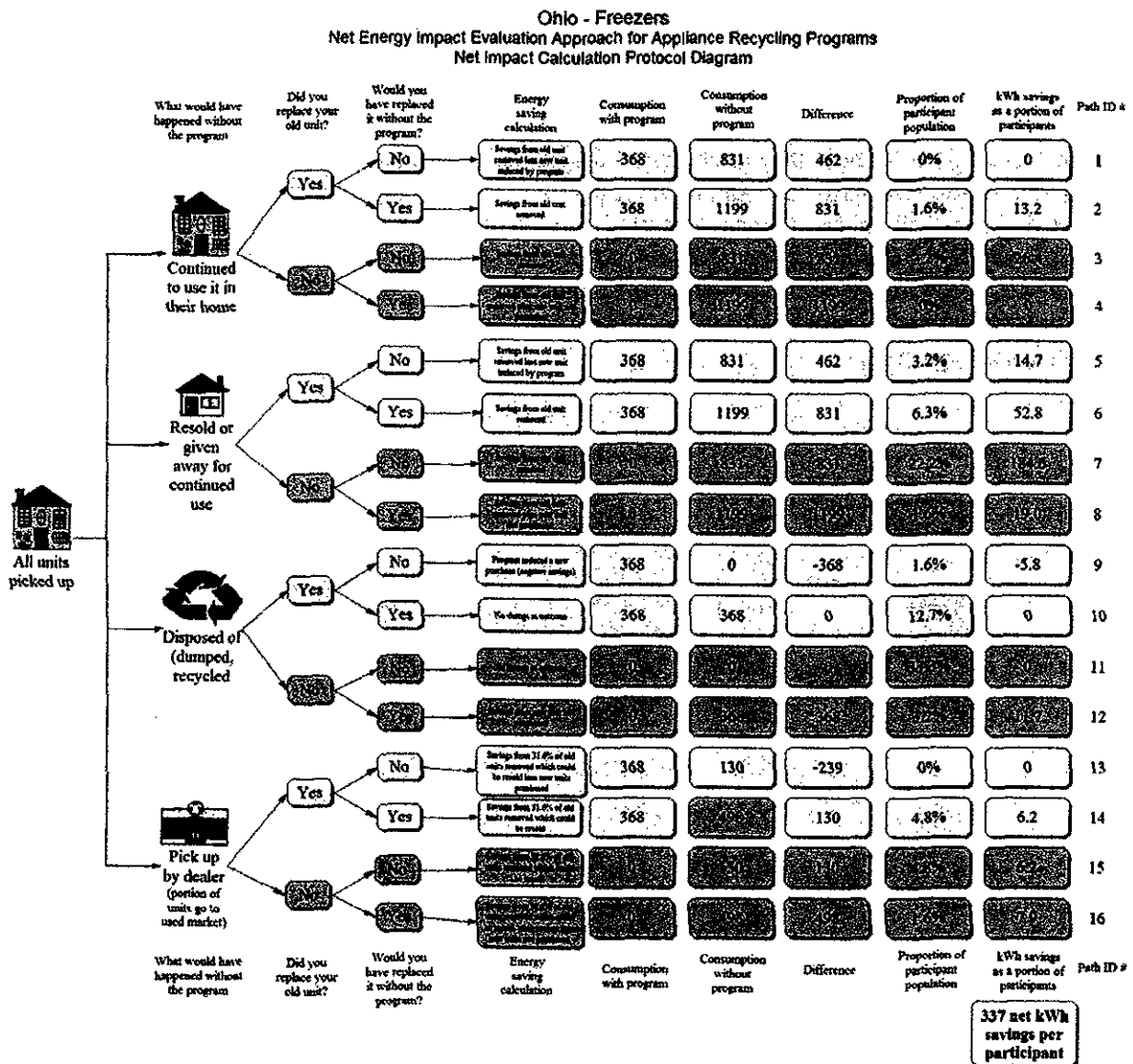


Figure 4. Sixteen Paths Analysis for Freezers Demand Reduction

The summer coincident peak demand savings is calculated using the regression lines comparing kWh to temperature and selecting the highest average daily temperature for the corresponding weather station. A load shape adjustment factor³ is used coincident with the hour beginning 3PM and ending at 4PM (1.026 for refrigerators and 1.025 for freezers).

$$kW = kWh/day(T_{max}) / 24 \times LSAF$$

where:

³ Daily load shape adjustment factor also based on Blasnik, Michael, "Measurement and Verification of Residential Refrigerator Energy Use, Final Report, 2003-2004 Metering Study", July 29, 2004 (p. 48, using a weighted average Existing And New Units Summer Profile for hour beginning 15)

1. What would you have done with the unit if ARP was not available?
2. Have you since replaced the unit that was recycled?
3. Would you have replaced the unit if ARP was not available?

Figure 3 and Figure 4 show the sixteen paths diagrams for freezers and refrigerators along with the savings associated with each and the proportion of the participant population following each. Note that although there are sixteen possible logical outcomes with this analysis approach, some of the sixteen paths are unlikely outcomes that may not occur in a survey with a relatively small sample size: for example, from the 2013 participant survey in Ohio, there were no responses corresponding to path numbers one, nine, and thirteen among the 77 refrigerators that were recycled (see Figure 3).

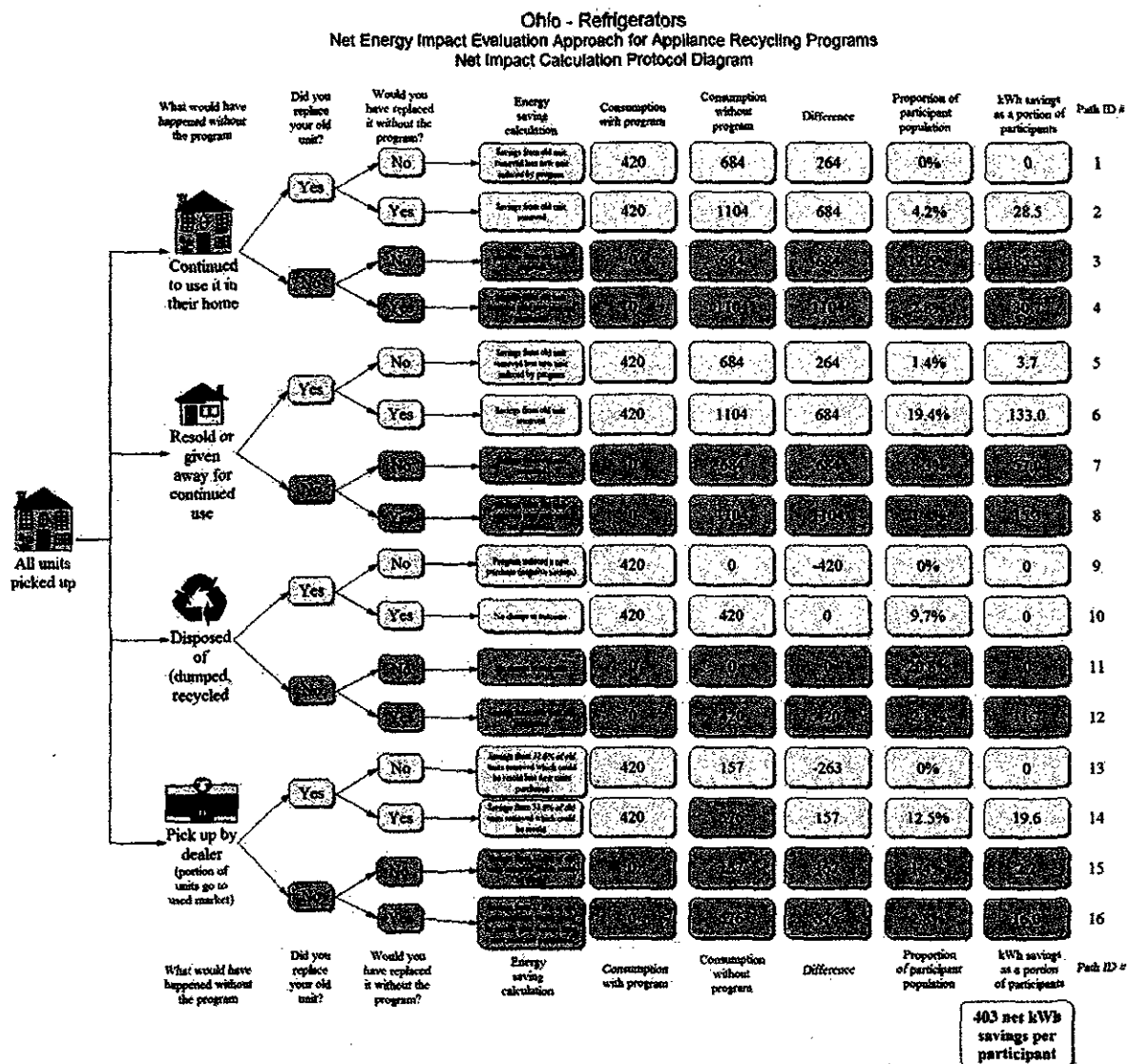


Figure 3. Sixteen Paths Analysis for Refrigerators

Table 10. New and Used Replacement Refrigerators and Freezers kWh

Used Refrigerator	kWh	Used Freezer	kWh
19-21.4 ft ³ top freezer	537	Below 16.5 ft ³ chest	404
21.5-24.4 ft ³ side by side	713	16.5-18.9 ft ³ upright	747
AVERAGE	625	AVERAGE	575.5
New Refrigerator	kWh	New Freezer	kWh
19-21.4 ft ³ top freezer	404	Below 16.5 ft ³ chest	341
21.5-24.4 ft ³ side by side	540	16.5-18.9 ft ³ upright	639
AVERAGE	472	AVERAGE	490

In the participant survey, if a respondent indicated that the unit recycled through the program had since been replaced, they were asked if it was replaced with a new or a used unit. Of the 77 refrigerators and 67 freezers recycled, 36 refrigerators and 20 freezers were replaced, replacement rates of 47% and 30% respectively. Of the 36 refrigerator replacements, 35 survey respondents provided the vintage of the replacement unit, 22 (63%) were new units and 13 (37%) were used. Of the 20 freezer replacements, 14 (70%) were new and 6 (30%) were used. Table 11 shows how these ratios were used to calculate the weighted average kWh for replacement units.

Table 11. Weighted Average Replacement Refrigerator and Freezer kWh

Refrigerators	Percentage	kWh	Freezers	Percentage	kWh
Used Refrigerator	37%	625	Used Freezer	30%	575.5
New Refrigerator	63%	472	New Freezer	70%	490
WEIGHTED AVERAGE		529	WEIGHTED AVERAGE		516

The percentage of units that are either donated or picked up by new appliance dealers that are resold on the secondary market is assumed to be the percentage of units recycled through the program that are in saleable condition. In Ohio, a unit is considered saleable if it is no more than 10 years old and in good working condition. This information is taken from the results of the participant survey, where respondents were asked to estimate the age of the unit and also to assess its condition. Only those customers who indicated that, in the absence of the program, their unit would have been either donated or picked up by a dealer were considered. Six (31.6%) out of 19 units were reported to be saleable, thus the estimated percentage of units in saleable condition is 31.6%.²

Finally, the weight for each path is determined by the proportion of the participant population following it. Which path a participant follows is determined by their responses to three questions in the participant survey:

² Recycled units in saleable condition are newer than the average recycled unit, thus they consume less energy. When calculating consumption without the program, recycled units in saleable condition that would have been donated or picked up by dealers are assigned the kWh value corresponding to a used replacement unit (625 for refrigerators and 575.5 for freezers in Ohio, as seen in Table 10) rather than the kWh values for "all recycled units."

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12	Unit that was picked up by the program would have been recycled anyway and replaced. With the program, the unit was recycled and not replaced.	Savings from new unit not purchased
13	A portion* of units picked up by the program would have been sold or given to someone else for continued use and not replaced. With the program, the unit was recycled and replaced.	Portion* of savings from old unit removed less new unit induced by the program
14	A portion* of units picked up by the program would have been sold or given to someone else for continued use and replaced. With the program, the unit was recycled and replaced.	Portion* of savings from old unit removed
15	A portion* of units picked up by the program would have been sold or given to someone else for continued use and not replaced. With the program, the unit was recycled and not replaced.	Portion* of savings from old unit removed
16	A portion* of units picked up by the program would have been sold or given to someone else for continued use and replaced. With the program, the unit was recycled and not replaced.	Portion* of savings from old unit removed plus savings from new unit not purchased

* A portion of units that are picked up by dealers or accepted as donations by charities find their way to the secondary market for resale. Energy savings for these paths is based on the proportion of units that would be resold.

The sixteen paths approach requires, as inputs:

- Average annual kWh consumption of a recycled unit
- Average annual kWh consumption of a replacement unit (new and used)
- Percentage of dealer/donation units that are sold on the secondary market
- Count of units following each path

The average annual kWh consumption of a recycled unit is the value determined by the “Watts up?” power meters adjusted for weather and in-service rate. An estimate for the average annual kWh consumption of a replacement unit was calculated using the Energy Star Refrigerator Retirement Savings Calculator. This assumption is necessary because data on replacement units was not collected for the metering sample and was sparse for the participant survey (57% of respondents did not know cubic footage, but 63% were the same size or larger units). For refrigerators, the estimate is the simple average of the annual kWh for a 19-21.4 cubic foot top freezer model and a 21.5-24.4 cubic foot side by side model. For freezers, the average annual kWh consumption of a replacement unit is estimated as the simple average of the annual kWh for a below 16.5 cubic foot chest model and a 16.5-18.9 cubic foot upright model. These values are shown in Table 10.

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- Recycled unit was not replaced and would not have been without the program.

The sixteen path analysis is a result of four absence-of-the-program outcomes multiplied by four replacing-the-recycled unit outcomes.

Table 9. Sixteen Paths Scenario Descriptions

Path number	Description of scenario	Energy savings calculation
1	Unit that was picked up by the program would have remained in use and not been replaced. With the program, the unit was recycled and replaced.	Savings from old unit removed less new unit induced by the program
2	Unit that was picked up by the program would have remained in use and also been replaced (the old primary unit would have been "demoted" to use as a secondary unit). With the program, the unit was recycled and replaced.	Savings from old unit removed
3	Unit that was picked up by the program would have remained in use and not been replaced. With the program, the unit was recycled and not replaced.	Savings from old unit removed
4	Unit that was picked up by the program would have remained in use and been replaced (the old primary unit would have been "demoted" to use as a secondary unit). With the program, the unit was recycled and not replaced. <i>For refrigerator recycling, this scenario only applies to a household that had at least two refrigerators before the program (because primary refrigerators are always replaced).</i>	Savings from old unit removed plus new unit not purchased
5	Unit that was picked up by the program would have been sold or given to someone else for continued use and not replaced. With the program, the unit was recycled and replaced.	Savings from old unit removed less new unit induced by the program
6	Unit that was picked up by the program would have been sold or given to someone else for continued use and replaced. With the program, the unit was recycled and replaced.	Savings from old unit removed
7	Unit that was picked up by the program would have been sold or given to someone else for continued use and not replaced. With the program, the unit was recycled and not replaced.	Savings from old unit removed
8	Unit that was picked up by the program would have been sold or given to someone else for continued use and replaced. With the program, the unit was recycled and not replaced.	Savings from old unit removed plus new unit not purchased
9	Unit that was picked up by the program would have been recycled anyway and not replaced. With the program, the unit was recycled and replaced.	Program induced a new purchase (negative savings)
10	Unit that was picked up by the program would have been recycled anyway and replaced. With the program, the unit was recycled and replaced.	No savings
11	Unit that was picked up by the program would have been recycled anyway and not replaced. With the program, the unit was recycled and not replaced.	No savings

including both refrigerators and freezers, is 721 kWh. Refrigerators used less energy than freezers, 684 kWh compared to 831 kWh.

Sixteen Path Direct Net Analysis Approach

TecMarket Works has developed a set of sixteen paths as a net energy impact evaluation approach for appliance recycling programs. Each of the paths represents a particular course of action taken by a participant as it relates to a single recycled unit. This approach compares the outcome of the program to what would have happened in the absence of the program, where savings achieved is the delta of the two situations (what would have happened in the market without the program versus what happened in the market as a result of the program). This type of analysis is required for recycling programs because the program affects more than just the energy use of the participating homes. It affects both the new and used appliance stream by changing what is bought and sold in the new and used markets. Not all paths are affected by all appliance recycling programs. The paths that are changed are representative of a program on a specific market located within the geographical area served by that program.

Each of the sixteen paths is explained in detail in Table 9. These sixteen paths can be divided into four major categories according to what the participant would have done in the absence of the Appliance Recycling Program:

- Units that would have been kept in use by the household that recycled them (paths 1-4)
- Units that would have been sold or given to another household to be used (paths 5-8)
- Units that would have been taken off the grid and disposed of anyway without the program (paths 9-12)
- Units that would have gone to dealers or charities that accept used appliances (paths 13-16)

In the first two categories above, without the program the recycled unit would have remained on the grid either in the participant's household (if they kept it) or someone else's household (if they sold it or gave it away). In the third category of paths (disposal), the recycled unit would have been taken off the grid even without the program. The fourth category (dealers and charities) represents a combination of recycled units that would have returned to the grid through the secondary market and units that would have been disposed of anyway. When these types of organizations acquire used appliances, they resell the units that can be resold profitably, while those that cannot be resold are disposed of (through recycling and sometimes dismantling for spare parts) and do not return to the power grid. Since units that would have been taken off the grid without the program do not contribute to program savings, only the proportion of "resalable" recycled units that would have gone to dealers and charities contribute to program savings.

Each of these four categories of action is further subdivided into four paths based on whether the recycled unit was replaced, and the participants' intention to replace the unit (or not) before the program:

- Recycled unit was replaced but would not have been without the program,
- Recycled unit was replaced and would have been replaced anyway without the program
- Recycled unit was not replaced but would have been replaced without the program

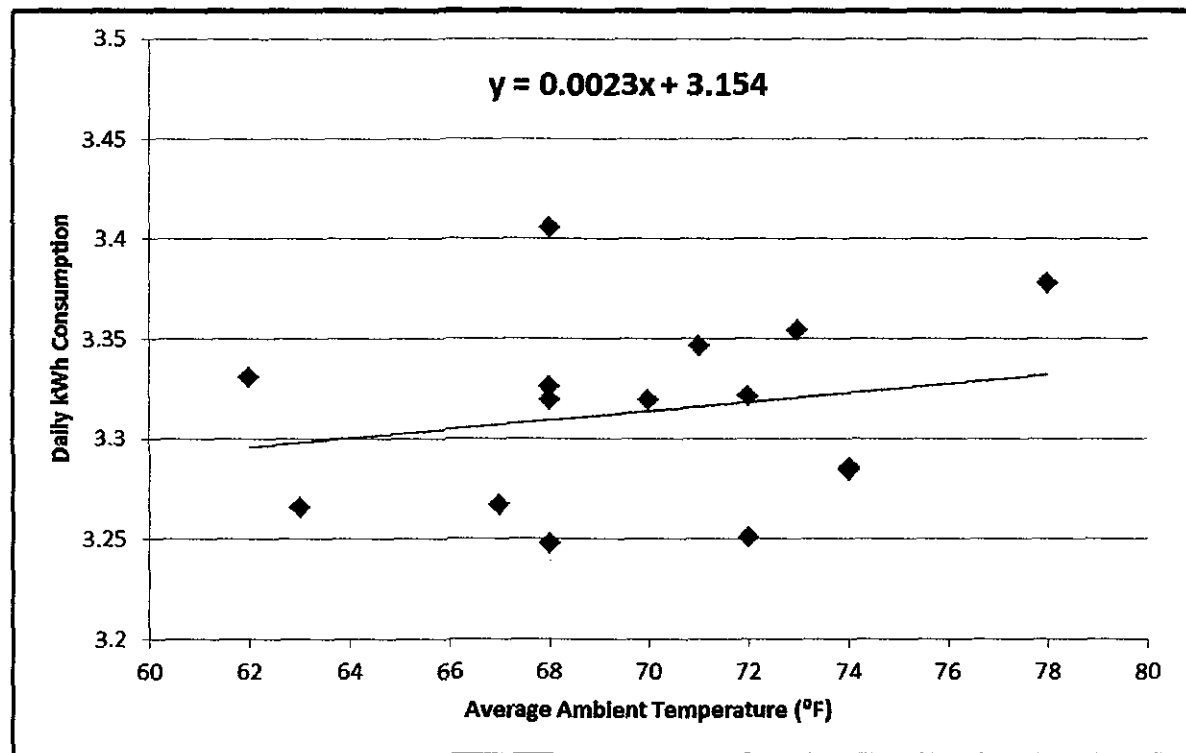


Figure 2. Ambient temperature vs. kWh: weak correlation

In-Service Rate

The in-service rate is defined as the proportion of the year a given recycled appliance had been in use rather than unplugged. If recycling a secondary refrigerator or a freezer, respondents to the participant survey were asked to add up the time the unit in question was plugged in and running during the last 12 months. The average secondary refrigerator has an in-service rate of 74.1% (8.89 months out of 12). The weighted average in-service rate for all refrigerators is then 79.4%, assuming primary units are always in service and using the ratio of primary to secondary refrigerators from the total population as seen in Table 8. The average freezer has an in-service rate of 71.5%.

Table 8. Refrigerator and Freezer In-Service Rates

In-Service Rate	Refrigerator		Freezer
	Primary	Secondary	
Participation	168	652	623
In-Service Months	12	8.89	10.11
In-Service Rate	79.4%		71.5%

These in-service rates function as an adjustment to gross savings. The average annual weather normalized consumption of a unit recycled through ARP after adjusting for the in-service rate,

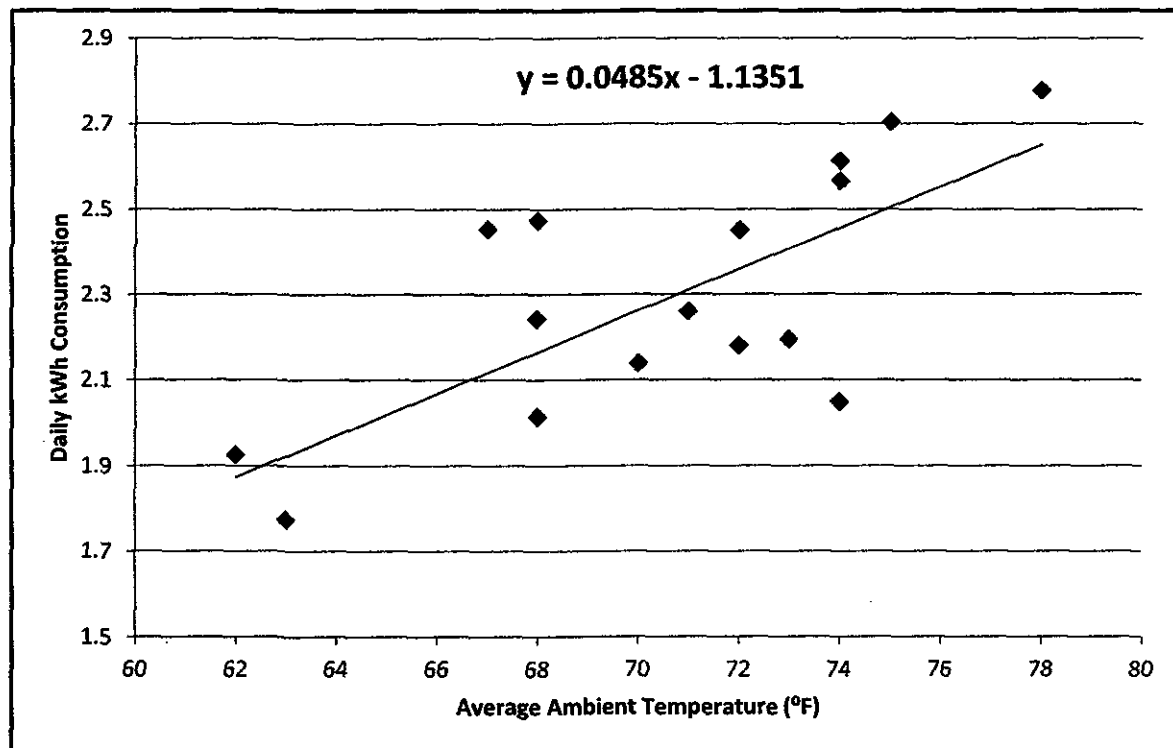


Figure 1. Ambient temperature vs. kWh: strong positive correlation

Figure 1 is an example of a unit whose consumption has a strong positive correlation with ambient temperature. That is, as temperature increases, so does kWh consumed. The unit represented in Figure 1 is a 14 year old refrigerator located in an unconditioned space. By contrast, Figure 2 shows the regression line for a unit that has a weak correlation with ambient temperature. The unit represented in Figure 2 is a 25 year old refrigerator located in a conditioned space.

As anticipated, units in unconditioned spaces exhibit a much stronger relationship with ambient temperature than do units in conditioned spaces. The refrigerator in Figure 1 is able to use much less energy when it is cooler outside. The refrigerator in Figure 2 is largely unaffected by ambient temperature; usage pattern fluctuations drive differences in its daily consumption.

The strong predictive nature of this relationship allows for straightforward extrapolation of the monitoring period to a full meteorological year using the equation of the regression line to estimate the average year's kWh consumption based on average daily temperatures from TMY3 data for the typical (long-term average) meteorological year. The average annual weather normalized consumption of a unit recycled through ARP, including both refrigerators and freezers, is 932 kWh. Refrigerators used less energy than freezers, 862 kWh compared to 1,163 kWh. The slopes and intercepts for each unit's regression line and the accompanying weather normalized annual kWh consumption estimate can be seen in *Appendix K: Regression Table*.

Impact Estimates: Engineering

This section presents the results of the refrigerator and freezer in-situ metering study of Duke Energy's Appliance Recycling Program in Ohio.

The metering study was conducted by TecMarket Works and included metering at 33 sites metered from May 15 to August 19, 2013. After data processing, there were a total of 30 units with usable data sets (23 refrigerators and 7 freezers). All units were evaluated in the participants' homes using: a "Watts up?" power meter installed directly to the refrigerator; two "Onset HOBO" temperature meters, one inside the refrigerator compartment (for refrigerator/freezer combinations) or inside the freezer box (for freezers), and one measuring the temperature of the air in the space immediately surrounding the refrigerator or freezer; and a "DENT SMARTlogger" time-of-use monitor to determine door openings. A summary of the results is shown in Table 7 below.

Table 7. Summary of Engineering Savings Estimates

Estimate	Gross Savings		Net Savings	
	kWh	kW	kWh	kW
Per Participant Annual kWh Savings: Overall	546	0.0636	402	0.0429
Per Participant Annual kWh Savings: Refrigerator	487	0.0510	403	0.0424
Per Participant Annual kWh Savings: Freezer	721	0.1015	337	0.0444

Power Meter Results

The average annual raw, unadjusted consumption, as measured by the "Watts up?" power meters, of a unit recycled through ARP, including both refrigerators and freezers, is 996 kWh. Freezers used more energy than refrigerators, 1,051 kWh compared to 979 kWh. As there were no refrigerators in the metering sample identified as primary, no comparison of primary versus secondary refrigerators is available. All freezers are considered secondary by default.

Weather Normalized Savings

The metering results, in their raw, unadjusted form, represent the energy consumption of the sampled units during the monitoring period, not for the entire year. To account for temperature differences throughout the year, the "Onset HOBO" temperature meters were used to establish a relationship between kWh and the temperature in the vicinity of the unit. Outdoor temperatures were researched in a historical weather database and found to have a strong correlation with energy consumption, since outdoor temperature affects indoor temperature in unconditioned spaces. This adjustment takes into account a waste heat factor for units in conditioned spaces.

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of savings, however, the risk to estimation accuracy is expected to be small as a result of our regression approach and the range of units included in our meter sample. The kWh consumption of a replacement unit used to calculate gross savings, where survey data indicated the recycled unit was replaced by another unit, is based on industry engineering and operation assumptions determined using a combination of historical data (adjusted for degradation based on the age of the appliance) and calculations cited in the Energy Star specifications. Customer specific data on replacement units was not available.

Net to Gross Methodology

TecMarket Works employs a direct net energy impact analysis approach that complies with USDOE's Uniform Methods Protocol (UMP). The evaluation approach used in this study is considered a best practice approach because it accounts for in-home use conditions and usage patterns as well as market operations impacts that impact energy use on the local grid. The approach is explained in the *Sixteen Path Direct Net Analysis Approach* section on page 26.

Participant Surveys

From the sample list of 1,923 customers, 594 participants were called between August 21 and September 6, 2013, and a total of 131 telephone surveys were conducted yielding a response rate of 22.1% (131 out of 594).

Engineering Analysis

For the in situ metering, from the sample list of 350 customers, all were called and 33 were recruited yielding a recruitment rate of 9.4% (33 out of 350).

Table 6. Summary of Data Collection Efforts

Data Collection Effort	# Available Contacts	# of Successful Contacts	Sample Rate
Management Interviews	6	6	100%
Dealer Interviews	23	17	74%
Participant Surveys	1,923	131	6.8%
Appliance Monitoring	350	33	9.4%

Expected and achieved precision

Participant Surveys

The survey sample methodology for the telephone survey had an expected precision of 90% +/- 6.2% and an achieved precision of 90% +/- 6.9%.

Engineering Analysis

The expected precision of the engineering analysis was +/- 10% at 90% confidence. The achieved precision was +/-16.4% at 90% confidence. This is based on the mean energy savings and the standard deviation of the individual estimates compared to the mean. Achieved precision is less than planned as a result of a low sample size caused by recruiting difficulties and records being dropped from the sample due to bad data. Additionally, a wide range of unit consumption was observed in the metering study, resulting in a higher than expected coefficient of variation.

Description of Measures and Selection of Methods by Measure(s) or Market(s)

To qualify for the ARP, a refrigerator or freezer must be between 10-30 cubic feet and in working condition. Both primary and secondary units were eligible. All customers are in the residential market.

Threats to validity, sources of bias and how those were addressed

This analysis relies on a short term metering study with a sample size of 30. All savings estimates are a product of the conditions observed in the sample. The sample was drawn at random and is assumed to be representative of all participating customers, however, the response rate was low, indicating a potential for self-selection bias. The monitoring occurred over a short-term period and was extrapolated to annual consumption using a regression model based on outdoor temperature changes. The potential for extrapolation error associated with the regression model exists for outdoor temperatures outside the range of the monitored data. A longer metering period and a larger sample size would better represent the full spectrum of variation in characteristics and circumstances and therefore provide a more accurate estimation

loggers was used to plot a regression line for each unit correlating average kWh with the average room and average outdoor temperature. The equation of the regression line was then applied to a typical meteorological year's (TMY3 data) outdoor temperature data for the Cincinnati, OH weather station to provide weather normalized annual consumption. Units were then mapped to one of the 16 paths based on participant survey responses to calculate average net savings per unit recycled (see Table 9 on page 27).

