Responsible Appliance Disposal Program

RAD

EPA

2010 Annual Report

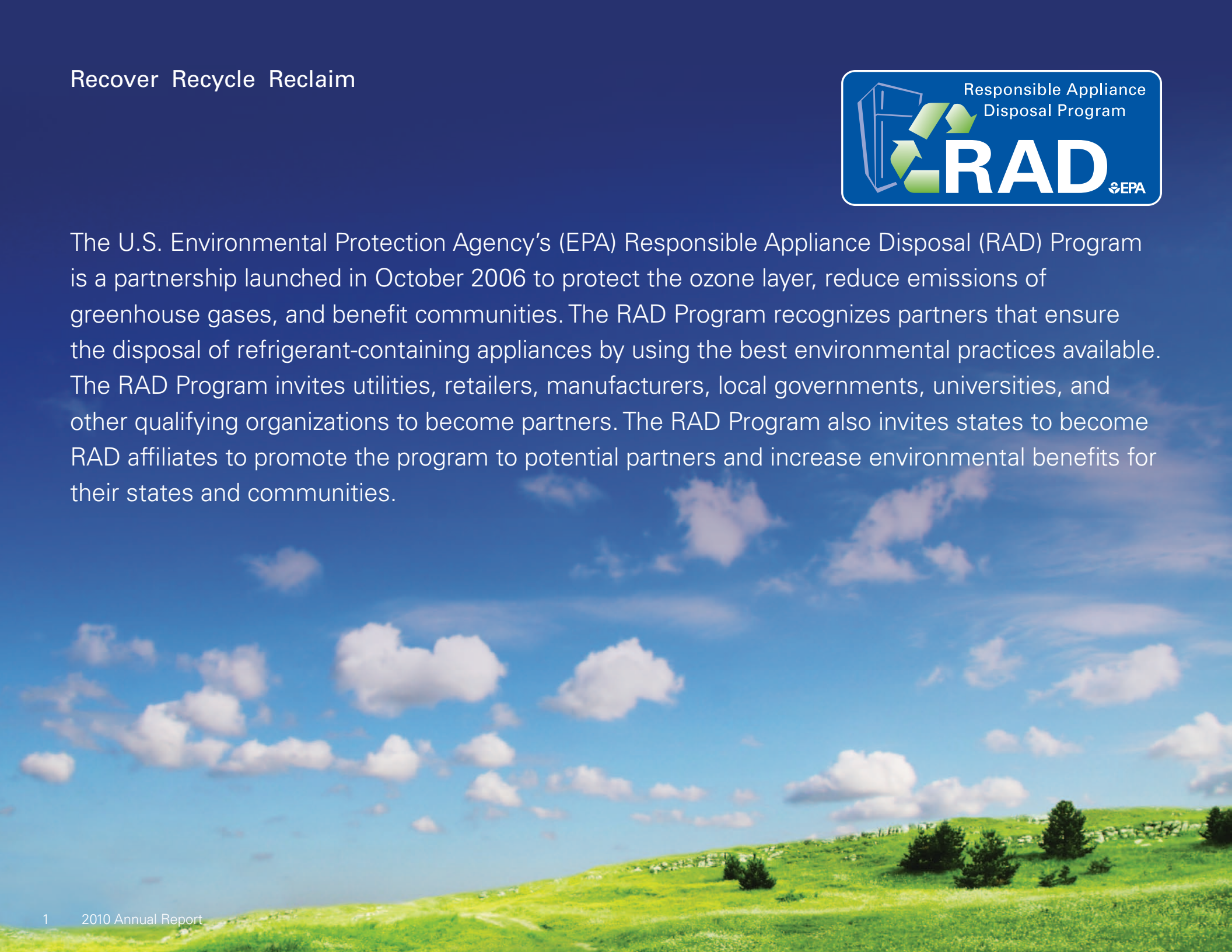
Recover Recycle Reclaim

Responsible Appliance Disposal Program

RAD

EPA

The U.S. Environmental Protection Agency's (EPA) Responsible Appliance Disposal (RAD) Program is a partnership launched in October 2006 to protect the ozone layer, reduce emissions of greenhouse gases, and benefit communities. The RAD Program recognizes partners that ensure the disposal of refrigerant-containing appliances by using the best environmental practices available. The RAD Program invites utilities, retailers, manufacturers, local governments, universities, and other qualifying organizations to become partners. The RAD Program also invites states to become RAD affiliates to promote the program to potential partners and increase environmental benefits for their states and communities.



