Trinity Consultants

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# Refrigerant Compliance: How this topic impacts everyone.

## Louisiana A&WMA Annual Conference

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*Christine Haman, PhD – Senior Consultant*

# Basic Refrigerant Types

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## CFCs

- Class I ODS with ODP > 0.2
- R-11, R-12, etc.
- Production phased out since 1996

## HCFCs

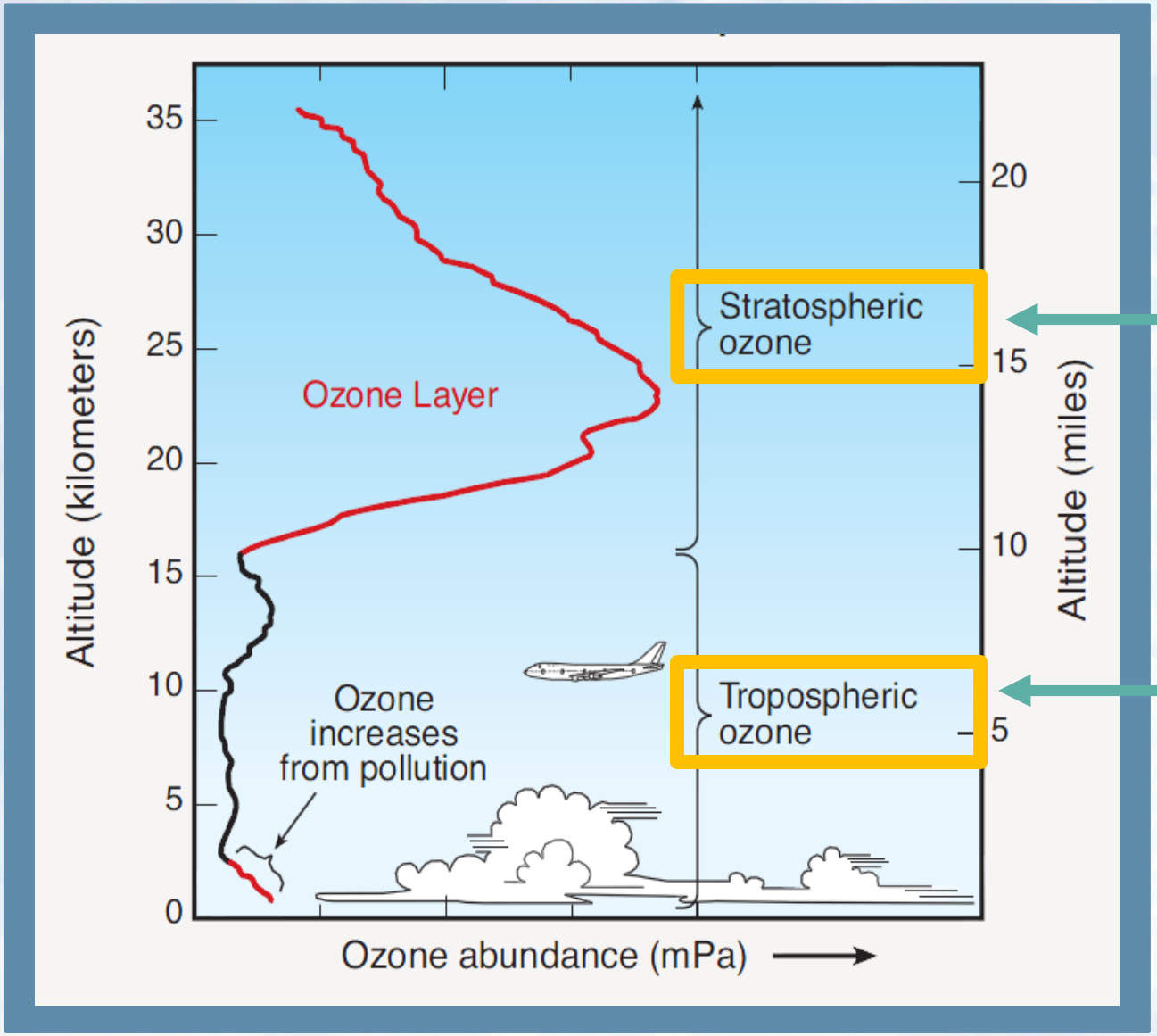
- Class II ODS with ODP < 0.2
- R-22, R-141b, etc.
- Production being phased out by 2020 (R-22 phase out started in 2010)

## HFCs

- Non-ODS, but several have high GWP
- R-134a, R-407C, R-410A, etc.
- Production targeted for future phase down

