

YUKON
ENERGY



Yukon
Energy, Mines and Resources

Overview

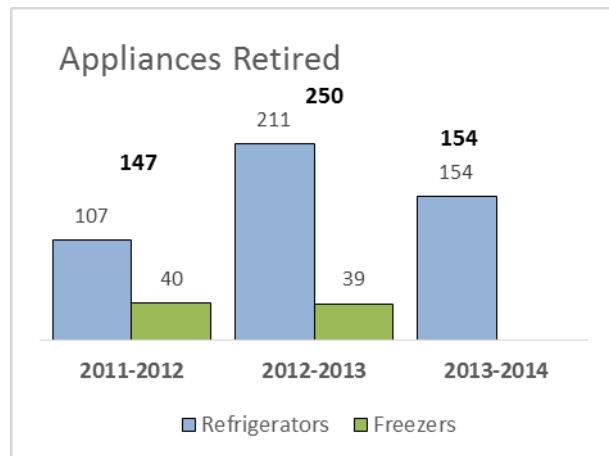
The Refrigerator and Freezer Retirement Pilot Program launched June 2011, as a partnership initiative between the Government of Yukon's Energy Solutions Centre (ESC) and Yukon Energy Corporation (YEC). The purpose of the two-year pilot program was to reduce the residential energy load of Yukon communities by incentivizing the retirement of older, inefficient refrigerators and freezers as part of a Yukon-wide Demand Side Management (DSM) initiative. In April 2013, the Refrigerator and Freezer Retirement Pilot Program evolved into the Refrigerator Retirement Program, with rebates for freezers no longer offered due to the limited energy efficiency gains related to retiring those appliances.

The 2013-2014 Refrigerator Retirement Program incentivizes the earlier retirement of older, less efficient refrigerators by offering a \$50 incentive to the client to participate in the program and by covering the transport of the appliance to the landfill (\$69) and the landfill tipping fee costs (\$40). The total value to the client is approximately \$160. At the landfill, the appliance is decommissioned, the refrigerant is removed and the white metal is recycled.

To date the program has been successful in retiring 551 appliances and realizing an estimated 991,000 kWh in lifetime energy savings and \$110,000 in lifetime client cost savings. The program has achieved an average energy savings cost of \$0.169 per kWh which compares favourably to the Yukon government's avoided cost of supply target of \$0.21 per kWh).¹

Results

A total of 492 clients have participated in the program and have retired 551 appliances since the launch of the pilot in 2011. The busiest months for the program have been the fall with an average of 26 appliances collected in October over the last three years. Retirements peaked in December 2012, when 49 appliances were retired, 38 of which were owned by a non-profit housing organization. The 2012-2013 fiscal year was the peak year to date for the program with 250 appliances retired. Over the last fiscal year, participation dropped 38 per cent with 154 appliances collected in 2013-2014 (note that 2013-2014 was the first year that freezers were no longer collected).



¹ Energy savings cost is a ratio that measures the cost of the program versus the lifetime energy savings achieved by the program. The avoided cost of supply is the point where it costs more to save a kWh of electricity than it does to produce a kWh through the development of new power sources. For a complete description of assumptions and calculations see Appendix A.

When comparing refrigerator retirements, the program grew from 107 refrigerators collected in the first year with 58 refrigerators permanently retired (rather than replaced), to 211 refrigerators collected in the second year with 31 refrigerators permanently retired and declined in the last fiscal year with the collection of 154 refrigerators with only 6 refrigerators permanently retired.