Overview

Through the RAD Program, partners reduce emissions of ozone-depleting substances (ODS) and greenhouse gases (GHGs) by recovering appliance foam and refrigerant. The program also leads to other environmental benefits by promoting the safe handling of hazardous materials and encouraging the recycling of durable materials—which protects human health, saves landfill space, and reduces energy consumption.

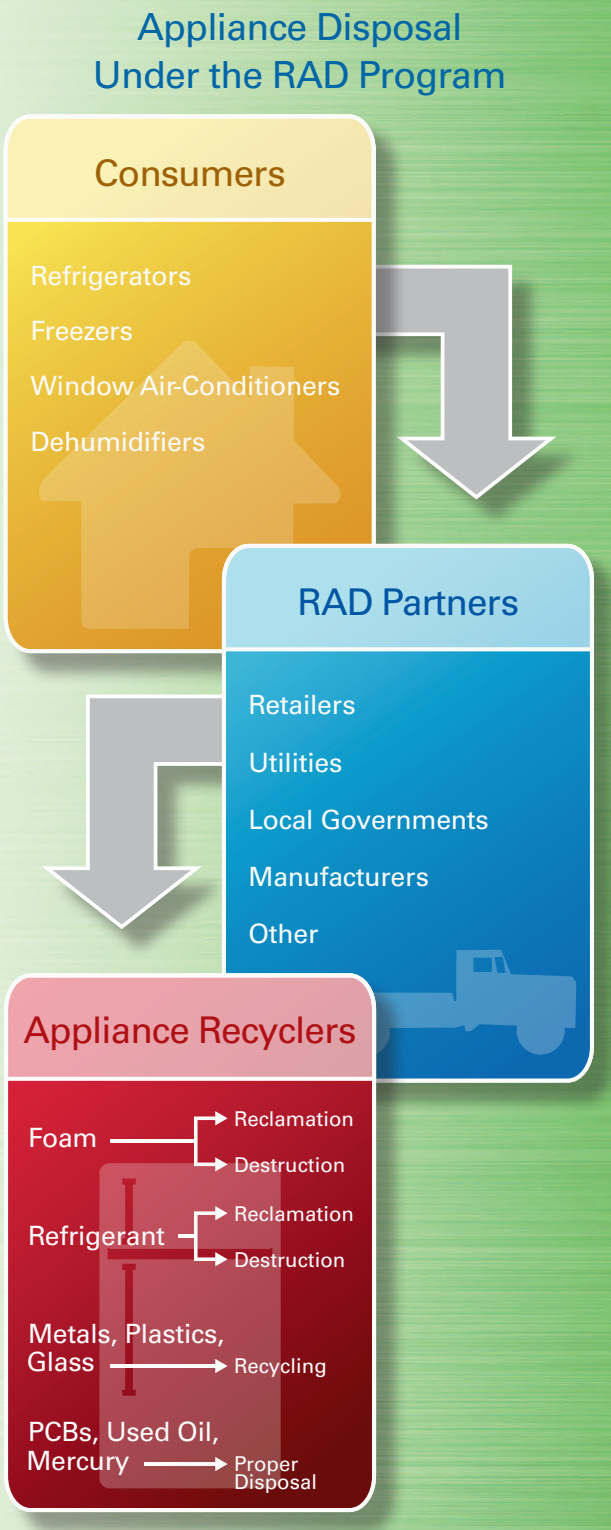
RAD partners achieve these benefits by collecting old refrigerant-containing appliances from consumers and responsibly disposing of them with the help of an appliance recycler. The appliance recycler uses best environmental practices to ensure that:

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

In addition, some 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.

The benefits of the RAD Program are experienced on both global and local levels. Specifically, the avoided emissions of ODS and GHGs result in global environmental benefits, while the prevention of appliance dumping and the release of hazardous/toxic materials provides local environmental benefits to communities.

This annual report presents the RAD Program environmental benefits for 2010.



The Need for the RAD Program

EPA estimates that 9.4 million refrigerators and freezers, 4.5 million window air-conditioning units, and 950 thousand dehumidifiers were disposed of in the United States in 2010.

Because these appliances contain ODS, GHGs, hazardous substances, and recyclable materials, disposing of them using best environmental practices results in significant benefits for the environment and human health. Federal law requires that prior to disposal or recycling of appliances (1) all refrigerant be recovered, 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.