# ODS Science

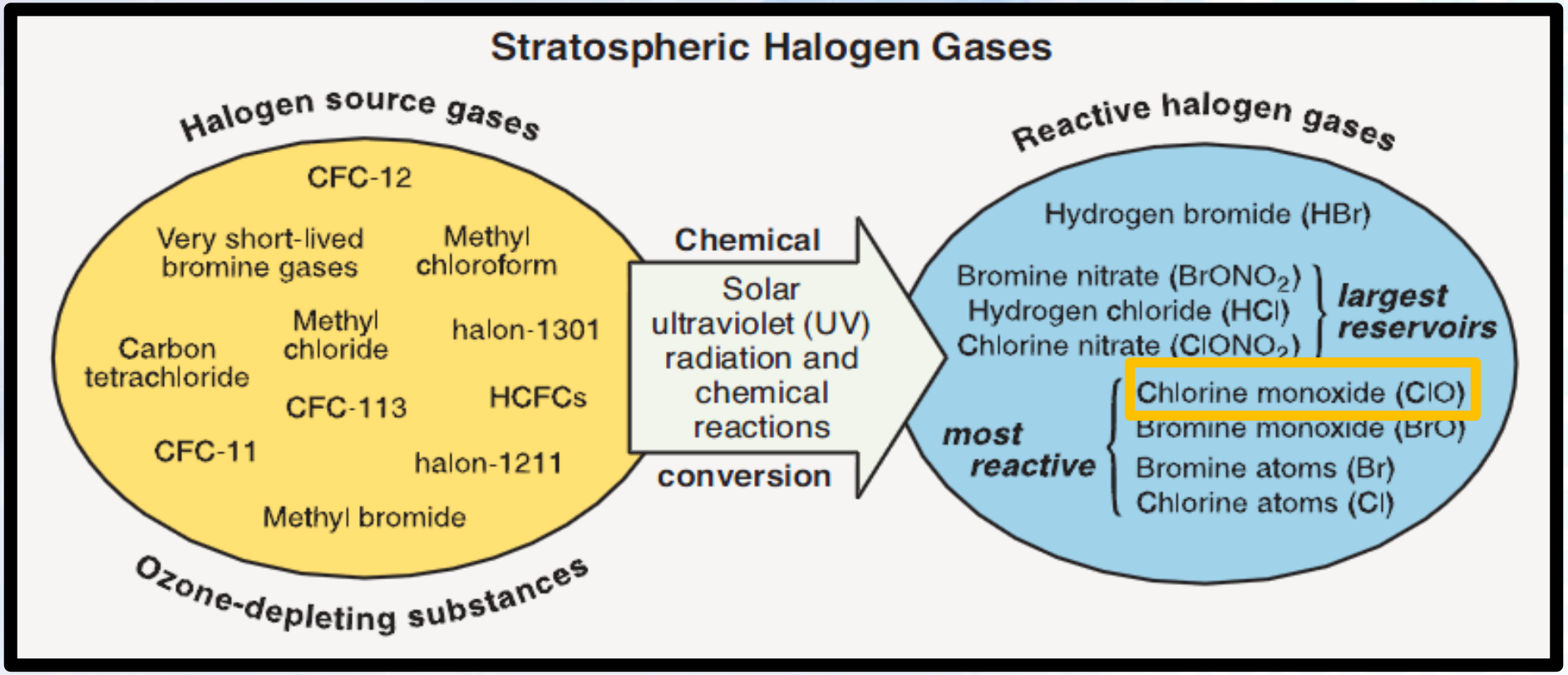
# Atmospheric Ozone




"Good Ozone"

"Bad Ozone"

