



Recover

Recycle

Reclaim



Responsible Appliance
Disposal Program

RAD 

2007 Annual Report



Recover Recycle Reclaim

EPA's Responsible Appliance Disposal (RAD) Program is a voluntary partnership program that began in October 2006 to help protect the ozone layer and reduce emissions of greenhouse gases. The RAD Program recognizes partners that ensure the disposal of refrigerant-containing appliances using the best environmental practices available. The RAD Program invites utilities, municipalities, retailers, manufacturers, universities, and other qualifying organizations to become partners.

Overview

Through the RAD Program, partners reduce emissions of ozone-depleting substances (ODS) and greenhouse gases (GHGs) by recovering appliance foam and refrigerant. They also prevent the release of hazardous materials, as well as save landfill space and energy by recycling durable materials instead of landfilling them (eliminating the need to produce virgin materials). RAD partners achieve these benefits by using best practices to dispose of appliances; namely, they ensure that:

- Refrigerant is recovered and reclaimed or destroyed;
- Insulation foam is recovered and destroyed, or the blowing agent is recovered and reclaimed;
- Metals, plastic, and glass are recycled; and
- Polychlorinated biphenyls (PCBs), mercury, and used oil are recovered and properly disposed.

In addition, certain RAD partners also reduce energy consumption by encouraging appliance owners to permanently retire old, inefficient units. For example, many utility partners offer a monetary reward for the pick-up of old, working refrigerators/freezers.

The inaugural RAD Program results presented in this annual report are for calendar year 2007.





The Need for the RAD Program

It is estimated that 8 million refrigerators/freezers, 4 million air-conditioning units, and 1 million dehumidifiers were disposed of in the United States in 2007.

Because these appliances contain ozone-depleting substances, greenhouse gases, hazardous substances, and recyclable materials, their proper disposal is critical for environmental and human health. Federal law requires that (1) all refrigerant be recovered prior to dismantling or disposing of appliances, and (2) universal waste (e.g., 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.

RAD Partners

Nine partners reported their accomplishments for the RAD Program from January 1, 2007 through December 31, 2007:

1. Austin Energy (TX)
2. Fort Collins Utilities (CO)
3. Nevada Power/Sierra Pacific Power (NV)
4. Pacific Gas and Electric (CA)
5. PacifiCorp (CA, ID, OR, UT, WA, WY)
6. Sacramento Municipal Utility District (CA)
7. San Diego Gas and Electric (CA)
8. Snohomish Public Utility District (WA)
9. Southern California Edison (CA)

In total, there are 13.5 million households served by the responsible appliance disposal programs of these nine partners, representing approximately 12% of U.S. households.

Results

In 2007, the RAD Program's nine utility partners collected and processed a total of 176,163 refrigerant-containing appliances, including:

- 166,557 refrigerators/freezers;
- 9,316 stand-alone freezers; and
- 290 air-conditioning units.

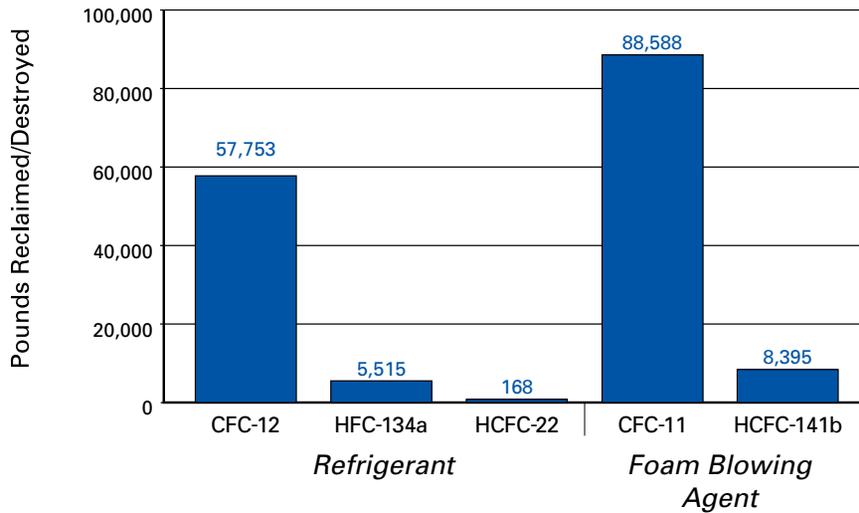
By disposing of these units using the best available practices, RAD partners have helped protect the stratospheric ozone layer, reduce GHG emissions, reduce energy use, and increase recycling. The benefits of these practices are described in the following pages.

