Responsible Appliance Disposal Program

RAD EPA

RAD Refrigerator Recycling Pilot Program in Indian Country: Yakama Nation Case Study

Background

The U.S. EPA's Responsible Appliance Disposal (RAD) Program promotes the proper disposal of old, inefficient refrigerators and freezers to minimize the release of ozone-depleting substances (ODS), greenhouse gases (GHGs), and other harmful substances. Federal law requires that all refrigerant be recovered prior to dismantling or disposing of appliances, and universal waste (mercury), used oil, and PCBs be properly managed and stored. However, the laws do not require the recovery of appliance foam, which represents a significant source of ODS and GHG emissions. EPA enforcement data show that very few appliances are disposed of in an environmentally friendly way and in accordance with these regulations. By requiring the removal and destruction/reclamation of refrigerants and foam-blowing agents that are not covered under existing federal regulations, the RAD Program minimizes the emissions of ODS and GHGs from refrigerated appliances. In addition, the RAD Program saves landfill space; conserves energy through the premature removal of working appliances and the recycling of durable materials (e.g., metals, plastics, glass); and prevents the release of PCBs, mercury, and used oil. All utilities, retailers, and municipalities are invited to join as Partners. Current Partners serve regions throughout the U.S.

In 2009, the RAD Program received funding from EPA's Tribal Program to conduct a small-scale refrigerator/freezer recycling pilot program designed to benefit a tribal community. Specifically, the pilot program targeted the removal and proper disposal of approximately 250 old refrigerators and freezers from within tribal land, as well as outreach to and education for tribal residents.

This report summarizes the pilot project activities, environmental results, and lessons learned, and provides guidance for future programs that are similar or larger in scale.

Summary of Program Activities

The RAD pilot program ran from August to November 2010. The program was designed to remove and properly dispose of approximately 250 old refrigerators and freezers from within tribal lands, as well as conduct outreach to educate tribal residents about the importance of proper disposal. This section details the program activities performed during this timeframe.

Selection of Tribal Nation and Appliance Recycler

In August 2010, EPA began reaching out to Tribal Nations to identify an appropriate community. Selection was based on the following criteria:

- Large population and sufficient density to ensure that the 250 unit collection target was attainable. Ideally the community would have at least 8,000 households (assuming a harvest rate of roughly 3% of households);
- Available infrastructure to support a fast-paced marketing campaign and appliance collection program;
- Tribal Nation employees interested in the program and able to help ensure its success; and
- A community need for the program.

Based on these criteria and conversations with multiple Tribal Nations and Confederated Tribal Organizations, the Yakama Nation was selected as the program host. The Yakama Nation Reservation occupies 1.4 million acres located in south central Washington, which is the largest land area of the 29 Tribes in Washington State. The Reservation encompasses the cities of Toppenish and Wapato and the town of Harrah, as well as unincorporated areas (including the areas known as Satus and White Swan). The Yakama Nation has an estimated population of 33,800, with approximately 9,100 households on the Reservation. The Yakama Nation sustains a strong infrastructure and network for communication and outreach, owns community trucks that are equipped to collect large household appliances, and would benefit from the program in many ways. In particular, the Yakama Nation Department of Solid Waste recently surveyed residents about the illegal dumping of appliances on the Reservation lands, and found that significant dumping has resulted from the financial disincentive to dispose of appliances at landfills, which charge a disposal fee of $5 per unit. Therefore, a program that offers a positive incentive for properly disposing of refrigerated appliances could reduce the impact of illegal dumping within the Yakama Nation Reservation. In addition, the community is relatively financially depressed and would benefit from the pilot program's per-unit financial incentive as well as the short-term employment opportunities. Finally, the Yakama Nation Department of Solid Waste expressed interest in participating in this RAD pilot program.