# Stratospheric Ozone Depletion



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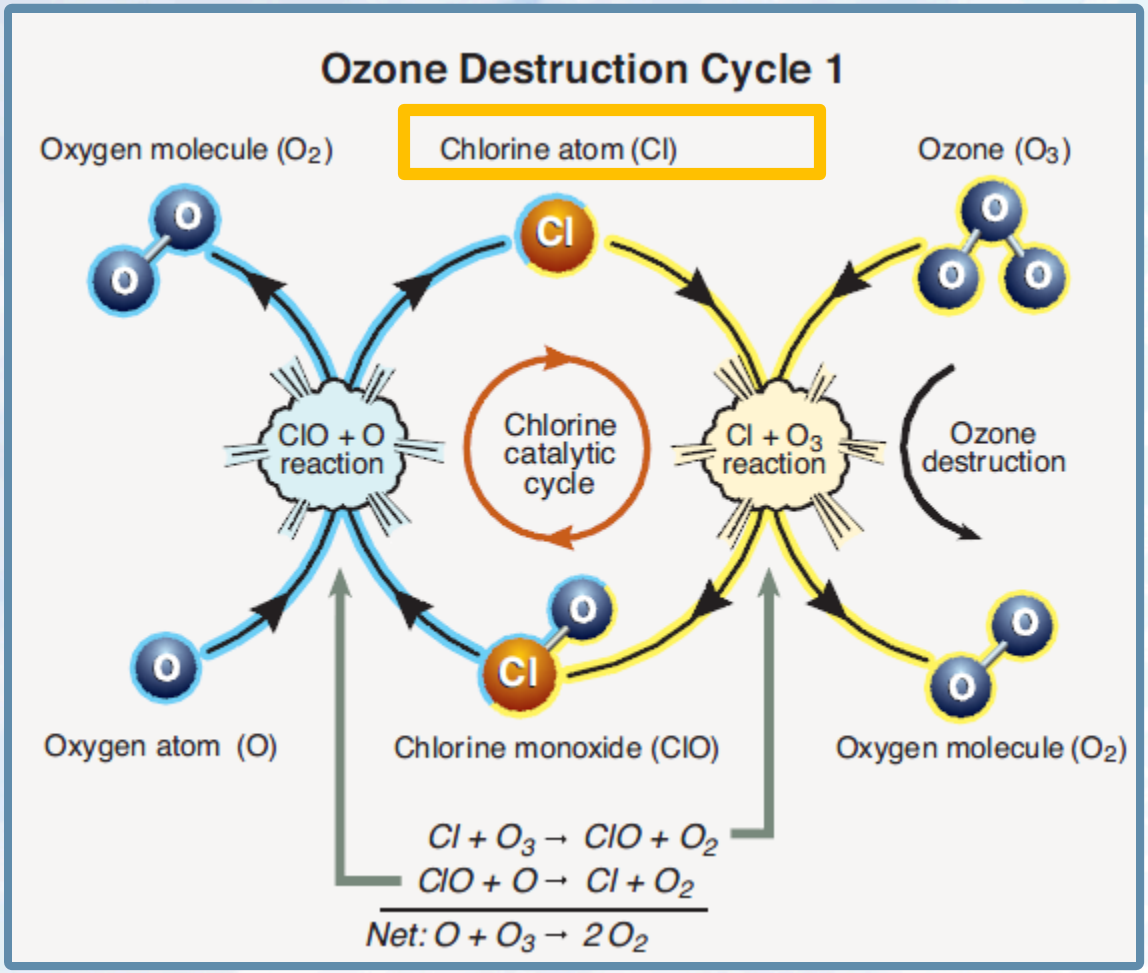
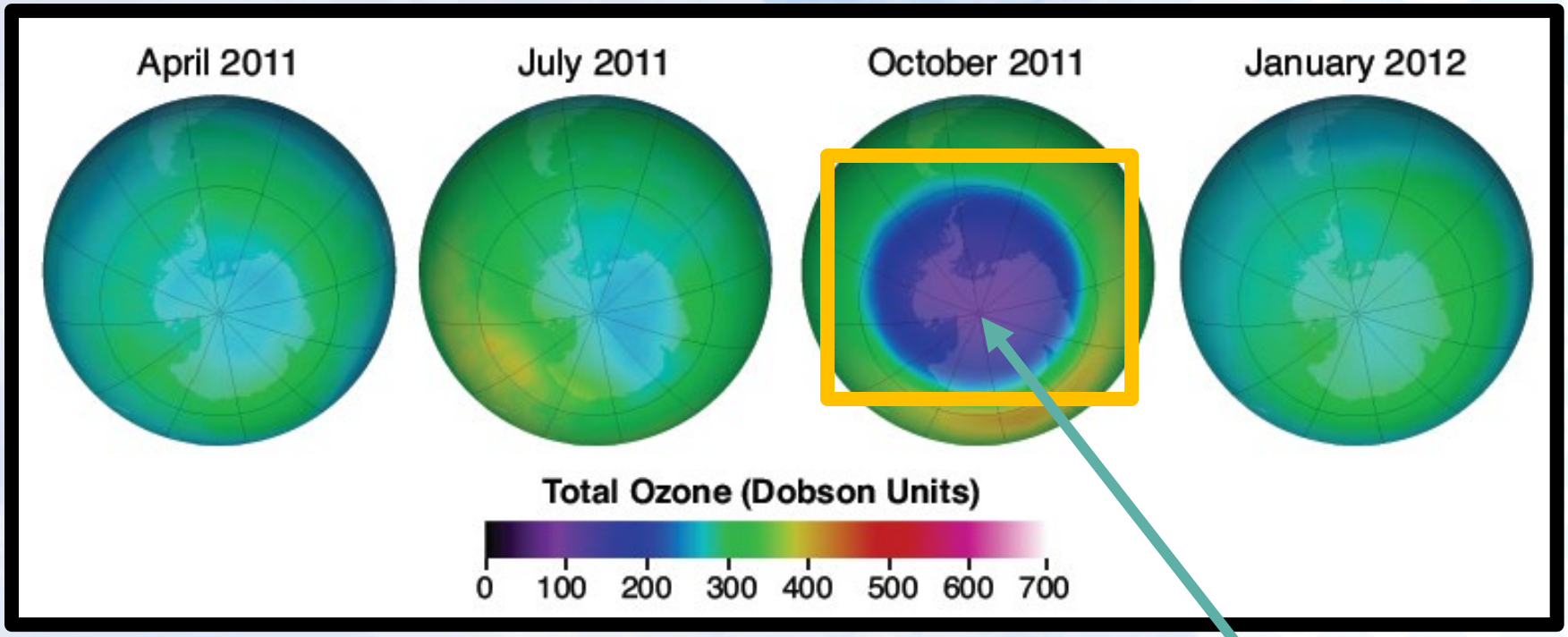



A single atom of **chlorine**, acting as a catalyst, destroys many ozone molecules (~100,000) before it reacts with another gas and breaks the catalytic cycle.