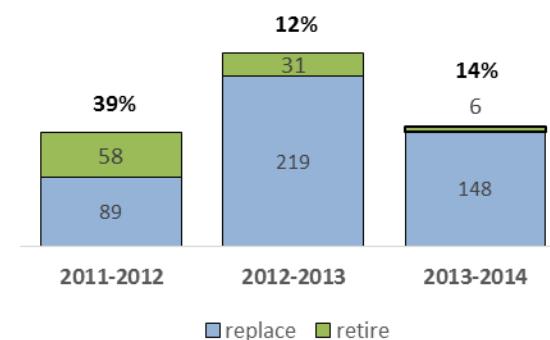
Program energy and cost savings are based on whether the client is intending to permanently retire the refrigerator (e.g. in the case of an older, inefficient beer fridge in the garage) or whether the client is intending to replace the refrigerator with a newer, more energy efficient model. In the case of a permanent retire, lifetime energy savings are calculated by multiplying the historical energy use of the appliance by the years remaining in its lifespan.² If an appliance is older than 13 years, a five-year multiplier is used instead to calculate energy and cost savings. The five-year multiplier assumes the operating life of the appliance was shortened by five years due to the program incentive. In the case of an appliance replacement, the lifetime energy savings are calculated by subtracting the average energy use of a new, energy efficient Energy Star refrigerator from the historical energy use of the retired appliance and that result is multiplied by the remaining years in its lifespan, or by the five-year multiplier.

Lifetime energy savings for the 2013-2014 Refrigerator Retirement Program are projected to be 256,000 kWh based on 154 refrigerators retired with a lifetime client cost savings projected at \$33,000. Lifetime energy savings were down 118,000 kWh from 2012-2013 when 374,000 kWh of lifetime energy savings were achieved. This marks a decline of 32 per cent in energy savings between the two fiscal years which corresponds to the difference in total appliances retired in those years – 155 appliances in 2013-2014

	Total Appliances Retired	Lifetime Energy Savings (kWh)	Lifetime Cost Savings (\$)
2011-2012	147	360,598	\$36,781
2012-2013	250	374,417	\$40,437
2013-2014	154	255,690	\$32,600
	551	990,705	\$109,819

and 250 appliances in 2012-2013. The lifetime energy savings are not directly proportional between fiscal years due to the age, energy use and types of appliances retired (in 2012-2013 both refrigerators and freezers were included in the program).

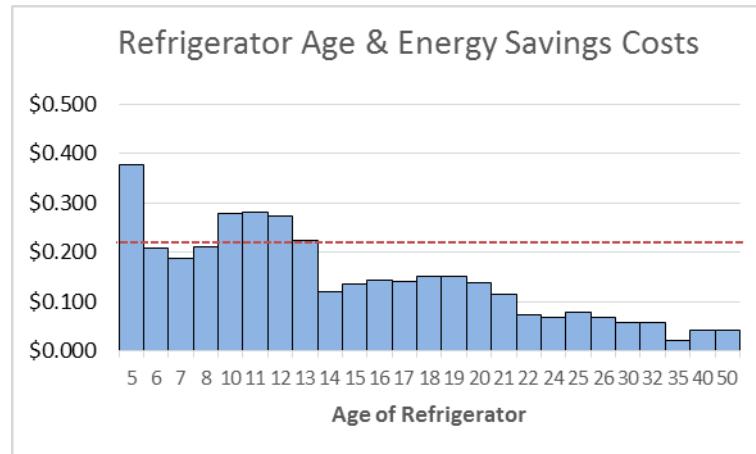
Refrigerator Retirement Ratio



² NRCan identifies 18 years as the [typical lifespan of a refrigerator](#).

To evaluate the cost effectiveness of the Refrigerator and Freezer Retirement Pilot Program, the cost of the program can be compared against the avoided cost of supply. The avoided cost of supply “is the marginal cost to produce one more unit of electrical energy.”³ Yukon government has identified \$0.21 per kWh as the target avoided cost for the Yukon Integrated Grid. The Refrigerator Retirement Program averaged \$0.169 per kWh cost savings for the 2013-2014 fiscal year⁴ which compares well as it is four cents below the government’s targeted avoided cost. To further lower the energy savings cost of the program, either the lifetime energy savings must increase (by increasing the age limit of retired refrigerators) or program delivery costs must decrease.