Characteristics of Gases Used as Refrigerants and Foam-Blowing Agents in Appliances Reaching End-of-Life

Compound	Global Warming Potential (GWP)*	Ozone Depletion Potential (ODP)	Predominant Use in Appliances
CO_2	1	0	--
CFC-11	4,750	1	Foam
CFC-12	10,900	1	Refrigerant
HCFC-22	1,810	0.055	Refrigerant
HCFC-141b	725	0.11	Foam
HFC-134a	1,430	0	Refrigerant

* GWP calculations are based on the 100-year direct GWPs provided in the Intergovernmental Panel on Climate Change Fourth Assessment Report (2007). GWP values are relative to carbon dioxide (CO_2), which has a GWP of 1.

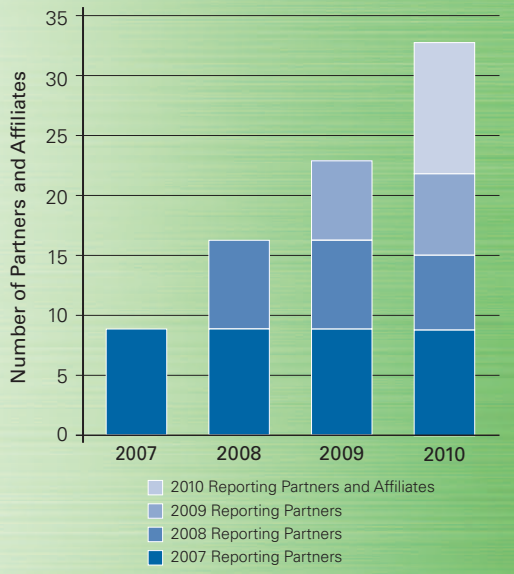
RAD Partners and Affiliates

Thirty-four partners and affiliates reported their accomplishments for the RAD Program from January 1, 2010, through December 31, 2010:

- American Electric Power (OH)
- Arizona Public Service (AZ)
- Appliance Smart (GA, MN, OH, TX)
- Austin Energy (TX)
- Baltimore Gas and Electric Company (MD)
- Best Buy (Nationwide)
- City of Burbank Water & Power (CA)
- City of Palo Alto Utilities (CA)
- City of Fort Collins Utilities (CO)
- City of Richland Energy Services (WA)
- Commonwealth Edison (IL)
- Consumers Energy (MI)
- Dayton Power & Light Company (OH)
- Energy Trust of Oregon (OR)
- Georgia Power (GA)
- Great River Energy (MN)
- Hoosier Energy (IN)
- Idaho Power (ID)
- Nebraska Public Power District (NE)
- NV Energy (NV)
- Pacific Gas & Electric Company (CA)
- PacifiCorp (CA, ID, UT, WA, WY)
- PNM (NM)
- Puget Sound Energy (WA)
- Sacramento Municipal Utility District (CA)
- Salt River Project (AZ)
- San Diego Gas & Electric (CA)
- Sears Home Services (Nationwide)
- Silicon Valley Power (CA)
- Snohomish County Public Utility District No. 1 (WA)
- Southern California Edison (CA)
- Vectren Energy Delivery (IN, OH)
- West Virginia Department of Environmental Protection (WV)
- WPPI Energy (WI)

Program Growth

The RAD Program has grown significantly over the last 4 years. In the last year alone, the program has expanded from having 23 to a total of 34 partners and affiliates.



"EPA's RAD Program enables WPPI Energy to provide a valuable recycling service to its communities that encourages energy efficiency and demonstrates responsible environmental stewardship. Not only can homeowners achieve energy cost savings through the program, they can do so with confidence that sustainable practices are being followed for the removal of their old appliances."

—Jake Oelke, WPPI Energy Assistant Vice President of Energy Services

Recover Recycle Reclaim

west virginia department of environmental protection

"West Virginia is proud to be the first state to join the RAD Program as a state affiliate, and to promote the reduction of ozone-depleting substances and greenhouse gases from old appliances through the West Virginia Energy Efficiency Appliance Rebate Program (WVEEARP). The publicity we have received from the RAD Program has helped spread awareness about appliance recycling efforts within our state."

—Gregory E. Adolfson,
Sustainability Officer,
West Virginia Department of
Environmental Protection (WVDEP)

RAD State Affiliates

In 2010, the RAD Program welcomed West Virginia as its first RAD state affiliate. State affiliates were invited to help promote the RAD Program to potential partners within their state through information dissemination and strategic outreach.

The role of a state affiliate is to support existing, new, and potential partners within their states and communities by:

- Serving as a technical clearinghouse/resource on responsible appliance disposal program development and implementation within the state;
- Providing partner recognition for achievement through press releases, articles, and awards; and
- Exchanging information on program development/implementation and best practices with program partners.