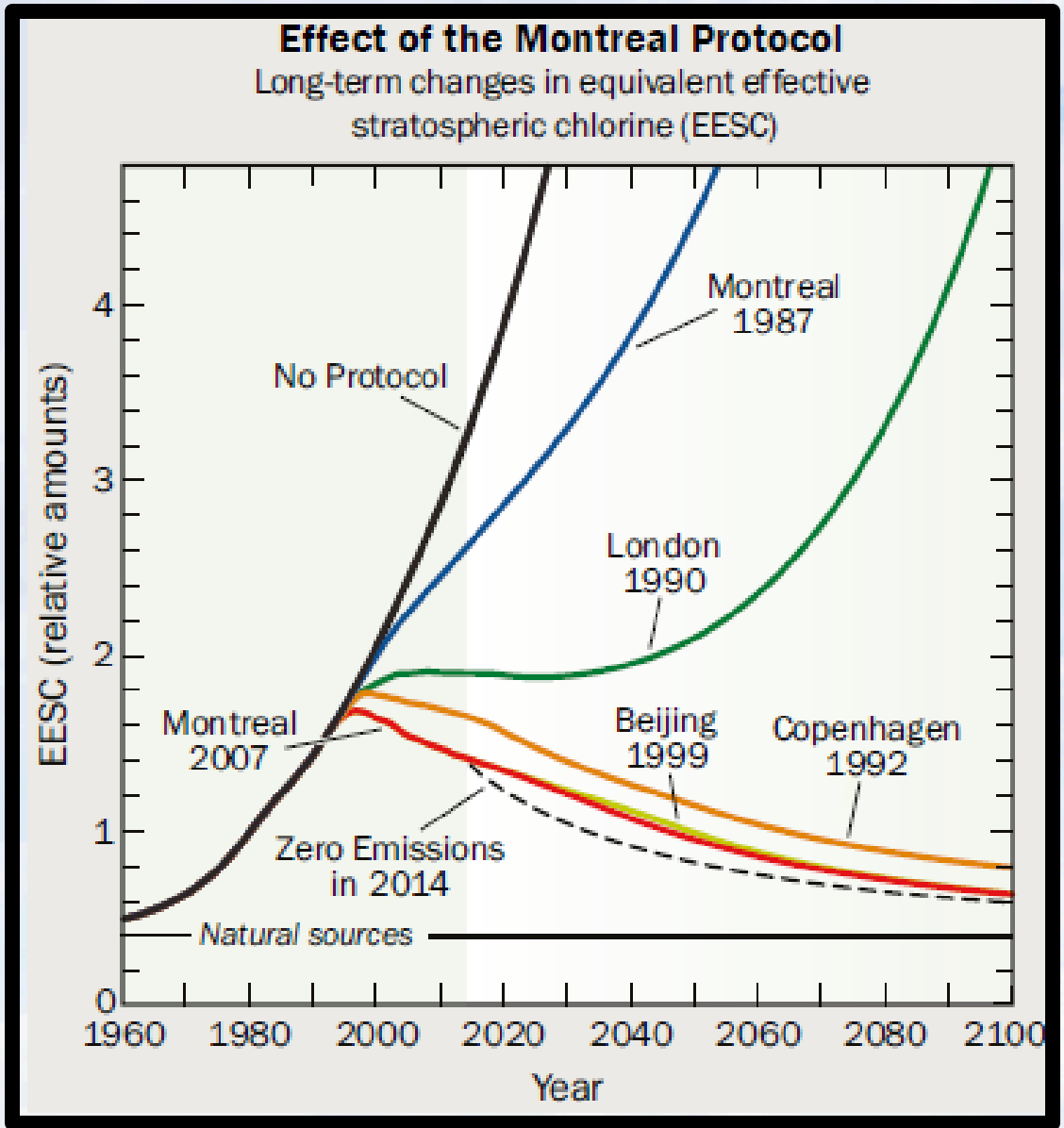
# Stratospheric Ozone “Hole”




Antarctic Spring Ozone Depletion

# ODS Regulations

# International Treaties History




**<u>September 2007:</u>**
Agreement on accelerated phase-out of HCFCs

# Expansion of Montreal Protocol

## Kigali Amendment – October 2016

Phase-down of HFCs, which are non-ODS substitutes that are potent GHGs (10% - 2019, 40% - 2024…)

Started with 2014 U.S. led proposal in Paris

If ratified, EPA could amend 40 CFR 82 to implement the phase-down of HFCs

# How do EPA's Refrigerant Rules Impact Facilities and Technicians?

## 1. Phase out of Specific Refrigerants (Subparts A, C, G, & I)

- CFCs phased out of production in 1996 (e.g., R-11, R-12)
- HCFCs being phased out of production (e.g., R-22) by 2020
- HFCs now targeted for phase down
- SNAP Program approves/ disapproves substitutes
- Reduces supply and increases cost

## 2. Required Practices when Working on AC Units (Subparts B & F)*

- Technician certifications
- Evacuation & recovery (no venting)
- Disposal requirements
- Sales restrictions
- Leak repair provisions for large appliances
- Promotes recovery, recycling, & reclamation

*Commonly referred to as Clean Air Act Section 609 (mobile) and Section 608 (stationary) provisions

# Relevance to Industry

## 1. Phase out of HCFCs and HFCs…

- **Increase refrigerant costs and accelerate equipment retrofits/replacements**

## 2. Non-compliance with the leak repair provisions…

- Earthgrains Baking - $5.25 million
- Bristol Meyer Squibb - $3.65 million
- American Seafoods Group - $9-$15 million

## 3. Revised leak repair provisions…

- Significant raising of the bar for recordkeeping

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- **Significant raising of the bar for recordkeeping**