The Refrigerator Age and Energy Savings Cost Savings chart identifies the optimal refrigerator retirement age at 14 years old. At this age the retirement cost savings falls below the avoided cost target of \$0.21 per kWh. Note that the cost savings do not trend down in a smooth progression but tend to step up and down in small increments. This is due to the differences in annual energy consumed year to year by the individual refrigerators that make up the yearly sample. The total energy consumed by those appliances is averaged out to give a historical average energy consumption for that year. Two bumps to note in particular are the bump up for five year old refrigerators (refrigerators manufactured in 1989) and the bump downward for 11 year old refrigerators to 14 year old refrigerators (2003 to 2000). These bumps are due to energy efficiency gains and are amplified and/or damped by the lifetime multiplier. Please see Appendix A on Assumptions for historical annual energy use data and the energy savings cost calculation details.



Potential Program Revisions

The table below provides an overview of the effect of various measures to the program’s cost of energy savings. Assuming program participation levels remain consistent from 2013-2014, increasing the retirement age to 10 years, reducing the rebate amount by half (from \$50 to \$25) and reducing the ad costs by half results in an energy savings cost of \$0.120 per kWh. These changes would have the effect of making the performance of the program more attractive on an avoided cost of energy basis, however, participation would likely be negatively impacted as these measures might act as barriers to client participation.

³ “[Avoided Costs \(Incremental Costs\)](#),” North Carolina Sustainable Energy Association,

⁴ Energy savings cost = (Rebate + Transportation cost + Tipping fee + (Total fiscal year program advertising cost / Total fiscal year refrigerator count)) / Lifetime energy savings.

2013-2014 Program	Energy Savings Cost (\$/kWh)	Energy Savings Cost with 1/2 Half Rebate (\$/kWh)	Energy Savings Cost with 1/2 Ad Costs (\$/kWh)	Energy Savings Cost with 1/2 Rebate and 1/2 Ad Costs (\$/kWh)
5 yr retirement age	\$0.169	\$0.147	\$0.156	\$0.134
10 year retirement age	\$0.154	\$0.134	\$0.140	\$0.120

The challenge in introducing revisions is in finding a balance between minimizing the cost of energy savings while optimizing client participation. In terms of minimizing the cost of energy savings, raising the age of retirement and lowering the rebates and advertising costs will have the greatest impact on lowering the cost of energy savings. Maintaining the program's current status quo or increasing the rebate or advertising costs might facilitate client participation at or near current levels.

Advertising appears to be one area where costs can be trimmed. In 2013-2014, advertising represented 16per cent of the Refrigerator Retirement program budget. Despite a \$1,500 increase (33 per cent) in the advertising budget, total appliances collected in 2013-2014 declined by 38per cent. Furthermore, as part of the program, clients participate in a survey that asks them to identify how they heard about the program. Approximately 32 per cent of clients identified word-of-mouth, 26 per cent identified in-store promotion, 17 per cent identified newspaper advertising and 11 per cent identified the web (ESC website, online advertisement) as their main sources of information about the program. To reduce costs, some targeted cuts to advertising could be made such as discontinuing newspaper ads and focusing on lower cost media such as word-of-mouth, in-store promotion and online advertisement. See Appendix C for advertisement campaign for 2013-2014.

This report recommends a two-step approach be taken that addresses the cost of energy savings while balancing the impact on client participation. These two steps are:

1. Raise the required age of refrigerators to 10 years, and
2. Reduce the advertising budget by \$2,000 to \$2,500.

Instituting these measures will lower the cost of energy savings from \$0.169 to \$0.140. The cost/benefit of these measures are summarized in the table below.

Measures	Benefits	Costs
Raise retirement age of qualifying refrigerators to 10 yrs.	Limits retirement of newer refrigerators which are, on average, energy efficient appliances with energy savings costs that are higher than the government avoided cost target of \$0.21 per kWh.	Limits number of refrigerators that qualify for the program. Introduces potential for free-ridership (participants exaggerating age of refrigerator to qualify for the program).
Reduce advertising budget by \$2,000 to \$2,500.	Lowers advertising costs and improves average cost of energy savings.	Potential negative impact on client participation.