> *"The RAD pilot program resulted in significant pollution prevention and avoidance of illegal refrigerator dumping, as well as economic benefits for the Yakama Nation community."*
>
> —Loretta Zammarchi, Yakama Nation Solid Waste Department

Once Yakama Nation agreed to host the RAD pilot program, a targeted request for proposals was sent to appliance recycling companies to enlist their services for the dismantling and proper disposal of the collected appliances. JACO Environmental, Inc. (JACO) was selected to process the collected appliances, arrange for the dissemination of program incentive checks, and assist with marketing and outreach efforts as needed.

Project Kick-off

A project kick-off meeting was held on September 8, 2010, to arrange program logistics, confirm the project schedule, and discuss marketing strategies. Based on this meeting, participants developed the program timeline presented in Table 1.

EPA, Yakama Nation Solid Waste Department, and JACO worked together to ensure that these tasks were completed by the funding deadline. Activities associated with each task are detailed below.

In addition, the monetary value and conditions for receipt of a refrigerator disposal incentive were discussed. Since other utility-sponsored appliance disposal programs in the area offer $30 incentives, it was agreed that a $30 incentive would be offered for up to two old refrigerators per household, whether they were working or non-working.

Table 1: Timeline of Program Activities

Program Activities		Dates
Task 1:	Develop and Conduct Community Marketing and Outreach	Mid-September to Mid-October
Task 2:	Arrange and Implement Refrigerator/ Freezer Pick-up: Establish Pick-up Hotline, Collect Appliances	October to Early November
Task 3:	Process Refrigerators/Freezers Following RAD Program Guidelines and Document Results	Mid-October to Mid-November
Task 4:	Disseminate Incentive Checks	Mid-October to Late November

Community Marketing and Outreach Campaign

Yakama Nation spearheaded the marketing and community outreach campaign. They developed a poster/flyer that was disseminated at community stores, longhouses, churches, and other central locations. Representatives from the Yakama Nation Department of Solid Waste attended community meetings and met with Nation elders to publicize the program and answer questions. Newspaper ads and 60-second radio spots were also developed and released in the Yakama Nation Review and on KYNR in October (see textbox for radio spot text). Community members also received information about the program at major community events and through the Yakama Nation staff email lists. In addition, the Area Agency on Aging, a tribal program benefiting elderly tribal members, distributed over 200 mailers to their membership list. Finally, Yakama Nation staff notified the Toppenish and Wapato communities through their Public Works and Police Departments to promote the collection efforts in the broader community. Figure 1 presents the poster used to publicize the program throughout the community. No mailer was sent to the whole community, as the Yakama Solid Waste Department did not have ready access to a tribal enrollment list.

KYNR Radio Spot

Hey Yakamas, do you have an old inefficient refrigerator or freezer that you need to get rid of? The Yakama Nation Solid Waste Program may be of help.

For the month of October, the Yakama Nation Solid Waste Program in cooperation with U.S. EPA's Responsible Appliance Disposal Program will pay you $30 to collect and recycle your old fridge or freezer.

Interested? Here is how the project works.This offer is available to all residents of the Yakama Nation – enrolled or non-enrolled. The unit must be owned by you and we will accept it working or not. Up to two units per household. It must be emptied of all food contents and be accessible for pick up. To make arrangement for free pickup, call Yakama Nation Solid Waste Program at 865-5121 ext. 6041. You will receive your $30 reward in the mail within 3-4 weeks following the pickup.

Our flyers and the sign-up slips are posted in the Yakama Nation agency buildings if you are interested in this offer. But, remember this is a limited time offer and you must register!

By recycling your old fridge or freezer, you have taken a personal positive action to keep our Reservation clean and safe of illegally disposed and dumped units. Hey Yakamas, give yourself a high five!

Figure 1: Poster/flyer developed by Yakama Solid Waste Department and disseminated throughout the Yakama Nation

YAKAMA NATION SOLID WASTE PROGRAM

RESPONSIBLE APPLIANCE DISPOSAL PROJECT

LIMITED TIME OFFER

GET $30 FOR YOUR OLD FREEZER OR REFRIGERATOR WORKING OR NOT!

Do you have an old, inefficient refrigerator or freezer that you need to get rid of? The Yakama Nation Solid Waste Program may be of help.