Data collection methods, sample sizes, and sampling methodology

Management Interviews

Interviews and follow up exchanges were conducted by phone with six staff members from Duke Energy, JACO, ADI, and RSE. Conversations ranged from half an hour to two and half hours. The interview instruments can be seen in Appendix A: Management Interview Instrument and Appendix B: Vendor Interview Instrument.

Appliance Dealer Interviews

Phone interviews were completed with 15 new and used appliance dealers found via an internet search for businesses operating within Duke Energy's Ohio service territory. Sample interview guides are provided in Appendix C: Used Appliance Dealer Survey Instrument and Appendix D: New Appliance Dealer Survey Instrument.

Participant Surveys

Duke Energy provided TecMarket Works with a list of 2,562 records for recycled appliances in Ohio (1,907 refrigerator records and 655 freezer records). After removing records with missing contact information, duplicate records, "do not contact" numbers and customers who have recently been surveyed about other programs, the sample list consisted of 1,923 contactable customers. The survey was conducted by telephone by TecMarket Works staff from the list of 1,923 customers in Ohio who recycled freezers and/or refrigerators, and 131 survey respondents completed the survey by telephone.

Engineering Analysis

This analysis uses a combination of in situ metering data and participant survey data. The survey was conducted by TecMarket Works staff from a random sample from a list of 2,562 customers in Ohio who recycled freezers and/or refrigerators, and 131 survey respondents completed the survey by telephone. Metering participants were recruited over the phone, independent of the phone survey, from a list of upcoming scheduled appliance pickups. From a list of 350 customers, there were 33 sites recruited.

Number of completes and sample disposition for each data collection effort

Management Interviews

From May to November 2013, TecMarket Works interviewed six program managers and vendors for this evaluation. This represents a completion rate of 100%.

Appliance Dealer Interviews

Between August 2 and 23, 2013, TecMarket Works completed 15 phone interviews with companies selling appliances in Ohio. Appliance dealers were contacted a maximum of four times or until the contact resulted in a completed interview or a refusal to participate.

Methodology

Overview of the Evaluation Approach

The process evaluation consists of three primary components: management interviews, interviews with new and used appliance dealers, and participant surveys.

Study Methodology

Management Interviews

TecMarket Works conducted interviews with the Duke Energy's product manager and with its customer marketing campaign manager. We also spoke with JACO's program manager and its call center coordination manager, as well as the general manager of Appliance Distribution Inc. (ADI), the subcontractor responsible for collections in Kentucky, Ohio, and Indiana. We also talked to the account manager with Runyon, Saltzman, and Einhorn (RSE), the JACO subcontractor responsible for program marketing.

The interviews considered program design, execution, operations, staff and customer interactions, data tracking and transfer methods, and personal experiences in order to identify any implementation issues and discuss opportunities for improvement. Interview guides were used to ensure a full and complete battery of questions were addressed to the interview subjects.

Sample guides are shown in "Appendix A: Management Interview Instrument" and "Appendix B: Vendor Interview Instrument."

Appliance Dealer Interviews

TecMarket Works conducted phone interviews with new and used appliance dealers to assess refrigerators and freezers, their opinions of the program, and its effect on their businesses. Dealers included national retailers, regional chains, and local businesses. Conversations ranged from five minutes to more than 30 minutes. Interview guides are shown in Appendix C: Used Appliance Dealer Survey Instrument and Appendix D: New Appliance Dealer Survey Instrument.

Participant Surveys

This survey focused on customers who, according to program tracking records, recycled refrigerators and/or freezers through the Appliance Recycling program from Duke Energy. The survey was conducted by telephone by TecMarket Works staff from a list of 1,923 customers in Ohio who recycled freezers and/or refrigerators, and 131 survey respondents completed the survey by telephone. The survey instrument can be found in "Appendix G: Participant Survey Instrument".

Engineering Analysis

For this analysis, field technicians installed meters in situ at each of 33 selected sites to monitor energy consumption, room temperature, and door openings. Daily average outdoor temperatures were gathered from a web-based historical weather database (weatherunderground.com), using weather data for the monitoring dates and city of residence for each participant. Annual energy usage was determined by multiplying the average hourly kWh from the power meter data by 8,760. To account for differences in temperature throughout the year, data from the temperature

TecMarket Works**Program Description****Table 5. Program Performance Aug 1, 2012 - July 31, 2013**

State	Collection Period	Freezers			Refrigerators			Combined Units		
		Goal	Actual	% Goal	Goal	Actual	% Goal	Goal	Actual	% Goal
OH	Aug 1 – Dec 31, 2012	113	137	127%	450	387	86%	563	524	93%
OH	Jan 1 – July 31, 2013	871	526	60%	3500	1558	45%	4371	2084	48%
OH	Combined	984	663	67%	3950	1945	49%	4934	2608	53%

While this level of collections falls well below the program's designated goals, TecMarket Works finds that the performance gap has reasonably less to do with marketing, call center practices, or collection handling—all of which appear to be generally strong—and more to do with the initially projected harvest rates, which were calculated by an external consultant in 2006 based upon an incentive level of \$30 per unit. Despite the fact that the program did not begin collecting units until six years after that study was conducted, the harvest rates and incentive levels remained the same while the marketplace and economy continued to change. This appears to be one factor in the difference between projected and actual collection numbers. Other factors are discussed in more detail in the following management section.

Program Description

The purpose of Duke Energy's Appliance Recycling Program (ARP) is to target residential customers in order to preempt the continued use of still-cooling refrigerators and freezers. Working primary and secondary units are collected, free of charge, from customer homes and taken to a central location where they are dismantled and recycled in an environmentally appropriate manner. To qualify, units must be between 10-30 cubic feet. To encourage participation, the program offers customers a financial incentive of \$30 per unit that is paid by check after dismantling of the unit has been confirmed. Customers are allowed to recycle up to two units per year.

Depending upon their model, age, and condition, older refrigerators and freezers can consume several times as much energy as newer, more efficient units. Thus the primary goal of the program is to remove working refrigerators and freezers from customer homes and keep them off of the secondary market to ensure they do not continue to draw upon the power grid. This reduces base load demand upon the electric system and thereby also helps in lowering peak load requirements. Secondary objectives of the program include educating customers about the energy saving and environmental benefits of recycling older units.

Program Goals and Participation

Program goals were set in conjunction with advice from an external consultancy that helped to determine an annual harvest rate for collecting used refrigerators and freezers. This was calculated based upon the number of active residential accounts, estimates of homeownership, demographics, and other factors within the Ohio service territory. Harvest rate projections ramp up during the first three years of the program as shown in the table below.

Table 4. Appliance Recycling Harvest Rates

		Ohio
Total Residential Electric Service Accounts		447,069
2012	# of Units	3,380
	Harvest Rate	0.8%
2013	# of Units	4,371
	Harvest Rate	1.0%
2014	# of Units	4,875
	Harvest Rate	1.1%

Because the program started in October of 2012, its initial year-end goals were prorated and used for calibration purposes for the first full year of the program. The program began with an initial goal of 563 units to be collected in Ohio by the end of 2012. By December 31, 2012 program collections totaled 524 units (93% of goal). The 2013 program goal was set for 4,371 units. Between January 1 and July 31, 2013 the program had collected 2,084 units (48% of goal). When both time periods are combined, the first 10 months of program operations resulted in 53% of combined goal for Ohio. Table 5 summarizes the program's performance to date.

Metering participants were recruited over the phone, independent of the phone survey, from a list of upcoming scheduled appliance pickups. From a list of 350 customers, there were 33 sites recruited.

Evaluation Objectives

This evaluation of Duke Energy's residential Appliance Recycling Program was conducted in an effort to determine the program's energy savings, operational effectiveness, market effects, and customer satisfaction. This evaluation pertains to the program as it was administered in Ohio.

Introduction and Purpose of Study

Summary Overview

This document presents the process and impact evaluation report for Duke Energy's Residential Appliance Recycling Program as it was administered in Ohio. The evaluation was conducted by TecMarket Works, BuildingMetrics, and Matthew Joyce, subcontractors to TecMarket Works.

Summary of the Evaluation

TecMarket Works performed a process evaluation comprised of management interviews, new and used appliance dealer interviews, and a survey of residential program participants to identify program implementation issues, assess customer responses and satisfaction levels, and examine the effects of the program on the sale of used and new refrigerators and freezers, as well as to look at appliance dealer policies for deliveries and removal.

This impact evaluation utilized in situ metering study to assess the energy consumption of the old-but-operable appliances that remained in use until immediately prior to program participation. It incorporates a direct net energy impact analysis approach that complies with USDOE's Uniform Methods Protocol (UMP). The evaluation approach used in this study is considered a best practice approach because it accounts for in-home use conditions and usage patterns as well as market operations impacts that impact energy use on the local grid. The metering study used to identify energy impacts was supplemented by a participant survey, as presented in Table 3 below.

Table 3. Evaluation Date Ranges

Evaluation Component	Sample Pull: Start Date of Participation	Sample Pull: End Date of EMV Sample	Dates of Data Collection
Management Interviews	N/A	N/A	Interviews conducted from 5/28/13 to 11/20/13
Dealer Interviews	N/A	N/A	Interviews conducted from 8/2/13 to 8/23/13
Participant Surveys	09/26/2012	07/25/2013	Surveys conducted from 8/21/13 through 9/6/13
Appliance Monitoring	05/13/2013	08/19/2013	September through November 2013

Between May and November of 2013, TecMarket Works conducted interviews with managers and staff members at the leading firms involved in the implementation of this program, including Duke Energy, JACO Environmental, and Runyon, Saltzman and Einhorn.

TecMarket Works also spoke with used and new appliance dealers operating within the Duke Energy services territories in Ohio. Their businesses were found via an internet search and were interviewed by phone between August 2 and 23, 2013.

TecMarket Works conducted a phone survey with a random sample of 131 participants (who combined recycled 67 freezers and 77 refrigerators, including 13 customers who recycled multiple units) between August 21 and September 6, 2013.

- The market for used appliances is influenced by a wide number of factors and continues to change with time. Thus it may be helpful to plan a follow up study of the marketplace within a few years in order to understand and appreciate those changes are influencing customer expectations, willingness to participate, and satisfaction with the program.

- Because landlords represent the largest group of appliance purchasers, consider developing an aspect of the program that targets property management companies to encourage their participation either with collections of individual refrigerators that require replacement or via large scale replacements at one time, linked to a replacement incentive for energy efficient units. Such a move could increase the energy savings of the program, while providing landlords with cash offsets to replace inefficient refrigerators, making their rental units more attractive to tenants. Because this would also encourage these market actors to acquire new units (rather than used), it could make the replacement process more convenient by avoiding multiple search, purchase, delivery and installation efforts.
- To better reach its goals the program team may also consider expanding eligibility beyond residential customers to other types of buildings, including schools, offices, and industrial locations.
- Duke Energy may be able to generate leads for the program by adding a question about secondary refrigerators and freezers to future customer surveys, such as the Home Energy House Call survey.
- Consider taking advantage of Duke Energy's internal customer satisfaction and net promoter scores to develop an initiative that encourages program participants to refer their families and friends.
- Arranging joint promotions with municipal and private recycling firms to promote environmentally appropriate recycling may be a way to increase awareness at fairly low cost. Duke Energy launched a retailer-utility partnership with Sears in Indianapolis in the late fourth quarter of 2013 collecting 12 units thru December. If demonstrated to be effective in that territory, a similar effort may be worthwhile in Ohio as well. Such a partnership will need to address the potential for reducing Duke Energy's net to gross ratio through the collection of non-working units. In theory, the potential for such an arrangement exists among all new appliance dealers who collect older units, with the greatest opportunity lying in those companies that sell the largest number of units. Retailers who are already participating in the EPA's RAD program, such as Home Depot and Best Buy may be ready partners for joint promotions and coordinated collections. While midsize companies that collect older units as a service to their customers may also represent possible partners. The program may be a more challenging "sell" at firms, such as Lowes, Menards, HH Gregg and others, which generate revenue from the used units that they collect.
- Duke Energy may also be able to increase the used appliance collections by new appliance dealers with point of sale promotion materials to encourage them to mention the program to customers shopping for new units. Freeridership can be minimized by not implementing this practice with firms that are actively participating in the EPA's RAD program.
- As permitted under filing requirements, consider accepting units from and paying incentives to used appliance dealers who are willing to recycle working units via the program instead of reselling them. A method for determining the portion of units that would go into the secondary market would have to be explored prior to implementation.

131), the incentive payment (21.4% or 28 out of 131), and the ease of participation (18.3% or 24 out of 131). Customers who recycled multiple units are more likely to mention getting rid of old units and creating space/reducing clutter, and are less likely to mention the incentive money. Two-thirds of survey participants (64.9% or 85 out of 131) could not name a least favorite aspect of the program; among those who did name least favorite aspects of the program, the most frequently mentioned complaints involve scheduling the appliance pick-up (wanting to schedule a pick-up sooner, not enough scheduling options, having to reschedule, etc.)

- See section titled "Favorite and Least Favorite Aspects of the Program" on page 97.
- Only 20.6% (27 out of 131) of surveyed program participants report that they have seen a reduction in their electric bills since they recycled their old appliances. There is no statistically significant difference between customers who recycled a refrigerator, a freezer, or multiple units.
 - See section titled "Customers Noticing a Reduction in Their Electric Bill after Removing Appliances" on page 100.
- About a third of customers surveyed (30.5% or 40 out of 131) report having taking additional energy efficiency actions since participating in the Appliance Recycling program, and the average influence rating of the program on these actions is 6.0 on a 10-point scale. The most common action reported is switching to efficient light bulbs (12.2% or 16 out of 131), and a similar number (12.2% or 16 out of 131) report that they received free CFLs from Duke Energy. Four customers (3.1% of 131) report having a Home Energy House Call audit since recycling their appliances, and three customers (2.3% of 131) have joined the Power Manager program.
 - See sections titled "Additional Energy Efficiency Actions since the Program" and "Participation in Other Duke Energy Programs" on pages 100 and 102.

Recommendations

- It seems logically sound that cancellation rates will diminish with a greater number of appointment time slots and with shorter time intervals between customer calls and pick up dates. However, that will remain an indirect effect until more customers begin making appointments. Therefore, Duke Energy and JACO should also take multiple actions to increase program enrollments and direct steps to reduce cancellations wherever possible.
- Raising incentive amounts from \$30 to \$40 or \$50 per unit will likely increase participation and help the program to reach its targeted goals. The Duke Energy and JACO conducted an incentive level effectiveness study in North Carolina and South Carolina with 240,000 Duke Energy customers during September and October 2013 to assess participation levels at higher incentive levels. The study found a 230% increase in customer enrollments when the incentive was raised to a \$50 over the current \$30. These findings should be considered for their cost effectiveness as means of increasing program participation compared with the costs of increasing marketing spend per unit to make more people aware of the program and its benefits at lower incentive levels.

(26.7% or 20 out of 75 customers recycling refrigerators and 27.7% or 18 out of 65 customers who recycled freezers). For both groups, the next-most likely outcome is keeping the recycled units in the home (21.3% or 16 out of 75 for refrigerators and 18.5% or 12 out of 65 for freezers). In total, only 28.0% (21 out of 75) of refrigerator recyclers and 32.3% (21 out of 65) of freezer recyclers would have disposed of the units in a way that would ensure they are not used again in the future (taken it to a dump, paid someone else to take it to a dump, or left it on the curb for garbage pick-up).

- See section titled “Intentions in the Absence of the Recycling Program” on page 85.
- More than half of customers would have had their units removed at a later time (or not at all) in the absence of the recycling program (61.3% or 46 out of 75 who recycled refrigerators, 60.0% or 39 out of 65 for those who recycled freezers). Only 14.7% (11 out of 75) of refrigerator recyclers and 3.1% (2 out of 65) of freezer recyclers would have disposed of their units sooner without the Duke Energy Appliance Recycling Program.
 - See section titled “Intentions in the Absence of the Recycling Program” on page 85.
- Most customers who replaced or did not replace their recycled units would have done the same thing in the absence of the program. Among refrigerator recyclers, just 6.7% (5 out of 75) did not replace their unit but say they would have without the program, while 1.3% (1 out of 75) say they did replace their unit but would not have without the program. For freezers, 6.2% (4 out of 65) did not replace but would have without the program, while 4.6% (3 out of 65) did replace but would not have without the program.
 - See section titled “Intentions in the Absence of the Recycling Program” on page 85.
- This program gets very high satisfaction ratings from participants: on a 10-point scale, the average rating for the program overall is 9.72, with the ratings for specific aspects of the program ranging from 9.34 up to 9.88. Overall satisfaction with Duke Energy is somewhat lower (but still high) at 8.75 using the same scale. Overall, 67.2% (88 out of 131) of surveyed customers said that participating in this program made them feel more favorable toward Duke Energy, while none (0% of 161) said it made them feel less favorable.
 - See section titled “Program Satisfaction” on page 90.
- Customers were also asked to rate their overall satisfaction with the program on a five-point scale; 95.4% (125 out of 131) gave this program the highest possible positive rating of “very satisfied”, with the remaining customers all stating that they were “somewhat satisfied” (4.6% or 6 out of 131). None of the surveyed customers (0 out of 131) gave neutral or negative ratings for their satisfaction with the program.
 - See section titled “Program Satisfaction” on page 95.
- Surveyed participants' favorite aspects of this program are the convenience of home pick-up (mentioned by 26.0% or 34 out of 131), getting rid of old units (23.7% or 31 out of

- Four-fifths of customers surveyed (82.4% or 108 out of 131) correctly recalled that the incentive for the program is \$30 per unit recycled. All of the remaining customers who answered the question stated amounts within \$10 of the correct amount, though 4.6% (6 out of 131) could not recall. Eight surveyed customer (6.1% of 131) donated their incentive to the Helping Hands Assistance program and the remainder (93.9% or 123 out of 131) kept the cash. The median length of time between appliance pick-up and receipt of the incentive payment was three weeks; only three participants (2.3% of 131) waited for 6 weeks or longer, and none (0% of 166) reported that they had not received payment by the time of this survey.
 - See section titled "Incentive Payments" on page 79.
- All but one of the primary refrigerators recycled by surveyed customers (94.7% or 18 out of 19 units) have been replaced. Less than a third of recycled freezers (29.9% or 20 out of 67) and secondary refrigerators (31.0% or 18 out of 58) have been replaced. Another seven customers (5.3% of 131) still intend to purchase replacement freezers or secondary refrigerators in the next 12 months (four freezers and three secondary refrigerators). Most replacement units for primary refrigerators (83.3% or 15 out of 18) and freezers (70.0% or 14 out of 20) were purchased new, however only a minority of replaced secondary refrigerators were replaced with new units (38.9% or 7 out of 18). About one in four (27.8% or 5 out of 18) of the replacement secondary refrigerators were moved from somewhere else in the home (often representing the demotion of a main refrigerator to secondary status), as was one (5.0% of 20) of the replacement freezers, though none (0% of 28) of the replacement primary refrigerators were moved from elsewhere in the home.
 - See section titled "Replacing Recycled Units" on page 80.
- Most replacement freezers (60.0% or 12 out of 20) were acquired before the old unit was recycled, as were most primary refrigerators (66.7% or 12 out of 18); however, replacement refrigerators used as secondary units were usually not acquired before recycling the old unit (27.8% or 5 out of 18). By a large margin, replacement freezers were smaller (70.0% or 14 out of 20) rather than larger (10.0% or 2 out of 20) than the recycled units that they replaced. Half of the main refrigerators were replaced with units of about the same size (50.0% or 9 out of 18), though more of these replacement refrigerators are larger (33.3% or 6 out of 18) rather than smaller (16.7% or 3 out of 18) compared to the recycled units. For secondary refrigerators, twice as many replacements are larger (44.4% or 8 out of 18) than smaller (22.2% or 4 out of 18), and a third are the same size (33.3% or 6 out of 18). A minority of respondents were able to state the exact cubic footage of their new units; among those who provided the cubic footage, the average sizes of replacement refrigerators are 22.6 cubic feet for main units and 21.1 cubic feet for secondary units, while the average freezer size was reported as 14.1 cubic feet.
 - See sections titled "Replacing Recycled Units" and "Characteristics of Replacement Units" on pages 80 and 83.
- If the Duke Energy Appliance Recycling program had not been available, the most likely outcomes for recycled refrigerators and freezers would be giving them away for free

- A plurality of 40.5% of participants (53 out of 131) learned about Duke Energy's Appliance Recycling program from inserts with their monthly bills, with about one in three mentioning advertising (32.8% or 43 out of 131) and 19.1% (25 out of 131) mentioning referrals from friends, family, neighbors or co-workers.
 - See section titled "Program Awareness and Reasons for Participation" on page 68.
- The most-mentioned main reason for customers getting rid of a refrigerator was that it was a spare unit that was not being used much (40.0% or 30 out of 75 customers who recycled refrigerators), followed by it not working properly (18.7% or 14 out of 75) and wanting to save energy (12.0% or 9 out of 75). For freezers, the most-mentioned main reason for disposal was also that the unit was a spare that was not used much (52.3% or 34 out of 65 customers who recycled freezers), and the next most-mentioned main reasons are that the unit was not working properly (12.3% or 8 out of 65) and wanting to save energy (9.2% or 6 out of 65). When asked why they chose to dispose of their old units through the Appliance Recycling program from Duke Energy, the main reason given by customers was the convenience of home pick-up (37.4% or 49 out of 131 participants surveyed), followed by the cash incentive (24.4% or 32 out of 131). Customers who recycled one refrigerator are significantly more likely to mention the cash incentive, while customers who recycled a freezer are more likely to mention the convenience of home pick-up; customers who recycled multiple units were significantly more likely to say that they did not know of any other options for disposal.
 - See sections titled "Customers' Reasons for Recycling Refrigerators", "Customers' Reasons for Recycling Freezers" and "Customers' Reasons for Recycling Appliances through the Duke Energy Program" on pages 70, 72 and 73.
- Surveyed customers were asked if the incentive and the program information had any influence on their decision to participate in this program; 72.5% (95 out of 131) indicated that the incentive was an influence for them, and 68.7% (90 out of 131) indicated that the program information was an influence.
 - See section titled "Customers' Reasons for Recycling Appliances through the Duke Energy Program" on page 73.
- Nearly two-thirds of surveyed customers (62.6% 82 out of 131) signed up for the program by telephone, and 22.9% (30 out of 131) signed up online. Most of the remaining customers either did not sign up themselves (someone else in the household did), or else cannot recall how they signed up. Among those who signed up by telephone, only 6.1% (5 out of 82) had to place more than one call. Among all surveyed participants, only two (1.5% of 131) said they were not able to schedule a convenient pick-up time, while another three (2.3% of 131) reported that the collection team did not arrive on time, though no one surveyed (0% of 131) said that they did not receive a confirmation call prior to pick-up.
 - See section titled "Participation in the Program" on page 76.

dealers we surveyed agreed that they are able to sell every used unit that they obtain, and those who only sell used units indicated that they could sell more units if they could obtain them.

- With used unit supplies down and costs for replacement parts high, sales prices for used units are rising. But the price increases are not proportionate to the differential between supply and demand, since many dealers do not feel their customers will tolerate the higher sticker prices. As a result used dealer profit margins are being squeezed.
- The perceived effect of the program on appliance dealer businesses appears to be correlated with their business model. The more reliant the dealers are upon obtaining older units from individual people, the more adversely the program is thought to be impacting their businesses. Regardless of business model, no used appliance dealers felt the program was good for their business.
- According to the used appliance dealers we spoke with, landlords may account for up to half of their annual sales of used refrigerators and freezers. While in years past a single appliance dealer used to be able to supply one landlord with all or most of the units desired, landlords now need to visit several dealers in order to obtain enough used units to meet their needs.
- Overall the program appears to be having little to no measurable effect on new unit sales. However, the gap between used unit availability and demand has to be filled by a lack of purchase or by the acquisition of a new more energy efficient unit, thereby further increasing savings in the market.

From the Customer Surveys

- TecMarket Works surveyed 131 customers in Ohio who recycled 77 refrigerators and 67 freezers (including thirteen customers who recycled two units apiece). Nineteen (24.7% of 77) of the recycled refrigerators were being used as the main refrigerator in the household, while 58 (75.3% of 77) of the recycled refrigerators were secondary or "spare" units.
 - See sections titled "Participant Survey Results" and "Characteristics of Recycled Units: Refrigerators" on page 63.
- Most recycled freezers (56.7% or 38 out of 67) and about half of the spare refrigerators (48.3% or 28 out of 58) were kept in the basement, and around 40% of these units were not kept in rooms that are heated in winter or cooled in the summer. Customers report the average age of their recycled freezers is 26.4 years, older than the average age of recycled primary refrigerators (15.4 years), but about the same average age as secondary refrigerators (28.9 years). The majority of recycled units were kept plugged in and running year-round (100% of 19 primary refrigerators, 72.4% of 58 secondary refrigerators, and 67.2% of 67 freezers). While 85.1% (51 out of 67) of recycled freezers were described as being in good physical condition, only 57.1% (44 out of 77) of recycled refrigerators were described as being in good physical condition.
 - See sections titled "Characteristics of Recycled Units: Refrigerators" and "Characteristics of Recycled Units: Freezers" on pages 63 and 67.

efficient and savings levels erode, it will be important to set levels that keep a careful eye on cost effectiveness.

- See section titled "Incentive Payments" on page 50.
- A controlled test of incentive amounts among 240,000 Duke Energy customers in North Carolina and South Carolina during September of 2013 demonstrated that higher incentive levels of \$40 and \$50 result in increased participation levels and greater energy savings associated with the additional units collected. These findings should be considered for their applicability and cost effectiveness in the Ohio service territory.
 - See section titled "Incentive Payments" on page 50.
- Although collection numbers lag behind projected goals, overall program administration and daily operations appear to be strategically well-considered, carefully timed and coordinated, and effectively executed.
 - See section titled "Evaluation" on page 53.

From the New and Used Appliance Dealer Interviews

For more details on the findings below see section titled "Appliance Dealer Interview Results" beginning on page 56.

- New and used appliance dealers are generally reluctant to discuss their sales volume and business practices, thereby making it difficult to quantify for this evaluation the number of used units sold annually.
- Knowledge of the program among new and used appliance dealers is modest, with more used dealers indicating awareness than new dealers.
- Market volume of used units is down markedly from years past. Duke Energy's Appliance Recycling Program is contributing to this decline, but the dealers we spoke with cited other factors as being more significant, including business decisions by major retailers, the federal government's Cash-for-Clunkers appliance recycling effort, and the price of scrap metal.
- The reduction of the availability of used units is adversely affecting small used appliance dealers who rely on individual people with spare units to obtain stock they can resell. Dealers who sell units that are less than five years old and dealers who purchase used appliances in bulk from wholesalers and auctions appear to be better able to withstand program-induced market changes. Targeting bulk units headed for the used market may be an opportunity for additional reductions to the used appliance market.
- Demand for used refrigerators and freezers remains strong. The dealers we spoke with reported that while some customers will opt to purchase new units when used ones are unavailable, most of their customers are financially unwilling or unable to purchase new units due to price sensitivity or other factors such as creditworthiness. This ensures that the demand for used units remains high.
- With strong demand and low inventories, the market for used refrigerators is supply constrained, meaning there are not enough used units to meet demand. All appliance

- See section titled "Appliance Collection" on page 46.
- Duke Energy never comes into legal possession of the units. All dismantling and recycling activities are specific to JACO and meet or exceed state and federal laws, as well as the more stringent Responsible Appliance Disposal¹ (RAD) program guidelines.
 - See section titled "Dismantling and Recycling" on page 49.
- The financial incentive levels for the program are currently set at \$30 per unit for Ohio customers. JACO processes and mails most checks within two to four weeks, which is less than the contracted six week time frame. No challenges or issues were reported with incentive processing or accounting.
 - See section titled "Incentive Payments" on page 50.
- All parties report clear and regular communication, smooth functioning, and collaborative teamwork in the accomplishment of shared goals.
 - See section titled "Management Coordination and Communication" on page 52.
- The program did not meet its goal for 2012. In its first three months of operation in Ohio the program recycled 387 refrigerators and 137 freezers for a total of 524 units, toward an initial goal of 563 units. This represents 93% of goal. Between January 1 and July 31, performance in Ohio stood at 1,558 refrigerators and 526 freezers for a total of 2,084 units or 48% of its annual goal.
 - See section titled "Program Goals and Participation" on page 17.
- Overall in the first 10 months of operations, the program collected 2,608 units in Ohio.
 - See section titled "Program Goals and Participation" on page 17.
- While noting the opportunity for incremental improvements in call center processing, the availability of appointments, and cancellation rates, TecMarket Works considers low performance against goals to be largely attributable to the current incentive level of \$30 per unit and the initial harvest rate projections upon which the program's annual goals are based.
 - See section titled "Incentive Payments" on page 50.
- A Market Potential Study (MPS) was used as the basis for projections regarding annual collections and establishing the incentive level for the program. The targets based on this older MPS may not have been as appropriate as those of a newer study, by the time of the actual launch.
 - See section titled "Program Goals and Participation" on page 17
- Raising incentive amounts from \$30 to \$40 or \$50 per unit may increase participation and help the program to reach its targeted goals. However, as refrigerators become more

¹ See <http://www.epa.gov/ozone/partnerships/rad/> for more information.

- Six (31.6%) out of the 19 units recycled through the program that, in the absence of the program, would have been picked up by a dealer or donated were reported to be in saleable condition and would likely have ended up on the secondary market.
 - See paragraph under Table 11 on page 29.
- Net to gross ratios for refrigerators and freezers are 82.8% and 46.7% respectively.
 - See *Net to Gross Analysis* on page 34.
- Program wide average remaining useful life (RUL) is calculated to be 5 years.
 - See *Remaining Useful Life* on page 33.