By participating in the program, West Virginia aimed to reduce emissions of ODS and GHGs, as well as the number of retired appliances entering landfills and the quantity of toxic chemicals released within their communities.

The RAD Program welcomes other states to participate.

New River Gorge Bridge, West Virginia

RAD Program in Indian Country

In 2010, the RAD Program conducted a small-scale refrigerator and freezer recycling program designed to benefit the tribal community of Yakama Nation.

Through this short-term program, 192 refrigerators and freezers were collected and recycled using best practices. The pilot program achieved ozone benefits of 95 ODP-weighted kilograms (kg), climate benefits of 717 metric tons of carbon dioxide equivalent ($MTCO_2e$), and the recycling of 30,336 lbs. of durable materials. In addition, the program provided a number of social and economic benefits to the Yakama Nation community, including short-term employment, financial incentives in return for refrigerator disposal, and education about proper waste disposal.

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

Yakama Nation Staff with Collection Truck

"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. It also increased public awareness in the Yakama Nation about proper waste management."

—Loretta Zammarchi, Yakama Nation Solid Waste Department

Results

In 2010, the RAD Program's 33 partners collected and processed a total of 735,442 refrigerant-containing appliances, including:

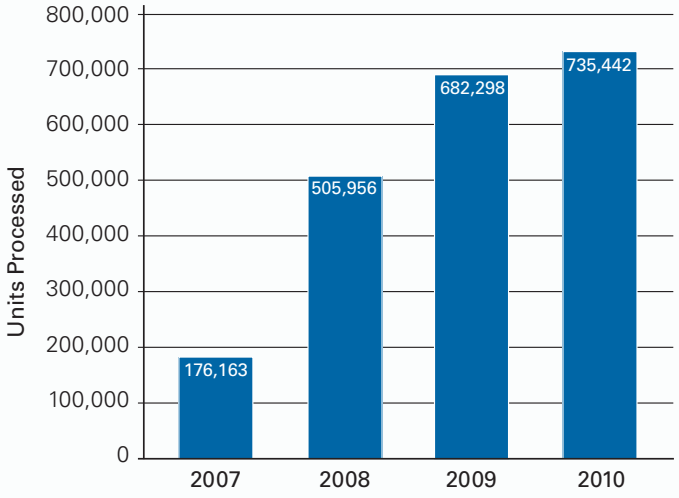
- 669,523 refrigerators
- 63,387 stand-alone freezers
- 2,376 window air-conditioning units
- 156 dehumidifiers

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

"Best Buy has helped consumers recycle old appliances and electronics for many years. Our decision to partner with the EPA RAD Program is yet another way we can help consumers make responsible choices to dispose of their appliances using the best technologies available."

—Leo Raudys, Senior Director, Best Buy Environmental Sustainability

Total Number of Refrigerant-Containing Appliances Processed by RAD Partners, 2007–2010