# Developments in Refrigerant Phase Out Schedules

# Relevance to Industry

## HCFC Production Phase Out Schedule

**2015**

**90%**

**2020**

**99.5% Overall**

**100% R-22, R-141b**

**2030**

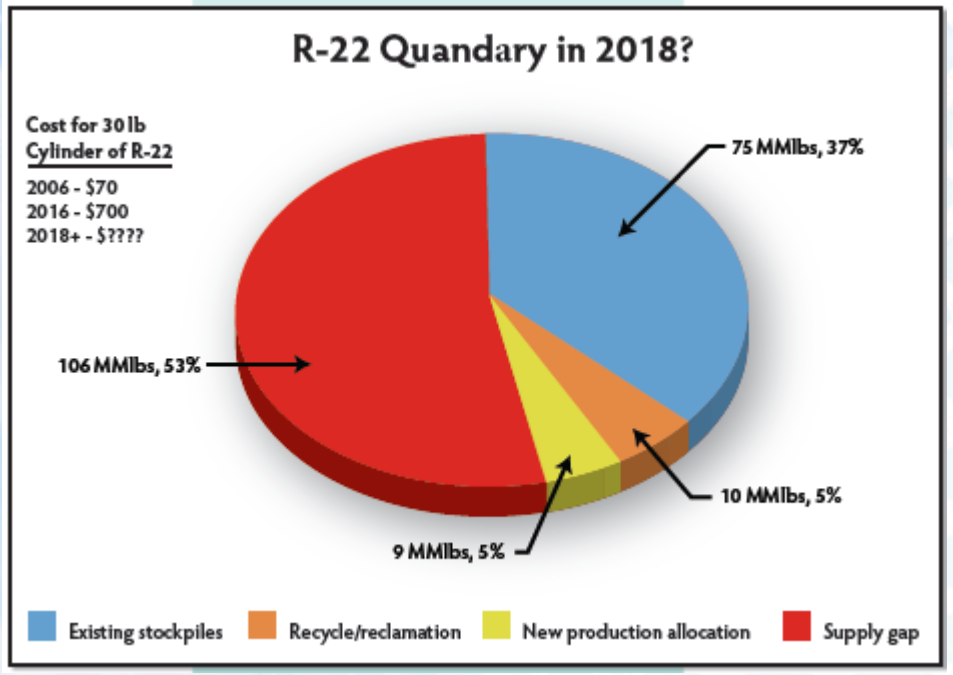
**100%**

# R-22 Quandary…

EPA production allocations = 13 million lbs (2017), 9 million lbs (2018), & 4 million lbs (2019)

EPA estimates recycle/reclamation < 10 million lbs/year in 2016

Represent only a fraction of the ~200 million lb/year service need in the U.S.



# Latest on R-22…

**1. Continues to be most commonly used refrigerant across all industry sectors.**

- **Installed capacities at most sites range from several 100 lbs to several 1,000 lbs.**

**2. Most retrofits/retirements are NOT planned.**

**3. R-22 prices have returned from $25-$35/lb levels to $10-$17/lb levels.**

- Due largely to success of R-407C as replacement in AC applications.

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# HFCs are the NEW Target

**HFCs (e.g., R-134a, R410A), which are the most common replacement for HCFCs, are the new target since they are potent GHGs.**

# HFC Targeting Mechanisms

1. EPA's SNAP Program

2. Kigali Amendment to Montreal Protocol

3. Expansion of 40 CFR 82, Subpart F (i.e., CAA Section 608) provisions to non-ODS substitutes

# How should Facilities Prepare for Impending Refrigerant Phase Outs?

## Phase Out Preparation

Facility managers must develop inventory of appliances (age, size, refrigerant type) to **quantify exposure to expected rise** in refrigerant costs

Watch for **availability of next generation refrigerants** (e.g., HCs, HFOs, HFO/HFC blends)

Analyze new AC/R unit installations and retrofits based on available **cost data and unit lifetimes**…

# How should Facilities Prepare for Impending Refrigerant Phase Outs?

**If R-407C is facing an impending phase down, does it make sense to switch your R-22 unit to R-407C?**

# Developments in Required Work Practices when Servicing Refrigerant Containing Appliances

# Subpart F Matrix by Appliance & Refrigerant Type (prior to rule revision)

| Category | Venting Prohibition | Sales Restrictions | Evacuation Req's | Technician Certs | Disposal Req's | Leak Repair Provisions |
|---|---|---|---|---|---|---|
| Appliances w/ Non-ODS Substitutes | Yes (unless listed as exempt) | No | No | No | No | No |
| Small Appliances (≤ 5 lbs ODS) | Yes | Yes | Yes (specific) | Yes | Yes (specific) | No |
| Medium Appliances (> 5 lbs & < 50 lbs ODS) | Yes | Yes | Yes | Yes | Yes (no explicit records) | No |
| Large Appliances (≥ 50 lbs ODS) | Yes | Yes | Yes | Yes | Yes | Yes |

# Leak Rate Provisions for Comfort Cooling Appliances - Overview (prior to rule revision)

- Applicable to units with full charge **≥ 50 lbs ODS-containing refrigerant**
  - Applicability determined on a circuit-by-circuit basis
- If the leak rate ≥ applicable "trigger rate" (**15% for comfort cooling appliances**)
  - The leak should be repaired within 30 days*, or
  - The system should be retrofitted (within 1 year), or
  - The system should be retired from service (within 1 year)
- *One option to extend repair window – mothballing (evacuation & shutdown)
- Servicing records required
  - Date & type of service
  - Amount of refrigerant added
  - Date & amount of refrigerant purchased (if add own refrigerant)

# Leak Rate Calculation – It's a Projection of Amount Lost if Not Repaired for a Year

***EPA Leak Rate Calculation for Appliances with Full Charge ≥ 50 lbs – Annualizing Method***

**Step 1.** Take the pounds of refrigerant added to bring the unit to a full charge, and divide that by the number of pounds the unit holds at full charge.