For the months of September and October the YNSWP in cooperation with the US EPA's Responsible Appliance Disposal Program (RAD) will pay you $30 to collect and recycle your old fridge or freezer.

GET $30 For Your Old Refrigerator or Freezer

Fill out the information below and return to:
Yakama Nation Facility Management Office
401 Fort Rd. Toppenish, WA or call
865-5121 x 6041 Today

I understand this is a one-time limited offer.
Only applies to refrigerators and freezers

YES! SIGN ME UP FOR YAKAMA NATION RESPONSIBLE APPLIANCE DISPOSAL PROJECT
Yakama Nation Facility Management Office /Solid Waste
401 Fort Rd. Toppenish, WA (509) 865-5121 X 6041

NAME _____

MAILING ADDRESS _____

APPLIANCE PICK UP ADDRESS _____

CITY _____ ZIP _____

PHONE (H) _____ (C)_____

___ I have a working refrigerator/freezer

____I have a non-working refrigerator/freezer

Responsible Appliance Disposal Program RAD EPA

JACO Environmental

HOW DOES THE PROJECT WORK?

- The offer is available to all residents of the Yakama Nation
- The unit must be owned by YOU.
- Up to two (2) units per household.
- Working and non-working units qualify.
- All units must be accessible and empty for pickup. **NO FOOD!**
- Call the YNSW Program to make arrangements to have your units picked up for FREE.
- You will receive your $30 Reward in the mail within 3-4 weeks following pick up.

WHY RECYCLE YOUR OLD UNIT?

Proper disposal of old, inefficient refrigerators and freezers:

- Minimizes the release of ozone depleting substances, greenhouse gases and other harmful substances into our environment.
- Reduces overall energy demand and monthly utility bill.
- Prevents costly clean up of illegally disposed of and dumped units.

This project is being provided by Yakama Nation Solid Waste Program in coordination with US EPA's Responsible Appliance Disposal Program and JACO Environmental

For more information on waste disposal, reduction and recycling contact Yakama Nation Solid Waste Program at P.O. Box 151 Toppenish, WA (509) 865-5121 x 6453

Help Keep Our Reservation Clean and Safe. Dispose of Your Appliances Responsibly
Sign Up Today!

Refrigerator Collection

While simultaneously developing the marketing and outreach campaign, Yakama established a call-in hotline to identify program participants. Yakama Nation targeted old units to be collected from people's homes. Solid Waste Department staff fielded the calls, sign-up forms, and other sign-up requests, and entered all requests into a customer database. Collection routes were organized to minimize travel distance; Yakama Nation staff met twice daily to determine the most efficient appliance pick-up routes and update the customer database.

The Yakama Nation Solid Waste department staff collected units in trucks owned by the Yakama Nation, which each held between 10 and 20 units. Figure 2 depicts Yakama Nation staff, Alfrieda Peters and John DeMontiney, with a collection truck en route to collect refrigerators for proper disposal.

The Yakama Nation staff recorded the refrigerator and freezer data (i.e., type of appliance, whether it was working or non-working, and pick-up location) to submit to JACO for processing, and labeled each unit with a unique ID number and date using indelible marker, as shown in Figure 3.

An initial test run of eight units was performed to ensure that the collection process ran smoothly. Afterwards, the full-scale collection efforts were launched. Within the first week, 53 units were collected; by the project completion date, 192 units were collected. All collected units were non-working at time of pick-up. Yakama staff explained that because the community is financially distressed, people will retain their old appliances as long as possible, and even pass them down through family members. The collected units were stored in a 53-foot trailer truck provided by JACO and parked at the Yakima Waste Systems' transfer station yard in Granger. Yakima Waste Systems, the contract hauler for the Yakama Nation, provided this storage area free of charge. Figure 4 depicts the units stored inside. Yakama Nation staff estimated that for each pick-up, a total of roughly 12 miles were traveled prior to reaching the central transfer station.

