



# A RAD Partnership:

## U.S. Approach for Appliance Recycling

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# Overview

- Regulatory Program
  - Safe Disposal regulations
- Voluntary Program
  - Responsible Appliance Disposal (RAD) Program

# EPA's Regulatory Program for Disposal of Appliances



- Regulations under U.S. Clean Air Act
  - Prohibit intentional refrigerant release during appliance service, maintenance, repair or disposal
  - Require safe disposal of *small appliances*:
    - ≤5 pounds of refrigerant
    - Household units - Refrigerators, freezers, ACs, dehumidifiers
    - Other small units - Vending machines, water coolers
- Waste Regulations
  - Resource Conservation & Recovery Act (RCRA) and the Toxic Substances Control Act (TSCA) require proper management and storage of universal waste (e.g., mercury), used oil, and PCBs

# Requirements: Small Appliances



- Generally enter waste stream with charge intact
- Technician certification not required for refrigerant recovery
- Final person in disposal chain (e.g., recycler or landfill) must:
  - Recover remaining refrigerant; OR
  - Verify signed statement from person from whom appliance is received that refrigerant has been properly recovered previously
- Keep copies of signed statement for at least 3 years

# What Happens To Old Appliances?



## Old refrigerated appliances collected by municipalities and retailers may be either...

### – Disposed

- Refrigerant may or may not be recovered and reclaimed/destroyed, as required by law
- Foam is landfilled
- Fate of used oil, PCBs, mercury uncertain
- Metal components scrapped