**Step 2.** Take the shorter of:
A) the number of days that have passed since the last day refrigerant was added OR
B) 365 days
and divide that number into 365 days/year

$$Leak\ Rate\ (\%\ per\ year) = \frac{Refrigerant\ Added\ (lbs)}{Full\ Charge\ (lbs)} \times \frac{365\ \left(\frac{days}{year}\right)}{A\ or\ B\ (days)} \times 100$$

**Step 3.** Multiply the result from Step 1 by the result from Step 2.

**Step 4.** Multiply the number calculated in Step 3 by 100 to calculate a percentage.

Rule also allows for use of the rolling average method, but the annualizing method is, by far, the most commonly used method. Note also that only one leak rate calculation method can be used per facility.

# Leak Rate Calculation Example

- Determines the amount of refrigerant that **would** leak out in a year if nothing done
- Example (using "**Annualizing Method**"):
  **Day 1** - Unit fully charged with 250 lbs of R-22
  **Day 8** - Unit found to have lost 2 lbs of R-22

  **Leak Rate** = **41.7%** =

$$\left(\frac{2\text{ lbs refrigerant added}}{250\text{ lbs refrigerant in full charge}}\right)\times\left(\frac{365\text{ day/yr}}{7\text{ days since refrigerant last added}}\right)\times 100$$

# Refrigerant Servicing Rule Revisions

**Rule represents overhaul of 40 CFR 82, Subpart F**

**Finalized on 11/18/2016 (81 FR 82272)**

**Staggered compliance dates of 1/1/2017, 1/1/2018, & 1/1/2019**

# Refrigerant Servicing Rule Revisions

## Three Primary Categories of Changes

1. Extension to non-ODS containing substitutes

2. Revised appliance disposal requirements

3. Revised leak repair provisions for appliances with full charge ≥ 50 lbs

# Extension to Non-ODS Substitutes, Highlights

- Newly manufactured recovery/recycling equipment must be certified, 1/1/2017 [82.158]
- Restriction on sale of refrigerant, 1/1/2017 & 1/1/2018 [82.154(c)-(d)]
- Technicians must be certified, 1/1/2018 [82.161(a)]
- Evacuation requirements for disposal or opening of appliances, 1/1/2018 [82.155 & 82.156(a)-(d)]
- Leak repair provisions as they apply to appliances with full charge ≥ 50 lbs refrigerant, 1/1/2019 [82.157]

# Extension to Non-ODS Substitutes, Common Problem Areas

Technicians not meeting proper evacuation level, which varies by refrigerant and size of appliance

Lack of documentation when using alternative evacuation levels

Using recovery equipment that has not been certified for a particular refrigerant


**Pay attention to certification labels!**

# **Revised** Small Appliance Disposal Requirements

- Two options for final processors (e.g., scrap recyclers, landfills) when disposing of small (≤ 5 lb) appliances*
  - **Option 1** – evacuate and recover refrigerant
  - **Option 2** – verify that refrigerant has been evacuated previously via A) signed statements or B) contract
- **2016 rule:**
  - Relocates these provisions from 82.156(f) & 82.166(i) to 82.155
  - Under Option 2, adds requirement to obtain signed statement when all refrigerant in an appliance has "leaked out" prior to delivery due to unavoidable occurrences
  - Effective date = 1/1/2017 for ODS-containing refrigerants and 1/1/2018 for non-exempt substitutes

*Also applies to disposal of MVACs and MVAC-like appliances

# New Medium Appliance Disposal Requirements, 1/1/2018

- **2016 rule adds explicit technician recordkeeping requirements for disposal of appliances with full charge > 5 lbs and < 50 lbs [82.156(a)(3)]**
  - Company name
  - Location of the appliance
  - Date of recovery
  - Type of refrigerant recovered for each appliance
  - The quantity of refrigerant, by type, recovered from all disposed appliances in each calendar month
  - The quantity of refrigerant, by type, transferred for reclamation and/or destruction
  - The person to whom it was transferred
  - The date of transfer
- **Owners/operators only required to maintain these records if directly employ technicians**

# Appliance Disposal Requirements

## Common PROBLEM Areas

- Not having records associated with appliance disposal events
- Not providing signed statements or having required contract language in place with scrap recycler
- Not differentiating between appliances that “leaked out” versus those that required evacuation

# Revisions to Leak Repair Provisions for ≥ 50 lb Units - Highlights, 1/1/2019

**1. Extends applicability to appliances that contain non-exempt substitutes (e.g., HFCs).**

- **Late-breaking news…**

**2. Lowers allowable leak (or repair "trigger") rates [82.157(c)(2)].**

- Comfort cooling & other units - 15% to 10%
- Commercial refrigeration – 35% to 20%
- Industrial process refrigeration - 35% to 30%

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# Revisions to Leak Repair Provisions for ≥ 50 lb Units - Highlights, 1/1/2019

- **Initial and follow-up verification testing:**
  - Now required for **all appliance types**, including comfort cooling and commercial refrigeration (was only req'd for industrial units previously)
  - **Shortens window** for performing follow-up verification test from 30 days to 10 days of initial verification test or of the appliance achieving normal operating characteristics and conditions
- **Standard list of extensions to 30-day repair window for all appliance types:**
  - Mothballing, necessary parts unavailable, radiological contamination issues, & other rules make repair within window impossible
  - 120-day repair window if industrial process shutdown (IPS) required to make repair still reserved for IPRAs

# Revisions to Leak Repair Provisions for ≥ 50 lb Units - Highlights, 1/1/2019

**Establishes leak inspection requirements if exceed allowable leak rates [82.157(g)]**

**CRA/IPRA ≥ 500 lbs:**
quarterly, until 4 consecutive quarters w/ no leaks above allowable leak rate

**All other units ≥ 50 lbs:**
once per calendar year, until 1 year w/ no leaks above allowable leak rate

Must be performed by certified technicians; Not required if equipped with automatic leak detection system