Figure 2: Yakama Nation Staff with Collection Truck

Figure 3: Unit Labeling

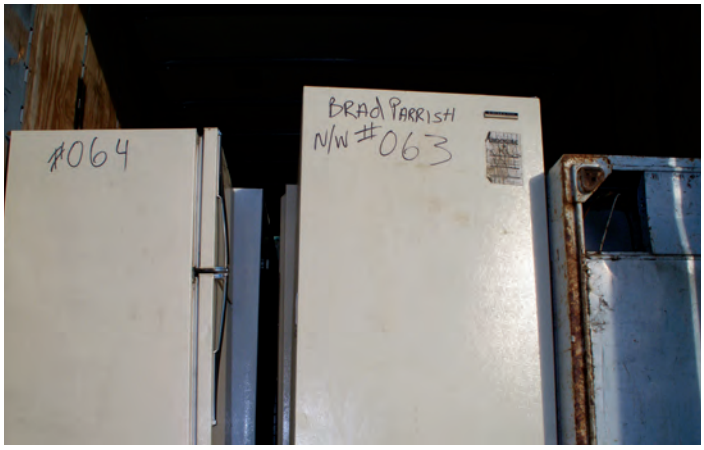


Figure 4: Collected Units in JACO Truck Ready for Transfer

Each truck held approximately 65 units. Once the truck was filled, Yakama Nation staff contacted JACO to exchange it for an empty one. This procedure continued until all 192 units were taken to the JACO processing facility located 300 miles away in Everett, Washington. The first shipment on October 20 contained 67 units, followed by a second load of 63 units on October 28, and a final load of 62 units on November 11, 2010. The 3 truckloads sent to the processing facility traveled a total distance of 1,800 miles.

Refrigerator Processing

All units were processed at the JACO appliance recycling facility in Everett, Washington according to RAD Program standards. Specifically, refrigerant was destroyed at Clean Harbors in El Dorado, Arkansas for carbon credits; HFC refrigerant was reclaimed at Perfect Cycle in Red Oak, Texas; foam was manually removed and sent for destruction at the Spokane Regional Waste-to-Energy facility; durable materials were sent for recycling; and hazardous materials were properly handled by Univar USA Inc. in Redmond, Washington, to minimize threats to the environment and human health. Figure 5, Figure 6, and Figure 7 depict the refrigerator recycling process at the JACO facility.

The names and locations of third parties handling these materials, as well as the quantities and fates of all recovered materials, were documented and provided to EPA using the 2010 RAD Annual Reporting Form. The number of units and materials processed are summarized below.

Incentive Check Dissemination

JACO provided incentive checks to the households that turned in their old working or non-working units. In total, 163 checks were disseminated to 122 households totaling $4,890. A maximum of two incentive checks were disseminated per household.

Program Costs

The Yakama Nation RAD pilot program cost approximately $50,000. Some of these funds were used to identify an appropriate tribal nation and to resolve logistical concerns before initiating the program. If the project had a longer timeframe with greater funding to process more units, economies of scale would be achieved. Following collection, each unit was processed at a cost of roughly $45 (in addition to any incentive [$30] provided).

Figure 5: Refrigerant recovery using an SEG machine at JACO refrigerator recycling facility

Figure 6: JACO employee saws refrigerator to access insulation foam

Figure 7: JACO employee removes insulation foam from refrigerator

Summary of Program Results

During the two-month Yakama Nation RAD pilot program, a total of 192 units from community households and Facility Management were collected and processed at the JACO recycling facility. 163 incentive checks, totaling $4,890, were delivered to community members. By disposing of these units using the best available practices, Yakama Nation has helped protect the ozone layer, reduce GHG emissions, and increase the recycling of durable components. The benefits of these practices are described below and shown in Table 2.