**OR**

### – Resold

- Old units continue to strain energy demand
- Ultimate disposal uncertain

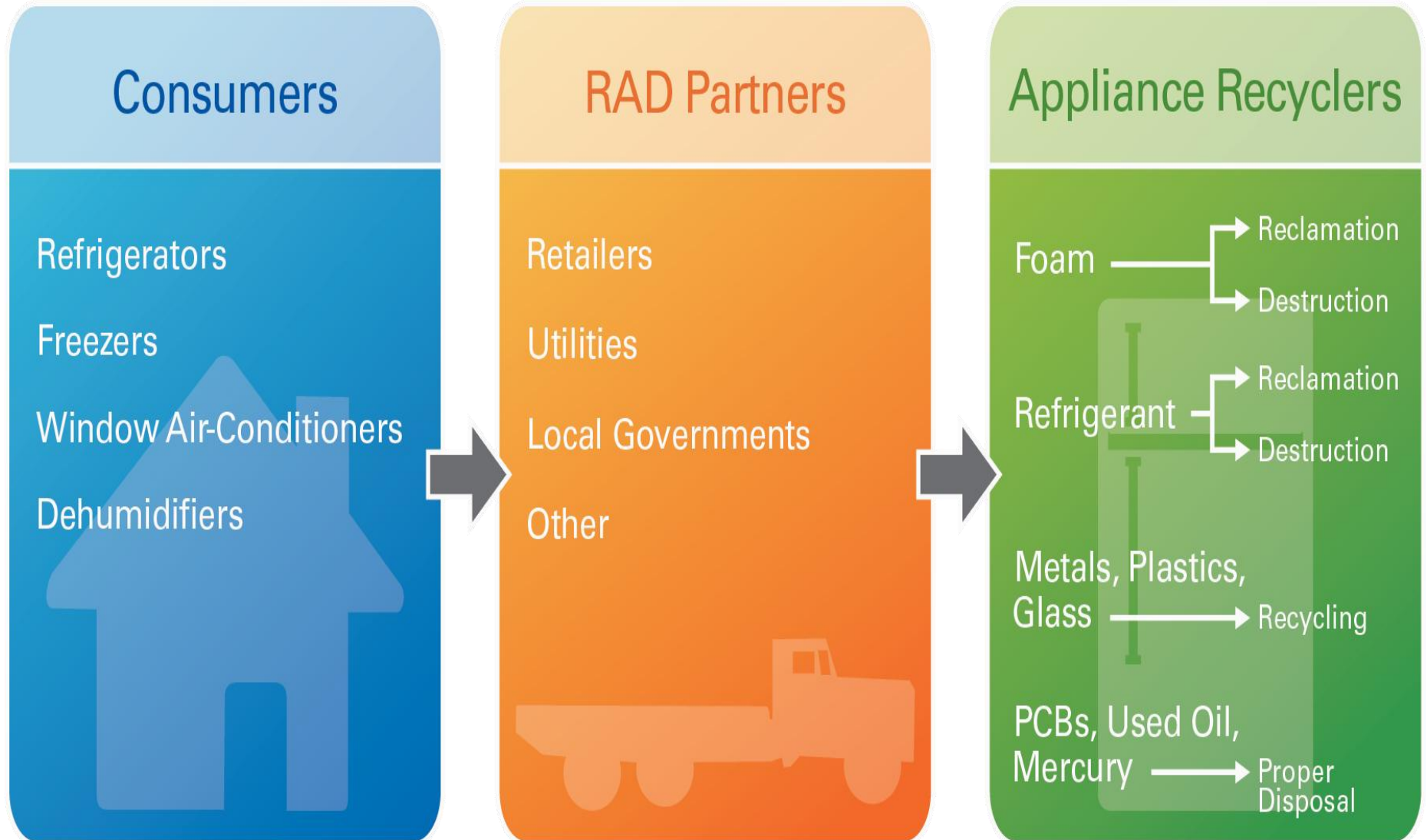


# EPA's Partnership Program



EPA implemented the RAD Program in October 2006 to capture the environmental benefits of end-of-life foam recovery from household refrigerators and freezers, and to engage players earlier in the disposal chain

# **RAD:** partnership with 50+ retailers, utilities, & manufacturers to responsibly recycle household refrigerators & air-conditioners



# RAD partners commit to...



- **Partners comply with appliance disposal laws**
  - Recover **refrigerant** for destruction or reclamation
  - Properly manage and store universal waste (e.g., **mercury**), **used oil**, and **PCBs**
- **BUT, RAD Partners go beyond laws:**
  - Recovering appliance **foam**
  - Promoting **recycling** of durable goods
  - Promoting retirement of old, inefficient appliances to **save energy**
  - **Annual reporting**



# What affects ozone layer and climate system?



- *1/2 lb Refrigerant: Ozone-depleting substance (ODS) or HFC*
- *1 lb Foam Blowing Agent: ODS or HFC*
- *>150 lbs of Durable Goods: Metals, plastics, & glass that, if landfilled, create the need for production of new materials*



# Environmental Impacts of ODS & HFCs in Household Refrigerators/Freezers:

## *Foam Blowing Agents and Refrigerants*

Chemical	ODP	GWP	Use in Appliances
CFC-11	1.0	4,750	Foam
CFC-12	1.0	10,900	Refrigerant
HCFC-141b	0.11	725	Foam
HFC-134a	0	1,430	Refrigerant/Foam
HFC-245fa	0	1,030	Foam
Isobutane (R-600a)	0	3	Refrigerant
Cyclopentane	0	<25	Foam

GWPs from IPCC Fourth Assessment Report and EPA's Transitioning to Low GWP Alternatives Factsheet

# Benefits of Recycling 1,000 Old Fridges Containing ODS

- 1,500 lbs ODS
- About 4.6 MMTCO<sub>2</sub>eq
- Including greenhouse gas emissions prevented through:
  - Recovering CFC refrigerant
  - Recovering CFC foam blowing agent
  - Recycling durable goods