Significant Process Evaluation Findings

From the Management Interviews

- The program employs a multi-pronged marketing strategy that combines Duke Energy customer communications (bill inserts, emails, website and online services [OLS] promotions), with paid advertising (print, broadcast, and digital), and creative public relations events staged for the public and the news media.
 - See section titled "Marketing" on page 38.
- Each marketing activity is tracked and measured for effectiveness. Every caller to the call center is asked how they heard about the program, while digital marketing uses unique URLs and Google Analytics to track web traffic. Bill inserts represent the most popular source for both calls and website visits.
 - See section titled "Scheduling and Customer Inquiries" starting on page 41.
- Customers can make an appointment for collection via phone or internet. Appointments placed via the call center outnumber web appointments by approximately two to one. No operational challenges were reported with either method. A Duke Energy-JACO review of cancellations showed that customers sometimes enrolled by internet and then placed a phone call to enroll as well.
 - See section titled "Scheduling and Customer Inquiries" starting on page 41.
- The program had an overall cancellation rate of 15% during 2012, and slightly higher rates of 19.3% during 2013. TecMarket Works identifies these cancellation rates as an area for additional investigation to determine reasons for them and to categorize them into those for corrective action and those such as the deletions of duplicate customer enrollments. This may help to improve program performance since the marketing and scheduling teams have already effectively executed their assigned roles and obtained the customers' commitment to program participation.
 - See section titled "Scheduling and Customer Inquiries" starting on page 41.
- No challenges or issues with refrigerator or freezer collection were reported.

Executive Summary

Key Findings

This section presents the key findings and recommendations identified through the evaluation of the Ohio Residential Appliance Recycling Program. Table 1 presents the estimated overall ex post energy impacts from the engineering analysis.

Table 1. Estimated Overall Impacts

Net Savings	Refrigerators	Freezers
Annual Savings Per Participant Per Year		
kWh	403	337
kW	0.0422	0.0474

These net savings estimates are based on the net assessment approach described in the *Sixteen Path Direct Net Analysis Approach* section of this report. This 16-path approach is consistent with the newly released USDOE Uniform Evaluation Protocols (UMP) because it provides a direct-net assessment approach by assessing the way in which the program impacts energy use in the homes of participants and non-participants. As USDOE points out in their UMP, these programs change the way the appliance market operates and provides savings beyond the home of the participant that are typically missed in evaluations that focus only on participants' homes. The 16-path analysis approach developed by TecMarket Works expands on the USDOE UMP approach by allowing the consumers of evaluation results to see the program's effects or lack of effects on all of the market operations channels that can be impacted by these types of programs.

Significant Impact Evaluation Findings

The estimated net impacts are presented in the *Impact Estimates: Engineering* section of the report. A summary of the results is shown in Table 2.

Table 2. Engineering Analysis Estimated Impacts

Estimate	Gross Savings		Net Savings	
	kWh	kW	kWh	kW
Per Participant Annual kWh Savings: Overall	546	0.0636	402	0.0429
Per Participant Annual kWh Savings: Refrigerator	487	0.0510	403	0.0424
Per Participant Annual kWh Savings: Freezer	721	0.1015	337	0.0444

- The average secondary refrigerator has an in-service rate of 74.1% (8.89 months out of 12). The weighted average in-service rate for all refrigerators is 79.4%. The average freezer has an in-service rate of 71.5%.
 - See Table 8 on page 25.
- The average annual kWh consumption of a replacement refrigerator is 529 kWh. A replacement freezer is 516 kWh.
 - See Table 11 on page 29.

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Final Report

**Process and Impact Evaluation of Duke Energy's
Residential Appliance Recycling Program (ARP)
in Ohio**

**Prepared for
Duke Energy**

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Table 21. Location of Secondary Refrigerators

Location	All recycled secondary refrigerators (N=58)
Basement	48.3%
Garage	41.4%
Laundry room	3.4%
Kitchen	1.7%
<i>"In our son's downstairs kitchen"</i>	1.7%
<i>"In our combined basement/garage area"</i>	1.7%
<i>"Side room"</i>	1.7%

As Table 22 indicates, most secondary refrigerators are kept in rooms that are heated in the winter (63.8% or 37 out of 58) and cooled in the summer (62.1% or 36 out of 58). Assuming that all main refrigerators are kept in areas of the house that are heated and cooled⁸ (in or by the kitchen), overall about three-quarters of the refrigerators recycled by surveyed customers were kept in rooms that are heated (72.7% or 56 out of 77) and cooled (71.4% or 55 out of 77).

Table 22. Refrigerators Kept in Rooms that Have Heating and Cooling

	Main refrigerators (N=19)	Secondary refrigerators (N=58)	Total (N=77)
Stored in a room that is heated in the winter	100.0%	63.8%	72.7%
Stored in a room that is cooled in the summer	100.0%	62.1%	71.4%

Although survey respondents did not know the ages of one recycled refrigerator in seven (14.3% or 11 out of 77), nearly half (48.1% or 37 out of 77) were 20 years old or older. Only seven refrigerators (9.1% of 77) were less than 10 years old.

Recycled refrigerators that were used as spare or secondary units tend to be significantly older: the mean age of recycled secondary units is 28.9 years, while the mean age of recycled primary units is 15.4 years (this difference is significant at $p < .05$ using ANOVA). None of the primary units recycled was older than 35 years (0.0% of 19), compared to 31.0% (18 out of 58) of the secondary units (this difference is significant at $p < .05$ using student's t-test). The average age of all refrigerators recycled (main and secondary together) is 25.4 years and the median age is 20 years.

⁸ All 131 surveyed respondents in Ohio have heating and cooling systems for their homes.

Table 23. Age of Recycled Refrigerators

Age of recycled refrigerator	Main refrigerators (N=19)	Secondary refrigerators (N=58)	Total (N=77)
Less than 10 years old	10.5%	8.6%	9.1%
10 years to 14 years old	36.8%	12.1%	18.2%
15 years to 19 years old	15.8%	8.6%	10.4%
20 years to 24 years old	21.1%	13.8%	15.6%
25 years to 34 years old	5.3%	10.3%	9.1%
35 years or older	0.0%	31.0%	23.4%
Don't know	10.5%	15.5%	14.3%

Secondary refrigerators recycled through this program have been used as secondary units for an average of 13.3 years, and the median length of time is 11.5 years.⁹ There are also two recycled spare refrigerators (3.4% of 58) which were not being used; these units were acquired along with the purchase of a home. The distribution of time being used as a spare refrigerator is shown in Table 24.

Table 24. Length of Time that Secondary Refrigerators have Been Used as Spares

Length of time	All recycled secondary refrigerators (N=58)
Less than a year	6.9%
1 year up to 3 years	6.9%
3 years up to 6 years	10.3%
6 years up to 10 years	12.1%
10 years up to 15 years	17.2%
15 years up to 25 years	32.8%
25 years or more	10.3%
Was not using unit (came with home)	3.4%
Don't know	0.0%

Table 25 shows that most (72.4% or 42 out of 58) secondary refrigerators were plugged in and running all of the time. Assuming that all main refrigerators are also plugged in and running all of the time, overall 79.2% (61 out of 77) of refrigerators recycled by surveyed customers were plugged in and running all of the time. Seven recycled refrigerators (9.1% of 77) were not plugged in and running before they were recycled.

⁹ When computing the mean and median length of time that units have been used as spares, two units which were described as having been used for "zero" years were not included, since these customers described these spare units as having been acquired through the purchase of a home (the unit came with the home and was not used by the new occupants).

Table 25. Refrigerator Usage

Refrigerator usage	Main refrigerators (N=19)	Secondary refrigerators (N=58)	Total (N=77)
Plugged in and running all the time	100.0%	72.4%	79.2%
For special occasions only	0.0%	8.6%	6.5%
During certain months of the year only	0.0%	6.9%	5.2%
Not plugged in and running	0.0%	12.1%	9.1%

The five customers who said they used their spare refrigerators “for special occasions only” estimated that their units were plugged in and running for an average of about four months during the past year. Among the four customers who said they used their spare refrigerator “during certain months of the year only”, units were plugged in and running an average of about 2.5 months during the past year. Six of the nine respondents (66.7%) who had their spare units running for only part of the year report that they run their spare units mainly during “a mix if both summer and other times of the year”.

Table 26 indicates that a majority of 57.1% (44 out of 77) of refrigerators recycled by surveyed program participants were in good working order. Approximately a third of recycled units were working but in need of minor repairs (32.5% or 25 out of 77) and the remaining tenth were working but with significant performance problems (10.4% or 8 out of 77). None of the refrigerators recycled by surveyed participants were described as not being in working order, which is a requirement for participation in the program (units are supposed to be functional in order to qualify).

Even though they tend to be newer than secondary units (see Table 23), recycled refrigerators that were used as “main” kitchen units were significantly more likely to have significant performance issues (26.3% or 5 out of 19) compared to units that were used as secondary or spare refrigerators (5.2% or 3 out of 58; this difference is significant at $p < .05$ using student’s t-test). While nearly two-thirds of the recycled secondary units were in good condition (65.5% or 38 out of 58), less than a third of main refrigerators were in good condition (31.6% or 6 out of 19; this difference is significant at $p < .05$ using student’s t-test).

Table 26. Condition of Recycled Refrigerators

Condition of recycled refrigerator	Main refrigerators (N=19)	Secondary refrigerators (N=58)	Total (N=77)
Worked and was in good physical condition	31.6%	65.5%	57.1%
Worked but needed minor repairs	42.1%	29.3%	32.5%
Worked but had significant performance problems	26.3%	5.2%	10.4%
It did not work	0.0%	0.0%	0.0%
Don't know	0.0%	0.0%	0.0%

Characteristics of Recycled Units: Freezers

Most freezers recycled by surveyed customers were kept in the basement (56.7% or 38 out of 67), with the garage being the next-most common location (35.8% or 24 out of 67), as seen in Table 27.

Table 27. Location of Recycled Freezers

Location	All recycled freezers (N=67)
Basement	56.7%
Garage	35.8%
Laundry room	3.0%
Dining room	1.5%
Utility room	1.5%
"In our mud room / breezeway"	1.5%

Table 28 indicates that a majority of recycled freezers were kept in rooms that were heated in the winter (59.7% or 40 out of 67) and cooled in the summer (56.7% or 38 out of 67).

Table 28. Freezers Kept in Rooms that have Heating and Cooling

	All recycled freezers (N=67)
Stored in a room that is heated in the winter	59.7%
Stored in a room that is cooled in the summer	56.7%

About two-thirds of the freezers recycled by survey respondents (62.7% or 42 out of 67) were twenty years old or older. Only one respondent (1.5% of 67) recycled a freezer that was less than ten years old, as seen in Table 29. The average age of freezers recycled by surveyed program participants is 26.4 years and the median age is 22 years.

Table 29. Age of Recycled Freezers

Age of recycled freezer	All recycled freezers (N=67)
Less than 10 years old	1.5%
10 up to 15 years old	11.9%
15 up to 20 years old	16.4%
20 up to 25 years old	20.9%
25 up to 35 years old	17.9%
35 years or older	23.9%
Don't know	7.5%

As seen in Table 30, the majority of freezers recycled by survey respondents were plugged in and running all of the time (67.2% or 45 out of 67), though 25.4% (17 out of 67) were not plugged in and running at all.

Table 30. Freezer Usage

Freezer Usage	All recycled freezers (N=67)
Plugged in and running all the time	67.2%
For special occasions only	1.5%
During certain months of the year only	1.5%
Not plugged in and running	25.4%
Plugged in and running all the time until a month or two ago when we unplugged it	4.5%
Don't know	0.0%

Among the two surveyed customers who used their freezer “certain months of the year” or “for special occasions only”, the average amount of usage for the recycled unit was 6 months out of the past 12 months. One of these customers ran their freezer mainly during non-summer months (for 9 months out of the year), and the other specified that they had the freezer running during “wintertime” (for 3 months out of the year).

The majority of freezers recycled by surveyed program participants are described as being in good physical condition (85.1% or 51 out of 67), as seen in Table 31. Only six freezers (9.0% of 67) were described as having significant performance problems, while one freezer (1.5% of 67) was non-functional.

Table 31. Condition of Recycled Freezers

Condition of recycled freezer	All recycled freezers (N=67)
Worked and was in good physical condition	85.1%
Worked but needed minor repairs	13.4%
Worked but had significant performance problems	9.0%
It did not work	1.5%
Don't know	0.0%

Program Awareness and Reasons for Participation

All of the customers responding to the survey (100% of 131) recall participating in the Appliance Recycling program.

A plurality of nearly half of customers surveyed (40.5% or 53 out of 131) first became aware of the Appliance Recycling program through an insert with their monthly bill. Advertising (32.8% or 43 out of 131) and word-of-mouth from family, friends, neighbors and coworkers (19.1% or 25 out of 131) were also mentioned by significant numbers of participants.

There are two significant differences in Table 32: Customers who recycled one refrigerator were more likely to have heard of the program from friends, family and neighbors (28.1% or 18 out of 64) compared to those who recycled one freezer (9.3% or 5 out of 54), and customers who recycled one freezer were more likely to mention an email from Duke Energy (7.4% or 4 out of

54) than those who recycled a refrigerator (0.0% of 54; both of these differences are significant at $p < .05$ using student's t-test).

Table 32. Source of Awareness of the Appliance Recycling Program

Source of Awareness	Recycled one refrigerator (N=64)	Recycled one freezer (N=54)	Recycled multiple units (N=13)	Total (N=131)
Insert with monthly bill	40.6%	40.7%	38.5%	40.5%
Advertisement on radio, TV or newspaper (listed below)	31.3%	35.2%	30.8%	32.8%
From a friend, family, neighbor, coworker	28.1%	9.3%	15.4%	19.1%
Saw info at Duke Energy website	4.7%	5.6%	7.7%	5.3%
Email from Duke Energy	0.0%	7.4%	0.0%	3.1%
From another energy program (listed below)	0.0%	3.7%	0.0%	1.5%
From appliance dealer or retailer (listed below)	1.6%	0.0%	0.0%	0.8%
Some other way (listed below)	3.1%	1.9%	7.7%	3.1%
Don't know / not specified	3.1%	7.4%	7.7%	5.3%

Percentages may total to more than 100% because participants could give multiple responses.

Forty-three survey participants (32.8% of 131) mentioned advertising as the source of their awareness of the recycling program. These 43 responses are categorized and listed below; the most frequent response mentioned by a third of these participants is *The Cincinnati Enquirer* newspaper.

Newspapers (N=20 or 46.5% of 43)

- *Cincinnati Enquirer* (N=14)
- *Unspecified newspaper* (N=5)
- *Hamilton Journal newspaper*

Television (N=16 or 37.2% of 43)

- *Unspecified television* (N=9)
- *Channel 12* (N=2)
- *Channel 9* (N=2)
- *Channel 9 or channel 12*
- *Channel 19 news*
- *"On the news."*

Radio (N=11 or 25.6% of 43)

- *Unspecified radio* (N=8)
- *700 WLW* (N=2)
- *WARM 98*

Other (N=1 or 2.3% of 43)

- *Online newsletter from WCPO radio.*

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Note: the list above totals to more than 43 responses because respondents could name multiple sources of awareness.

Two survey participants (1.5% of 131) named other energy programs as their source of awareness. These responses are listed below.

- *Home Energy House Call.*
- *An intern from the Department of Environmental Services.*

One survey participants (0.8% of 131) mentioned an appliance dealer or retailer. This response is listed below.

- *Sears.*

Four survey participants (3.1% of 131) named “other” sources of awareness. These four responses are listed below.

- *A news article in the newspaper.*
- *A repair person working on my dryer told me about it.*
- *I called Duke Energy to obtain more information about the program.*
- *Recommendation from a lady who works for my auto mechanic.*

Customers' Reasons for Recycling Refrigerators

Figure 9 shows the reasons surveyed customers who participated in the Appliance Recycling program give for disposing of their refrigerators. Nearly half (overall 48.0% or 36 out of 75) of participants mentioned that the unit they recycled was a spare that was not used much or at all, and for a plurality of 40.0% (30 out of 75) of respondents this was the main reason they recycled their refrigerators. Two more reasons were given by more than 25% of customers who recycled refrigerators: wanting to save energy (32.0% or 24 out of 75), and that the unit was not working properly (overall 28.0% or 21 out of 75). Although only two customers (2.7% of 75) mentioned saving money on utility bills as their main reason for participating, eleven more customers (14.7% of 75) mentioned saving money as a secondary reason for participating.

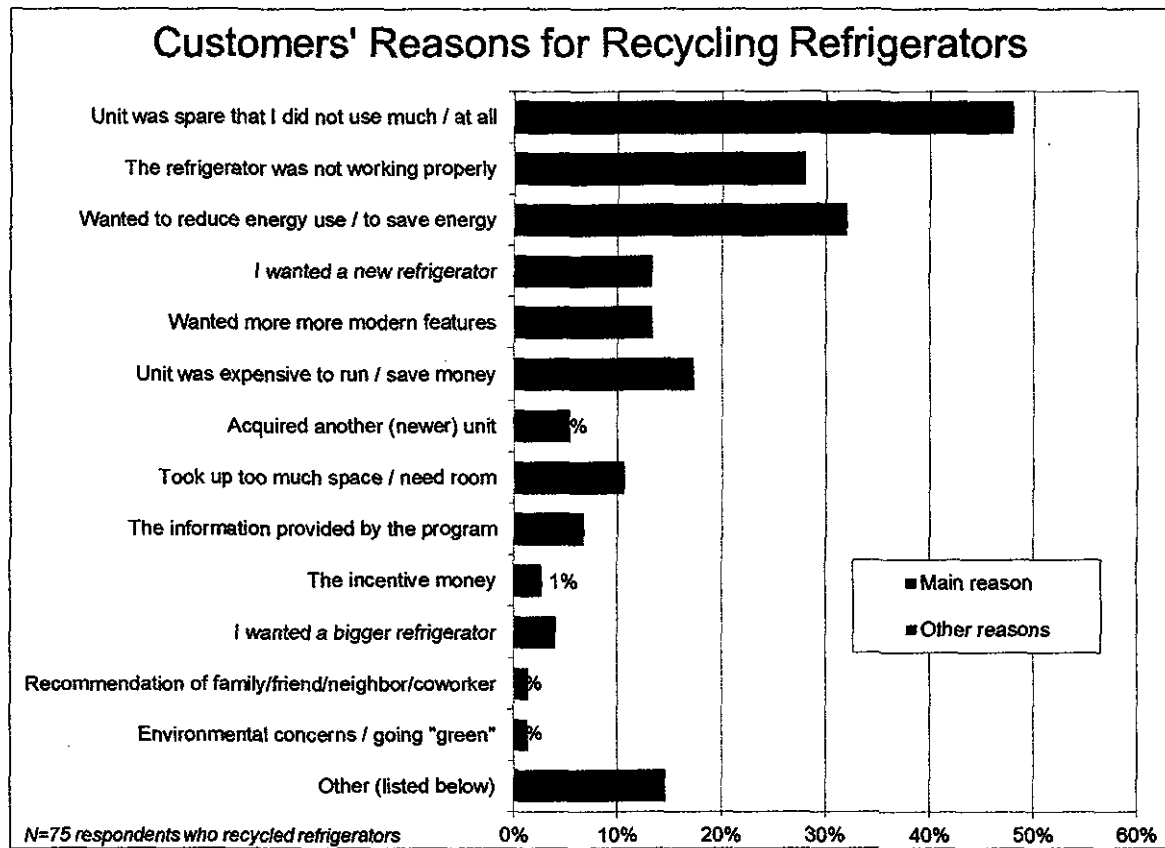


Figure 9. Customers' Reasons for Recycling Refrigerators

Eleven survey participants who recycled refrigerators named "other" reasons for participating in the program. These responses are listed below.

Main reasons (N=4)

- *Cosmetic; it looked bad.*
- *It was too big.*
- *We wanted to upgrade to a freezer. The refrigerator part was no longer needed.*
- *We moved.*

Other reasons (N=7)

- *The convenience of not having to drain the Freon myself.*
- *I wanted to replace it with a freezer.*
- *The refrigerator was white in color, and I wanted stainless steel.*
- *I wanted to downsize our refrigerators.*
- *My beer fridge looked bad, appearance-wise.*
- *Our contractor recommended it.*
- *A recommendation from a lady who works for my auto mechanic.*

Customers' Reasons for Recycling Freezers

Figure 10 shows the reasons for disposing of freezers given by surveyed customers in the recycling program who recycled freezers. Two-thirds (66.2% or 43 out of 65) mentioned that the recycled freezer was a spare unit that was not used much or at all, and more than a half (52.3% or 34 out of 65) said this was the main reason. The only other specific reason given by more than 20% of survey participants who recycled freezers is to save energy (overall 35.4% or 23 out of 65). Another 18.5% (12 out of 65) mentioned saving money on utility bills, and 13.8% (9 out of 65) mentioned that their freezers were not working properly.

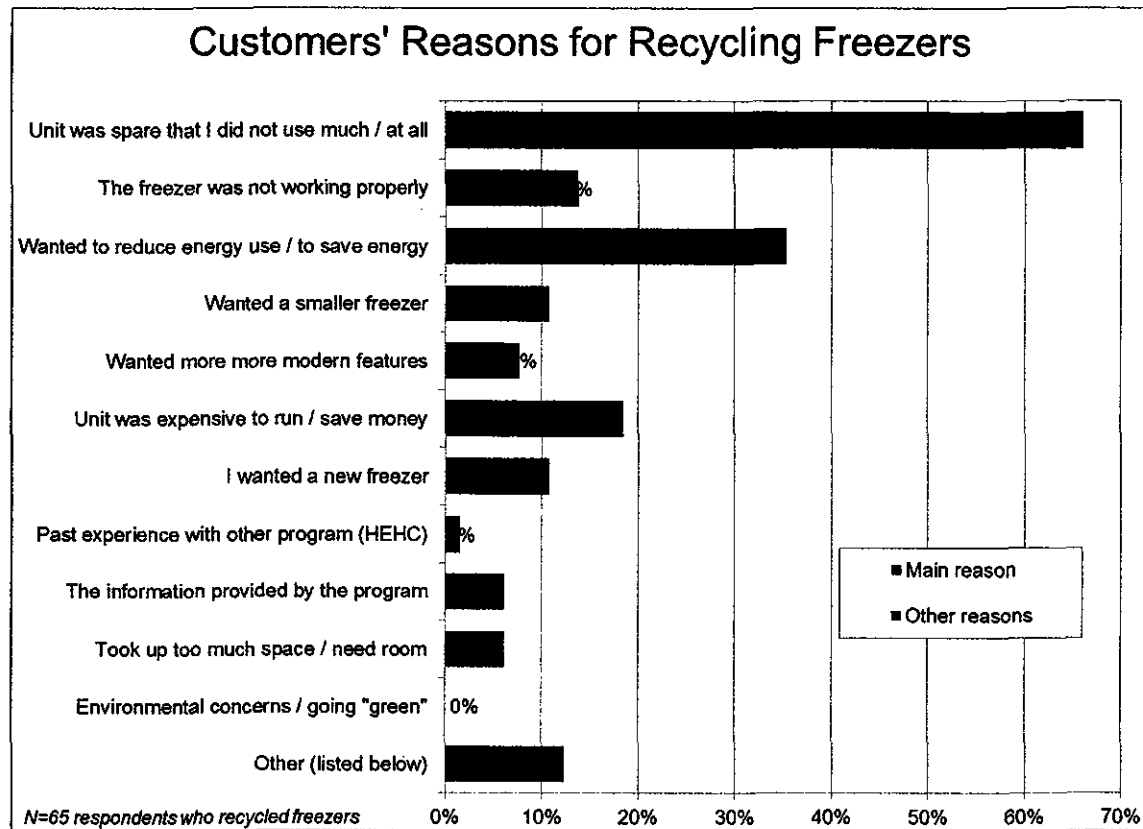


Figure 10. Customers' Reasons for Recycling Freezers

Eight survey participants who recycled freezers named "other" reasons for participating in the program. These responses are listed below.

Main reasons (N=3)

- *My wife wanted it gone due to a rust spot in the inside bottom of the freezer.*
- *We were moving and didn't have room for it at the new house.*
- *We are downsizing.*

Other reasons (N=5)

- *The freezer was manual defrost, which was inconvenient.*
- *That big freezer was a bother to clean; it did not have a self-defrost.*

- *It was in garage so it was always running in summer.*
- *I thought the freezer was a fire hazard.*
- *We wanted to try to win the contest for oldest appliance.*

Customers' Reasons for Recycling Appliances through the Duke Energy Program

Table 33 shows the main reasons given by customers for recycling their units through the Duke Energy Appliance Recycling program rather than disposing of the units some other way. A plurality of 37.4% (49 out of 131) cited the convenience of home pick-up, and nearly a quarter (24.4% or 32 out of 131) mentioned the cash incentive. Another 11.5% (15 out of 131) said they did not know of any other way to dispose of their old units.

Customers who recycled one refrigerator were significantly more likely to mention the cash incentive as the main reason they recycled through the Duke Energy program (34.4% or 22 out of 64, higher than the other two groups at $p < .05$ using student's t-test), and customers who recycled one freezer were more likely to mention the convenience of home pick-up (44.4% or 24 out of 54) and environmentally-friendly disposal (13.0% or 7 out of 54; both significantly higher than refrigerator recyclers at $p < .10$ or better using student's t-test). Customers who recycled multiple units were more likely to mention that they did not know of any other option (30.8% or 4 out of 13, higher than the other two groups at $p < .05$ using student's t-test).

Table 33. Main Reasons for Recycling Through the Duke Energy Program

Reason	Recycled one refrigerator (N=64)	Recycled one freezer (N=54)	Recycled multiple units (N=13)	Total (N=131)
The convenience of the home pick-up	29.7%	44.4%	46.2%	37.4%
The cash incentive	34.4%	16.7%	7.7%	24.4%
Did not know of any other way / no other option	9.4%	9.3%	30.8%	11.5%
Appliance was disposed of in a way that was good for the environment	4.7%	13.0%	7.7%	8.4%
Pick-up was free	3.1%	5.6%	7.7%	4.6%
Information from ad or web site convinced me	4.7%	1.9%	0.0%	3.1%
Information from mailings convinced me	3.1%	1.9%	0.0%	2.3%
Experience with Duke Energy: familiar, reliable, trustworthy	3.1%	1.9%	0.0%	2.3%
Recommended by friend/family/neighbor/coworker	4.7%	1.9%	0.0%	3.1%
Recommended by dealer/retailer/contractor	0.0%	1.9%	0.0%	0.8%
Timing / speed of pick-up	0.0%	0.0%	0.0%	0.0%
Other (listed after Figure 11)	3.1%	1.9%	0.0%	2.3%
Don't know	0.0%	0.0%	0.0%	0.0%

Additional reasons (not including the "main reason") customers recycled their units through the Duke Energy program are shown in Table 34. The cash incentive (overall 26.7% or 35 out of 131), the convenience of home pick-up (27.5% or 36 out of 131), and disposing of the appliance in an environmentally-friendly way (18.3% or 24 out of 131) were the most-mentioned secondary reasons for participating in the program.

Table 34. Additional Reasons for Recycling through the Duke Energy Program (Not Including Main Reason)

Reason	Recycled one refrigerator (N=64)	Recycled one freezer (N=54)	Recycled multiple units (N=13)	Total (N=131)
The cash incentive	17.2%	35.2%	38.5%	26.7%
The convenience of the home pick-up	26.6%	27.8%	30.8%	27.5%
Appliance was disposed of in a way that was good for the environment	23.4%	14.8%	7.7%	18.3%
Did not know of any other way / no other option	4.7%	7.4%	7.7%	6.1%
Pick-up was free	9.4%	24.1%	7.7%	15.3%
Recommended by friend/family/neighbor/coworker	4.7%	3.7%	0.0%	3.8%
Experience with Duke Energy: familiar, reliable, trustworthy	1.6%	1.9%	0.0%	1.5%
Recommended by dealer/retailer/contractor	1.6%	0.0%	7.7%	1.5%
Timing / speed of pick-up	1.6%	0.0%	0.0%	0.8%
Other (listed after Figure 11)	0.0%	3.7%	7.7%	2.3%

Percentages may total to more than 100% because participants could give multiple responses.

Figure 11 shows the combined main and secondary reasons why surveyed customers recycled their units through the Duke Energy program. Overall, about two-thirds of customers (64.9% or 85 out of 131) mentioned the convenience of home pick-up as a reason they participated in the Duke Energy program, and more than half (51.1% or 67 out of 131) mentioned the cash incentive. Another 26.7% (35 out of 131) mentioned environmentally-friendly disposal, 19.8% (26 out of 131) mentioned free pick-up, and 17.6% (23 out of 131) said they did not know of any other way to dispose of old units.

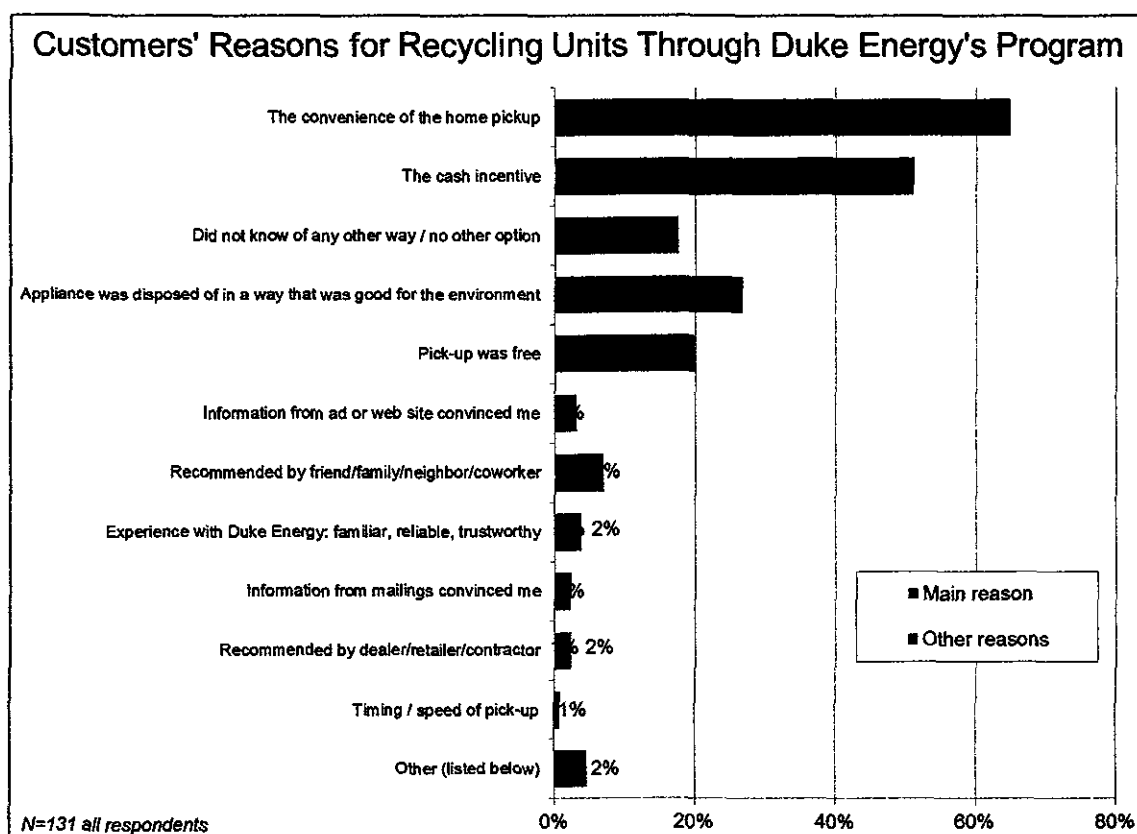


Figure 11. Customers' Reasons for Recycling Units through the Duke Energy Program

Six survey participants gave "other" reasons for recycling their units through the Duke Energy program. These responses are listed below.