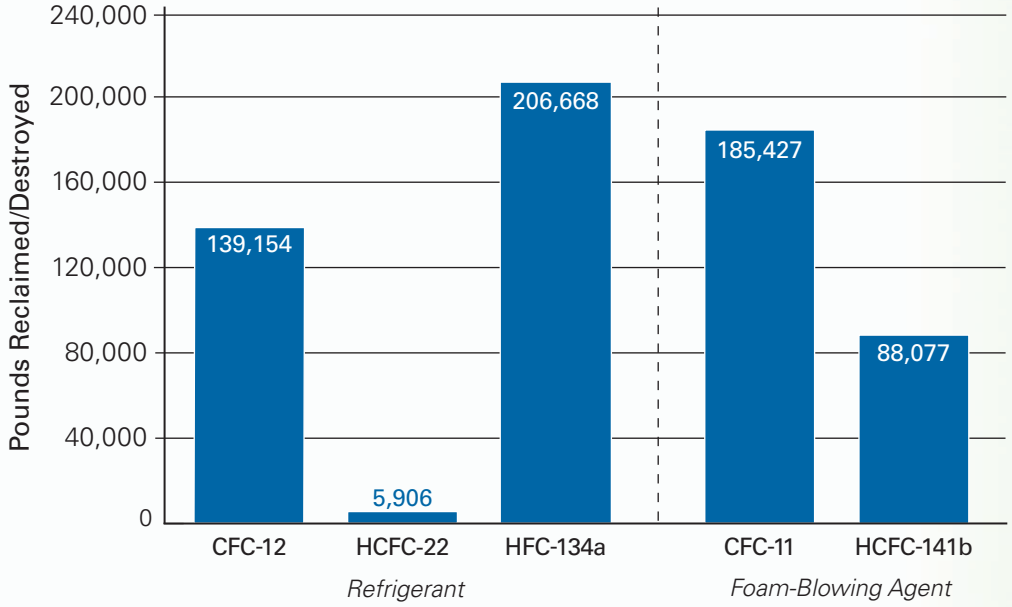


Stratospheric Ozone Benefits

RAD partners not only reduce emissions of ODS 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 foam-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 0.47 lb. of refrigerant and 0.90 lb. of foam-blowing agent from each refrigerator/freezer. Across all equipment types, RAD partners recovered a total of 145,060 lbs. of CFC and HCFC refrigerant, and 273,504 lbs. of CFC and HCFC foam-blowing agent. By avoiding the release of these refrigerants and foam-blowing agents into the environment, an estimated 417,798 lbs. of ODS (151 ODP-weighted metric tons) were avoided during 2010.

Refrigerants and Foam-Blowing Agents Reclaimed or Destroyed by RAD Partners in 2010



The Importance of Stratospheric Ozone Protection

Since the appearance of an ozone hole over the Antarctic in the early 1980s, Americans have become more aware of the health threats posed by the release of ODS.

These substances decrease the atmosphere's natural protection from the sun's harmful ultraviolet (UV) rays, which have been linked to major human health problems, including skin cancer, eye damage, other skin problems (e.g., sunburn, premature aging), and immune suppression.

To reverse stratospheric ozone depletion and its associated health effects, the *Montreal Protocol on Substances that Deplete the Ozone Layer* was signed in 1987 to phase out ODS production and consumption. The Protocol has been ratified by 196 countries and will result in significant ozone recovery in the 21st century, assuming that countries comply with its provisions.

Carbon Credits

In February 2010, the Climate Action Reserve (the Reserve) approved a project protocol for the destruction of ozone-depleting substances for carbon credits. The protocol allows both ODS refrigerant and foam-blowing agent to be destroyed at certified U.S. facilities in exchange for carbon credits. 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 generally ranged from $5 to $10 per $MTCO_2e$. Based on this price, the destruction of refrigerant from a single refrigerator containing CFC-12 may yield an approximate carbon offset credit value of $15* under the Reserve—not accounting for project costs such as those associated with registration, administration, and verification.

* This assumes a 15% CO_2e discounting, based loosely on the project accounting requirements of the Reserve.

Climate Benefits

CFCs, HCFCs, and HFCs contained in appliances are all potent 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 CO_2 on an equal mass basis. Therefore, recovering these compounds, even in small quantities, can result in significant climate benefits. 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.

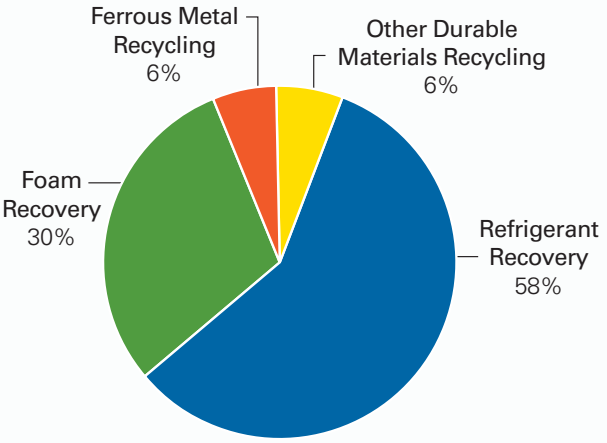
During 2010, RAD partners achieved the reduction of 1.41 million metric tons of carbon dioxide equivalent ($MMTCO_2e$), which is equivalent to approximately 276,845 passenger car emissions for one year. Of this, 58% can be attributed to reclaiming or destroying refrigerant, 30% to reclaiming or destroying foam-blowing agents, and 12% to recycling durable materials. Additional climate benefits are realized through energy savings detailed on the next page.

In 2010, RAD partners achieved climate benefits equivalent to:

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

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

GHG Emissions Avoided by Responsible Appliance Disposal



Energy Savings

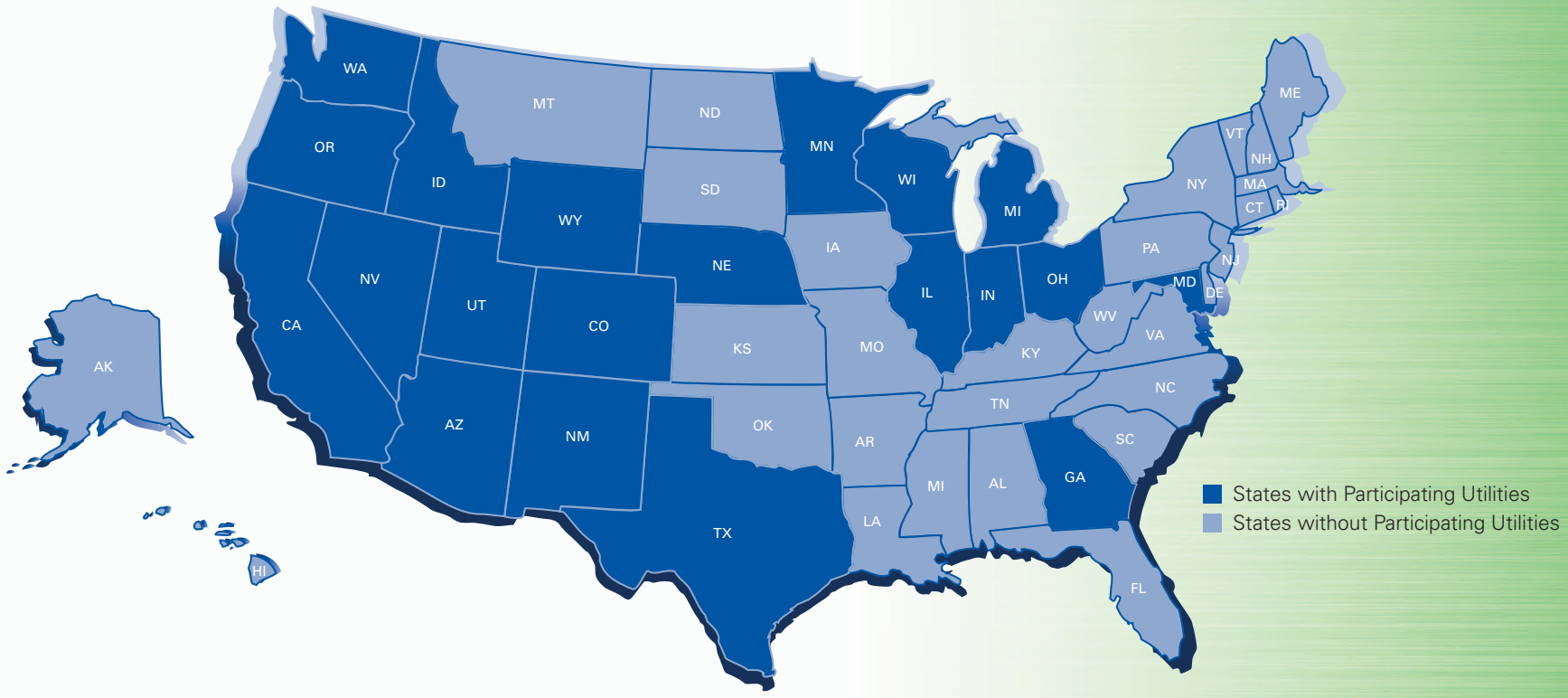
For utilities, appliance recycling programs can be an important component of a successful demand side management program.