Table 2: Summary of Units and Materials Processed

Number of Units Processed	192
Refrigerators	*169*
Stand-Alone Freezers	*23*
Ozone Benefits (ODP-weighted kg avoided)	95
Climate Benefits ($MTCO_2e$)	717
Durable Materials Recycled (lbs.)	30,336
Hazardous Substances Properly Treated	
Used Oil (gal.)	15
Other Hazardous Components	11

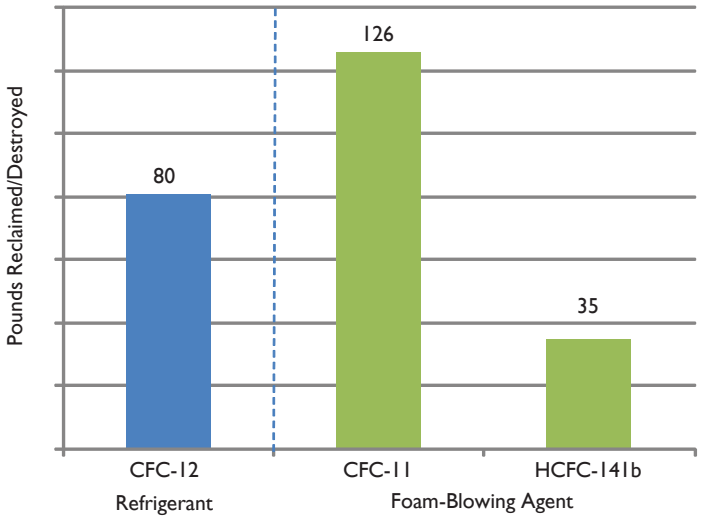
All collected units were not working at the time of pick-up. Many of the appliances were over 40 years old, some of which contained fiberglass insulation, which pre-dated the use of ODS-blown foam insulation.

Ozone Benefits

Disposal of the 192 Yakama Nation refrigerators and freezers resulted in ozone benefits through the recovery and destruction of refrigerant as well as foam-blowing agents. The depletion of stratospheric ozone has led to significant increases in UV reaching the Earth's surface, which in turn has been linked to several major human health problems, including: skin cancer, cataracts, and immune suppression.

JACO recovered and stored 80 lbs. of CFC refrigerant from these units, all of which will ultimately be sent to Clean Harbors in El Dorado, Arkansas for destruction for carbon credits (see text box). Using a manual foam removal technique followed by incineration at Spokane Regional Waste-to-Energy, JACO also recovered and destroyed 161 lbs. of CFC and HCFC foam-blowing agent. By avoiding the release of this refrigerant and foam-blowing agent into the environment, an estimated 253 lbs. of ozone-depleting substances (ODS) were avoided through this pilot program—equivalent to 95 ODP-weighted kilograms. Figure 8 presents the total quantities of ODS refrigerant and foam-blowing agents destroyed. Environmental benefits associated with foam removal were lower than anticipated due to the fact that 31 collected units contained fiberglass in lieu of ODS foam.

Figure 8: Total Quantity of ODS Refrigerant and Foam-Blowing Reclaimed or Destroyed (lbs.)



Carbon Credits from ODS Destruction

All ODS refrigerant was stored by JACO for destruction in exchange for carbon credits through the Climate Action Reserve (the Reserve). The refrigerant will be combined with other waste refrigerant recovered from retired equipment and then shipped to a reclamation facility in Champaign, Illinois for cleaning. The reclaimed refrigerant will be sent to a certified carbon credit destruction facility in El Dorado, Arkansas.

The revenue that can be generated from carbon credits varies based on a number of factors, including carbon price. In 2010, the price of carbon offset credits on the Reserve, known as Climate Reserve Tonnes (CRT), generally ranged from $5 to $10 per metric ton of carbon dioxide equivalent ($MTCO_2e$). Based on the Reserve's ODS project protocol, the destruction of refrigerant from a single disposed refrigerator containing CFC-12 may yield an approximate carbon offset credit value of $15*—not taking into account project costs such as registration, administration, verification, etc.