Main reasons (N=3)

- *I posted it on Craigslist, but only got one call and the offer was less than Duke's offer.*
- *I thought it was good that they would find out how much energy the appliance was using when they had the device on it.*
- *I thought Duke had a use for the freezer.*

Other reasons (N=3)

- *Other companies offering appliance pick up would have made me drain the Freon beforehand.*
- *It's a new service. I wanted to try it and see how it worked.*
- *The contribution of the \$30 incentive to a good cause. [This customer donated their incentive money to the Helping Hands Assistance program.]*

Customers were also asked if the incentive payment and the information provided explaining the program had any influence on their decision to participate. As seen in Figure 12, both the incentive (72.5% or 95 out of 131) and the information (68.7% or 90 out of 131) were an influence for most customers. Customers who recycled a refrigerator were more likely to say

they were influenced by the incentive (76.6% or 49 out of 64) than the information (62.5% or 40 out of 64; this difference is significant at $p < .05$ using student's t-test), but there were no significant differences between these influence ratings for those who recycled a freezer, multiple units or for all surveyed participants together.

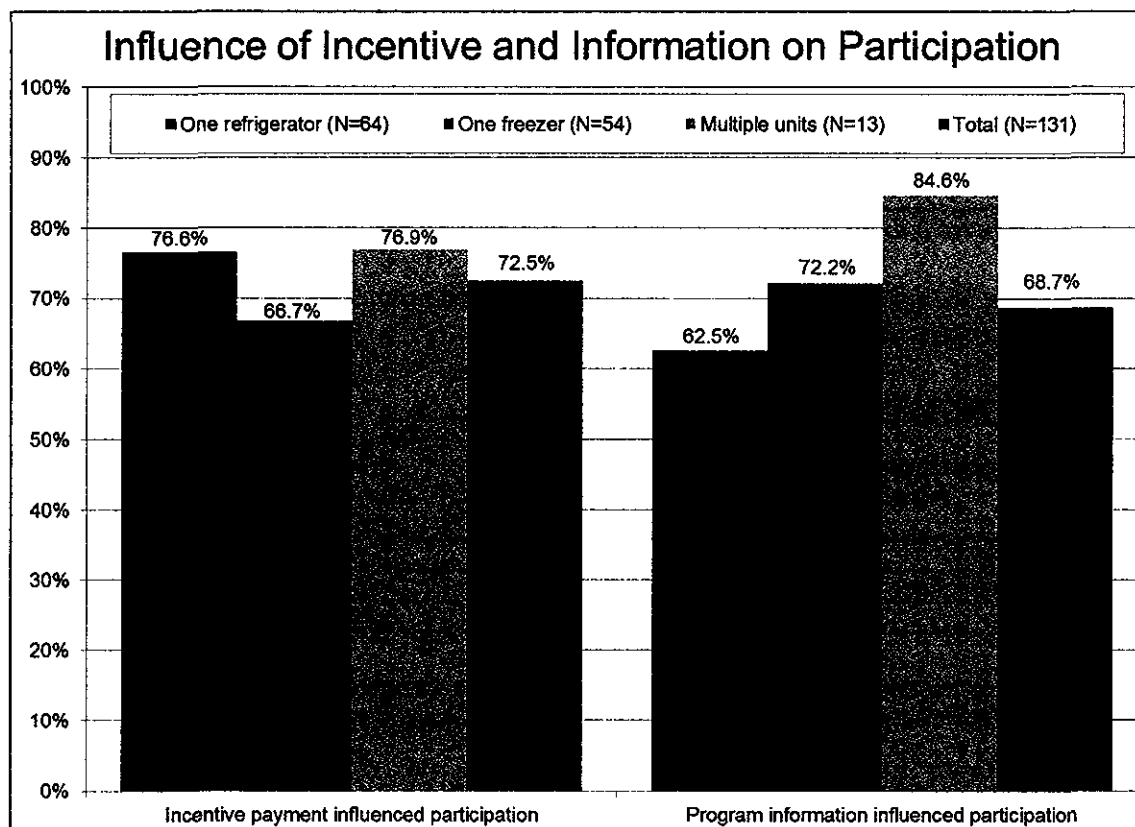


Figure 12. Influence of Incentive Payment and Program Information on Participation

Participation in the Program

Nearly two-thirds of surveyed participants signed up for the program by telephone (62.6% or 82 out of 131) and 22.9% (30 out of 131) signed up online, while another 12.2% (16 out of 131) were signed up by someone else in their household. There are no statistically significant differences between customers who recycled different units.

Table 35. Methods of Signing Up for the Program

Who signed up and how	Recycled one refrigerator (N=64)	Recycled one freezer (N=54)	Recycled multiple units (N=13)	Total (N=131)
Respondent signed up for program	84.4%	88.9%	92.3%	87.0%
Respondent signed up by telephone	60.9%	63.0%	69.2%	62.6%
Respondent signed up online	23.4%	22.2%	23.1%	22.9%
Respondent signed up but can't recall how	1.6%	3.7%	0.0%	2.3%
Someone else in the household signed up	14.1%	11.1%	7.7%	12.2%
Don't know	1.6%	0.0%	0.0%	0.8%

Percentages may total to more than 100% because participants could give multiple responses.

As seen in Table 36, only 6.1% (5 out of 82) of customers who signed up for the program by telephone had to call more than once to sign up.

Table 36. Signing Up for the Program by Telephone

Base: Respondents who signed up by telephone	Recycled one refrigerator (N=39)	Recycled one freezer (N=34)	Recycled multiple units (N=9)	Total (N=82)
Called one time	87.2%	94.1%	100.0%	91.5%
Called more than once	10.3%	2.9%	0.0%	6.1%
Don't know	2.6%	2.9%	0.0%	2.4%

The five surveyed customers who had to call more than once to sign up for the program were asked why they had to make more than one call. These responses are listed below.

- *I needed to reschedule. (N=2)*
- *It was difficult to get through the first time, plus the representative did not properly enter our information, which meant we had to reschedule the pick-up.*
- *I called back to verify the date and time of the pick-up.*
- *I called Duke and they gave me a number to call for the pick-up.*

Overall, 97.7% (128 out of 131) of surveyed customers were able to schedule a convenient pick-up time, as shown in Table 37. Only two respondents (1.5% of 131) were unable to schedule a convenient pick-up time.

Table 37. Scheduling a Convenient Pick-Up Time

	Recycled one refrigerator (N=64)	Recycled one freezer (N=54)	Recycled multiple units (N=13)	Total (N=131)
Able to schedule convenient pick-up time	96.9%	98.1%	100.0%	97.7%
Not able to schedule convenient pick-up time	1.6%	1.9%	0.0%	1.5%
Don't know	1.6%	0.0%	0.0%	0.8%

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According to Table 38, only 9.9% (13 out of 131) of survey participants scheduled pick-up dates that were more than one month from the date they signed up for the program, while 6.9% (9 out of 131) were able to schedule a pick-up within a week of the date they signed up for the program. Most customers (71.0% or 93 out of 131) scheduled pick-ups for between one week and one month after the date they signed up, although about one in eight (12.2% or 16 out of 131) could not recall the length of time between sign-up and appliance pick-up.

Table 38. Length of Time between Scheduling Appointment and Pick-Up

	Recycled one refrigerator (N=64)	Recycled one freezer (N=54)	Recycled multiple units (N=13)	Total (N=131)
Less than 1 week	7.8%	5.6%	7.7%	6.9%
1 week up to 2 weeks	21.9%	29.6%	23.1%	25.2%
2 weeks up to 1 month	50.0%	37.0%	61.5%	45.8%
1 month up to 2 months	12.5%	9.3%	0.0%	9.9%
2 months or longer	0.0%	0.0%	0.0%	0.0%
Don't know	7.8%	18.5%	7.7%	12.2%

As seen in Table 39, none of the surveyed participants (0.0% of 131) said that they did not receive a confirmation call before pick-up, although 7.6% (10 out of 131) could not recall whether they received a confirmation call or not. The vast majority (92.4% or 121 out of 131) did recall receiving a confirmation call.

Table 39. Customers Receiving a Confirmation Call before Pick-Up

	Recycled one refrigerator (N=64)	Recycled one freezer (N=54)	Recycled multiple units (N=13)	Total (N=131)
Received confirmation call before pick-up	90.6%	96.3%	84.6%	92.4%
Did not receive confirmation call before pick-up	0.0%	0.0%	0.0%	0.0%
Don't know	9.4%	3.7%	15.4%	7.6%

Table 40 shows that 96.2% (126 out of 131) of surveyed customers say that the collection team arrived on time to pick up their units for recycling. Only three respondents (2.3% of 131) said that the collection team was not on time, while the other 1.5% (2 out of 131) of survey respondents could not recall.

Table 40. Timeliness of Collection Team's Arrival

	Recycled one refrigerator (N=64)	Recycled one freezer (N=54)	Recycled multiple units (N=13)	Total (N=131)
Collection team arrived on time	96.9%	94.4%	100.0%	96.2%
Collection team did not arrive on time	1.6%	3.7%	0.0%	2.3%
Don't know	1.6%	1.9%	0.0%	1.5%

Incentive Payments

Four out of five customers surveyed (82.4% or 108 out of 131) recalled correctly that the incentive for this program is \$30 per unit recycled, as seen in Table 41. Six customers (4.6% of 131) could not recall the incentive amount, and no customers (0.0% of 131) guessed an amount that was more than \$10 away from the correct amount.

Table 41. Customers' Recall of Incentive Amount

Incentive per unit	Recycled one refrigerator (N=64)	Recycled one freezer (N=54)	Recycled multiple units (N=13)	Total (N=131)
\$19 or less	0.0%	0.0%	0.0%	0.0%
\$20 to \$29	7.8%	9.3%	0.0%	7.6%
\$30 (actual amount)	81.3%	81.5%	92.3%	82.4%
\$31 to \$39	6.3%	5.6%	0.0%	5.3%
\$40 to \$49	0.0%	0.0%	0.0%	0.0%
\$50 to \$59	0.0%	0.0%	0.0%	0.0%
\$60 or more	0.0%	0.0%	0.0%	0.0%
Don't know	4.7%	3.7%	7.7%	4.6%

As shown in Table 42, only eight survey respondents (6.1% of 131) said that they donated their incentive to the Helping Hands Assistance program. The remaining vast majority of 93.9% (123 out of 131) took the incentive payment.

Table 42. Taking Payment or Donating the Program Incentive

	Recycled one refrigerator (N=64)	Recycled one freezer (N=54)	Recycled multiple units (N=13)	Total (N=131)
Took payment for incentive	93.8%	92.6%	100.0%	93.9%
Donated incentive to Helping Hands Assistance	6.3%	7.4%	0.0%	6.1%
Don't know	0.0%	0.0%	0.0%	0.0%

Table 43 indicates that only three surveyed customers (2.3% of 131) reported waiting 6 weeks or longer to receive their incentive payment, and none (0 of 131) report that they are still waiting for their payment to arrive. More than one respondent in ten (12.2% or 16 out of 131) was unable to answer this question; among respondents who were able to give a length of time, roughly equal numbers received their checks in under three weeks (40.5% or 53 out of 131) and in over three weeks (41.2% or 54 out of 131). The median length of time waiting for an incentive payment check to arrive is 3 weeks.

Table 43. Length of Time to Receive Incentive Payment

Time from unit pick-up to receipt of incentive check	Recycled one refrigerator (N=64)	Recycled one freezer (N=54)	Recycled multiple units (N=13)	Total (N=131)
Less than 1 week	0.0%	5.6%	0.0%	2.3%
1 week up to 2 weeks	10.9%	16.7%	30.8%	15.3%
2 weeks up to 3 weeks	17.2%	25.9%	38.5%	22.9%
3 weeks up to 4 weeks	25.0%	18.5%	15.4%	21.4%
4 weeks up to 5 weeks	14.1%	13.0%	0.0%	12.2%
5 weeks up to 6 weeks	9.4%	0.0%	7.7%	5.3%
6 weeks up to 7 weeks	0.0%	3.7%	0.0%	1.5%
Longer than 7 weeks	1.6%	0.0%	0.0%	0.8%
Have not received payment yet	0.0%	0.0%	0.0%	0.0%
Donated incentive (no payment to receive)	6.3%	7.4%	0.0%	6.1%
Don't know	15.6%	9.3%	7.7%	12.2%

Replacing Recycled Units

TecMarket Works asked surveyed program participants if they have replaced the units they recycled, or if they are intending to replace the units in the next 12 months. As seen in Figure 13, all but one of the main refrigerators¹⁰ which were recycled has been replaced (94.7% or 18 out of 19).

However, only 31.0% (18 out of 58) of secondary refrigerators have been replaced, and only 29.9% (20 out of 67) of recycled freezers have been replaced. Out of the total of 77 refrigerators recycled by program participants, 46.8% (36 out of 77) have already been replaced. There are also three customers who still plan to replace secondary refrigerators in the next 12 months (5.2% of 58), and four customers who plan to replace freezers in the next 12 months (6.0% of 67).

¹⁰ One respondent who recycled two refrigerators said that one of their recycled units was their main refrigerator, but that neither of the recycled units have been replaced or are intended to be replaced. Normally the main refrigerator would always be replaced; otherwise the home would be left without any refrigerator (though sometimes replacement units are moved from elsewhere in the home, meaning that previously owned units are “promoted” or “demoted” to main or secondary status). Recycling two refrigerators and not replacing either of them suggests that there were at least three refrigerators in this home before the program. There may be some special circumstance involved in this case which was not captured by the survey (such as a home with two main refrigerators implying multiple families or individuals sharing a home).

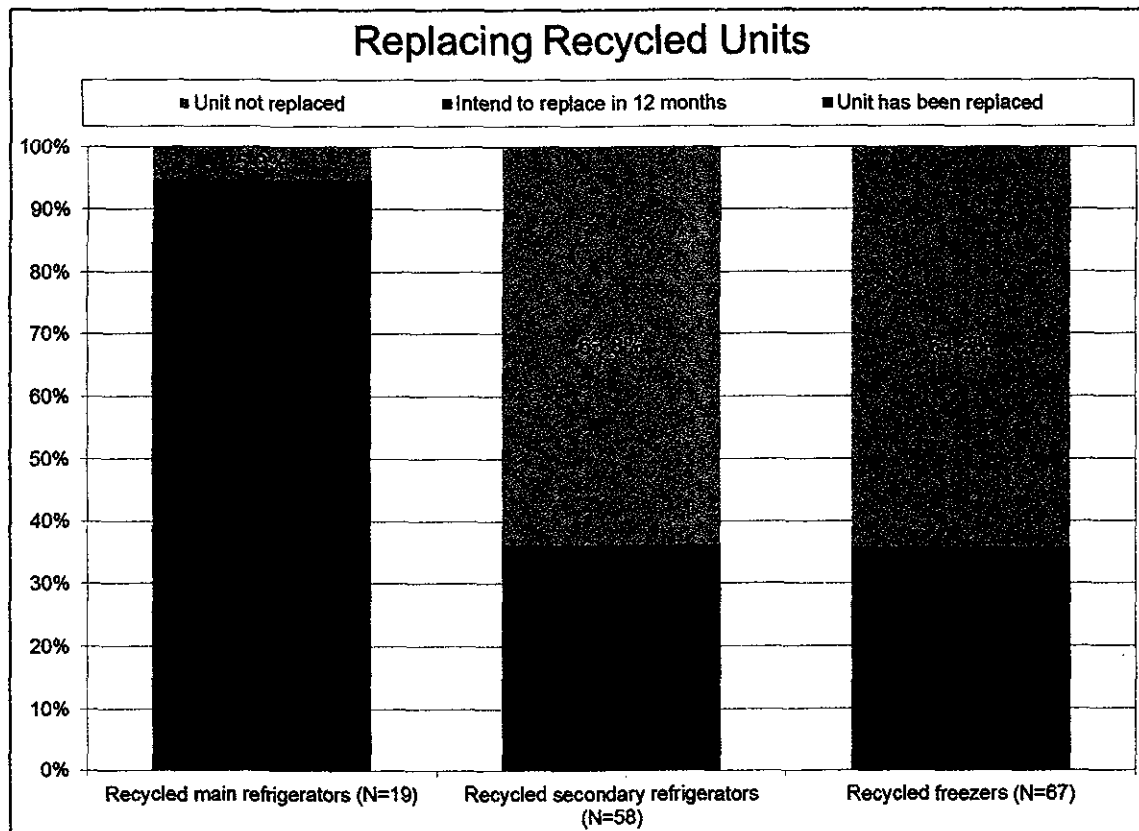


Figure 13. Replacing Recycled Units

Table 44 shows significant differences between replacement units for recycled refrigerators that were used as main units, and refrigerators that were used as secondary units. Main refrigerators are significantly more likely to be replaced with units purchased new (83.3% or 15 out of 18), and to be replaced before the old unit is recycled (66.7% or 12 out of 18) compared to secondary refrigerator replacements (only 38.9% or 7 out of 18 were replaced with brand new units, and only 27.8% or 5 out of 18 were replaced before recycling the old unit; these differences are significant at $p < .05$ using student's t-test). Main refrigerators are also the only type of units which were sometimes picked up for recycling on the same day that the replacement unit was delivered (27.8% or 5 out of 18, significantly different from 0.0% in the other two groups at $p < .05$ using student's t-test).

The pattern with replacement freezers more closely resembles main refrigerator replacement than secondary refrigerator replacement, in that freezers are mostly replaced with brand new units (70.0% or 14 out of 20) and replaced before recycling the old unit (60.0% or 12 out of 20).

Replacements for secondary refrigerators are also more likely to be units moved from somewhere else in the house (27.8% or 5 out of 18) compared to replacements for main refrigerator units (0.0% of 18) or replacements for freezers (5.0% or 1 out of 20; both differences are significant at $p < .05$ using student's t-test). When a secondary refrigerator is replaced with another unit moved from elsewhere in the household, this usually represents the old primary unit being "demoted" to secondary status upon the acquisition of a newer unit.

Table 44. Source and Timing of Replacement Unit Acquisition

<i>Base: replaced units</i>	Replaced main refrigerator (N=18)	Replaced secondary refrigerator (N=18)	Replaced freezer (N=20)	Total (N=56)
Bought new replacement unit	83.3%	38.9%	70.0%	64.3%
Bought used replacement unit	16.7%	27.8%	25.0%	23.2%
Moved replacement unit from somewhere else in the home	0.0%	27.8%	5.0%	10.7%
Don't know	0.0%	5.6%	0.0%	1.8%
Acquired replacement same day as recycling pick-up	27.8%	0.0%	0.0%	8.9%
Acquired replacement before recycling pick- up	66.7%	27.8%	60.0%	51.8%
Acquired replacement after recycling pick-up	5.6%	38.9%	35.0%	26.8%
Replacement was another unit already in the home	0.0%	27.8%	5.0%	10.7%
Don't know	0.0%	5.6%	0.0%	1.8%

Table 45 shows how long before or after the recycling pick-up date customers acquired their replacement units (for only those customers who purchased a replacement unit before or after the pick-up date). Majorities of customers who replaced a main refrigerator (83.3% or 10 out of 12) or freezer (58.3% or 7 out of 12) before recycling their old unit received the replacement unit less than two weeks before recycling pick-up. However, 40.0% (2 out of 5) of secondary refrigerator replacements were acquired more than six months before pick-up (significantly different from the other groups at $p < .10$ or better using student's t-test). Overall, only four units replaced before recycling (13.8% of 29) were replaced more than two months before recycling pick-up.

Replacement units acquired after recycling pick-up are less common; recall from Table 44 that more than twice as many units were replaced before recycling as after recycling. About half of the units replaced after recycling pick-up (46.7% or 7 out of 15) were replaced within two weeks of recycling, and only one (6.7% of 15) was replaced more than six months after recycling.

Table 45. Timing of Replacement of Recycled Units

<i>Base: replaced unit BEFORE recycling</i>	Replaced main refrigerator (N=12)	Replaced secondary refrigerator (N=5)	Replaced freezer (N=12)	Total (N=29)
Replaced unit less than 2 weeks before recycling	83.3%	40.0%	58.3%	65.5%
Replaced unit 2 weeks to 2 months before recycling	16.7%	20.0%	25.0%	20.7%
Replaced unit 2 to 6 months before recycling	0.0%	0.0%	8.3%	3.4%
Replaced unit more than 6 months before recycling	0.0%	40.0%	8.3%	10.3%
Don't know how long before recycling	0.0%	0.0%	0.0%	0.0%
<i>Base: replaced unit AFTER recycling</i>	Replaced main refrigerator (N=1)	Replaced secondary refrigerator (N=7)	Replaced freezer (N=7)	Total (N=15)
Replaced unit less than 2 weeks before recycling	0.0%	57.1%	42.9%	46.7%
Replaced unit 2 weeks to 2 months before recycling	0.0%	14.3%	28.6%	20.0%
Replaced unit 2 to 6 months before recycling	0.0%	14.3%	28.6%	20.0%
Replaced unit more than 6 months before recycling	0.0%	14.3%	0.0%	6.7%
Don't know how long after recycling	100.0%	0.0%	0.0%	6.7%

Characteristics of Replacement Units

As shown in Table 46, the most popular style of replacement refrigerator is a two-door model with the freezer on top, which replaced a plurality of main refrigerators (38.9% or 7 out of 18) and secondary refrigerators (38.9% or 7 out of 18). In total, 88.9% (32 out of 36) of replacement refrigerators are two-door models (with freezer on top, freezer on bottom, or side-by-side).

None of the replacement main refrigerators are manual defrost (0% of 18), while one of the replacement secondary refrigerators is manual defrost (5.6% or 1 out of 18).

Table 46. Replacement Refrigerator Type

<i>Base: replaced refrigerator</i>	Replaced main refrigerator (N=18)	Replaced secondary refrigerator (N=18)	Total (N=36)
Single door, freezer compartment inside	0.0%	5.6%	2.8%
Two doors, side by side	22.2%	33.3%	27.8%
Two doors, freezer on top	38.9%	38.9%	38.9%
Two doors, freezer on bottom	33.3%	11.1%	22.2%
Three doors, two for refrigerator and one for freezer on bottom	5.6%	0.0%	2.8%
"The recycled unit was replaced with a small chest freezer"	0.0%	5.6%	2.8%
"Dorm style mini-fridge"	0.0%	5.6%	2.8%
Don't know	0.0%	0.0%	0.0%

Table 47 indicates that half of replacement freezers are upright models (50.0% or 10 out of 20), while a similar number are chest freezers (45.0% or 9 out of 20). One customer (5.0% of 20) replaced their recycled freezer with a refrigerator.

Sixteen of these replacement freezers (80.0% of 20) are frost free, while three (15.0% of 20) are manual defrost, and in one case (5.0% of 20) the customer did not know.

Table 47. Replacement Freezer Type

<i>Base: replaced freezer</i>	Replaced freezer (N=20)
Chest freezer	45.0%
Upright freezer	50.0%
Refrigerator with a freezer section	5.0%

Most replacement freezers (70.0% or 14 out of 20) are smaller than the recycled freezers they replaced, while only two (10.0% of 20) are larger, as seen in Table 48 (both of these percentages are significantly different from the refrigerator groups at $p < .05$ using student's t-test). Half of the customers who replaced main refrigerators got a new unit the same size as the old one (50.0% or 9 out of 18), while more customers acquired larger replacement main refrigerators (33.3% or 6 out of 18) than acquired smaller replacements (16.7% or 3 out of 18). A plurality of 44.4% (8 out of 18) of secondary refrigerators which were replaced were also replaced with larger units.

Table 48. Relative Size of Replacement Units

<i>Base: replaced units</i>	Replaced main refrigerator (N=18)	Replaced secondary refrigerator (N=18)	Replaced freezer (N=20)	Total (N=56)
Replacement unit is larger	33.3%	44.4%	10.0%	28.6%
Replacement unit is the same size	50.0%	33.3%	20.0%	33.9%
Replacement unit is smaller	16.7%	22.2%	70.0%	37.5%
Don't know	0.0%	0.0%	0.0%	0.0%

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Most surveyed customers do not know the cubic footage of their replacement units (overall 57.1% or 32 out of 56). Based on the responses of customers who were able to report a number for the cubic footage of their replacement units, main refrigerators were replaced with units that average 22.6 cubic feet, while secondary units were replaced with models that average 21.1 cubic feet, and the average freezer replacement unit was 14.1 cubic feet. The distribution of responses is shown in Table 49.

Table 49. Cubic Footage of Replacement Units

<i>Base: replaced units</i>	Replaced main refrigerator (N=18)	Replaced secondary refrigerator (N=18)	Replaced freezer (N=20)	Total (N=56)
Under 14 cubic feet	0.0%	0.0%	15.0%	5.4%
14 cubic feet up to 18 cubic feet	5.6%	5.6%	35.0%	16.1%
18 cubic feet up to 21 cubic feet	16.7%	5.6%	0.0%	7.1%
21 cubic feet up to 25 cubic feet	16.7%	0.0%	0.0%	5.4%
25 cubic feet or more	16.7%	11.1%	0.0%	8.9%
Don't know	44.4%	77.8%	50.0%	57.1%

Recall from Table 44 that 33.9% (19 out of 56) of replacement units were not acquired or purchased new. Table 50 shows the ages of previously-used units that replaced units recycled by the program (both units purchased or otherwise acquired used, and units moved from somewhere else in the home). Almost half of (42.1% or 8 of 19) of used replacement units are reported as being less than ten years old, though 21.1% (4 out of 19) did not know how old their replacement units are.

Table 50. Age of Used Replacement Units

<i>Base: replaced unit with used unit or unit moved from somewhere else in the home</i>	Replaced main refrigerator (N=3)	Replaced secondary refrigerator (N=10)	Replaced freezer (N=6)	Total (N=19)
Replacement unit less than 10 years old	100.0%	20.0%	50.0%	42.1%
Replacement unit 10 up to 15 years old	0.0%	30.0%	33.3%	26.3%
Replacement unit 15 up to 20 years old	0.0%	10.0%	0.0%	5.3%
Replacement unit 20 to 25 years old	0.0%	10.0%	0.0%	5.3%
Replacement unit 25 years old or older	0.0%	0.0%	0.0%	0.0%
Don't know age of replacement unit	0.0%	30.0%	16.7%	21.1%

Intentions in the Absence of the Recycling Program

TecMarket Works asked participants what they would have done with their recycled units in the absence of the program; the results are shown in Table 51. For both refrigerators and freezers, the most frequent response is "given it away for free" (26.7% or 20 out of 75 for refrigerators, 27.7% or 18 out of 65 for freezers), followed by "kept it" (21.3% or 16 out of 75 for refrigerators and 18.5% or 12 out of 65 for freezers).

If the categories "taken it to a dump", "hired someone to take it to a dump" and "leave for curbside pick-up" are combined into one category representing units that would have been taken off of the grid even without the program, then 28.0% (21 out of 75) of refrigerator recyclers and

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32.3% (21 out of 65) of freezer recyclers were going to have their units removed from the grid anyway. Thus, most of the units recycled by the program may have remained in use after the program, either in the customers' household (if they kept it) or in another household (if they were going to sell or donate it to someone).

There are some significant differences between the intentions of customers who recycled refrigerators and freezers. Customers who recycled freezers are more likely to say they would have donated their old units to charity (6.2% or 4 out of 65, compared to 1.3% or 1 out of 75 refrigerator recyclers; this difference is significant at $p < .10$ using student's t-test). Freezer recyclers would also have been more likely to pay someone to haul their unit to the dump (16.9% or 11 out of 65) than customers who recycled refrigerators (8.0% or 6 out of 75; this difference is significant at $p < .10$ using student's t-test). Since a larger percentage of recycled refrigerators than freezers are replaced, participants who recycled refrigerators are also more likely to say they would have given their old units to the dealers who delivered their replacements (12.0% or 9 out of 75, compared to 1.5% or 1 out of 65 freezer recyclers; this difference is significant at $p < .05$ using student's t-test).

Table 51. What Customers Would Have Done in the Absence of the Program

Recycled unit disposition without the program	Respondents who recycled refrigerators (N=75)	Respondents who recycled freezers (N=65)
Given it away for free	26.7%	27.7%
Kept the old unit	21.3%	18.5%
Hired someone to take it to a dump or recycling center	8.0%	16.9%
Taken it to a dump or recycling center	14.7%	12.3%
Sold it	2.7%	4.6%
Had it removed by the dealer that delivered replacement unit	12.0%	1.5%
Donated to a charity that accepts used appliances	1.3%	6.2%
Given it to a dealer that accepts used units (without buying a replacement)	1.3%	3.1%
Leave for curbside pick-up on large item recycling day	5.3%	3.1%
Get rid of it some other way (listed below)	1.3%	0.0%
Don't know	5.3%	6.2%

One customer who recycled a refrigerator gave a response that did not fit any of the categories above, which is listed below.

- *We would have left it for the new homeowners.*

Customers who would have kept their recycled units in the absence of the program were asked how these units would have been used if they had kept them. As seen in Table 52, 18.8% of these refrigerators (3 out of 16) would have been stored unplugged, and 75.0% (9 out of 12) of these freezers would also have been stored unplugged. Most of the refrigerators that would have been kept (81.3% or 13 out of 16) would have been used as secondary refrigerators at least part of the time.