Budget

The 2013-2014 Refrigerator Retirement Program is operated as a partnership between ESC and YEC. As per the 2013-2014 Contribution Agreement, ESC is responsible for administering the program and providing half the funding while YEC is responsible for providing the other half of the funding, upon receipt of an interim or final report. Total projected appliances to be retired in 2014-2015 is set at 125 with a total budget estimated at \$21,750.

Fiscal Year	Units	Unit Value	Rebates	Transport	Tipping Fee	Ads	Total
2014-2015 (Projected)	125	\$50	\$6,250	\$8,500	\$5,000	\$2,000	\$21,750
2013-2014	155	\$50	\$7,750	\$10,538	\$6,200	\$4,508	\$28,996
2012-2013	250	\$50	\$12,500	\$17,405	\$8,750	\$3,000	\$41,655
2011-2012	142	\$50	\$7,155	\$9,095	\$5,040	\$3,164	\$24,454

Conclusion

To date the Refrigerator Retirement Program (and its predecessor, the Refrigerator and Freezer Retirement Program) have been successful in retiring 551 appliances and realizing an estimated 991,000 kWh in lifetime energy savings and \$110,000 in lifetime client energy cost savings. Based on the avoided cost of electricity, the program comes in at \$0.169 per kWh which is a favourable result coming in under Yukon government's avoided cost target of \$0.21 per kWh.

It is recommended that the following items be considered as revisions to the Refrigerator Retirement Program to further lower the program's energy savings costs.

- Increase the required age of refrigerators from five years to 10 years. Increasing the age required to 10 years would lower the 2013-2014 program energy savings cost to \$0.154⁵ per kWh and reduce the retirement of newer, energy efficient appliances.
- Consider decreasing the advertising budget from \$4,500 to \$2,250 to further reduce the program energy savings cost to \$0.140 per kWh.
- Develop an Evaluation, Monitoring and Verification (EMV) report on the Refrigerator Retirement Program to provide a detailed evaluation of the economic impact and the continuing viability of the program.

Note that these adjustments would also have the effect of introducing barriers to the program which may decrease client participation. With the implementation of the recommended revisions to the program and the implementation of a more detailed EMV report, the program can continue to operate with strong energy savings costs and continue to generate energy and cost savings for clients and contribute to ESC and YEC's Demand Side Management objectives.

⁵ Please note that increasing the retirement age to 15 years would lower the energy savings cost further to \$0.118 – an attractive proposition – but one that raises the issue of monitoring whether clients' refrigerators are, indeed, 15 years or older. Most clients can estimate whether their refrigerators are 10 years or older. Clients would be harder-pressed to identify whether their appliances would fall between the 10 and 15 year mark. Independent verification of the age of the appliance is not fiscally feasible.

Appendix A – Assumptions

Appendix B – Refrigerator Retirement Form

Refrigerator Retirement Program

Protocol

Please collect the information from the client in the form below. Inform the client of the following program details:

- Confirm with the client that their refrigerator(s) is 5 years or older and in current use.
- Once we collect and submit their information, A-1 Delivery will contact them within the week to schedule the pick-up of their appliance(s).
- A-1 has busy weeks and if they haven't contacted them within 7 days give us a call. We will contact A-1 for them and place the client on a priority pick-up list.
- The client will be emailed a Client Application Form that they must print out, sign and date and give to the A-1 driver. Or they can leave the signed form inside the refrigerator for the driver to collect.
- (If the client does not have email they can download the form from our website (www.energy.gov.yk.ca/fridge_freezer_retirement.html) or stop by the office.
- Appliance and rebate processing may take 5 to 6 weeks.