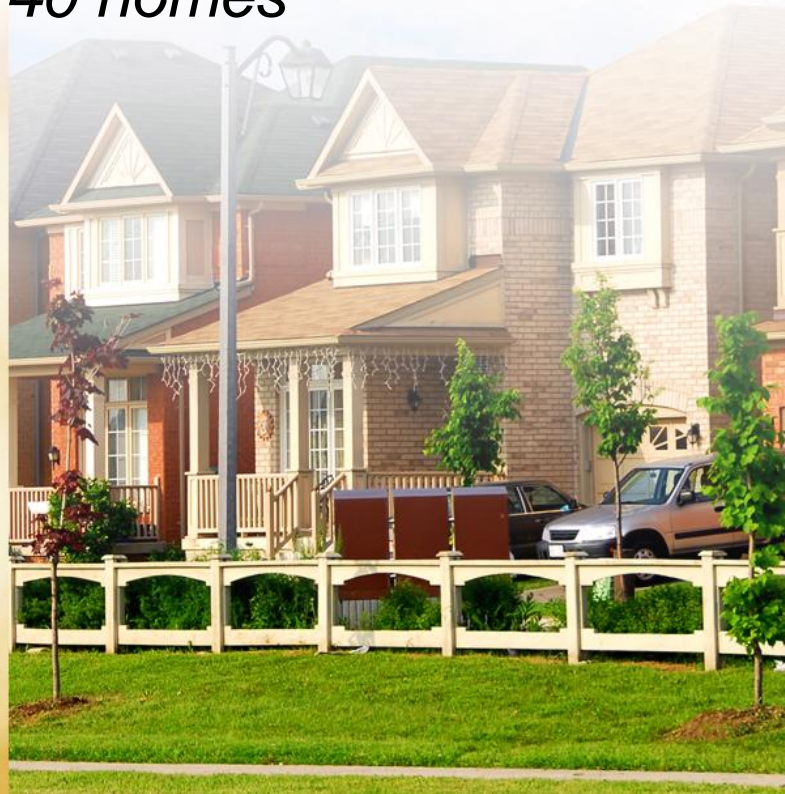
Equivalent to CO<sub>2</sub> emissions sequestered annually by 3,770 acres of U.S. forests

# Climate Benefit of Recycling 1,000 HFC Refrigerators



**Containing HFC refrigerant & foam  
~1 MMTCO<sub>2</sub>eq**

*Equivalent to GHG emissions from annual electricity  
use of 140 homes*



# Reduces Energy Demand



- Some parts of the U.S. need to reduce strain on electric grid
- Many utilities implement appliance recycling under their Demand Side Management program
- In 2011, RAD utility partners:
  - On average, collected appliances >20 years old
  - Saved 3.2 billion kWh, or \$424 million for customers



# Helps Partners Achieve Green Goals



- ✓ Ozone Layer Protection
- ✓ Climate Benefits
- ✓ Cleaner, Safer Communities
- ✓ Energy Savings



... and RAD's annual reporting form allows partners to track environmental achievements

Aggregate RAD Program accomplishments  
shared annually

# Recognizes Partners' Corporate Stewardship



Fully automated recycling facility in Philadelphia with General Electric In September 2011

Large California utility uses semi-automated foam recovery equipment

*EPA, Southern California Edison Mark Recycling of 1 Million Refrigerators*  
**COMPTON, Calif.,** May 24, 2012 – Southern California Edison (SCE), one of the founding partners of U.S. EPA's Responsible Appliance Disposal (RAD) Program, today reached a national conservation milestone by crushing its 1 millionth refrigerator.



# Provides Tools and Resources



- Foam Handling Best Practices
- Recycling Trends/Capacity
- Partner Meetings to exchange information
- Webinars & Working Groups

A screenshot of the EPA's Responsible Appliance Disposal (RAD) Program website. The browser address bar shows "www.epa.gov/rad/". The page title is "Responsible Appliance Disposal (RAD) Program". The main content area is divided into several sections: "About the Program" with a photo of a recycling facility and a list of links; "Program Benefits" with a photo of a recycling symbol and a power outlet, and a list of links; "Become a Partner" with a graphic about partnerships and a list of links; and "Resources for Existing Partners" with a graphic of a tablet and a list of links. On the right side, there are three vertical panels: "Partner News and Events" with a list of recent news items, "RAD Publications" with a thumbnail for the 2011 Annual Report, and "Most Recent" with a list of recent publications. At the bottom, there is a contact link for the RAD Web editor.