Table 52. Use of Recycled Units If They Had Been Kept Instead of Recycled

Recycled unit use without the program	Respondents who recycled refrigerators but would have kept them without the program (N=16)	Respondents who recycled freezers but would have kept them without the program (N=12)
Stored it unplugged	18.8%	75.0%
Used it as a secondary refrigerator at least some of the time	81.3%	NA
Used it as my primary refrigerator or freezer	0.0%	25.0%
Don't know	0.0%	0.0%

Customers who would have kept using their old units without the program were asked how much they would have used them. Among the thirteen refrigerator recyclers who would have continued using their old units as secondary refrigerators, ten (76.9% of 13) would have had them plugged in and running all of the time, while one (7.7% of 13) would have used their old unit for "certain months of the year only" (totaling 7 months out of a year), and two (15.4% of 13) would have used their old units "only for special occasions" (averaging 3.5 months out of a year).

All three of the freezer recyclers (100% of 3) who would have kept using their freezers would have had them plugged in and running all of the time.

Furthermore, customers that would have kept their old units in use without the program were asked how much longer they think they would be using them. Among the thirteen refrigerator recyclers who would have kept their units running, nine (69.2% of 13) would have kept them running "indefinitely", while four (30.8% of 13) would have stopped using the old units within one to five years (averaging 2.6 years). Among the three freezer recyclers who would have kept their units running, all three (100%) would have kept them running "indefinitely."

Customers who "don't know" what they would have done in the absence of the program were also asked "*assuming you had kept [your old unit], would it have been stored unplugged or would you have continued using it?*" Among the four refrigerator recyclers who don't know what they would have done in the absence of the program, two say they would have stored their units unplugged, one would have kept using their recycled unit as a secondary refrigerator "at least some of the time", and one did not answer the question. Among the four freezer recyclers who don't know what they would have done in the absence of the program, two would have stored their units unplugged and two are not sure what they would have done if they had kept their old unit.

Customers who would have sold their old units were asked how much they think they would receive for the sale and how they would sell it. These responses are listed below.

Recycled refrigerators (N=2)

- \$25 or \$30 through garage/curb sale and word-of-mouth.
- \$22 through garage/curb sale.

TecMarket Works**Recycled freezers (N=3)**

- \$60 through *craigslist.com/internet sale*.
- \$50 through *word-of-mouth*.
- \$25 to \$50 through *posting on a community message board*.

Customers who would have hired someone to haul their old unit away were asked how much they would be willing to pay for this service. These responses are listed below.

Recycled refrigerators (N=6)

- *"I knew it was going to cost me, and I knew I couldn't afford it."*
- \$100 (N=2)
- \$50
- \$30
- \$25

Recycled freezers (N=11)

- \$75 to \$100
- \$50 (N=4)
- \$30 to \$50
- \$25
- *Don't know* (N=4)

Customers who would have given away or sold their old units were also asked if they had recipients (or buyers) in mind for these transactions.

- Among refrigerator recyclers, neither of the two customers (0%) who were intending to sell their unit had a specific person in mind, and only three of the 20 customers (15.0%) who were intending to give their unit away had a specific person in mind. The survey also included a question asking if respondents who would have transferred refrigerators to other people in the absence of the program knew whether the person they would have sold or given the unit to was going to use it as a main or secondary refrigerator. The three potential recipients and their potential usage of these recycled refrigerators are listed below.
 - *A scrap collector: not applicable.*
 - *My sons: to have them get rid of it for me.*
 - *My daughter-in-law's parents: would have used it as their main refrigerator.*
- Among freezer recyclers, two of the three customers (66.7%) who were intending to sell their units said they had a specific person in mind, though they described these recipients very generically as *"a neighbor or friend who has a family"* and *"family or friends"*. Among the 18 freezer recyclers who would have given their old units away for free, five (27.8% of 18) did have specific recipients in mind; these also tend to be generic responses and are listed below.
 - *A co-worker.*

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- *A family friend.*
- *Any family in need.*
- *A family member.*
- *Family or friends.*

Survey participants were also asked about the timing of disposing of their old units if the Duke Energy Appliance Recycling program had not been available. Table 53 shows that more than half of participants would have delayed disposing of their units: 61.3% (46 out of 75) of refrigerator recyclers would have waited, as would 60.0% (39 out of 65) of freezer recyclers.

Respondents who recycled refrigerators are significantly more likely to say they would have recycled their units *sooner* without the program (14.7% or 11 out of 75, compared to 3.1% or 2 out of 65 for freezer recyclers), and customers who recycled freezers are more likely than to answer “don’t know” to this question (7.7% or 5 out of 65) compared to refrigerator recyclers (1.3% or 1 out of 75; both of these differences are significant at $p < .05$ using student’s t-test).

Table 53. Timing of Unit Disposal in the Absence of the Program

Timing of recycled unit disposition without the program	Respondents who recycled refrigerators (N=75)	Respondents who recycled freezers (N=65)
Would have removed it sooner without the program	14.7%	3.1%
Would have removed it at the same time without the program	22.7%	29.2%
Would have removed it later without the program (total)	61.3%	60.0%
Up to a month later	8.0%	7.7%
More than one month up to six months later	12.0%	4.6%
Six months up to a year later	4.0%	12.3%
More than a year later	10.7%	7.7%
Would have kept it indefinitely / until it broke	14.7%	13.8%
Would have kept it for “other” time period (listed below)	1.3%	3.1%
Not sure how much later	10.7%	10.8%
Don’t know	1.3%	7.7%

Three surveyed customers gave “other” descriptions of how long they would have kept their recycled units in the absence of the program; these are listed below.

Recycled refrigerators (N=1)

- *Until we sold the house sometime.*

Recycled freezers (N=2)

- *Until my death, and then my kids would have to deal with it.*
- *Until we sell the house.*

Table 54 shows that five refrigerator recyclers (6.7% of 75) who did not replace their old units would have purchased replacements in the absence of the program, and only one surveyed customer (1.3% of 75) who replaced their old unit would not have done so in the absence of the program. Only four freezer recyclers (6.2% of 65) did not replace units but would have in the absence of the program, while three (4.6% of 65) did replace units but would not have done so in

the absence of the program. However, a large majority of customers surveyed would have taken the same action (either purchasing a replacement or not) with or without the program.

Table 54. Replacing Units in the Absence of the Program

Unit replacement without the program	Respondents who recycled refrigerators (N=75)	Respondents who recycled freezers (N=65)
Replaced unit, and would have replaced it without the program	46.7%	26.2%
Did not replace unit, but would have replaced it without the program	6.7%	6.2%
Replaced unit, but would not have replaced it without the program	1.3%	4.6%
Did not replace unit, and would not have replaced it without the program	42.7%	61.5%
Don't know if unit would have been replaced without the program	2.7%	1.5%

Program Satisfaction

TecMarket Works asked program participants to rate several specific aspects of the Duke Energy Appliance Recycling program on a 10-point scale, with “10” indicating very high satisfaction, and “1” indicating very low satisfaction. The average rating scores for all 131 surveyed participants are shown in Figure 14, along with average satisfaction ratings for the program overall and Duke Energy overall.

The Appliance Recycling program gets very high marks for satisfaction from surveyed customers: 9.72 for the program overall, as well as average scores above 9.5 for the collection team (9.88), telephone customer service representatives (9.80), and the sign-up and scheduling process (9.70). The size of the incentive payment (9.50) and time it took to receive payment (9.48) receive slightly lower satisfaction ratings, and the time between scheduling and pick-up (9.34) was rated lowest of any aspect of the program (the mean ratings for these three items are significantly lower than the top two items in Figure 14 at $p < .05$ using student's t-test). However, average satisfaction scores over 9.0 still represent a very high level of customer satisfaction; even for the lowest rated aspect of the program shown in the chart below, 72.4% or 92 out of 127 customers surveyed rated their satisfaction with the time between scheduling and pick-up at “10 out of 10”, the highest possible score.

Duke Energy received an overall mean satisfaction rating score of 8.75 from surveyed program participants, which is also a very high level of satisfaction, but lower than the 9.72 satisfaction for the Appliance Recycling program overall or for any of the six specific aspects of the program shown in Figure 14 (all differences significant at $p < .05$ using student's t-test). However, nearly half of surveyed program participants (46.5% or 60 out of 129) still rated their satisfaction with Duke Energy a “10 out of 10”, the highest possible score.

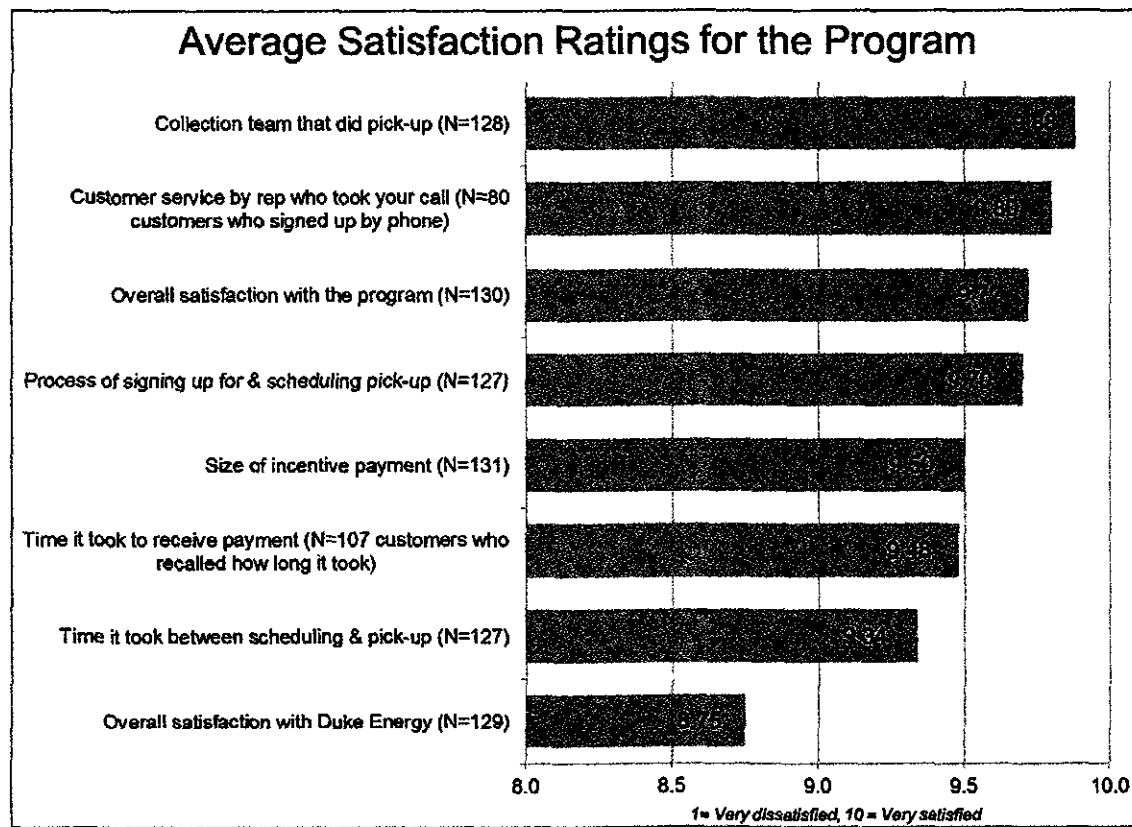


Figure 14. Average Satisfaction Ratings for the Appliance Recycling Program

Table 55 shows the average satisfaction ratings by unit(s) recycled. Customers who recycled one refrigerator give consistently lower satisfaction ratings than other surveyed customers for every aspect of the program, including overall program satisfaction (all differences significant at $p < .10$ or better using ANOVA), although customers who recycled refrigerators still tend to give very high levels of satisfaction of "9" or higher. There are no significant differences for satisfaction with Duke Energy by units recycled.

Table 55. Average Satisfaction Ratings by Unit(s) Recycled

Satisfaction ratings	Recycled one refrigerator (N=64)	Recycled one freezer (N=54)	Recycled multiple units (N=13)	Total (N=131)
Collection team that did pick-up	9.81	9.94	10.00	9.88
Customer service by representative who took your call (<i>Total N=80 customers who signed up by phone</i>)	9.62	9.97	9.89	9.80
Process of signing up for and scheduling pick-up	9.56	9.84	9.85	9.70
Size of incentive payment	9.27	9.78	9.54	9.50
Time it took to receive payment (<i>Total N=107 customers who recalled how long it took</i>)	9.20	9.71	9.75	9.48
Time it took between scheduling and pick-up	8.95	9.69	9.85	9.34
Overall satisfaction with the program	9.59	9.87	9.77	9.72
Overall satisfaction with Duke Energy	8.64	8.89	8.75	8.75

Customers who gave satisfaction scores of “7” or lower on a 10-point scale were asked what could be done to improve the situation. These responses are listed below for each aspect of the program rated.

No surveyed customers (0% of 131) gave satisfaction ratings of “7” or lower for the collection team or for the customer service representative who took their call.

One customer (0.8% of 131) gave satisfaction ratings of “7” or lower for the Appliance Recycling Program overall:

Recycled one refrigerator (N=1)

- *Duke could improve customer service to eliminate mistakes such as the one we experienced in which our initial pick up date was never entered into the system, requiring us to call back a second time to reschedule the appointment.*

Three customers (2.8% of 107 respondents who could recall how long it took to receive payment) gave satisfaction ratings of “7” or lower for time it took to receive payment:

Recycled one refrigerator (N=3)

- *Duke could shorten the length of time it takes to receive the check to two weeks or less.*
- *The payment could arrive within two to three weeks.*
- *I wanted it quicker.*

Four customers (3.1% of 131) gave satisfaction ratings of “7” or lower for the process of signing up and scheduling pick-up:

Recycled one freezer (N=1)

- *The days available were not in keeping with my schedule. I had to get someone else to be there when the crew came since no Thursdays were available in my area, only Tuesdays and Fridays.*

Recycled one refrigerator (N=3)

- *Duke could pick up the appliances in a timelier manner.*
- *Duke could provide a confirmation number for the scheduled appointment. The first time we called to schedule a pick-up we did not receive confirmation, the second time we did.*
- *Duke could shorten the length of time between scheduling the appliance pickup and when it actually was picked up.*

Six customers (4.6% of 131) gave satisfaction ratings of "7" or lower for the size of the incentive payment:

Recycled one refrigerator (N=5)

- *Duke could offer a higher incentive of \$75 to \$100 for a working appliance.*
- *Duke could offer a much higher monetary incentive, say \$75 or more.*
- *Duke could offer a slightly higher monetary incentive, say \$50.*
- *The size of the payment could be increased to \$50.*
- *Duke could offer more money for the appliance, say \$40-50.*

Recycled multiple units (N=1)

- *They could increase the payment, I think \$50 for each appliance would be a better incentive.*

Twelve customers (9.2% of 131) gave satisfaction ratings of "7" or lower for the time it took between scheduling and pick-up:

Recycled one refrigerator (N=11)

- *Duke could shorten the length of time between enrollment and pick-up to one week or less. (N=3)*
- *The pick-up could occur within one week of the initial call.*
- *Duke could shorten the length of time between enrollment and pick-up to five business days or less.*
- *The pick-up could take place within three to four days of the initial call.*
- *The appliance pick-up could take place within two weeks of enrolling in the program.*
- *The pick-up could occur within two weeks of the initial phone call.*
- *Duke could shorten the length of time between enrollment and actual pick-up.*
- *The pick-up could have been sooner.*
- *Have more available pickup times. It was difficult to coordinate my schedule with the appliance recycling team's schedule.*

Recycled one freezer (N=1)

- *I would have liked it if they could have come to pick up the appliance the same week as when called.*

Twenty-four customers (18.3% of 131) gave satisfaction ratings of “7” or lower for Duke Energy overall:

Recycled one refrigerator (N=15)

- *I've been hearing some things about what's been going on in Florida and this doesn't make me happy. They were going to build or rebuild a power plant, collected taxes to do this, and then jumped out. They didn't return the money collected in taxes. I'm not sure if I understand this situation exactly as it is, but I think this is a terrible way to treat your customers.*
- *Our neighborhood has a tendency to lose its electric when we get a storm. We have lived through several four and five-day outages. The lights flicker too often. They need to find some way to keep the electric more steady. It's a real pain to be constantly having to reset clocks and the like.*
- *The woman who sold us our house had the power shut off. We didn't know this before moving in the middle of November, so we called on a Friday to get the power turned on. We live right down the street from a substation. We were told by Duke Customer Service that they could not connect service until Monday because there was no one working that Saturday. So, our family, including a two-year-old child, spent a very cold weekend in this house. When the guy came on Monday to turn on the power, he literally had to flip two switches and it took him all of five minutes. I told him about what Duke Customer Service had said and he told me they had been working on Saturday. I felt like we had been given the runaround, sorry, out of luck. I'm a very easy going person, but this really made me mad. I mean, I've got a toddler in the house in winter. I was not happy.*
- *We have a power outage during every storm.*
- *We're new to the neighborhood. There are a lot of short outages where we just moved to. When we moved into the area neighbors warned us that there are just as many outages in the winter only they last for days so we should invest in a generator.*
- *Duke could provide better customer service, with more human interaction, particularly when power outages occur.*
- *It is my God-given right to complain about utilities. They do fine as a service, but it's a monopoly. I wish I could still get a paper copy of the bill, since I am now on electronic payment. It has caused me to miss a payment once when I didn't see the e-mail.*
- *I had great difficulty attempting to sign up for an energy assistance program with Duke. I would either get a recorded message saying something like they were full for the day or else get hung up on. I felt Duke created an expectation for me but in the end it seems that the program is not readily available. What is the point of offering it if I cannot even get on the phone with a representative?*
- *Duke could not charge a flat monthly rate for natural gas and instead base it on usage.*
- *Duke could lower their electricity rates and greatly reduce the number of inexplicable power outages we seem to experience every year.*
- *Duke could lower their rates and supply some information as to why they're the best competitive choice to provide our energy.*

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- *Lower the rates. (N=4)*

Recycled one freezer (N=7)

- *We are at the end of the line and we lose power frequently while the newer homes that were built around our home don't lose power every time we do. No one has been out to trim the trees around the power lines in ten or fifteen years. We lose power in most storms no matter how severe. When the wind from Hurricane Ike came through we lost power for nine days which was a horrible experience for us in our all-electric house. We even use electricity for our water well.*
- *We live in a neighborhood where it takes ten to twelve hours to get the power back on for our one block. Our neighbors across the street don't have this problem. It's very strange. We can't ever get them to explain why everyone around us has power, but it takes them that long to get our power back on. I mean, I don't know anything about how this works, maybe it's a transformer or something, but we haven't been real happy with them this week for this reason.*
- *I think that the Duke Energy rates are high, and I'd like to see them lower our bills. Also, I think Duke Energy should find some other means of choosing who qualifies for their assistance with the energy efficiency programs such as Home Energy House Call, home weatherization materials and labor. Duke needs to expand their scale as to who gets additional assistance; they especially should include and consider single parenting as a qualifier.*
- *I don't understand the billing or why the rates are what they are and why they keep going up.*
- *I think the rates are too high. The service has been good, though. I wish Duke Energy was a local company like it used to be.*
- *The rates are way too expensive and the rates keep going up far too much.*
- *The rates keep going up. I know they say it's only going to cost like \$3 per household but it never does. It's always more.*

Recycled multiple units (N=2)

- *Duke could be more understanding when customers are going through periods of financial strife and are temporarily unable to pay the entire amount of their energy bill.*
- *Duke could provide more information about how their energy rates compare with others.*

Program Satisfaction

Survey respondents were also asked to rate their satisfaction with the program on a five-point Likert scale. An overwhelming majority of 95.4% (125 out of 131) gave the highest possible rating of "very satisfied", while six participants (4.6% of 131) said they were "somewhat satisfied" and nobody said they were dissatisfied or even neutral towards the program. The distribution is shown in Figure 15.

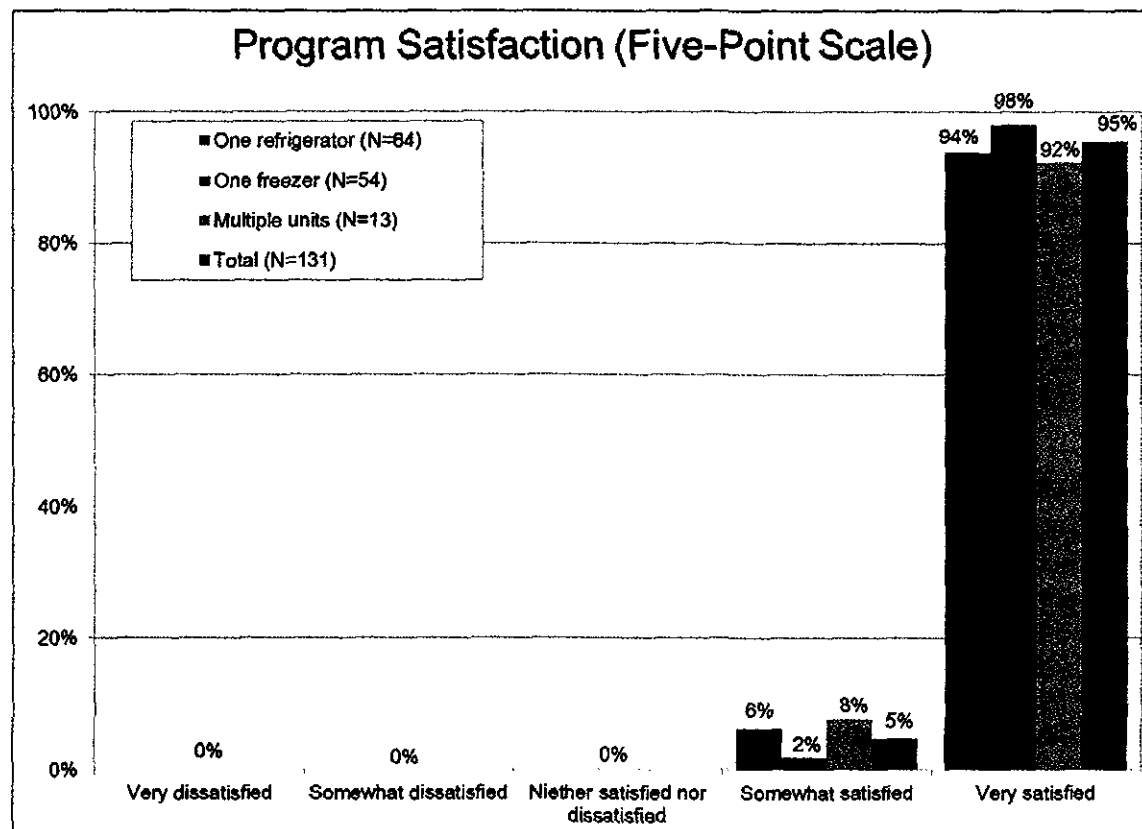


Figure 15. Satisfaction Ratings for the Appliance Recycling Program (Five-Point Scale)

After respondents answered this rating question, they were asked why they gave the ratings they did. These verbatim responses are listed in Appendix J: Participants' Reasons for Program Satisfaction Ratings.

Effect of the Program on Customers' Perception of Duke Energy

Survey respondents were asked if participating in the program made them feel more or less favorably about Duke Energy, or if it made no difference. Table 56 indicates that most customers (67.2% or 88 out of 131) feel more favorably about Duke Energy after the program, and none (0.0% of 161) feel less favorably. Customers who recycled multiple units were more likely to say the program made them feel more favorably about Duke Energy (84.6% or 11 out of 13, significantly higher than the other groups at $p < .10$ using student's t-test).

Table 56. Effect of Program Participation on Perception of Duke Energy

Perception of Duke Energy	Recycled one refrigerator (N=64)	Recycled one freezer (N=54)	Recycled multiple units (N=13)	Total (N=131)
Participating in the program made me feel more favorable about Duke Energy	65.6%	64.8%	84.6%	67.2%
Participating in the program did not make me feel any different about Duke Energy	34.4%	35.2%	15.4%	32.8%
Participating in the program made me feel less favorable about Duke Energy	0.0%	0.0%	0.0%	0.0%
Don't know	0.0%	0.0%	0.0%	0.0%

Favorite and Least Favorite Aspects of the Program

Surveyed customers were asked about their favorite and least favorite aspects of participating in the Appliance Recycling program. Table 57 indicates that the overall most popular aspects of the program are the convenience of home pick-up (and not having to personally haul the unit away; 26.0% or 34 out of 131), getting rid of old units (23.7% or 31 out of 131), the incentive payment (21.4% or 28 out of 131) and the ease of participation (hassle-free sign-up and scheduling; 18.3% or 24 out of 131). Some lesser-mentioned benefits include “green” disposal of old units (9.9% or 13 out of 131) and the courtesy and helpfulness of the pick-up crew and customer service representatives (7.6% or 10 out of 131).

Only two of the surveyed customers mentioned “saving energy” (1.5% of 131), and only one (0.8% of 131) mentioned “saving money on energy bills” as a favorite aspect of the program. However, recall from Figure 9 and Figure 10 that saving energy and saving money on bills were mentioned by several customers as reasons why they wanted to dispose of their old refrigerators and freezers; while saving money and energy may be motivations for deciding to participate in the program, few customers view these as primary program benefits afterwards.

There were some significant differences between customers who recycled different units: Customers who recycled multiple units are the most likely to mention “getting rid of old units”, “creating space” and “ease of participation” but none of them mentioned the incentive payment (all significantly different than other groups at $p < .10$ or better using student's t-test). Customers who recycled a refrigerator are the most likely to mention “convenience of home pick-up” (though 31.3% or 20 out of 64 is not significantly different from the other groups) and are the least likely to mention “getting rid of old units” and “ease of participation” (though these are not significantly different from the percentage of freezer recyclers mentioning those aspects as their favorites).

Table 57. Customers' Favorite Thing about Participating in the Appliance Recycling Program

Favorite aspects of the program	Recycled one refrigerator (N=64)	Recycled one freezer (N=54)	Recycled multiple units (N=13)	Total (N=131)
Convenience of home pick-up / not having to haul it myself	31.3%	22.2%	15.4%	26.0%
Getting rid of old unit(s)	18.8%	24.1%	46.2%	23.7%
The incentive payment	23.4%	24.1%	0.0%	21.4%
Ease of participation / sign-up and scheduling	12.5%	20.4%	38.5%	18.3%
Proper unit disposal / recycling parts / good for environment	9.4%	13.0%	0.0%	9.9%
Crew and customer reps were courteous / helpful / prompt / kind / etc.	10.9%	5.6%	0.0%	7.6%
Creating space at home / less clutter	3.1%	1.9%	15.4%	3.8%
Timing / quick turnaround / conveniently scheduled	4.7%	3.7%	7.7%	4.6%
Duke's concern for customers	0.0%	5.6%	0.0%	2.3%
Not having to pay for hauling / disposal	0.0%	1.9%	0.0%	0.8%
Saving energy	3.1%	0.0%	0.0%	1.5%
Saving money on energy bills	0.0%	0.0%	7.7%	0.8%
Other (listed below)	1.6%	1.9%	7.7%	2.3%
Don't know / not specified	1.6%	1.9%	0.0%	1.5%

Percentages total to more than 100% because participant could give multiple responses.

Three survey respondents mentioned "other" favorite aspects of the program. These are listed below.

Recycled one refrigerator (N=1)

- *My favorite thing was hearing that we were recycling one of the oldest refrigerators in the area.*

Recycled one freezer (N=1)

- *Everyone was shocked at how old the freezer was.*

Recycled multiple units (N=1)

- *My favorite thing was that my two appliances qualified for the program.*

Most surveyed program participants (64.9% or 85 out of 131) could not name a least favorite aspect of the program, and the only least favorite aspect mentioned by more than about 5% of surveyed participants was that they wanted a shorter turnaround time between scheduling and pick-up (8.4% or 11 out of 131). Customers' least favorite aspects of the program are shown in Table 58.

There are a few significant differences between customers who recycled different types of units: Customers who recycled multiple units (76.9% or 10 out of 13) and those who recycled a freezer

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(83.3% or 45 out of 54) are more likely to have not named a least favorite aspect of the program compared to those who recycled a refrigerator (46.9% or 30 out of 64; these differences are significant at $p < .05$ using student's t-test). Compared to other customers, those who recycled a refrigerator are more likely to complain about wanting faster pick-up, having to move the unit for pick-up, worrying that the unit would not be working, and the incentive payment being too small (differences significant at $p < .10$ or better using student's t-test).

Table 58. Least Favorite Things about Participating in the Appliance Recycling Program

Least favorite aspects of the program	Recycled one refrigerator (N=64)	Recycled one freezer (N=54)	Recycled multiple units (N=13)	Total (N=131)
Too long between scheduling and pick-up / pick-up was delayed	15.6%	1.9%	0.0%	8.4%
Scheduling the pick-up / had to schedule more than once / want more scheduling options	3.1%	5.6%	7.7%	4.6%
Misunderstanding about what would happen to recycled unit / feel bad about destroying a working unit	4.7%	3.7%	0.0%	3.8%
Waiting for payment / time to receive payment	3.1%	1.9%	7.7%	3.1%
Having to be present for pick-up / making arrangements / taking time off work	1.6%	5.6%	0.0%	3.1%
Having to move unit for pick-up	4.7%	0.0%	0.0%	2.3%
Having to clean / defrost unit for pick-up	4.7%	0.0%	7.7%	3.1%
Unit had to be plugged in for pick-up	1.6%	0.0%	0.0%	0.8%
Incentive payment is too small	4.7%	0.0%	0.0%	2.3%
Not being aware of the program sooner / need more advertising and awareness	3.1%	1.9%	0.0%	1.5%
Worried that unit would not be working by time of pick-up	3.1%	0.0%	0.0%	1.5%
Other (listed below)	7.8%	0.0%	0.0%	3.8%
Nothing / don't know	46.9%	83.3%	76.9%	64.9%

Percentages total to more than 100% because participant could give multiple responses.

Five customers (3.8% of 131) mentioned "other" aspects of the program as their least favorite; these responses are listed below.

Recycled one refrigerator (N=5)

- *I didn't realize when I was going to get check until the crew told me. I probably missed that information when I signed up.*
- *I had to coordinate two different people with two different appointments: one with the delivery of the new refrigerator and one with the pick-up of the old one. These appointments needed to be done on the same day.*
- *My least favorite thing was getting a courtesy call from the collection team a mere two minutes before they arrived, which was also a bit earlier than the appointment was initially scheduled for.*
- *My least favorite thing was the collection team mentioning that I had narrowly missed winning a \$1000 monthly prize for donating the oldest refrigerator.*

- *My least favorite thing was trying to determine whether our appliance qualified for the program.*

Customers Noticing a Reduction in Their Electric Bill after Removing Appliances

Survey participants were asked if they have noticed a reduction in their electric bills since their old units were recycled. As indicated in Figure 16, only about a quarter of customers (20.6% or 27 out of 131) definitely noticed a reduction in their electric bills. The percentage of customers noticing a reduction in their utility bill is not significantly different depending on whether the customer recycled a refrigerator, a freezer or multiple units.