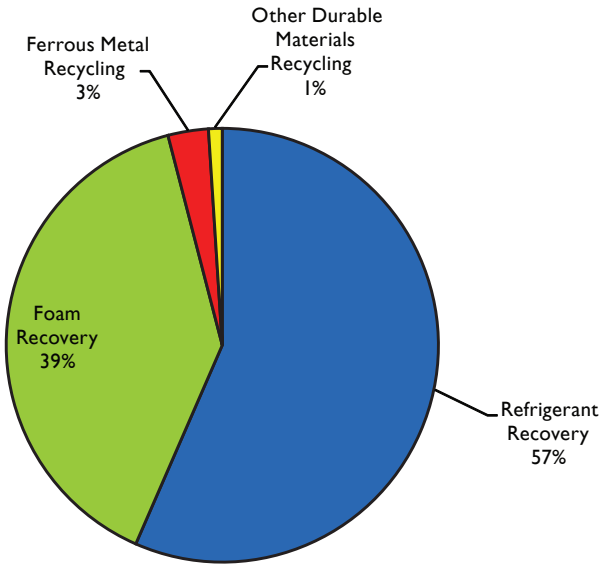
* This value assumes a 15% CO_2e discounting.

Climate Benefits

The CFCs, HCFCs, and HFCs contained in refrigerators are all potent greenhouse gases (GHGs). These refrigerants and blowing agents have direct global warming potentials (GWPs) up to 10,900—meaning that they are up to 10,900 times more effective at damaging the climate system than carbon dioxide (CO_2) on an equal mass basis. Therefore, recovering these compounds, even in small quantities, can result in significant climate benefits.

In addition, the recycling of durable materials from appliances prevents indirect GHG emissions associated with the generation of electricity, which would have otherwise been needed to produce virgin materials.

Figure 9: Climate Benefits Achieved in the Yakama Nation RAD Pilot Program



In total, the Yakama Nation pilot program achieved the reduction of 717 metric tons of CO_2 equivalent ($MTCO_2e$), equivalent to approximately 137 passenger car emissions over a one-year period. Of this, 57% can be attributed to reclaiming or destroying refrigerant, 39% to reclaiming or destroying foam-blowing agents, and 4% to recycling durable materials. Figure 9 presents the total GHG emissions reductions associated with this program.

Other Environmental Benefits

In the Yakama Nation pilot program, environmental benefits were also achieved by collecting abandoned units and otherwise keeping recyclable materials out of landfills and ensuring the proper handling of hazardous waste, as summarized below.

Materials prevented from going to a landfill:

- 24,000 pounds of ferrous metals
- 768 pounds of non-ferrous metals
- 4,800 pounds of plastic
- 768 pounds of glass

Toxic or hazardous materials properly handled:

- 15 gallons of used oil
- 11 PCB-containing capacitors

Yakama Nation disposed of 192 appliances in the pilot program; this resulted in 717 $MTCO_2e$ GHG emissions reductions, equivalent to approximately:

137 passenger cars NOT driven for one year

Source: EPA's Greenhouse Gas Equivalency Calculator. Available at http://www.epa.gov/cleanenergy/energy-resources/calculator.html.

If released into the environment, used oil can leak into groundwater and major waterways and pollute drinking water sources. In addition to used oil, appliances may contain toxic chemicals and heavy metals—namely PCBs from capacitors and mercury from thermostatic switches. PCBs are regulated by EPA as toxic substances; they may cause cancer and liver damage, and can have negative impacts on the neurological development of children, the human reproductive system, the immune system, and the endocrine system. Mercury is toxic and causes a variety of adverse health effects, including tremors, headaches, respiratory failure, reproductive and developmental abnormalities, and potentially, cancers.

Community Benefits

From the program's outset, the EPA and the Yakama Department of Solid Waste staff identified a number of program goals to benefit the greater community, namely:

- Avoid illegal dumping of refrigerators and freezers
- Prevent pollution through proper recycling
- Educate residents about proper waste disposal
- Employ local residents
- Promote solid waste services of the Yakama Nation and assess the feasibility of bulky item pick-up as a potential service to be added by the Department
- Provide economic benefit through financial incentives

All of these goals were indeed achieved, and the RAD pilot program garnered widespread community praise.