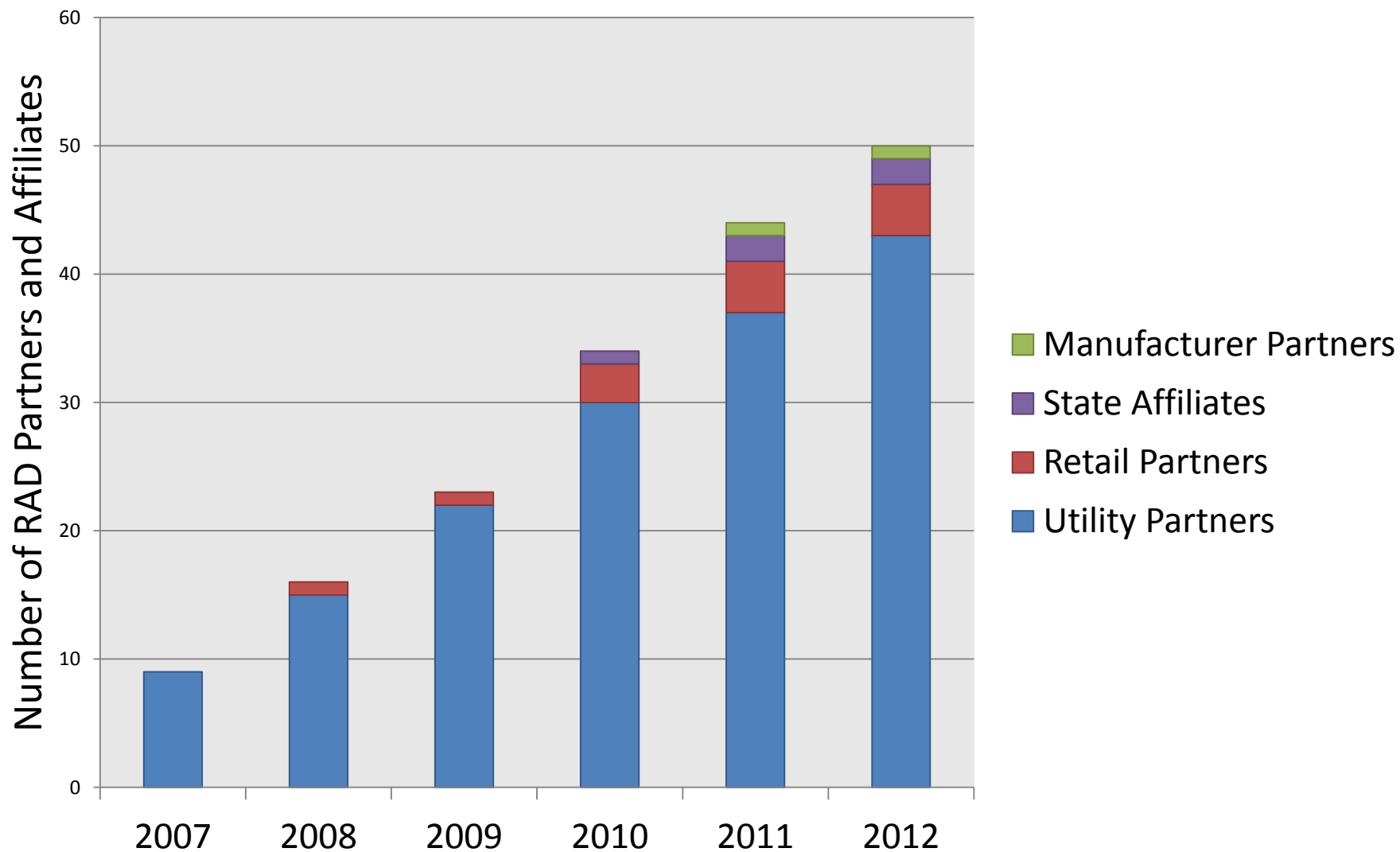


# Trends in U.S. Appliance Recycling



- The number and variety of RAD partners continues to grow steadily
  - **2006**: Program started with utilities
  - **2007**: First retailer joined
  - **2011**: First manufacturer joined
  - **2012**: Featured in U.S. corporate sustainability trade press; achieved greatest climate benefits to date
- Capacity to recycle to the RAD guidelines, including foam recovery, continues to expand across additional U.S. geographic areas

# RAD Program Growth



# Foam Recovery Best Practices



- U.S. appliance recyclers recover foam using either manual or automated processes
- **Manual:** foam is bagged and sent for incineration
- **Automated:** ODS blowing agent is extracted and sent for destruction or reclamation



# For more information



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