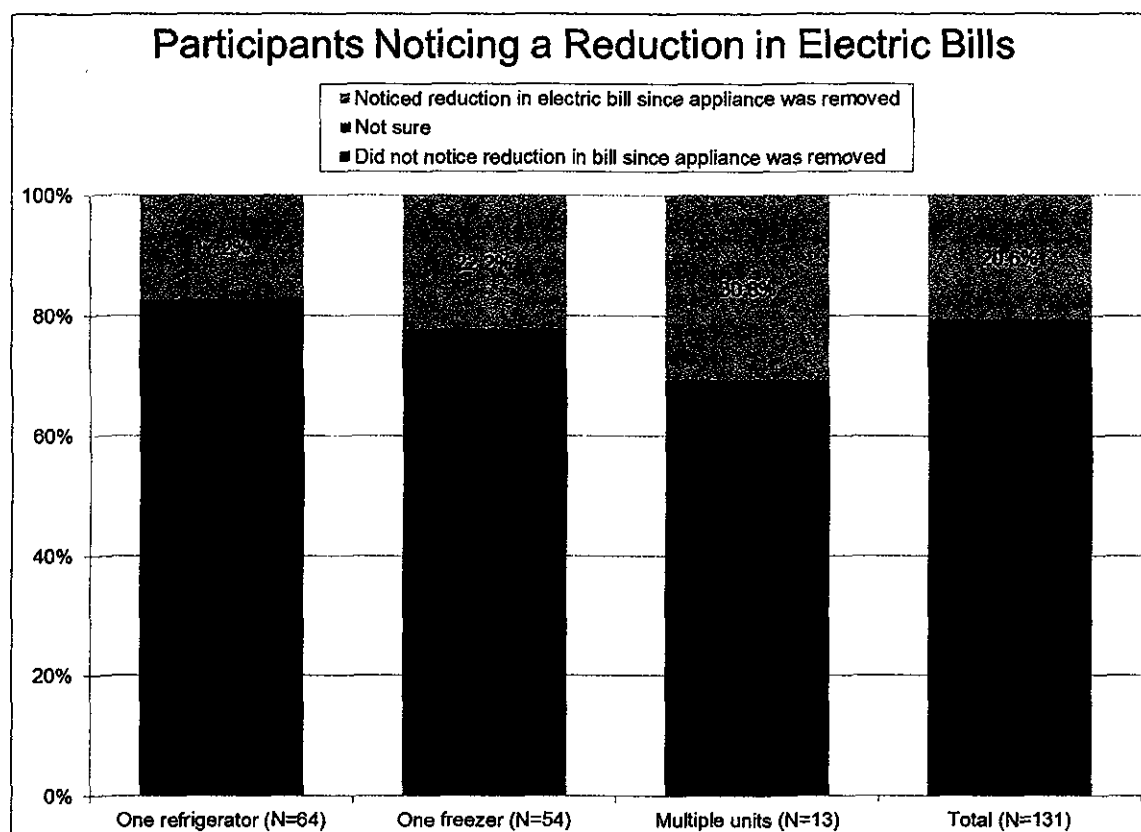


Figure 16. Participants Noticing a Reduction in Electric Bills since Their Old Appliance(s) Were Removed by Unit(s) Recycled

Additional Energy Efficiency Actions since the Program

Surveyed program participants were asked, “Based on your participation in the Duke Energy Appliance Recycling program, have you been inspired to take any additional actions to save energy?”, and also asked to rate the influence of the program on any actions taken.

Table 59 shows that the most common energy efficiency action taken since participating in the Appliance Recycling program is the installation of more efficient CFL and LED light bulbs (12.2% or 16 out of 131). Additionally, 3.1% (4 out of 131) of participants say they are

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following tips from MyHER reports, another 1.5% (2 out of 131) have had a Home Energy House Call, and 1.5% (2 out of 131) say they have disposed of or unplugged additional refrigerators and freezers. However, most participants (68.7% or 90 out of 131) report not having taking any additional energy efficiency actions.

There is only one difference between groups that reaches the $p < .05$ level of statistical significance (using student's t-test): Customers who recycled a refrigerator are more likely than the rest of the survey respondents to have installed more efficient lighting (18.8% or 12 out of 64).

Overall, the average influence of the program on actions taken after participation is 6.0 on a 10-point scale, where a "10" indicates the highest influence. The highest average influence ratings of the program are for conserving water (9.0 for the two respondents who took this action) and unplugging additional refrigerators and freezers (8.0 for the two respondents who took this action), although the number of respondents who took any given action is very small so these influence ratings should be taken only as directional indicators.

Table 59. Energy Efficiency Actions Taken after Participating in the Program

Energy efficiency actions taken since the program	Recycled one refrigerator (N=64)	Recycled one freezer (N=54)	Recycled multiple units (N=13)	Total (N=131)	Average Rating Influence of Program
Use efficient light bulbs	18.8%	5.6%	7.7%	12.2%	6.9
Upgrade appliances / Energy Star	4.7%	5.6%	7.7%	5.3%	3.1
Upgrade HVAC system	1.6%	1.9%	7.7%	2.3%	7.0
Home Energy House Call	1.6%	1.9%	0.0%	1.5%	5.5
Heating & cooling decisions	1.6%	3.7%	0.0%	2.3%	3.3
Following MyHER tips / joined MyHER	3.1%	3.7%	0.0%	3.1%	5.0
Conserving water	3.1%	0.0%	0.0%	1.5%	9.0
Add insulation	0.0%	0.0%	7.7%	0.8%	5.0
Install programmable thermostat	0.0%	1.9%	0.0%	0.8%	1.0
Unplug extra fridge / freezer	1.6%	1.9%	0.0%	1.5%	8.0
Other (listed below)	7.8%	5.6%	7.7%	6.9%	7.3
Did not take additional actions	64.1%	72.2%	76.9%	68.7%	NA
Don't know / not specified	1.6%	0.0%	0.0%	0.8%	NA

Percentages total to more than 100% because participants could mention multiple actions.

Nine surveyed participants (6.9% out of 131) mentioned "other" actions they have taken for energy efficiency. These responses are listed below.

Recycled one refrigerator (N=5)

- We had a new digital energy meter installed.
- I have continued to consider recycling more appliances.
- I installed a new storm door.
- I recycle cans and plastic.

- *I read the monthly energy-saving tips included in my Duke bill, such as using a crock pot instead of the oven.*

Recycled one freezer (N=3)

- *I thought if they're saying this would program would save me money, and they were willing to come forward to pay to do it, I could try to save money in other areas of my home.*
- *It has increased our energy usage awareness. We think about other appliances that we don't need to be using and appliances that we should be replacing with more efficient models.*
- *This summer, I used ceiling fans more to cut down on the cost of running air conditioning.*

Recycled multiple units (N=1)

- *I did some caulking and weather stripping. I wanted to try to do my part, also.*

Participation in Other Duke Energy Programs

TecMarket Works asked Appliance Recycling program participants if they had participated in any other Duke Energy programs since recycling their appliances. As seen in Table 60, about a quarter of these customers report participating in at least one additional program (23.7% or 31 out of 131). The most common are CFL giveaway programs (12.2% or 16 out of 131), Home Energy House Call (3.1% or 4 out of 131) and My Home Energy Report (also 3.1% or 4 out of 131).

Table 60. Self-Reported Participation in Other Duke Energy Programs

Participation in other Duke Energy programs	Recycled one refrigerator (N=64)	Recycled one freezer (N=54)	Recycled multiple units (N=13)	Total (N=131)
CFL program	9.4%	14.8%	15.4%	12.2%
Home Energy House Call	1.6%	5.6%	0.0%	3.1%
My Home Energy Report	4.7%	1.9%	0.0%	3.1%
Power Manager	1.6%	1.9%	7.7%	2.3%
CFLs through school (K-12 program)	3.1%	0.0%	0.0%	1.5%
Rate lock-in program	3.1%	0.0%	0.0%	1.5%
StrikeStop (power surge protection)	0.0%	0.0%	7.7%	0.8%
Residential Smart Saver	0.0%	0.0%	0.0%	0.0%
Personalized Energy Report	0.0%	0.0%	0.0%	0.0%
Other (listed below)	4.7%	0.0%	0.0%	2.3%
None of the above	75.0%	77.8%	69.2%	75.6%
Don't know	0.0%	0.0%	7.7%	0.8%

Percentages total to more than 100% because participants could mention multiple programs.

Three surveyed participants (2.3% out of 131) mentioned "other" Duke Energy programs they have joined since participating in the Appliance Recycling Program. These responses are listed below.

Recycled one refrigerator (N=3)

- *I am considering Home Energy House Call and the Peak Time Rebate Residential Pilot Program.*
- *I tried to sign up for the A/C checkup, but enrollment was full.*
- *I signed up for the Select Rate program.*

Appendix A: Management Interview Instrument

Name: _____

Title: _____

We are conducting this interview to obtain your opinions about and experience with the [STATE NAME] Appliance Recycling Program. We'll talk about the Program and its objectives, your thoughts on improving the program and its participation rates, and the technologies the program covers. The interview will take about an hour to complete. May we begin?

PROGRAM DESCRIPTION

In your own words, please describe the [STATE NAME] Appliance Recycling Program.

Please discuss the history and development of the program.

Why appliance recycling? Why not just disposal? Why can't customers drop off appliances?

Why refrigerators and freezers? (high energy consumption, common second units, models prior to 1993, etc.) Are other appliances being considered, such as room air conditioners, kitchen and laundry appliances? If so, which ones? When might they be incorporated into the program? What factors will be used to make the determination?

What are the program's goals? That is, what goals and metrics are you tasked with achieving (such as energy savings targets, numbers of new enrollments, numbers of units recycled, website visits, etc.)? What is the current performance towards these targets?

What are the current program's objectives? That is, aside from the numerical goals what is the program trying to accomplish (save energy, improve CSAT, protect environment, etc)? In your opinion, which objectives do you think are being met or will be met? Have the objectives changed over time. If yes, how do you think they have changed??

Are there any program objectives that are not being addressed or that you think should have more attention focused on them? If yes, which ones? How should these objectives be addressed? What should be changed? How will these changes improve the program? Would it improve customer satisfaction, lower program costs or delivery a better product to customers?

Should the program objectives be changed in any way because of market conditions, other external or internal program influences, or any other conditions that have developed since the program objectives were devised? What changes would you put into place, and how would it affect the objectives?

What are the program requirements for participation? What are the customer eligibility requirements?

What are the appliance requirements for program participation? Why unit sizes of 10-30 cu ft? Why is size important? Why a limit of 2 units?

Does ARP apply to renters as well as homeowners? Why or why not?

Are there any program changes that you think would improve the program's performance towards its goals and objectives?

PROGRAM MANAGEMENT AND OPERATIONS

Please describe your role and scope of responsibility in detail. What is it that you are responsible for as it relates to this program? When did you take on this role? If a recent change in management...Do you feel that Duke Energy gave you enough time to adequately prepare to manage this program? Did you get all the support that you needed to manage this program?

Please review with us how the Appliance Recycling Program operates relative to your duties, that is, please walk us through the processes and procedures and key events that allow you do currently fulfill your duties.

Have any recent changes been made to your duties? If so, please tell us what changes were made and why they were made. What are the results of the change?

Is there any other person or group within Duke Energy that you work with on the implementation of this program? Who is that and what role do they serve?

PROGRAM IMPLEMENTATION

Which third parties or vendors do you work with to implement this program? Please describe their roles in the implementation of the program.

Describe process of hiring and integrating JACO. Is the JACO program turn key?

What kinds of marketing, outreach and customer contact approaches do you use to make your customers aware of the program and its options?

Please describe the ARP process from initial marketing, through appliance pick up and dismantling, to verification and incentive processing.

Why must unit be plugged in at time of pick up?

Please describe the incentive process. How was the \$30 incentive amount determined? How long does it take for customers to get paid? In what form is the payment?

Please describe the JACO tracking and reporting system. Is it online? What reporting can you monitor and access? Pick ups, energy savings, program costs, emission impacts, call center volume, etc.

How effective is JACO in its assigned role? What works well? What could be improved? (Repeat for each third party vendor.)

How often and in what form do you communicate with JACO and any other vendors? How would you characterize your working relationships?

How do you manage and monitor or evaluate third-party involvement or performance? What do you do if vendor performance is exemplary or below expectations?

What are your quality assurance measures? What have those efforts uncovered?

MARKET ASSESSMENT AND BARRIERS

Describe the use of any advisors, technical groups or organizations that have in the past or are currently helping you think through the program's approach or methods. How often do you use them? What do you use them for?

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What information, research or assessments are you using to identify barriers and to develop more effective approaches/mechanisms for achieving program goals?

Can you cite any market, operational or technical barriers that impede a more efficient program operation? Please describe.

CUSTOMER RESPONSE

What percent of people schedule online pick up versus call in?

Do you assess, track or measure customer reaction to the program? If so, how?

What is the call volume for the program? Please characterize the nature of the calls?

How is customer satisfaction addressed in this program?

What percentage of participants donate to the Helping Hand assistance program?

DATA COLLECTION AND ENERGY SAVINGS

How does Duke Energy track and attribute energy savings?

CLOSING SUGGESTIONS AND COMMENTS

Overall, what about the Appliance Recycling Program works well and why?

Do you have any suggestions for how program performance toward goals can be increased?

In what ways can the Appliance Recycling Program's operations be improved?

If you could change any part of the program what would you change and why?

Are there any other issues or topics you think we should know about and discuss for this evaluation?

Is there anyone else that I should speak with to better complete this evaluation?

Appendix B: Vendor Interview Instrument

Name: _____
Title: _____

We are conducting this interview to obtain your opinions about and experience with the [STATE NAME] Appliance Recycling Program. We'll talk about the Program and its objectives, your thoughts on improving the program and its participation rates, and the technologies the program covers. The interview will take about an hour to complete. May we begin?

PROGRAM DESCRIPTION

In your own words, please describe the [STATE NAME] Appliance Recycling Program.

What is the history and relationship between JACO and Appliance Recycling Centers of America?

Why appliance recycling? Why not just disposal? Why can't customers drop off appliances?

Why refrigerators and freezers? (high energy consumption, common second units, models prior to 1993, etc.) Are other appliances being considered, such as room air conditioners, kitchen and laundry appliances? If so, which ones? When might they be incorporated into the program? What factors will be used to make the determination? Do you recycle other appliances for other utilities?

Please discuss the history and development of the program. When did you formally start the program with Duke? What dates did you start in each state?

What are the program's goals for 2012 and 2013 for each state? That is, what goals and metrics are you tasked with achieving (such as energy savings targets, numbers of new enrollments, numbers of units recycled, website visits, etc.)? How were these goals established? What is the current performance towards these targets?

What are the current program's objectives? That is, aside from the numerical goals what is the program trying to accomplish (save energy, improve CSAT, protect environment, etc)? In your opinion, which objectives do you think are being met or will be met? Have the objectives changed over time. If yes, how do you think they have changed??

Are there any program objectives that are not being addressed or that you think should have more attention focused on them? If yes, which ones? How should these objectives be addressed? What should be changed? How will these changes improve the program? Would it improve customer satisfaction, lower program costs or delivery a better product to customers?

Should the program objectives be changed in any way because of market conditions, other external or internal program influences, or any other conditions that have developed since the program objectives were devised? What changes would you put into place, and how would it affect the objectives?

What are the program requirements for participation? What are the customer eligibility requirements? Are you considering expanding to a wider audience?

What are the appliance requirements for program participation? Why unit sizes of 10-30 cu ft? Why is size important? Why a limit of 2 units? Why not built-ins, SubZeros?

Does ARP apply to renters as well as homeowners? Why or why not?

What are the requirements for the pick up location?

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Are there any program changes that you think would improve the program's performance towards its goals and objectives?

PROGRAM MANAGEMENT AND OPERATIONS

Please describe your role and scope of responsibility in detail. What is it that you are responsible for as it relates to this program? When did you take on this role? If a recent change in management...Do you feel that Duke Energy gave you enough time to adequately prepare to manage this program? Did you get all the support that you needed to manage this program?

Please review with us how the Appliance Recycling Program operates relative to your duties, that is, please walk us through the processes and procedures and key events that allow you do currently fulfill your duties.

Have any recent changes been made to your duties? If so, please tell us what changes were made and why they were made. What are the results of the change?

Is there any other person or group within Duke Energy that you work with on the implementation of this program? Who is that and what role do they serve?

PROGRAM IMPLEMENTATION

Other than Duke Energy do you work with any other firms or organization to implement this program? Please describe their roles in the implementation of the program.

How is marketing handled? What is your relationship with Runion, Salzman, Einhorn? What marketing channels do you use? How are these coordinated? Tell me about your pop up museum, filet-a-frig, and other media events.

Help me to understand the mechanics of how the program operates. Walk me through the process by which a customer signs up for the program/requests an appointment. What info do you capture when the customer enrolls? What happens if the appointment time doesn't work for the customer? What happens if the customer can't be home?

Please describe the ARP process from initial marketing, through appliance pick up and dismantling, to verification and incentive processing.

What do you do while at the customer's house? Why must unit be plugged in at time of pick up? Why do you start to dismantle the frig at the customer's house?

What does ATO stand for?

Can you describe the demanufacturing process for me? What are the environmental regulations and controls that go into this effort? Why are they important?

How is the program structured so that Duke Energy never actually takes ownership/possession of the appliance?

How are customer incentives handled? Please describe that process from start to finish.

What are your quality assurance measures? What have those efforts uncovered?

Please describe your tracking and reporting system. Is it online? What sort of tracking and reporting do you do? How often and in what format? Tell me about the customer dashboard.

Please characterize your performance to date. What are your SLAs? How are you doing towards them? Any lapses since you started?

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How often and in what form do you communicate with Duke Energy and any other businesses? How would you characterize your working relationships?

What is the business cycle of the program? Are there certain times of the year that are busier than others? When and why? How do you take this into consideration for marketing and implementation?

How does the way you run the program for Duke Energy differ from how you run it for other utility clients?

MARKET ASSESSMENT AND BARRIERS

Describe the use of any advisors, technical groups or organizations that have in the past or are currently helping you think through the program's approach or methods. How often do you use them? What do you use them for?

What information, research or assessments are you using to identify barriers and to develop more effective approaches/mechanisms for achieving program goals?

Can you cite any market, operational or technical barriers that impede a more efficient program operation? Please describe.

CUSTOMER RESPONSE

What percent of people schedule online pick up versus call in?

Do you assess, track or measure customer reaction to the program? If so, how?

What is the call volume for the program? Please characterize the nature of the calls?

How is customer satisfaction addressed in this program?

CLOSING SUGGESTIONS AND COMMENTS

Overall, what about the Appliance Recycling Program works well and why?

Do you have any suggestions for how program performance toward goals can be increased?

In what ways can the Appliance Recycling Program's operations be improved?

If you could change any part of the program what would you change and why?

Are there any other issues or topics you think we should know about and discuss for this evaluation?

Is there anyone else that I should speak with to better complete this evaluation?

Appendix C: Used Appliance Dealer Survey Instrument

INSTRUMENT

Respondent information

Name: _____ Title: _____

Address: _____ City: _____

Zip: _____ Phone: _____

Introduction

Hello. I am calling on behalf of Duke Energy, which sponsors the Appliance Recycling program that collects and recycles old operating refrigerators and freezers. We are trying to figure out how this program is affecting the market for used refrigerators and freezers. First, we want to ask your opinions of the program and the effects it may or may not be having on your business and the market for used units. Then, we want to ask you some questions to understand how the market for used units operates. The information you provide will be combined with information from others and summarized to describe how this market works. As we are doing the interview, please feel free to let me know if you are not comfortable with answering any of the questions I ask.

Respondent responsibilities

1. What are your primary responsibilities? *(Get respondent's title)*

Effect of Appliance Recycling- program on market

2. Are you aware of Duke Energy's Appliance Recycling program? *(Describe program to respondent if not aware. The Duke Energy Appliance Recycling program pays the utility's residential customers a rebate to have their working refrigerators and freezers picked up and removed from their homes to be recycled in an environmentally safe way.)*
3. What are your opinions of the Appliance Recycling program?
4. What effect does the program have on your business? Why? *(Carefully probe for whether or not these effects have already happened. If they have already happened, ask for examples. If they have not already happened, ask about how big they think the program would have to be and how long they think the program would have to run before it started to have an effect on their business.)*
5. What effect does the program have on the supply of used refrigerators? Why? *(As with Q4, carefully probe for whether or not these effects have already happened.)*

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6. What effect does the program have on the demand for used refrigerators? Why? *(As with Q4, carefully probe for whether or not these effects have already happened.)*

Overview of operations

7. Please briefly describe how your business operates in the used refrigerator market. *(Obtain enough information to sketch flowchart)*
8. Do you also sell new refrigerators? What percent of the refrigerators you sell are new vs. used?
9. Considering the other businesses that you know of in STATE NAME that sell used refrigerators and freezers, how would you compare the number of units that your company sells compared to the number that they sell?
- ☐ We sell more used units than the average company
 - ☐ We sell about the same number as other companies.
 - ☐ We sell fewer used units than the average company
 - ☐ Don't know/Not Sure

Acquisition process

10. Describe the ways in which you locate and obtain used refrigerators? Has this changed in the last year? If so, how has this changed? *(For each way that units are located and obtained, probe for percent of units in which this method was used last year vs. now)*

	Way unit is located and obtained	Refrigerators	
		Percent of units last year	Percent of units now
a.			
b.			
c.			
d.			
e.			

11. Who are your main suppliers of used refrigerators? *(Ask for description of each supplier)*
12. Roughly how many used refrigerators do you obtain in typical year? *(If not answered in Q4-Q6, then probe for changes in the last year)*

	Number of refrigerators
a. Now	
b. Last year	

13. How do the number of refrigerators you obtain vary by supplier? *(Obtain percent breakdown of refrigerators by supplier)*

Supplier (from Q11)	Percent of refrigerators
a.	

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Appendices

-
- b. _____
c. _____
d. _____
e. _____
-

14. Do you have enough used refrigerators to meet customer demand? If not, why is there a shortage? *(If not answered in Q4-Q6, then probe for changes in the last year)*
15. Please describe the range of conditions of the units that you accept in terms of age, working condition, wear, damage, appearance, etc?
16. What steps do you take to prepare the units you accept for sale to the public?
17. What are the main reasons why you reject units?
18. What do your suppliers do with the units that you reject?

Market for used refrigerators

19. Can you please characterize the general types of customers you sell to? *(Landlords, individuals, people looking for a primary or secondary unit, homeowners/renters/college students, etc.)*
20. What percent of the used refrigerators that you get in are made available for sale to your customers? What happens to the other percentages?
_____ %
21. Of the number you get in and make available for sale, what percent are actually sold?
_____ %
22. Typically about what percent of the units you make available for sale do you end up getting rid of because you were unable to sell them?
_____ %
23. What are the main reasons why you are unable to sell these units?
24. I would now like to ask you a hypothetical question: If your current used refrigerator stream was reduced in half, how would that effect your sales of used refrigerators?
25. What kind of things would you do to cope with this market reduction? Could you get more from other sources?
26. How successful do you think you would be in filling the void?

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27. I would now like to ask you a question about the used refrigerator market. I would like you to tell me, in your opinion, which of the following three phrases most closely describes the used refrigerator market in your area?

- ☐ It is a supply-constrained market. That is, if you could obtain more units that were in reasonably good condition you could sell them in a reasonable amount of time.
- ☐ It is a demand-constrained market. That is, if you could obtain more units that were in reasonably good condition you would not be able to sell them in a reasonable amount of time.
- ☐ The market is a balanced market in which your current supply is about equal to your ability to sell them in a reasonable amount of time.

Decommissioning and recycling process

28. What do you do with the refrigerators that you cannot sell?

29. What steps do you take to decommission and recycle the parts from the refrigerators that you cannot sell? On about what percent of these units are you able to recycle parts?

Other notes (ask if any other comments)

Appendix D: New Appliance Dealer Survey Instrument

INSTRUMENT

Respondent information

Name: _____ Title: _____
Address: _____ City: _____
Zip: _____ Phone: _____

Introduction

Hello. I am calling on behalf of Duke Energy, which sponsors the Appliance Recycling program that collects and recycles old operating refrigerators and freezers. We are trying to figure out how this program is affecting the market for used refrigerators and freezers. First, we want to ask your opinions of the program and the effects it may or may not be having on your business and the market for used units. Then, we want to ask you some questions to understand how the market for used units operates. The information you provide will be combined with information from others and summarized to describe how this market works. As we are doing the interview, please feel free to let me know if you are not comfortable with answering any of the questions I ask.

Respondent responsibilities

30. What are your title and your primary responsibilities at the location where you sell new refrigerators? *(Get respondent's title)*

Effect of Appliance Recycling- program on market

31. Are you aware of Duke Energy's Appliance Recycling program? *(Describe program to respondent if not aware. The Duke Energy Appliance Recycling program pays the utility's residential customers a rebate to have their working refrigerators and freezers picked up and removed from their homes to be recycled in an environmentally safe way.)*
32. What are your opinions of the Appliance Recycling program?
33. What effect does the program have on your business? Why? *(Carefully probe for whether or not these effects have already happened. If they have already happened, ask for examples. If they have not already happened, ask about how big they think the program would have to be and how long they think the program would have to run before it started to have an effect on their business.)*
34. What effect does the program have on your company's sales of new refrigerators? Why? *(As with Q4, carefully probe for whether or not these effects have already happened.)*

35. Do you think that a program that dismantles old units leads to increased sales of new units?

New Unit Sales

36. What is your best estimate of many new refrigerators and freezers your company sells in a year?

37. Considering the other businesses that you know of in STATE NAME that sell new refrigerators and freezers, how would you compare the number of units that your company sells compared to the average number that are sold by these other businesses?

- ☐ We sell more new units than the average company
- ☐ We sell about the same number as other companies.
- ☐ We sell fewer new units than the average company
- ☐ Don't know/Not Sure

Dealing with Old Units

38. Does your company offer to remove old units for your customers who buy new units?

39. If you do remove older units, what percent and volume of buyers opt to have their older units taken away?

40. If so, who removes the old units?

41. What is typically done with the old units? What percentage and volume are resold at retail, resold at wholesale, given away (ask who?), recycled, trashed?

Percent

- ___ sold in their own retail shop(s)
- ___ sold wholesale to a bulk receiver of used units
- ___ given away
- ___ recycled via a recycling facility
- ___ trashed or dumped at waste or landfill facility
- ___ other (what is that) _____

42. If your company does not help with the removal of older units, what do you typically advise customers buying new units to do with their old ones?

Other notes (ask if any other comments)

Appendix E: Marketing Samples



Figure 17. Seasonal Bill Insert



Figure 18. Yahoo Banner Ad

Get rid of the old Fridge - Get a \$30 rebate & easy pickup

www.duke-energy.com/recycle

Save up to \$150 a year on energy

#10 - Pay Per Click Ad

Figure 19. Google Pay-Per-Click Ad




Earn \$30 for your old fridge or freezer.

Plus, save nearly \$150 a year in energy costs.

Do you have an old working fridge or freezer at home? We'll pick it up for free – and give you \$30.*

[Learn More](#)
[FAQs](#)

How it works



1 SCHEDULE AN APPOINTMENT



2 WE PICK UP YOUR APPLIANCE



3 APPLIANCE IS RECYCLED



4 WE SEND YOU \$30

Why recycle?

Older refrigerators and freezers can add up to \$150 to your power bill each year. Recycling your unit will help you reduce your energy use and keep harmful materials out of landfills.

Get started today!

Scheduling an appliance pickup is easy. Simply visit us online or call 855-398-6200. Our representatives are available by phone between 7 a.m. and 8 p.m. on weekdays, and between 10 a.m. and 5 p.m. on Saturdays.

Figure 20. Email Promotion

#9 Newspaper Ad



Rethink. Recycle. Reward.

GET \$30 FOR YOUR OLD REFRIGERATOR

SAVE UP TO \$150 A YEAR ON ENERGY

Chances are the older refrigerator or freezer in your basement or garage is running up your utility bill by an average of \$150 a year. Recycle it, reduce your energy use and keep harmful materials out of landfills. We'll pick it up for free and you'll pick up \$30.

For a **FREE** pickup, call 855.398.6200 or visit duke-energy.com/recycle.

Duke Energy.

Refrigerators and stand-alone freezers must be in working condition and between 10 and 30 cubic feet using inside measurements. Customers must own units being recycled. Limit two units per residential address. A check will be mailed within 4-8 weeks after appliance collection. Additional restrictions apply. This program is available to Indiana customers only. Visit duke-energy.com/recycle for complete program terms and conditions.

CODE: PRINT

Figure 21. Newspaper Ad

Appendix F: Online Scheduling Module Sign Up

Please enter your zip code to schedule your Unit Pickup.

zip code

[Show Schedule Dates](#)

Requirements for Program Participation

1. The eligible refrigerator or freezer must be clean, empty, defrosted, and in working condition.
2. The unit must meet the size requirement which is 10 cu ft - 30 cu ft.
3. You must have an active residential electric account with Duke Energy at the address where you would like us to pickup the refrigerator/freezer.
4. There is a limit of two (2) units per customer address per calendar year.
5. An adult, 18 years of age or older, must be present to sign and release the unit at the time of the pickup.
6. The unit needs to be plugged in and running on the day of the pickup.
7. Recycling appliance must be disconnected from waterlines prior to the pickup crew's arrival.
8. You must provide clear and safe access to your appliances for the removal team. They will not risk injury or be able to move personal effects or modify your home (e.g.; remove door or railings) to remove the unit(s).

Why participation is important to you

1. We give you a rebate of \$30 for a working refrigerator or freezer, pick them up and recycle them.
2. *Old refrigerators and freezers typically use two times more electricity than newer models that are being produced today. If everybody tries to do their part to conserve energy and to recycle responsibly, this could help manage our energy resources well into the future.*

If you have any questions about the recycling program, or if you would like to schedule your pickup date by phone; please feel free to contact our customer service center toll free at 855-398-6200.

Figure 22. Online Scheduling Module page 1

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Select your preferred Schedule Date :

Please select a day that is most convenient for you. You will receive a call 24 to 48 hours before your appointment date to confirm a 4-hour window for the pickup to take place.