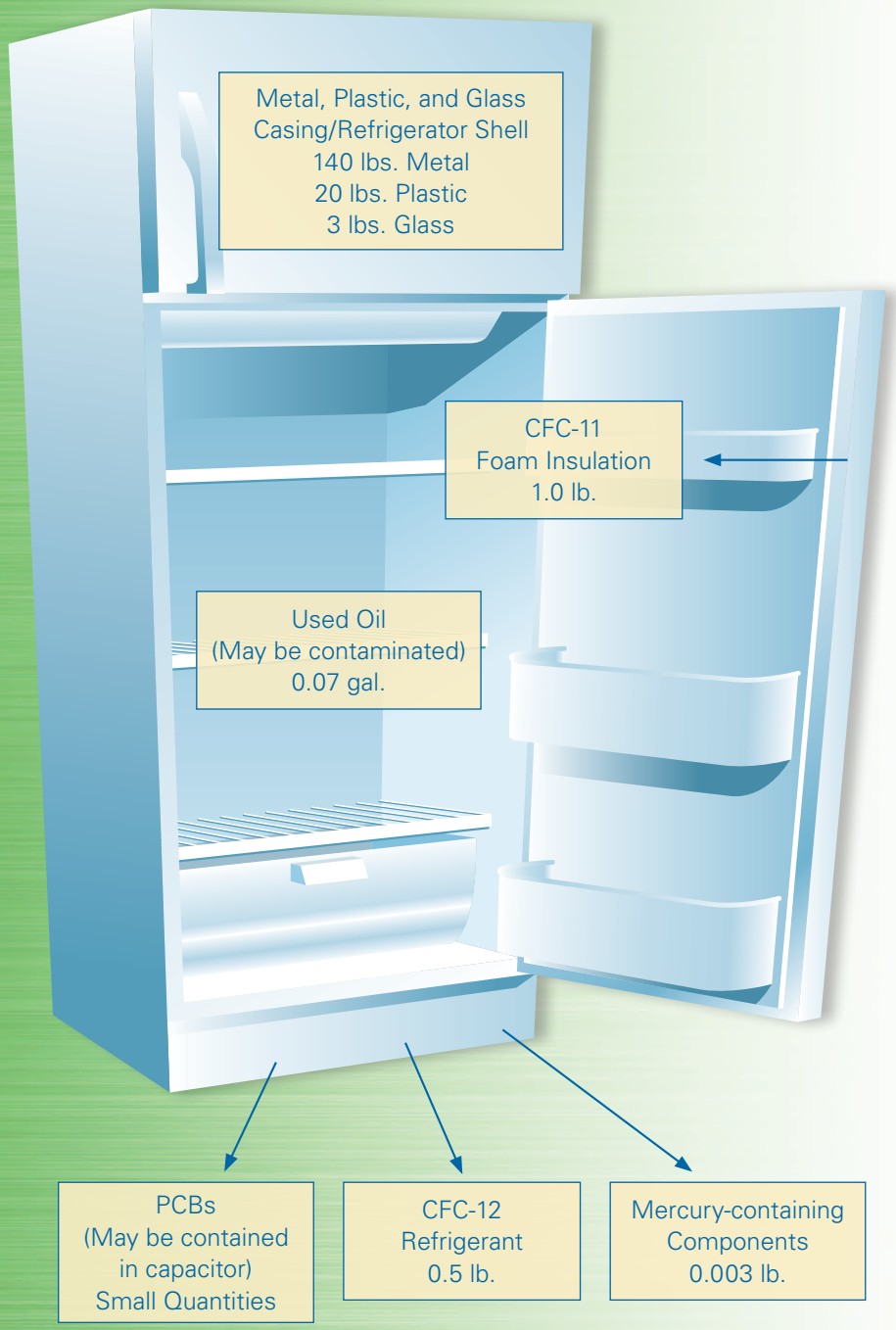
Replacing old, inefficient refrigerant-containing appliances reduces the amount of electricity needed to power them and, therefore, the amount of indirect GHG emissions released. In 2010, appliance recycling programs operated by the 30 RAD utility partners covered a territory of 31.5 million households across 20 states, representing approximately 27% of U.S. households. In total, RAD utility partners reduced energy use by more than 3.0 billion kilowatt-hours (kWh) by removing old refrigerators, stand-alone freezers, window air-conditioning units, and dehumidifiers from the grid. These energy savings translate to climate benefits of approximately 2.17 $MMTCO_2e$ and are estimated to have saved consumers $372 million.

*Getting rid of a 20-year-old refrigerator could reduce your electricity bill by over $115 per year.**

* Actual energy and costs savings will vary by equipment model and region. These estimates are conservative and are based on national averages (ENERGY STAR 2011 Databook).

RAD Utility Partners Across the United States





Other Environmental Benefits

In 2010, RAD partners further protected the environment by keeping recyclable materials out of landfills and ensuring the proper handling of hazardous waste, as shown below.

Materials prevented from going to a landfill:

- 85.4 million lbs. of ferrous metals
- 15.6 million lbs. of non-ferrous metals
- 15.1 million lbs. of plastic
- 2.3 million lbs. of glass

Toxic or hazardous materials properly handled:

- 0.04 million gal. of used oil
- 45,024 PCB-containing capacitors
- 41,444 mercury-containing components

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.

Increasing Program Benefits Over Time

In 2007, nine RAD partners recovered 63,436 lbs. of refrigerant and 147,740 lbs. of foam-blowing agent. As of 2010, the program has expanded to 33 partners and one state affiliate, which have recovered 351,727 lbs. of refrigerant and 273,504 lbs. of foam-blowing agent.