“The RAD Program provides us with an opportunity to partner with the EPA in an effort we both believe in.”

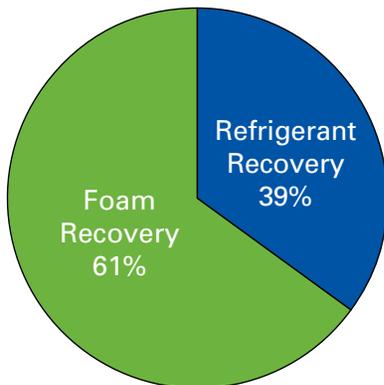
—Tom Schober, Southern California Edison ARP Program Manager

Recover Recycle Reclaim

Refrigerants and Foam Blowing Agents Reclaimed or Destroyed by RAD Partners in 2007



Emissions of Ozone-Depleting Substances Avoided by RAD Partners in 2007



Significant ozone benefits are realized through the recovery of foam, as old refrigerators/freezers contain nearly twice as much ODS in insulating foam as in refrigerant.

Stratospheric Ozone Benefits

RAD partners not only reduce emissions of ozone-depleting substances by recovering and reclaiming or destroying refrigerant, but they recover and reclaim or destroy foam blowing agents, which also deplete the ozone layer.

Partners recover foam from appliances manually or by using an automated system, and then reclaim or destroy the blowing agent. Foam destruction is typically performed using municipal solid waste incinerators (e.g., waste to energy facilities) or rotary kiln incinerators. On average, partners recovered 0.37 lbs. of refrigerant and 0.58 lbs. of foam blowing agent from each refrigerator/freezer. Across all equipment types, RAD partners recovered a total of 57,921 lbs. of CFC and HCFC refrigerant, and 96,983 lbs. of CFC and HCFC foam blowing agent. By avoiding the release of this refrigerant and foam blowing agent into the environment, an estimated 66 ODP-weighted metric tons were avoided during 2007.

Characteristics of Gases Used as Refrigerants and Foam Blowing Agents in Appliances

Compound	GWP ^a	ODP ^c	Atmospheric Lifetime ^b	Predominant Use in Appliances
CO ₂	1	0	5–200	NA
CFC-11	4,750	1	45	Foam
CFC-12	10,890	1	100	Refrigerant
HCFC-22	1,810	0.055	11.9	Refrigerant
HCFC-141b	725	0.11	9.3	Foam
HFC-134a	1,300	0	13.8	Refrigerant

^a GWP = Global warming potential; the ratio of heat trapped by one unit mass of a gas to that of one unit mass of carbon dioxide. Calculations for HFCs are based on the 100-year GWPs provided in the *Intergovernmental Panel on Climate Change Second Assessment Report: Climate Change 1995*. Calculations for ODS (CFCs and HCFCs) are based on the 100-year GWPs provided in *The 2006 Assessment of the Scientific Assessment Panel of the United Nations Environment Programme's Ozone Secretariat*.

^b Atmospheric lifetimes are based on the *Intergovernmental Panel on Climate Change Third Assessment Report: Climate Change 2001*.

^c ODP = Ozone depletion potential; the ratio of the impact on stratospheric ozone of a chemical compared to the impact of a similar mass of CFC-11 are based on the United Nations Environment Programme's *Montreal Protocol on Substances that Deplete the Ozone Layer* (2000).

NA = Not applicable.

Appliance Components Recovered by RAD Partners, 2007

Appliance Component	Amount Recovered (lbs.)
Refrigerant Reclaimed or Destroyed	63,436
Foam Blowing Agent Reclaimed or Destroyed	96,983
Ferrous Metals Recycled	23,249,800
Other Durable Materials Recycled	
Non-ferrous Metals	563,564
Plastic	2,969,960
Glass	392,329
Rubber	158,812

Climate Benefits

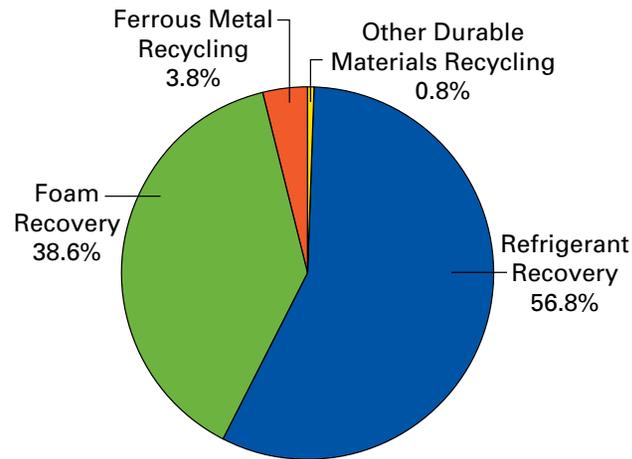
CFCs, HCFCs, and HFCs contained in appliances are all potent greenhouse gases.