Postal Code	Open Dates	Day	Select	Open Appointments
47129	8/23/2013	Friday	<input type="radio"/>	4
47129	8/31/2013	Saturday	<input checked="" type="radio"/>	15
47129	9/5/2013	Thursday	<input type="radio"/>	15

Choosing a city is optional, choosing a city will put the city in automatically on the fill out page.

Clarksville	<input type="radio"/>
-------------	-----------------------

Requirements for Program Participation

1. The eligible refrigerator or freezer must be clean, empty, defrosted, and in working condition.
2. The unit must meet the size requirement which is 10 cu ft - 30 cu ft.
3. You must have an active residential electric account with Duke Energy at the address where you would like us to pickup the refrigerator/freezer.
4. There is a limit of two (2) units per customer address per calendar year.
5. An adult, 18 years of age or older, must be present to sign and release the unit at the time of the pickup.
6. The unit needs to be plugged in and running on the day of the pickup.
7. Recycling appliance must be disconnected from waterlines prior to the pickup crew's arrival.
8. You must provide clear and safe access to your appliances for the removal team. They will not risk injury or be able to move personal effects or modify your home (e.g.: remove door or railings) to remove the unit(s).

- ☒ I have read and agree to the above terms and conditions of the Appliance Recycling Program.

Apply for Selected Date

Why participation is important to you

1. Because of the way appliances have to be recycled, many recycling companies have to charge a fee to pickup and recycle your old appliances. When you participate in this program, we pick it up and recycle your old refrigerator or freezer for free.
2. Old refrigerators and freezers typically use two times more electricity than newer models that are being produced today. If everybody tries to do their part to conserve energy and to recycle responsibly, this could help manage our energy resources well into the future.

If you have any questions about the recycling program, or if you would like to schedule your pickup date by phone; please feel free to contact our customer service center toll free at 855-398-6200.

Figure 23. Online Scheduling Module page 2

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Enrollment Form for Appliance Recycling Program

In order to be eligible for the Refrigerator/Freezer recycling program, you must fill in all of the fields below. When you are done, click the continue button to submit your information. Please make sure all the information is correct. If you have any questions related to this form, please call our operators at 855-398-6200

All fields marked with a "*" are required.

Pickup Date:	8/31/2013
How did you hear about us? *	-Select-
Resident Status *	-Select-

Electric Account Information

Account Holder First Name: *	Account Holder Last Name: *
Service Address: *	
(Address where appliance is located at for the day of pickup)	
Service City: *	Service State: *
Which intersection is nearest to your home? *	
Service Zip Code: *	Email: *
47129	
Daytime Phone: *	Alternate Phone: Ext:
Utility Account Number:	

Are you interested in donating your rebate check to the Duke Energy Helping Hands Program? * -Select-

☐ Opt-In

By checking the "Opt-in" checkbox above, I acknowledge that I'm signing up to receive important messages about appliance recycling and similar offerings. I understand that I will be able to unsubscribe from these messages at any time.

Figure 24. Online Scheduling Module page 3 (part 1)

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☐ Check here if the Payee Address is the same as the Pickup Address

Incentive checks will be mailed to the following:

First Name: * _____ Last Name: * _____

Address: * _____

City: * _____ State: * _____

Zip Code: * _____

How many units do you have for pickup? *

(If you are recycling one side-by-side refrigerator, it will be considered as one appliance for recycling. It will not be counted as two separate units.)

Refrigerator Freezer

0 ▼ 0 ▼

Is the unit working? (i.e. does the unit cool?) * ☐ Yes ☐ No

Is the unit between 10 and 30 cubic feet? * ☐ Yes ☐ No

To check your unit's size, enter your unit's width, depth and height **inside dimensions** (in inches) in the three boxes below.

Width : _____ Depth : _____ Height : _____

Do you have a Sub Zero unit? * -Select- ▼

Unit pickup location * -Select- ▼

Does unit removal require using stairs? * -Select- ▼

Do you live in a gated community? * -Select- ▼

Figure 25. Online Scheduling Module page 3 (part 2)

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Customer Information

This is the information you entered. Carefully review all entries. Click the "Edit" button if you need to make any corrections. Please click the "Final Submission" button to confirm your pickup appointment.

Pickup Date	: 12/31/2013
How did you hear about us?	: Appliance retailer
Account Holder First Name	: zzzTEST4416
Account Holder Last Name	: zzzz
Service Address	: zzz4416
Service City	: zz
Service State	: zz
Service Zip Code	: 00141
Email	: no@email.com
Alternate Phone	:
Ext	:
Daytime Phone	: 000-000-0000
Utility Account Number	: 0
First Name	: zzzTEST4416
Last Name	: zzzz
Address	: zzzMailAddress4416
City	: zzzMailCity
State	: zzzMailState
Zip Code	: 95551
Resident Status	: Owner
Which intersection is nearest to your home?	: zzz zzz zzz
Do you have a Sub Zero unit?	: No
Unit pickup location	: Kitchen
Does unit removal require using stairs?	: No
Do you live in a gated community?	: No
Refrigerator Count	: 1
Freezer Count	: 0

An email will be sent to you 48 hours prior to your pickup date as a reminder. Please call Jaco Environmental at 855-398-6200 if you should have any questions.

The Jaco Staff

[Edit](#) [Final Submission](#)

Figure 26. Online Scheduling Module page 4

PickUp Confirmation

Date of Scheduled Pickup : 12 31 2013 Tuesday
ATO # 2831185 The ATO Number is your reference number.

Your pickup is planned for 1 Refrigerator unit(s).



You will receive a call 24 to 48 hours prior to your appointment date listed above to confirm the appointment and provide a 4-hour window for the pick-up to take place.

The refrigerator or freezer needs to be plugged in and working at the time of the pickup. Remove all food prior to the time of pickup. You need to provide clear access to your unit. Our pickup team will not be able move furniture or other materials in the way of the removal or modify your home in any way to get the unit out (such as removing doors or railings). If clear access is not provided when the crew arrives, the crew may ask you to reschedule your pickup when you can provide a clear path.

As a contracted partner of your utility company, it is important to know that our drivers are required to have a visible identification badge. Please be sure to look for the identification badge.

Thank you for your order.

If you have any questions about the recycling program, or need to reschedule your pickup, please feel free to contact our customer service center toll free at 855-398-6200.

[Print My Confirmation Schedule](#)

JACO Environmental, on behalf of Duke Energy would like to thank you for your participation in the program. JACO Environmental is totally committed to protecting the environment and preserving the earth's valuable resources through the art of responsible appliance recycling.

Figure 27. Online Scheduling Module page 5

Appendix G: Participant Survey Instrument

The questions below require mostly short, scaled replies from the interviewee, and not all questions will be asked of all participants. This interview will take approximately 20 minutes. Use four attempts at different times of the day and different days before dropping from contact list. Call times are from 10:00 a.m. to 8:00 p.m. EDT or 9-7 CDT Monday through Saturday. No calls on Sunday.

Note: Only read words in bold type. Instructions are in italics.

*Always make sure you have the correct Survey ID.
Please copy and paste it. A hand-typed approximation is not acceptable.*

Surveyor Name*

Survey ID*

State*

☐ North Carolina

☐ South Carolina

☐ Indiana

☐ Ohio

☐ Kentucky

for answering machine 1st through penultimate attempts:

Hello, my name is _____. I am calling to conduct a customer survey about the Appliance Recycling Program, on behalf of Duke Energy. I'm sorry I missed you. I'll try again another time.

for answering machine - Final Attempt:

Hello, my name is _____. I am calling to conduct a customer survey, on behalf of Duke Energy. This is my last attempt at reaching you, my apologies for any inconvenience.

if person answers

Hello, my name is _____. I am calling on behalf of Duke Energy to conduct a customer survey about the Appliance Recycling Program. May I speak with _____ please?

If person talking, proceed. If person is called to the phone reintroduce. If not home, ask when would be a good time to call and schedule the call-back.

We are conducting this survey to obtain your opinions about the Appliance Recycling Program. Duke Energy's records indicate that you participated in the Appliance Recycling Program in [month / year]. If you qualify, we will send you a check for \$20 for completing

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the survey. It will take about 20 minutes and your answers will be confidential, and will help us to make improvements to the program to better serve others. May we begin the survey?

Note: If this is not a good time, ask if there is a better time to schedule a callback.

1a. Do you recall participating in the Appliance Recycling Program?*

- ☐ Yes
- ☐ No
- ☐ DK/NS

If NO or DK/NS to Q1a, ask:

1b. This program was provided through Duke Energy. In this program, Duke Energy sends contractors to your home to pick up your old refrigerator or freezer for recycling. Do you remember participating in this program?*

- ☐ Yes
- ☐ No
- ☐ DK/NS

If No or DK/NS to Q1b, end interview and go to next participant.

1c. How many stand-alone freezers did you get rid of through Duke Energy's Appliance Recycling Program?*

- ☐ 0
- ☐ 1
- ☐ 2
- ☐ 3 or more *specify::* _____ *

1d. How many refrigerators did you get rid of through Duke Energy's Appliance Recycling Program?*

- ☐ 0
- ☐ 1
- ☐ 2
- ☐ 3 or more *specify::* _____ *

[ASK IF "REFRIGERATOR" CHECKED IN Q1c]:

1e. Was the refrigerator you recycled your main refrigerator in or near your kitchen, or was it a secondary refrigerator kept somewhere else in the house, or did you recycle more than one refrigerator?*

- ☐ Main (kitchen)
- ☐ Spare/Secondary (not in kitchen)
- ☐ Recycled multiple refrigerators
- ☐ N/A -- (Respondent is not primary user of fridge (landlord, etc.)) *TERMINATE*
- ☐ DK/NS

1f. Were any of these your main refrigerator kept in or near the kitchen?*

- ☐ Yes
- ☐ No

1g. Was the freezer that you recycled one that used primarily by people in your household, or was it primarily used by tenants or other people?*

- ☐ Primarily used by respondent's household
- ☐ Respondent is not primary user of freezer (landlord, etc.) [TERMINATE]

TERMINATE IF RESPONDENT DID NOT RECYCLE AT LEAST ONE REFRIGERATOR OR FREEZER.

REFRIGERATOR QUESTIONS

IF "REFRIGERATOR" CHECKED IN Q1c, BEGIN WITH Q2a AND CONTINUE FOLLOWING "SKIP" PROMPTS; OTHERWISE SKIP AHEAD TO Q14a FOR FREEZER QUESTIONS.

2a. How old was the refrigerator when Duke Energy removed it?

[OR if multiple refrigerators, read]:

How old were the refrigerators when Duke Energy removed them?*

- ☐ Numeric open end; record in years (record all units if more than one, noting which is main/kitchen unit: _____*)
- ☐ Less than one year
- ☐ DK/NS

if they recycled one refrigerator, ask:

2b. What was the condition of the refrigerator? Would you say ...*

- ☐ It worked and was in good physical condition
- ☐ It worked but needed minor repairs like a door seal or handle
- ☐ It worked but had some significant performance problems
- ☐ It did not work
- ☐ DK/NS

if they recycled two refrigerators, ask:

2c. What was the condition of the main refrigerator from your kitchen that you recycled?

Would you say ...*

- ☐ It worked and was in good physical condition
- ☐ It worked but needed minor repairs like a door seal or handle
- ☐ It worked but had some significant performance problems
- ☐ It did not work
- ☐ DK/NS

if they recycled two refrigerators, ask:

2d. What was the condition of the spare refrigerator which was not in your kitchen that you recycled? Would you say ...*

- ☐ It worked and was in good physical condition
- ☐ It worked but needed minor repairs like a door seal or handle
- ☐ It worked but had some significant performance problems
- ☐ It did not work
- ☐ DK/NS

3. What was the main reason you chose to get rid of the old refrigerator that was picked up by Duke Energy?*

if they recycled two units, use "other specify" response and write in details]

- ☐ The refrigerator was expensive to run / to save money
- ☐ Wanted to reduce energy use / to save energy
- ☐ The refrigerator was not working properly
- ☐ The refrigerator was a spare that I did not use very much / use at all
- ☐ The refrigerator was old and I wanted something with more modern features
- ☐ I wanted a bigger refrigerator
- ☐ I wanted a new refrigerator
- ☐ The information provided by the program
- ☐ Past experience with this program
- ☐ Because of past experience with another Duke Energy program

ask: What other Duke program?: _____ *

- ☐ Recommendation from other utility program

ask: What other utility program?: _____ *

- ☐ Recommendation of family/friend/neighbor/co-worker
- ☐ Recommendation of dealer/retailer/contractor
- ☐ Recommendation of someone else

ask: Who?: _____ *

- ☐ Environmental concerns / going "green"
- ☐ Other

SPECIFY:: _____ *

- ☐ DK/NS

4. Were there any other reasons you chose to get rid of the refrigerator?*

if they recycled two units, use "other specify" response and write in details]

- ☐ The refrigerator was expensive to run / save money
- ☐ Wanted to reduce energy use / save energy
- ☐ The refrigerator was not working properly
- ☐ The refrigerator was a spare that I did not use very much / use at all
- ☐ The refrigerator was old and I wanted something with more modern features
- ☐ I wanted a bigger refrigerator
- ☐ I wanted a new refrigerator
- ☐ The information provided by the program
- ☐ Past experience with this program
- ☐ Because of past experience with another Duke Energy program

ask: What other Duke program?

- ☐ Recommendation from other utility program

ask: What other utility program?

- ☐ Recommendation of family/friend/neighbor/co-worker
- ☐ Recommendation of dealer/retailer/contractor
- ☐ Recommendation of someone else

ask: Who?

- ☐ Environmental concerns / going "green"

- ☐ Other *SPECIFY*
- ☐ DK/NS
- ☐ No other reasons

if "spare/secondary" or "two refrigerators" checked in q1d, ask q5a through q6c; otherwise skip to q7a.

5a. Where was your spare or secondary refrigerator located before it was removed by Duke Energy? That is, not where it was located when it was picked it up, but where it was located when you were still using it?*

- ☐ Kitchen
- ☐ Garage
- ☐ Porch/Patio
- ☐ Basement
- ☐ Other *SPECIFY*: _____ *
- ☐ DK/NS

5b. Was this refrigerator located in a room that is heated in the winter?*

- ☐ Yes
- ☐ No

5c. Was this refrigerator located in a room that is cooled in the summer?*

- ☐ Yes
- ☐ No

5d. For how long had you been using this refrigerator as a spare or secondary when you decided to get rid of it?*

- ☐ [numeric open end, record in years]: _____ *
- ☐ Less than one year
- ☐ DK/NS

6a. Thinking just about the past year, was the refrigerator in your [question("option value"), id="33"] plugged in and running...?*

- ☐ All the time
- ☐ For special occasions only
- ☐ During certain months of the year only, or
- ☐ Was it never plugged in and running?
- ☐ DK/NS

6b. If you add up the total time the refrigerator in your [question("option value"), id="33"] was plugged in and running during the last 12 months that you had it, about how many total months would that be? Your best estimate is okay.*

- ☐ Less than 1 month
- ☐ 1 Month
- ☐ 2 Months
- ☐ 3 Months

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- ☐ 4 Months
- ☐ 5 Months
- ☐ 6 Months
- ☐ 7 Months
- ☐ 8 Months
- ☐ 9 Months
- ☐ 10 Months
- ☐ 11 Months
- ☐ 12 Months
- ☐ DK/NS

6c. Was the refrigerator in your [question("option value"), id="33"] running during the summer or was it mainly running during other times of the year?*

- ☐ Running all the time
- ☐ Running during the summer
- ☐ Mainly running other times of the year
- ☐ A mix of both summer and other times of the year
- ☐ DK/NS
- ☐ Other *specify*:: _____

7a. Was the refrigerator that was picked up by Duke Energy replaced with another one?*

- ☐ Yes
- ☐ No

7b. Are you intending to purchase another refrigerator within the next 12 months to replace the one that you recycled?*

- ☐ Yes
- ☐ No
- ☐ DK/NS

CONTINUE ONLY IF "YES" CHECKED IN Q7a; OTHERWISE SKIP TO Q11

8a. Did you replace the refrigerator that was removed with a new refrigerator you bought, a used refrigerator you bought, or a refrigerator you moved from somewhere else in the house?*

If they got a replacement without having to pay for it themselves, check "bought new" if it was a new unit, or "bought used" if it was not a new unit.

- ☐ Bought New
- ☐ Bought Used
- ☐ Moved from somewhere else in the house
- ☐ DK/NS

8b. Did you acquire the replacement refrigerator before or after the old refrigerator was picked up by Duke Energy?*

- ☐ Before
- ☐ After
- ☐ Got it the same day

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☐ DK/NS

8c. How long [BEFORE / AFTER from Q8b] the old one was picked up did you get the replacement refrigerator? Was it*

- ☐ Within one to two weeks
☐ Over two weeks, but less than two months
☐ Within two to three months
☐ Within four to six months
☐ Within six to twelve months/ one year, or
☐ More than one year
☐ Other (Please specify): _____ *
☐ DK/NS

ASK q9 ONLY IF "BOUGHT USED" OR "MOVED FROM SOMEWHERE ELSE" IN Q8a

9. How old is this replacement refrigerator?*

- ☐ [NUMERIC OPEN END, RECORD IN YEARS]: _____ *
☐ Less than one year
☐ DK/NS

10a. Please keep thinking about the refrigerator that replaced the refrigerator removed by Duke Energy. Does your replacement refrigerator have ...*

- ☐ A single door, with a freezer compartment inside
☐ Two doors, side by side, with a freezer on one side
☐ A Top freezer, or
☐ A Bottom freezer?
☐ Other SPECIFY:: _____ *
☐ DK/NS

10b. Is the replacement refrigerator frost-free or manual defrost?*

- ☐ Frost free
☐ Manual defrost
☐ Other SPECIFY:: _____ *
☐ DK/NS

10c. Is your replacement refrigerator larger, smaller or the same size as the one it replaced?*

- ☐ Larger
☐ Smaller
☐ Same Size
☐ DK/NS

10d. Do you know the cubic footage of your new refrigerator?*

- ☐ Yes [numeric open end]:: _____ *
☐ No or DK/NS

Next I am going to ask you about alternative steps you might have taken with your refrigerator(s) if the Duke Energy Appliance Recycling program had not been available.

11. Please tell me which of the following you would have been most likely to have done if the Appliance Recycling program from Duke Energy had not been available to pick up your refrigerator(s) for recycling. Would you have...*

[read response list; record only one response]

- ☐ Kept your old refrigerator
- ☐ Sold it
- ☐ Given it away for free
- ☐ Had it removed by the dealer you got your new or replacement refrigerator from
- ☐ Given it to a dealer that accepts used refrigerators (without purchasing a new refrigerator)
- ☐ Taken it to a dump or recycling center
- ☐ Hired someone to take it to a dump or recycling center
- ☐ Or, get rid of it some other way.

ask: What would you have done? : _____ *

☐ DK/NS

11a. How much do you think you would have been able to sell your old refrigerator for?*

11b. How would you have tried to sell your old refrigerator?*

check all mentioned

- ☐ Garage or curb sale
- ☐ Newspaper ad
- ☐ craigslist or internet sale
- ☐ Sold to a used appliance dealer
- ☐ Word of mouth / friends, family, neighbors
- ☐ Other (specify):

11c. How much would you have been willing to spend to hire someone to take your refrigerator away?*

12a. If the Duke Energy Appliance Recycling program had not been available, do you think you would you have gotten rid of your refrigerator(s) even sooner than you did, at the same time, or would it have taken you longer to get rid of it/(them)?*

- ☐ Would have done sooner
- ☐ Done at the same time
- ☐ Would have taken longer ask: How much longer? : _____ *
- ☐ DK/NS

12b. If the Appliance Recycling program from Duke Energy had not been available to pick up your refrigerator(s) for recycling, would you have replaced the refrigerator you recycled with a newer one?*

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- ☐ Yes, replace one recycled unit
☐ No
☐ DK/NS

12b. If the Appliance Recycling program from Duke Energy had not been available to pick up your refrigerators for recycling, would you have replaced the refrigerators you recycled with newer ones?*

- ☐ Yes, replace one recycled unit
☐ Yes, replace two units
☐ No
☐ DK/NS

12c. You said you would have given away your old refrigerator if the recycling program from Duke Energy had not been available. Is there a specific person that you would have given it to?*

ask only if "give it away" checked in q11

- ☐ Yes
☐ No
☐ DK/NS

12c. You said you would have sold your old refrigerator if the recycling program from Duke Energy had not been available. Is there a specific person that you would have sold it to?*

ask only if "sold it" checked in q11

- ☐ Yes
☐ No
☐ DK/NS

*if "yes" in q12c, ask:**

Who is it?: _____

What is this person's relationship to you?

RECORD RESPONSE (neighbor, relative, coworker, etc.): _____

if "yes" in q12c, ask:

12d. Do you know if the person you had intended to ["SELL" OR "GIVE" FROM Q11] your old refrigerator to was planning to use it as their main kitchen refrigerator, or would they have used it as a secondary or spare refrigerator, or done something else with it?*

- ☐ Yes, would have been used as main kitchen refrigerator
☐ Yes, would have been used as secondary refrigerator
☐ Yes, would have done something else with it *ask: What would they have done with it? :*

*

- ☐ No/DK/NS

CONTINUE ONLY IF "KEPT IT" OR "DON'T KNOW" CHECKED IN Q11; OTHERWISE SKIP TO Q14a (IF RECYCLED A FREEZER) OR Q25 (IF THEY DID NOT RECYCLE A FREEZER)

if "kept it" in q11

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13a. If you had kept the refrigerator, would it have been stored unplugged or used as a secondary refrigerator?*

☐ Stored it unplugged

ask: How long would you have kept this unplugged refrigerator stored at your home?:

*

☐ Used it as a secondary refrigerator at least some of the time

☐ Used it as my primary refrigerator

☐ DK/NS

read if "don't know" in q11

13a. Assuming you would have kept the refrigerator, would it have been stored unplugged or used as a secondary refrigerator?*

☐ Stored it unplugged

ask: How long would you have kept this unplugged refrigerator stored at your home?:

*

☐ Used it as a secondary refrigerator at least some of the time

☐ Used it as my primary refrigerator

☐ DK/NS

13b. If you had kept the refrigerator would you have had it plugged in and running...?*

record only one response

☐ All the time,

☐ During certain months of the year only,

☐ For special occasions only, or

☐ Not at all?

[SKIP TO Q14a IF ALSO RECYCLING FREEZER, OTHERWISE SKIP TO Q25]

☐ DK/NS

13c. If you add up the total time this refrigerator would have been plugged in and running over a 12 month period, about how many total months would that be? Your best estimate is okay.*

☐ Less than 1 month

☐ 1 Month

☐ 2 Months

☐ 3 Months

☐ 4 Months

☐ 5 Months

☐ 6 Months

☐ 7 Months

☐ 8 Months

☐ 9 Months

☐ 10 Months

☐ 11 Months

☐ 12 Months

☐ DK/NS

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13d. For how many years would you have continued using this refrigerator?*

best estimate is fine

☐ Less than 1 year

☐ [NUMERIC OPEN END; RECORD IN YEARS]: _____ *

☐ Until it broke, indefinitely

☐ DK/NS

FREEZER QUESTIONS

IF "FREEZER" CHECKED IN Q1c, BEGIN WITH Q14a AND CONTINUE FOLLOWING "SKIP" PROMPTS;
OTHERWISE SKIP AHEAD TO Q25 NOW.

Next, I'm going to ask you some specific questions about the freezer that was picked up by Duke Energy.

14a. How old was the freezer when Duke Energy removed it?*

- ☐ numeric open end; record in years (record all units if more than one): _____ *
- ☐ Less than 1 year
- ☐ DK/NS

if they recycled one freezer:

14b. What was the condition of the freezer? Would you say ...*

- ☐ It worked and was in good physical condition
- ☐ It worked but needed minor repairs like a door seal or handle
- ☐ It worked but had some significant performance problems, or that
- ☐ It wasn't working
- ☐ DK/NS

if they recycled two or more freezers:

14c. What was the condition of the MAIN FREEZER that you recycled? That is, the one that was used most often. Would you say ...*

- ☐ It worked and was in good physical condition
- ☐ It worked but needed minor repairs like a door seal or handle
- ☐ It worked but had some significant performance problems, or that
- ☐ It wasn't working
- ☐ DK/NS

ask if they recycled two or more freezers

14d. What was the condition of the SECONDARY freezer that you recycled? Would you say ...*

- ☐ It worked and was in good physical condition
- ☐ It worked but needed minor repairs like a door seal or handle
- ☐ It worked but had some significant performance problems, or that
- ☐ It wasn't working
- ☐ DK/NS

15. What was the main reason you chose to get rid of the old freezer that was picked up by Duke Energy?*

Record only one response. If they recycled two units, use "other specify" response and write in details

- ☐ The freezer was expensive to run / to save money
- ☐ Wanted to reduce energy use / to save energy
- ☐ The freezer was not working properly
- ☐ The freezer was a spare that I did not use very much / use at all
- ☐ The freezer was old and I wanted something with more modern features

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- ☐ I wanted a bigger freezer
- ☐ I wanted a new freezer
- ☐ The information provided by the program
- ☐ Past experience with this program
- ☐ Because of past experience with another Duke Energy program
- ask: **What other Duke program?** : _____ *
- ☐ Recommendation from other utility program
- ask: **What other utility program?** : _____ *
- ☐ Recommendation of family/friend/neighbor/co-worker
- ☐ Recommendation of dealer/retailer/contractor
- ☐ Recommendation of someone else
- ask: **Who?** : _____ *
- ☐ Environmental concerns / going "green"
- ☐ Other *specify*: _____ *
- ☐ DK/NS

16. Were there any other reasons you chose to get rid of the freezer?*

do not select answer selected in q15; allow for multiple responses

if they recycled two units, use "other specify" response and write in details

- ☐ The freezer was expensive to run / to save money
- ☐ Wanted to reduce energy use / to save energy
- ☐ The freezer was not working properly
- ☐ The freezer was a spare that I did not use very much / use at all
- ☐ The freezer was old and I wanted something with more modern features
- ☐ I wanted a bigger freezer
- ☐ I wanted a new freezer
- ☐ The information provided by the program
- ☐ Past experience with this program
- ☐ Because of past experience with another Duke Energy program
- ask: **What other Duke program?**
- ☐ Recommendation from other utility program
- ask: **What other utility program?**
- ☐ Recommendation of family/friend/neighbor/co-worker
- ☐ Recommendation of dealer/retailer/contractor
- ☐ Recommendation of someone else
- ask: **Who?**
- ☐ Environmental concerns / going "green"
- ☐ Other *specify*
- ☐ DK/NS
- ☐ No other reason

17a. Thinking just about the past year, was the freezer plugged in and running ...*

If they recycled more than one freezer, use "other specify" response to record details.

- ☐ All the time
- ☐ For special occasions only

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- ☐ During certain months of the year only, or
- ☐ It was never plugged in and running
- ☐ Other SPECIFY: _____ *
- ☐ DK/NS

If "special occasions" or "certain months" checked in q17a, ask q17b and q17c; otherwise skip to q18.

17b. If you add up the total time your freezer was plugged in and running during the last 12 months that you had it, about how many total months would that be? Your best estimate is okay.*

- ☐ numeric open end; record in years (record all units if more than one): _____ *
- ☐ Less than 1 month
- ☐ DK/NS

17c. Was the freezer running during the summer or was it mainly running during other times of the year?*

if they recycled more than one freezer, use "other specify" response to record details

- ☐ Running during the summer
- ☐ Mainly running other times of the year
- ☐ A mix of both summer and other times of the year
- ☐ Other (specify): _____ *
- ☐ DK/NS

18a. Where was the freezer located in your home before it was removed by Duke Energy?*

if they recycled more than one freezer, use "other specify" response to record details

- ☐ Kitchen
- ☐ Garage
- ☐ Porch/Patio
- ☐ Basement
- ☐ Other (specify): _____ *
- ☐ DK/NS

18b. Was the freezer located in a room that is heated in the winter?*

- ☐ Yes
- ☐ No

18c. Was the freezer located in a room that is cooled in the summer?*

- ☐ Yes
- ☐ No

for 19 Yes [SKIP TO Q20a] No [CONTINUE WITH Q19b, THEN SKIP TO Q23]

19a. Was the freezer that was picked up by Duke Energy replaced with another one?*

- ☐ Yes
- ☐ No

19b. Are you intending to purchase another freezer within the next 12 months to replace the one that you recycled?*

- ☐ Yes
- ☐ No
- ☐ DK/NS

CONTINUE ONLY IF "YES" CHECKED IN Q19a; OTHERWISE SKIP TO Q23

20a. Did you replace the freezer that was removed with a new freezer you bought, a used freezer you bought, or a freezer you moved from somewhere else in the house?*

If they got a replacement without having to pay for it themselves, check "bought new" if it was a new unit, or "bought used" if it was not a new unit.

- ☐ Bought New
- ☐ Bought Used
- ☐ Moved from somewhere else in the house [SKIP TO Q21]
- ☐ DK/NS

20b. Did you acquire the replacement freezer before or after the old freezer was picked up by Duke Energy?*

- ☐ Before
- ☐ After
- ☐ Got it the same day SKIP TO Q21
- ☐ DK/NS SKIP TO Q21

20c. How long [BEFORE / AFTER from Q20b] the old one was picked up did you get the replacement freezer?*

Record only one response

- ☐ Within one to two weeks
- ☐ Over two weeks, but less than two months
- ☐ Within two to three months
- ☐ Within four to six months
- ☐ Within six to twelve months/ one year, or
- ☐ More than one year
- ☐ Other (Please specify): _____ *
- ☐ DK/NS

21. How old is this replacement freezer?*

ASK ONLY IF "BOUGHT USED" OR "MOVED FROM SOMEWHERE ELSE" IN Q20a

- ☐ numeric open end; record in years: _____ *
- ☐ Less than 1 year
- ☐ DK/NS

22a. Is your replacement freezer ...*

- ☐ A chest freezer or
- ☐ An upright freezer
- ☐ Other: _____ *
- ☐ DK/NS

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22b. Is the replacement freezer frost free or manual defrost?*

- ☐ Frost free
- ☐ Manual defrost
- ☐ Other: _____ *
- ☐ DK/NS

22c. Is your replacement freezer larger, smaller or the same size as the one it replaced?*

- ☐ Larger
- ☐ Smaller
- ☐ Same Size
- ☐ DK/NS

22d. Do you know the cubic footage of your new freezer?*

- ☐ YES [numeric open end]: _____ *
- ☐ NO/DK/NS

Next I am going to ask you about alternative steps you might have taken with your freezer(s) if the Duke Energy Appliance Recycling program had not been available.