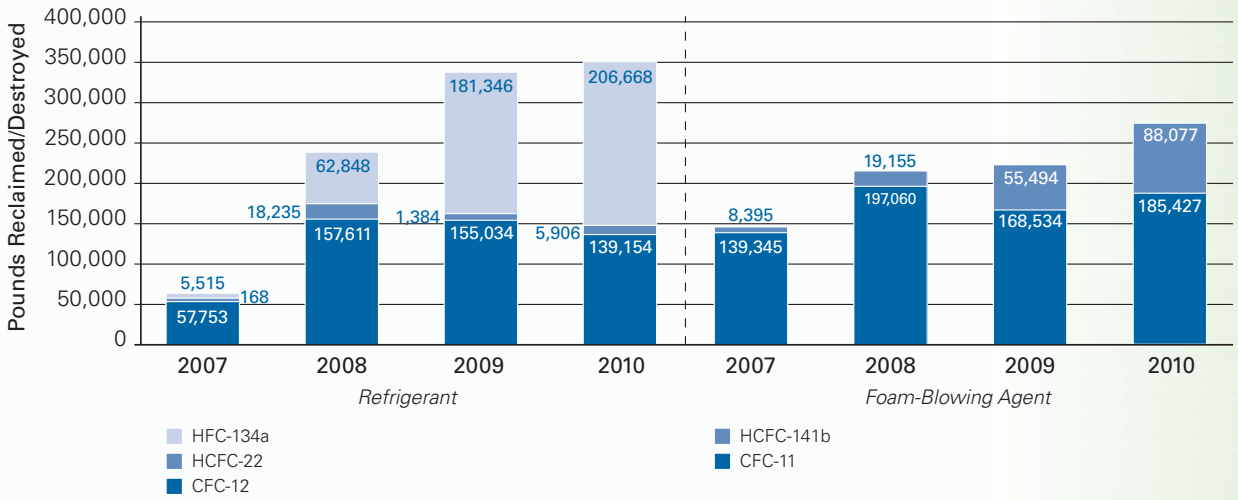
As the program matures, the relative number of units collected with CFC-based refrigerant and foam-blowing agent is decreasing, while the number with HFC refrigerant and HCFC-based foam-blowing agent is increasing; this trend will continue into the future, until the full fleet of older CFC units reaches retirement.

Green Jobs

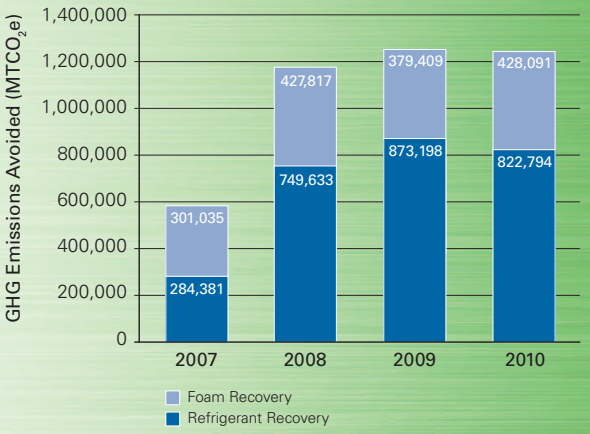
During the first 4 years, RAD program activities have employed over 1,200 people. For every 100,000 refrigerators recycled using best practices, 64 new green jobs are created.*

*RAD program estimates based on industry statistics.

Refrigerant and Foam-Blowing Agent Reclaimed or Destroyed by RAD Partners, 2007–2010



GHG Emissions Avoided through Proper Appliance Disposal by RAD Partners



Partner Recognition

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

For example, U.S. EPA has issued several press releases publicly recognizing new partners. All partners are listed on the RAD website. Partners are also given the opportunity to provide case studies of their programs to showcase on the RAD website. In addition, partners may use the RAD logo on their websites and other outreach materials.

Protecting the Environment, One Appliance at a Time

Of all refrigerant and foam types, CFCs present the greatest threat to the stratospheric ozone layer and climate systems when emitted.

Recently there has been an international transition away from the use of CFCs in the production of new appliances. But because of the long lifetime of appliances, many of the appliances being retired today still contain CFCs. Thus, it is critical that efforts to properly dispose of appliances and minimize emissions be undertaken now—before the opportunity is lost.

Although CFCs are no longer used in the production of new appliances, most new units sold in the United States today still contain high-GWP refrigerants and foam-blowing agents that will lead to increased concentrations of GHGs if not properly handled at end-of-life. Therefore, the importance of the RAD Program in promoting proper appliance disposal will continue well after the stock of CFC-containing appliances reaches end-of-life. By going above and beyond regulatory requirements to dispose of appliances using best practices and technologies, RAD partners are doing their part in protecting the environment.

To learn more, visit:

U.S. Environmental Protection Agency
Stratospheric Protection Division
www.epa.gov/Ozone/partnerships/rad

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Recycle

Reclaim

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