Other branches of the local government showed strong support for the program. The Tribal Water Code Program and the tribal and local Police Departments particularly appreciated the program because it kept refrigerators out of streams and irrigation ditches, which not only prevented pollution but removed potential safety hazards. "Through the RAD pilot program, we've seen many old refrigerators removed for proper recycling that would have otherwise been dumped illegally," said Sergeant Ben Scooter, police officer in the town of Wapato. "By avoiding the dumping of these units, the program prevented the release of harmful substances into our environment and likely prevented child injury or even death."

The pilot program also succeeded in educating residents about the hazards of improper waste disposal and the benefits of recycling. "Through publicity and incentives, the RAD pilot program increased public awareness in the Yakama Nation about proper waste management," said Loretta Zammarchi, Project Officer and Solid Waste Planner, Yakama Nation Solid Waste Department. "It also resulted in real benefits for local residents and our environment."

The pilot program employed 4 local people to administer the program and schedule/collect appliances. The program provided a total of 425 hours of labor. In addition, the pilot demonstrated the capabilities of the Yakama Nation's Solid Waste Department, empowering it to run similar waste collection programs in the future. According to Zammarchi, "The RAD pilot program allowed us to demonstrate that collection and proper disposal of bulk items, such as refrigerators, is a workable solid waste management service that can be offered by the Yakama Nation Facility Management to benefit both the community and the environment." Indeed, the RAD program received great support throughout the community, providing a solid foundation for the development of future waste disposal programs.

In addition to these benefits, the financial incentive of $30/unit also provided direct economic benefits to a financially distressed community.

Discussion and Lessons Learned

The Yakama Nation RAD pilot program achieved great success in collecting and properly disposing of old refrigerators and freezers. Despite the short timeframe, the program collected 192 units. The pilot ran smoothly and provided insight into how similar programs may be run in future.

Contributions to Program Success

According to representatives of the Yakama Nation Solid Waste Department, the program's success was owed to a number of important factors:

- **Infrastructure and staff.** The Yakama Nation Solid Waste Department had access to pick-up trucks large enough to collect multiple refrigerators and freezers, as well as knowledgeable staff who could efficiently implement the program on a short timeframe. Yakama staff was also able to plan collection routes based on existing waste collection routes and had a strong understanding of the community. Such planning efforts helped minimize transportation over the very large territory.
- **Community trust through strategic outreach.** The Department of Solid Waste is well-respected throughout the community and had access to effective publicity outlets, including community meeting places, such as churches and longhouses. As such, the Department received widespread community interest in and support for the program. Yakama Nation staff underscored that this trust was essential; in the past, the community has been taken advantage of by program scams, leaving residents hesitant to take part in similar call-in/take-back programs. With this in mind, the Solid Waste Department staff employed outreach strategies that relied on direct communication at community meetings and events rather than mass-mailings—which are typically used by appliance recycling programs throughout the United States.
- **Monetary incentives.** The $30 incentive was crucial to program success, as community members saw direct financial benefits from recycling their old refrigerators. Indeed, Solid Waste staff received feedback from participants indicating that the incentive had been the main reason for their participation.

Lessons Learned

A number of important lessons were learned, which may benefit future RAD programs. First, the incentive could have been increased or tiered to compel more people to turn in their old and/or working refrigerators/freezers. In this pilot program, 15 people canceled their scheduled pick-ups before their units were collected. Based on JACO's nearly 20 years of experience in implementing appliance recycling programs, higher incentives—on the order of $50 per unit—are needed to adequately motivate people to turn in their old units during difficult economic times. Similarly, to encourage the disposal of old, inefficient units that are still working, the program could offer a greater incentive for working units than for non-working.

Moving forward, other information can be collected during program implementation to further understand the program drivers and beneficiaries, and target future efforts accordingly. In particular, additional information could be obtained through a collection survey about participant demographics and how they learned about the program and chose whether or not to participate.

Overall, the Yakama Nation RAD Pilot Program achieved great success, especially as the first effort to implement a RAD-like recycling program on tribal lands within a very tight timeframe. Given the positive community responses and overall program benefits, it is clear that this program model can be used in future for similar and larger scale programs.

EPA

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