23. Please tell me which of the following you would have been most likely to have done if the Appliance Recycling program from Duke Energy had not been available to pick up your freezer(s) for recycling. Would you have...*

- ☐ Kept your old freezer, or
- ☐ Sold it -- ask: How much do you think you would have been able to sell your old freezer for?: _____ *
- ☐ Given it away for free
- ☐ Had it removed by the dealer you got your new or replacement freezer from
- ☐ Give it to a dealer that accepts used freezers (without purchasing a new freezer)
- ☐ Taken it to a dump or recycling center
- ☐ Hired someone to take it to a dump or recycling center - ask: How much would you have been willing to spend to hire someone to take your freezer away?: _____ *
- ☐ Or, get rid of it some other way.
- ask: What would you have done?: _____ *
- ☐ DK/NS

If 'Sold it', ask:

23a. How would you have tried to sell your old freezer?*

- ☐ Garage or curb sale
- ☐ Newspaper ad
- ☐ Craig's list or internet sale
- ☐ Sold to a used appliance dealer
- ☐ Word of mouth / friends, family, neighbors
- ☐ Other

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24a. If the Duke Energy Appliance Recycling program had not been available, do you think you would you have gotten rid of your freezer(s) even sooner than you did, at the same time, or would it have taken you longer to get rid of it(/them)?*

- ☐ Would have done sooner
☐ Done at the same time
☐ Would have taken longer *ask: How much longer?: _____* *
☐ DK/NS

24b. If the Appliance Recycling program from Duke Energy had not been available to pick up your freezer(s) for recycling, would you have replaced the freezer(s) you recycled with

(a) newer one(s)?*

- ☐ Yes, replace one recycled unit
☐ No
☐ DK/NS

24c. If the Appliance Recycling program from Duke Energy had not been available to pick up your freezers for recycling, would you have replaced the freezers you recycled with newer ones?*

- ☐ Yes, replace one recycled unit
☐ Yes, replace two units
☐ No
☐ DK/NS

if "Sold It", ask

24c1. You said you would have sold your old freezer if the recycling program from Duke Energy had not been available. Is there a specific person that you would have sold it to?*

- ☐ Yes

ask: Who is it?

If needed: What is this person's relationship to you? RECORD RESPONSE (neighbor, relative, coworker, etc.): _____ *

- ☐ No
☐ DK/NS

if "Given it away", ask

24c2. You said you would have given away your old freezer if the recycling program from Duke Energy had not been available. Is there a specific person that you would have given it to?*

- ☐ Yes

ask: Who is it?

If needed: What is this person's relationship to you? RECORD RESPONSE (neighbor, relative, coworker, etc.): _____ *

- ☐ No
☐ DK/NS

*Continue Only If "Kept It" Or "Don't Know" Checked In Q23; Otherwise Skip To Q25
 read if "kept it" in q23*

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24c2. If you had kept the freezer, would it have been stored unplugged or would you have continued using it?*

☐ stored unplugged

ask: How long would you have kept this unplugged freezer stored at your home?:

*

☐ continued using it

☐ DK/NS

read if "Don't Know" in q23

24c3. Assuming you would have kept the freezer, would it have been stored unplugged or would you have continued using it?*

☐ stored unplugged

ask: ask: How long would you have kept this unplugged freezer stored at your home?:

*

☐ continued using it

☐ DK/NS

24d. If you had kept the freezer would you have had it plugged in and running...?*

Record only one response

☐ All the time,

☐ During certain months of the year only,

☐ For special occasions only, or

☐ Not at all?

☐ DK/NS

24e. If you add up the total time this freezer would have been plugged in and running over a 12 month period, about how many total months would that be? Your best estimate is okay.*

☐ less than 1 month

☐ 1

☐ 2

☐ 3

☐ 4

☐ 5

☐ 6

☐ 7

☐ 8

☐ 9

☐ 10

☐ 11

☐ 12

☐ DK/NS

24f. For how many years would you have continued using this freezer? Your best estimate is fine.*

☐ Less than 1 year

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() # of years

numeric open end; record in years: _____ *

() Until it broke, indefinitely

() DK/NS

25. How were you first made aware of Duke Energy's Appliance Recycling Program?*

Allow for multiple responses

☐ Insert with monthly bill / mailing from Duke Energy

☐ Email from Duke Energy

☐ Saw information at the Duke Energy website

☐ Other web site

ask: Which one?

☐ Saw an advertisement on radio, TV, or on the newspaper

ask: Where?

☐ From an appliance dealer or retailer

ask: Which one?

☐ Through another energy program

ask: Which program?

☐ Through a low-income program

ask: Which program?

☐ Friend/ Family Member/ Neighbor / Co-Worker

☐ Other, *please specify:*

☐ DK/NS

26a. Once you decided to participate, the first step was signing up for the program. Are you the one that signed up, or did someone else in your household sign up?*

() I signed up

() Someone else signed up

() DK/NS

26b. Did you sign up online or on the phone?*

() Telephone

() Online

() Other *specify* : _____ *

() DK/NS

CONTINUE IF "TELEPHONE" CHECKED IN Q26b; OTHERWISE SKIP TO Q27

26c. Did you have to call more than once?*

() Yes *ask: Why did you need to call more than once?:* _____ *

() No

() DK/NS

26d. On a scale of 1 to 10 where 1 is very dissatisfied and 10 is very satisfied, how satisfied were you with the customer service provided by the representative who took your call?*

() 1 = very dissatisfied

...

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- ☐ 10 = very satisfied
☐ DK/NS

If 7 or less ask:

26e. How could this be improved?*

27. Were you able to schedule a pick-up date and time that was convenient for you?*

- ☐ Yes
☐ No
☐ DK/NS

28a. On a scale of 1 to 10 where 1 is very dissatisfied and 10 is very satisfied, how satisfied were you with the process of signing up for and scheduling your pick up?*

- ☐ 1 = very dissatisfied
...
☐ 10 = very satisfied
☐ DK/NS

If 7 or less ask:

28b. How could this be improved?*

29a. How much time passed between when you scheduled the appointment and when your appliance(s) was/were picked up?*

- ☐ record: _____*
☐ DK/NS

29b. On a scale of 1 to 10 where 1 is very dissatisfied and 10 is very satisfied, how satisfied are you with the time it took between when you scheduled the appliance pickup and when it actually was picked up?*

- ☐ 1 = very dissatisfied
...
☐ 10 = very satisfied
☐ DK/NS

If 7 or less ask:

29c. How could this be improved?*

30a. Just before the pick-up took place, did you or anyone in your household receive a call in advance to confirm the appointment or to let you know the collection team was coming?*

- ☐ Yes
☐ No
☐ DK/NS

30b. Did the collection team arrive on time?*

- ☐ Yes

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- ☐ No
☐ DK/NS

30c. On a scale of 1 to 10 where 1 is very dissatisfied and 10 is very satisfied, how satisfied were you with the collection team who picked up your appliance(s)? *

- ☐ 1 = very dissatisfied
...
☐ 10 = very satisfied
☐ DK/NS

If 7 or less ask:

30d. How could this be improved?*

31a. How much was the payment that Duke Energy offered you for recycling your appliance?*

31b. Did you take the payment, or choose the option to donate the money to the Helping Hand Assistance program?*

- ☐ took payment
☐ donated to Helping Hand Assistance program
☐ DK/NS

31c. On that same scale from 1 to 10, how satisfied are you with the size of the payment for participation in the Duke Energy Appliance Recycling program?*

- ☐ 1 = very dissatisfied
...
☐ 10 = very satisfied
☐ DK/NS

If 7 or less ask:

31d. How could this be improved?*

ONLY ASK Q31e-Q31g IF RESPONDENT ANSWERED "TOOK PAYMENT" IN Q31b, OTHERWISE SKIP AHEAD TO Q32a

31e. How long did it take to get the check after your appliance was picked up?*

- ☐ 1 week or less
☐ more than one week to 2 weeks
☐ more than 2 weeks to 3 weeks
☐ more than 3 weeks to 4 weeks
☐ more than 4 weeks to 5 weeks
☐ more than 5 weeks to 6 weeks
☐ more than 6 weeks to 7 weeks
☐ longer than 7 weeks SPECIFY NUMBER OF WEEKS: _____ *
☐ have not received my check yet SPECIFY NUMBER OF WEEKS: _____ *
☐ DK/NS [SKIP TO 32a]

31f. How satisfied are you with the amount of time it took to receive your payment from Duke Energy, using the same scale from 1 to 10? *

☐ 1 = very dissatisfied

...

☐ 10 = very satisfied

☐ DK/NS

If 7 or less ask:

31g. How could this be improved?*

32a. There are a number of ways you could have gotten rid of your appliance(s). What is the MAIN reason you chose the Duke Energy Appliance Recycling Program instead of some other way?*

Record only one response

☐ The cash incentive

☐ The convenience of the home pick-up / don't have to take it someplace myself

☐ Pick up was free

☐ Appliance was recycled / disposed of in a way that was good for environment

☐ Was recommended by friend / family / neighbor / coworker

☐ Was recommended by dealer / retailer / contractor

☐ Did not know of any other way / no other option

☐ Other *specify*: _____ *

☐ DK/NS

32b. Were there any other reasons?*

[do not read response list; do not select answer selected in q32a; allow for multiple responses]

☐ The cash incentive

☐ The convenience of the home pick-up / don't have to take it someplace myself

☐ Pick up was free

☐ Appliance was recycled / disposed of in a way that was good for environment

☐ Was recommended by friend / family / neighbor / coworker

☐ Was recommended by dealer / retailer / contractor

☐ Did not know of any other way / no other option

☐ Other *specify*

☐ No other reason

☐ DK/NS

☐ No other reason

33a. Did the incentive payment have any influence at all on your decision to participate in Duke Energy's Appliance Recycling program?*

☐ Yes

☐ No

☐ DK/NS

34a. Did the information provided explaining the program have any influence at all on your decision to participate in Duke Energy's Appliance Recycling program?*

- ☐ Yes
- ☐ No
- ☐ DK/NS

35a. Thinking about your entire experience with the Duke Energy Appliance Recycling Program overall, how satisfied are you with the service, using the same scale from 1 to 10?*

- ☐ 1 = very dissatisfied

...

- ☐ 10 = very satisfied
- ☐ DK/NS

If 7 or less ask:

35b. How could this be improved?*

35c. What was your FAVORITE thing about participating in the Appliance Recycling program?*

- ☐ (answer): _____ *
- ☐ DK/NS

35d. What was your LEAST favorite thing about participating in the Appliance Recycling program?*

- ☐ (answer): _____ *
- ☐ DK/NS

(ask q35e for Ohio only)

35e. If you were rating your overall satisfaction with the Appliance Recycling Program, would you say you were Very Satisfied, Somewhat Satisfied, Neither Satisfied nor Dissatisfied, Somewhat Dissatisfied, or Very Dissatisfied?*

- ☐ Very Satisfied
- ☐ Somewhat Satisfied
- ☐ Neither Satisfied nor Dissatisfied
- ☐ Somewhat Dissatisfied
- ☐ Very Dissatisfied
- ☐ Refused
- ☐ DK/NS

(ask q35f for Ohio only)

35f. Why do you give it that rating?*

36a. Using the same scale from 1 to 10, how satisfied are you with Duke Energy overall?*

- ☐ 1 = very dissatisfied

...

- ☐ 10 = very satisfied
- ☐ DK/NS

If 7 or less ask:

36b. How could this be improved?*

36c. Would you say participating in this program has made you feel more favorable, less favorable, or no different about Duke Energy? *

- ☐ More favorable about Duke Energy
- ☐ Less favorable about Duke Energy
- ☐ No different about Duke Energy
- ☐ DK/NS

37. Based on your participation in the Duke Energy Appliance Recycling Program, have you been inspired to take any additional actions to save energy?*

- ☐ Yes *ask: What energy saving actions have you taken? : _____* *
- ☐ No
- ☐ DK/NS

37a. Using a scale of 1 to 10, where 10 means very much and 1 means very little - to what extent did the Appliance Recycling program from Duke Energy motivate you to take these additional energy saving actions?*

Very little

- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6
- ☐ 7
- ☐ 8
- ☐ 9
- ☐ 10
- ☐ DK/NS

Very much

37b. Since participating in the program, have you participated in any other Duke Energy energy efficiency programs?*

- ☐ Yes - *ask: Which programs? : _____* *
- ☐ No
- ☐ DK/NS

37c. Have you noticed a reduction in the amount of your electric bill since your appliance(s) was/were removed?*

- ☐ Yes
- ☐ No
- ☐ DK/NS

Demographics

Finally, we have some general demographic questions...

d18. Do you own or rent your home?*

- ☐ Rent
- ☐ Own
- ☐ DK/NS

d18a. Do you pay your own electric bill or is it included in your rent?*

- ☐ Pay bill
- ☐ Included in Rent

d1. In what type of building do you live?*

- ☐ Single-family home, detached construction
- ☐ Single family home, factory manufactured/modular
- ☐ Single family, mobile home
- ☐ Row House
- ☐ Two or Three family attached residence-traditional structure
- ☐ Apartment (4 + families)---traditional structure
- ☐ Condominium---traditional structure
- ☐ Other: _____
- ☐ Refused
- ☐ DK/NS

d2. What year was your residence built?*

- ☐ 1959 and before
- ☐ 1960-1979
- ☐ 1980-1989
- ☐ 1990-1997
- ☐ 1998-2000
- ☐ 2001-2007
- ☐ 2008-present
- ☐ DK/NS

d3. How many rooms are in your home (excluding bathrooms, but including finished basements)?*

- ☐ 1-3
- ☐ 4
- ☐ 5
- ☐ 6
- ☐ 7
- ☐ 8
- ☐ 9
- ☐ 10 or more

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☐ DK/NS

d4. Which of the following best describes your home's heating system?*

Check all that apply

- ☐ None
- ☐ Central forced air furnace
- ☐ Electric Baseboard
- ☐ Heat Pump
- ☐ Geothermal Heat Pump
- ☐ Other

d5. How old is your heating system?*

- ☐ 0-4 years
- ☐ 5-9 years
- ☐ 10-14 years
- ☐ 15-19 years
- ☐ 19 years or older
- ☐ DK/NS
- ☐ Do not have

d6. What is the primary fuel used in your heating system?*

- ☐ Electricity
- ☐ Natural Gas
- ☐ Oil
- ☐ Propane
- ☐ Other: _____
- ☐ DK/NS

d7. What is the secondary fuel used in your primary heating system, if any?*

- ☐ Electricity
- ☐ Natural Gas
- ☐ Oil
- ☐ Propane
- ☐ Other: _____
- ☐ None
- ☐ DK/NS

d8. Do you use one or more of the following to cool your home?*

(Mark all that apply)

- ☐ None, do not cool the home
- ☐ Heat pump for cooling
- ☐ Central air conditioning
- ☐ Through the wall or window air conditioning unit
- ☐ Geothermal Heat pump
- ☐ Other (please specify?)
- ☐ DK/NS

d9. How many window-unit or "through the wall" air conditioner(s) do you use?*

- ☐ None
- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6
- ☐ 7
- ☐ 8 or more
- ☐ DK/NS

d10. What is the fuel used in your cooling system?*

- ☐ Electricity
- ☐ Natural Gas
- ☐ Oil
- ☐ Propane
- ☐ Other
- ☐ None
- ☐ DK/NS

d11. How old is your cooling system?*

- ☐ 0-4 years
- ☐ 5-9 years
- ☐ 10-14 years
- ☐ 15-19 years
- ☐ 19 years or older
- ☐ DK/NS
- ☐ Do not have

d12. What is the fuel used by your water heater?*

(Mark all that apply)

- ☐ Electricity
- ☐ Natural Gas
- ☐ Oil
- ☐ Propane
- ☐ Other
- ☐ No water heater
- ☐ DK/NS

d13. How old is your water heater?*

- ☐ 0-4 years
- ☐ 5-9 years
- ☐ 10-14 years
- ☐ 15-19 years

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- ☐ More than 19 years
- ☐ DK/NS

d14. What type of fuel do you use for indoor cooking on the stovetop or range?*

(Mark all that apply)

- ☐ Electricity
- ☐ Natural Gas
- ☐ Oil
- ☐ Propane
- ☐ Other
- ☐ No stovetop or range
- ☐ DK/NS

d15. What type of fuel do you use for indoor cooking in the oven?*

(Mark all that apply)

- ☐ Electricity
- ☐ Natural Gas
- ☐ Oil
- ☐ Propane
- ☐ Other
- ☐ No oven
- ☐ DK/NS

d16. What type of fuel do you use for clothes drying?*

(Mark all that apply)

- ☐ Electricity
- ☐ Natural Gas
- ☐ Oil
- ☐ Propane
- ☐ Other
- ☐ No clothes dryer
- ☐ DK/NS

d17. About how many square feet of living space are in your home?*

(Do not include garages or other unheated areas)

Note: A 10-foot by 12 foot room is 120 square feet

- ☐ Less than 500
- ☐ 500 to 999
- ☐ 1000 to 1499
- ☐ 1500 to 1999
- ☐ 2000 to 2499
- ☐ 2500 to 2999
- ☐ 3000 to 3499
- ☐ 3500 to 3999
- ☐ 4000 or more
- ☐ DK/NS

d19. How many levels are in your home (not including your basement)?*

- ☐ One
- ☐ Two
- ☐ Three

d20. Does your home have a heated or unheated basement?*

- ☐ Heated
- ☐ Unheated
- ☐ No basement

d21. Does your home have an attic?*

- ☐ Yes
- ☐ No

d22. Are your central air/heat ducts located in the attic?*

- ☐ Yes
- ☐ No
- ☐ N/A

d23. Does your house have cold drafts in the winter?*

- ☐ Yes
- ☐ No

d24. Does your house have sweaty windows in the winter?*

- ☐ Yes
- ☐ No

d25. Do you notice uneven temperatures between the rooms in your home?*

- ☐ Yes
- ☐ No

d26. Does your heating system keep your home comfortable in winter?*

- ☐ Yes
- ☐ No

d27. Does your cooling system keep your home comfortable in summer?*

- ☐ Yes
- ☐ No

d28. Do you have a programmable thermostat?*

- ☐ Yes
- ☐ No

d28b. How many thermostats are there in your home?*

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- ☐ 0
- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4 or more
- ☐ DK/NS

d29. What temperature is your thermostat set to on a typical summer weekday afternoon?*

- ☐ Less than 69 degrees
- ☐ 69-72 degrees
- ☐ 73-78 degrees
- ☐ Higher than 78 degrees
- ☐ Off
- ☐ DK/NS

d30. What temperature is your thermostat set to on a typical winter weekday afternoon?*

- ☐ Less than 67 degrees
- ☐ 67-70 degrees
- ☐ 71-73 degrees
- ☐ 74-77 degrees
- ☐ 78 degrees or higher
- ☐ Off
- ☐ DK/NS

d31. Do You Have a swimming pool, hot-tub or spa?*

- ☐ Yes
- ☐ No

d32. Would a two-degree increase in the summer afternoon temperature in your home affect your comfort.?*

Read all answers until they reply

- ☐ Not at all
- ☐ Slightly
- ☐ Moderately, or
- ☐ Greatly

d33. How many people live in this home?*

- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6
- ☐ 7
- ☐ 8 or more
- ☐ Prefer not to answer

d34. How many of them are teenagers?*

(age 13-19)

If they ask why: Explain that teenagers are generally associated with higher energy use.

- ☐ 0
- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6
- ☐ 7
- ☐ 8 or more
- ☐ Prefer not to answer

d35. How many persons are usually home on a weekday afternoon?*

- ☐ 0
- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6
- ☐ 7
- ☐ 8 or more
- ☐ Prefer not to answer

d36. Are you planning on making any large purchases to improve energy efficiency in the next 3 years?*

- ☐ Yes
- ☐ No
- ☐ DK/NS

The following questions are for classification purposes only and will not be used for any other purpose than to help Duke Energy continue to improve service.

d37. What is your age group?*

Read all.

- ☐ 18-34
- ☐ 35-49
- ☐ 50-59
- ☐ 60-64
- ☐ 65-74
- ☐ Over 74
- ☐ Prefer not to answer

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d38. Please indicate your annual household income.*

Read all.

- ☐ Under \$15,000
- ☐ \$15,000-\$29,999
- ☐ \$30,000-\$49,999
- ☐ \$50,000-\$74,999
- ☐ \$75,000-\$100,000
- ☐ Over \$100,000
- ☐ Prefer Not to Answer

We've reached the end of the survey. As I mentioned earlier, we would like to send you \$20 for your time and feedback today. Should we send the \$20 to {address on file}, or would a different address be better?*

Either way, enter entire address here

Name: _____
Address: _____
City: _____
State: _____
Zip: _____

You should receive your \$20 check in about 4-6 weeks. It will come in an envelope from our company: TecMarket Works.

Thanks again for your time today!

(politely end call)

Survey ID*

Do you have any comments that you would like to pass on to your supervisor about this survey?

TERMINATION SCRIPT:

I'm sorry, but since you did not recycle any refrigerators or freezers that you were personally using through Duke Energy's Appliance Recycling Program, you do not qualify to participate in this survey. Thank you for your time.

Good bye.

Appendix I: Household Characteristics and Demographics

One survey respondent who recycled a freezer did not complete the demographic and household questions at the end of the telephone survey. This customer's responses are shown as "missing" for the questions that were not answered.

In what type of building do you live?

	Frequency	Percent	Valid Percent	Cumulative Percent
Single-family home, detached construction	116	88.5	88.5	88.5
Single family home, factory manufactured/modular	2	1.5	1.5	90.1
Single family, mobile home	1	.8	.8	90.8
Two or Three family attached residence-traditional structure	1	.8	.8	91.6
Valid Apartment (4 + families)—traditional structure	1	.8	.8	92.4
Condominium—traditional structure	9	6.9	6.9	99.2
Other: "Apartment (2 units per building)"	1	.8	.8	100.0
Total	131	100.0	100.0	

What year was your residence built?

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 1959 and before	39	29.8	30.0	30.0
1960-1979	44	33.6	33.8	63.8
1980-1989	12	9.2	9.2	73.1
1990-1997	12	9.2	9.2	82.3
1998-2000	8	6.1	6.2	88.5
2001-2007	11	8.4	8.5	96.9
DK/NS	4	3.1	3.1	100.0
Total	130	99.2	100.0	
Missing 99	1	.8		
Total	131	100.0		

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How many rooms are in your home (excluding bathrooms, but including finished basements)?

	Frequency	Percent	Valid Percent	Cumulative Percent
4	2	1.5	1.5	1.5
5	19	14.5	14.6	16.2
6	24	18.3	18.5	34.6
7	26	19.8	20.0	54.6
Valid 8	24	18.3	18.5	73.1
9	12	9.2	9.2	82.3
1-3	1	.8	.8	83.1
10 or more	22	16.8	16.9	100.0
Total	130	99.2	100.0	
Missing 99	1	.8		
Total	131	100.0		

Which one of the following best describes your home's heating system?	Total (N=131)	
	Count	Percent
Central forced air furnace	105	80.2%
Electric baseboard	3	2.3%
Heat pump	21	16.0%
Geothermal heat pump	2	1.5%
Hot water heat / boiler	4	3.1%
Radiant ceiling / cable heat	1	0.8%
Wood stove / fireplace	2	1.5%
Other: gas fireplace	1	0.8%
None	0	0.0%
Don't know / not specified	1	0.8%
Missing	1	0.8%

May total to more than 100% because respondents could give multiple responses.

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How old is your heating system?

	Frequency	Percent	Valid Percent	Cumulative Percent
0-4 years	37	28.2	28.5	28.5
5-9 years	27	20.6	20.8	49.2
10-14 years	26	19.8	20.0	69.2
Valid 15-19 years	11	8.4	8.5	77.7
19 years or older	21	16.0	16.2	93.8
DK/NS	8	6.1	6.2	100.0
Total	130	99.2	100.0	
Missing 99	1	.8		
Total	131	100.0		

What is the primary fuel used in your heating system?

	Frequency	Percent	Valid Percent	Cumulative Percent
Electricity	37	28.2	28.5	28.5
Natural Gas	84	64.1	64.6	93.1
Oil	5	3.8	3.8	96.9
Valid Propane	3	2.3	2.3	99.2
DK/NS	1	.8	.8	100.0
Total	130	99.2	100.0	
Missing 99	1	.8		
Total	131	100.0		

TecMarket Works

What is the secondary fuel used in your primary heating system, if any?

	Frequency	Percent	Valid Percent	Cumulative Percent
Electricity	26	19.8	20.0	20.0
Oil	2	1.5	1.5	21.5
Other (listed below)	4	3.1	3.1	24.6
Valid Wood	3	2.3	2.3	26.9
None	94	71.8	72.3	99.2
DK/NS	1	.8	.8	100.0
Total	130	99.2	100.0	
Missing 99	1	.8		
Total	131	100.0		

Four respondents mentioned "other" secondary sources of heating fuel; these are listed below.

- *Electric Cadet wall heater*
- *Gas fireplace*
- *Geothermal*
- *Heat pump heater as a backup*

Do you use one or more of the following to cool your home?	Total (N=131)	
	Count	Percent
Central air conditioning	101	77.1%
Heat pump for cooling	20	15.3%
Through the wall or window air conditioning	8	6.1%
Geothermal heat pump	2	1.5%
Fans for cooling	2	1.5%
Other: "Central forced air furnace"	1	0.8%
None	0	0.0%
Don't know / not specified	1	0.8%
Missing	1	0.8%

May total to more than 100% because respondents could give multiple responses.

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How many window-unit or through the wall air conditioner(s) do you use?

	Frequency	Percent	Valid Percent	Cumulative Percent
1	6	4.6	4.6	4.6
2	2	1.5	1.5	6.2
3	4	3.1	3.1	9.2
4	1	.8	.8	10.0
Valid None	117	89.3	90.0	100.0
Total	130	99.2	100.0	
Missing 99	1	.8		
Total	131	100.0		

What is the fuel used in your cooling system?	Total (N=131)	
	Count	Percent
Electricity	124	94.7%
Natural gas	3	2.3%
Oil	0	0.0%
Propane	0	0.0%
Geothermal	0	0.0%
None	0	0.0%
Don't know / not specified	3	2.3%
Missing	1	0.8%

May total to more than 100% because respondents could give multiple responses.

How old is your cooling system?

	Frequency	Percent	Valid Percent	Cumulative Percent
0-4 years	41	31.3	31.5	31.5
5-9 years	22	16.8	16.9	48.5
10-14 years	35	26.7	26.9	75.4
15-19 years	9	6.9	6.9	82.3
19 years or older	14	10.7	10.8	93.1
DK/NS	8	6.1	6.2	99.2
Do not have	1	.8	.8	100.0
Total	130	99.2	100.0	
Missing 99	1	.8		
Total	131	100.0		

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What is the fuel used by your water heater?	Total (N=131)	
	Count	Percent
Electricity	59	45.0%
Natural gas	73	55.7%
Oil	0	0.0%
Propane	2	1.5%
Geothermal	0	0.0%
None	0	0.0%
Don't know / not specified	5	3.8%
Missing	1	0.8%

May total to more than 100% because respondents could give multiple responses.

How old is your water heater?

	Frequency	Percent	Valid Percent	Cumulative Percent
0-4 years	26	19.8	20.0	20.0
5-9 years	36	27.5	27.7	47.7
10-14 years	26	19.8	20.0	67.7
Valid 15-19 years	10	7.6	7.7	75.4
More than 19 years	15	11.5	11.5	86.9
DK/NS	17	13.0	13.1	100.0
Total	130	99.2	100.0	
Missing 99	1	.8		
Total	131	100.0		

What type of fuel do you use for indoor cooking on the stovetop or range?	Total (N=131)	
	Count	Percent
Electricity	102	77.9%
Natural gas	29	22.1%
Oil	0	0.0%
Propane	0	0.0%
None	0	0.0%
Don't know / not specified	1	0.8%
Missing	1	0.8%

May total to more than 100% because respondents could give multiple responses.

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Appendices

What type of fuel do you use for indoor cooking in the oven?	Total (N=131)	
	Count	Percent
Electricity	105	80.2%
Natural gas	25	19.1%
Oil	0	0.0%
Propane	0	0.0%
None	0	0.0%
Don't know / not specified	1	0.8%
Missing	1	0.8%

May total to more than 100% because respondents could give multiple responses.

What type of fuel do you use for clothes drying?	Total (N=131)	
	Count	Percent
Electricity	107	81.7%
Natural gas	22	16.8%
Oil	0	0.0%
Propane	0	0.0%
None	3	2.3%
Don't know / not specified	0	0.0%
Missing	1	0.8%

May total to more than 100% because respondents could give multiple responses.

About how many square feet of living space are in your home?

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 500 to 999	4	3.1	3.1	3.1
1000 to 1499	21	16.0	16.2	19.2
1500 to 1999	27	20.6	20.8	40.0
2000 to 2499	13	9.9	10.0	50.0
2500 to 2999	14	10.7	10.8	60.8
3000 to 3499	11	8.4	8.5	69.2
3500 to 3999	3	2.3	2.3	71.5
4000 or more	4	3.1	3.1	74.6
DK/NS	33	25.2	25.4	100.0
Total	130	99.2	100.0	
Missing 99	1	.8		
Total	131	100.0		

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Do you own or rent your home?

	Frequency	Percent	Valid Percent	Cumulative Percent
Rent	10	7.6	7.6	7.6
Valid Own	121	92.4	92.4	100.0
Total	131	100.0	100.0	

Do you pay your own electric bill or is it included in your rent?

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Pay bill	10	7.6	100.0	100.0
Missing System	121	92.4		
Total	131	100.0		

How many levels are in your home (not including your basement)?

	Frequency	Percent	Valid Percent	Cumulative Percent
One	62	47.3	47.7	47.7
Valid Two	63	48.1	48.5	96.2
Three	5	3.8	3.8	100.0
Total	130	99.2	100.0	
Missing 99	1	.8		
Total	131	100.0		

Does your home have a heated or unheated basement?

	Frequency	Percent	Valid Percent	Cumulative Percent
Heated	96	73.3	73.8	73.8
Valid Unheated	13	9.9	10.0	83.8
No basement	21	16.0	16.2	100.0
Total	130	99.2	100.0	
Missing 99	1	.8		
Total	131	100.0		