# Revisions to Leak Repair Provisions for ≥ 50 lb Units - Highlights, 1/1/2019

**Reporting required for appliances ≥ 50 lbs that leak more than 125% of their full charge in calendar year [82.157(j)]**

**"Chronic leaker" provision**

**Calculation =**
**amount added / full charge**
**(do not use standard leak rate calculation methods for this purpose)**

**Due March 1st the following year**

# Revisions to Leak Repair Provisions for ≥ 50 lb Units – Recordkeeping [82.157(l)], 1/1/2019

- Expanded servicing records (ID/location of appliance, date of service, parts of appliance serviced and type of service made to each part, name of person performing the service, amount and type of refrigerant added to or removed, full charge, leak rate, leak rate method used)
- Expanded full charge records (full charge, method used, revisions, and date of revisions) for all full charge methods
- Expanded verification test records (location of repairs tested, date, type, and results)
- Adds explicit records for mothballing (date and return to service)
- Adds explicit records for seasonal variance (dates of removal and corresponding addition)
- Adds records of leak inspections (date, method used, leak locations, and certification that all visible parts inspected)
- Adds records for automatic leak detection systems (installation, annual audit and calibration, and date/location of leaks detected)
- Purged refrigerant records (when exempting from leak rate calculations)
- Copies of reports and requests submitted to EPA
- Copies of retrofit/retirement plans

**Red = New**

# Revisions to Leak Repair Provisions for ≥ 50 lb Units - Clarifies Who is Responsible for Servicing Records [82.157(l)(2)], 1/1/2019

(2) Owners or operators must maintain a record including the following information for each time an appliance with a full charge of 50 or more pounds is maintained, serviced, repaired, or disposed of, when applicable. If the maintenance, service, repair, or disposal is done by someone other than the owner or operator, that person must provide a record containing the following information, with the exception of (l)(2)(vii) and (viii) of this section, to the owner or operator:

Similar language in leak inspection (l)(3) and verification testing (l)(5) recordkeeping provisions

**(vii) full charge of appliance and (viii) leak rate and method used to determine leak rate**

**Best Management Practice**

# Revisions to Leak Repair Provisions - Notifications & Reporting

Notifications/reports (e.g., repair window extension requests, chronic leaker reports) submitted electronically to 608reports@epa.gov [82.157(m)] (effective date = 1/1/2019)

# Summary, Recommendations, and the Future

# Subpart F Matrix by Appliance & Refrigerant Type (after rule revision)

| Category | Venting Prohibition | Sales Restrictions | Evacuation Req's | Technician Certs | Disposal Req's | Leak Repair Provisions |
|---|---|---|---|---|---|---|
| Appliances w/ Exempt Substitutes | No | No | No | No | No | No |
| Small Appliances (≤ 5 lbs ODS or Non-Exempt Substitute) | Yes | Yes<br>Applies to Non-Exempt Subs on:<br>1/1/17 – Used Ref<br>1/1/17 – Appliances<br>1/1/18 – New Ref | Yes (specific)<br>Applies to Non-Exempt Subs on:<br>1/1/18 | Yes<br>Applies to Non-Exempt Subs on:<br>1/1/18 | Yes (specific)<br>"Leaked out" Records Req'd on:<br>1/1/17 – ODS<br>1/1/18 – Non-Exempt Subs | No |
| Medium Appliances (> 5 lbs & < 50 lbs ODS or Non-Exempt Substitute) | Yes | Yes<br>Applies to Non-Exempt Subs on:<br>1/1/17 – Used Ref<br>1/1/17 – Appliances<br>1/1/18 – New Ref | Yes<br>Applies to Non-Exempt Subs on:<br>1/1/18 | Yes<br>Applies to Non-Exempt Subs on:<br>1/1/18 | Yes<br>Explicit Records Req'd on:<br>1/1/18 – ODS<br>1/1/18 – Non-Exempt Subs | No |
| Large Appliances (≥ 50 lbs ODS or Non-Exempt Substitute) | Yes | Yes<br>Applies to Non-Exempt Subs on:<br>1/1/17 – Used Ref<br>1/1/17 – Appliances<br>1/1/18 – New Ref | Yes<br>Applies to Non-Exempt Subs on:<br>1/1/18 | Yes<br>Applies to Non-Exempt Subs on:<br>1/1/18 | Yes<br>Applies to Non-Exempt Subs on:<br>1/1/18 | Yes<br>82.156(i) Applies thru:<br>12/31/18 – ODS<br><br>82.157 Applies starting:<br>1/1/19 – ODS<br>1/1/19 – Non-Exempt Subs |