CLIENT INFORMATION			
		First Name	Last Name
5/28/2014			
Pick-Up Address and Instructions			
Mailing Address			
City/Town	Whitehorse	Postal Code	Y1A
Phone(s)	(867)	Client Email	
APPLIANCE DETAILS			
1st Refrigerator	Replace Refrigerator	Age	1st Refrigerator *
2nd Refrigerator	None	Age 2nd Refrigerator	0
How did you hear about the Refrigerator Retirement Program? Please select... ▾			
Will transport appliance to landfill and collect tipping fee for later re-imbursal. <input type="checkbox"/> Self Transport			
<input type="button" value="Upload to SharePoint"/>			

Appendix C – Advertisement Campaign for 2013-2014

In 2013-2014, advertisement for the Refrigerator Retirement Program appeared in the print editions of the Yukon News and l’Aurore Boréale newspapers as well as online using Google Ads. There were two campaigns. One from September 13 to December 13, 2013 and the other from January 15 to February 28, 2014. All ads encouraged people to contact Energy Solutions Centre or to get more information on the Yukon government [webpage](#) for the Refrigerator Retirement Program.

The Google Ads were divided into two categories: the Display Ad which was a leaderboard and three different Word Ads which would appear based on searches in Google. It is important to note that the word ads compete with one another and the one that gets the most clicks is seen more often in the rotation. All online ads allow for the tracking of statistics outlined below. Ad appearances are also determined by budget allotment.

Online Ad	Timeline	Clicks	Impressions
Display Ad	September 1 to 30	164	119,424
	October 1 to 31	164	154,150
	November 1 to 30	210	146,746
	December 1 to 15	132	54,608
	January 15 to 31	134	67,186
	February 1 to 28	226	155,701
	150 days	1,030	697,815
Word Ad – Out to Pasture	September 1 to 30	1	1,034
	October 1 to 31	0	275
	November 1 to 30	0	148
	December 1 to 15	0	40
	January 15 to 31	8	2,005
	February 1 to 28	3	3,215
	150 days	13	6,717
Word Ad – Retire that Ice Box	September 1 to 30	0	827

	October 1 to 31	9	3,163
	November 1 to 30	11	2,729
	December 1 to 15	6	1,793
	January 15 to 31	0	802
	February 1 to 28	0	427
Totals	150 days	26	9,741
Word Ad – Yukon Fridge Retirement	September 1 to 30	13	3,077
	October 1 to 31	4	1,028
	November 1 to 30	0	1,316
	December 1 to 15	0	181
	January 15 to 31	3	1,420
	February 1 to 28	1	1,747
Totals	150 days	21	8,769

Clicks = when a user interacts with the ad by clicking on it.

Impressions = indicates how often ad appears on search results or website on the Google network.

Yukon News and the l'Aurore Boréale print ads:



Online Google Display Ad – Leaderboard (dynamic with three images):

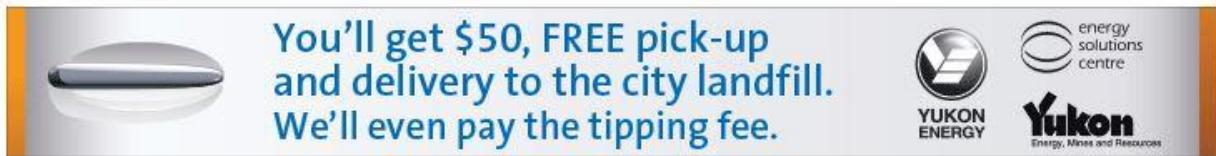
Image 1:



Image 2:



Image 3:



Google Word Ads:

Out To Pasture
Get \$50 for old fridge
Take part in our retirement program
We'll pick up & recycle it - free!

Retire that ice box
Get \$50 for old fridge
Take part in our retirement program
We'll pick up & recycle it - free!

Yukon Fridge Retirement
Get \$50 for old fridge
Take part in our retirement program
We'll pick up & recycle it - free!