In fact, these compounds have global warming potentials (GWPs) up to 10,890—meaning that they are up to 10,890 times more effective at trapping heat than carbon dioxide (CO₂) 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.

During 2007, RAD partners achieved the reduction of 500,571 metric tons of carbon dioxide equivalent (MtCO₂eq), which is equivalent to 91,680 passenger car emissions for one year. Of this, 56.8% can be attributed to reclaiming or destroying refrigerant, 38.6% to reclaiming or destroying foam blowing agents, and 4.6% to recycling durable materials.

Recover Recycle Reclaim

Greenhouse Gas Emissions Avoided by Responsible Appliance Disposal



RAD partners disposed of 176,163 appliances in 2007; this resulted in 500,571 MtCO₂eq* greenhouse gas emissions reductions, equivalent to:



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

* This does not include GHG emission reductions associated with early appliance retirement.

Energy Savings

For utilities, appliance recycling programs can be an important component of a successful Demand Side Management program.

Replacing old, inefficient refrigerators/freezers reduces the amount of electricity needed to power the appliances and, therefore, the amount of indirect GHG emissions released. In 2007, RAD utility partners reduced energy use by over 1.7 billion kilowatt hours (kWh) by collecting old refrigerators/freezers, stand-alone freezers, and air-conditioners. These energy savings are estimated to have saved consumers \$146 million.

- Replacing an inefficient, 20-year-old refrigerator with one that has earned the government's ENERGY STAR® label will save a household roughly 700 kWh/year or more—or upwards of \$50/year.*
- If a secondary refrigerator (e.g., in a basement or garage) is removed and not replaced, households can save about 1,200 kWh/year, or more than \$100/year.*

* Actual energy and costs savings will vary by equipment model and region. These estimates are conservative and are based on national averages (www.energystar.gov).

Other Environmental Benefits

In 2007, RAD partners further protected the environment by keeping recyclable materials out of landfills and ensuring the proper handling of hazardous waste, as shown below:

- 27,334,465 pounds of materials prevented from being landfilled;
- 222,029 pounds of used oil recycled or properly disposed;
- 1,387 pounds PCB-containing capacitors properly disposed; and
- 110 pounds mercury-containing components properly disposed.

If improperly handled, 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 polychlorinated biphenyls (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.





Partner Recognition

In return for their efforts, RAD partners receive public recognition and technical support from the U.S. EPA.

For example, on October 27, 2006, EPA held a launch event to induct the first seven partners into the RAD Program and issued press releases publicizing the start of the program. All partners are listed on the RAD website along with links to each partner's website. Partners are also given the opportunity to provide case studies of their programs to showcase on the RAD website.

EPA honored firms that help collect and recycle appliances as part of the agency's Responsible Appliance Disposal Program launch in Long Beach, CA, on October 27, 2006. Pictured here (from left to right) are: Wayne Natri, U.S. EPA Region 9 Administrator; Garth Williams, Snohomish Public Utility District; Gene Rodrigues, Southern California Edison; Mark Gaines, San Diego Gas and Electric; and Jim Parks, Sacramento Municipal Utility District.

Maximizing RAD Benefits: The Opportunity Is Now!

Of all refrigerant-containing appliances, those that contain CFC refrigerant and/or foam pose the greatest threats to the stratospheric ozone layer and climate.

Therefore, it is critical that efforts to properly dispose of appliances be undertaken today, before the full stock of CFC appliances is retired, and the opportunity to avoid harmful emissions is lost.

Ensuring the proper disposal of older appliances through the RAD Program is a priority, but the importance of the program will continue for years to come. Even new units being produced today contain high-GWP refrigerants and foam blowing agents that will lead to increased concentrations of greenhouse gases if they are not properly handled at end of life.

Additional Information

For additional information, contact:

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