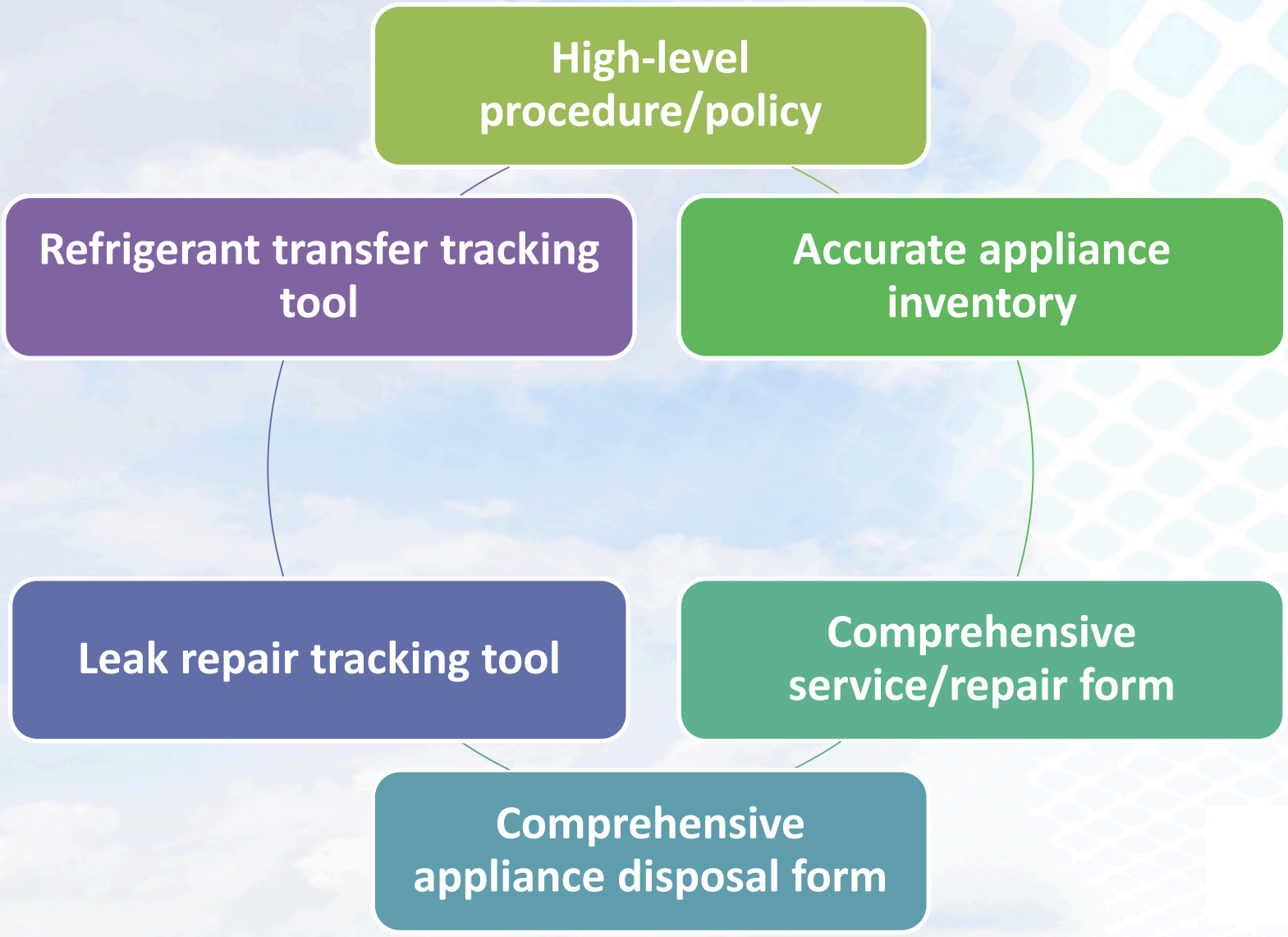
# What should you be doing now?

Using EPA required work practices previously reserved for ODS-containing refrigerants (e.g., R-11, R-22) on non-ODS substitutes (e.g., R-134a, R-410A) (technicians, certified recovery/recycling equipment, required refrigerant evacuation levels)

Have implemented changes to appliance disposal recordkeeping

Have implemented new leak repair provisions on ≥ 50 lb units including conducting initial and follow-up verification testing for all leaks (BMP) and implementing system to maintain new records

# Key Components of Refrigerant Compliance Program



# Common Mistakes

- **Assuming your contractor is handling the leak repair provisions (calculations, etc.) for you**
  - You are responsible for violations no matter what the cause!
- **Not knowing which units have full charge ≥ 50 lbs**
- **Assuming technicians have been trained on leak rate recordkeeping & reporting provisions**
- **Not maintaining technician certifications**
- **Not performing leak rate calculations promptly, if at all**
  - Only have 30 days from discovery to repair leaks if over trigger rate
- **Incomplete service records (often just an invoice is not enough)**
  - Not enough information on leak locations

# Recommendations

Implement program with primary goal of fixing all identified leaks within 30 days – simplifies regulatory impact (KISS)

Educate your maintenance personnel and/or contractor

(Annual refresher training)

Develop circuit-by-circuit inventory (focus on ≥ 50 lbs units first)

Create/purchase a system (e.g., spreadsheet, database) to store refrigerant addition data and automatically calculate leak rates on units ≥ 50 lbs

# Recommendations

Assign responsible person – SPOC

(frequent communication maintenance <-> environmental)

Develop timely process for integrating contractor service data into leak rate management program – “short feedback loop”

Require technicians to provide detailed information on leak locations to back-up fact that subsequent leaks are new leaks

Consider the value of auditing your program

# Recommendations

Add labels/tags clearly identifying ≥ 50 lbs units & evacuation requirements (tips off technicians -> leak rate provisions)

If leak rate calculations have never been done, perform historical calculations (3 years) to populate the spreadsheet & determine if any units are a potential problem (TV permit → 5 years)

Tighten contract language for HVAC contractors

Utilize general facility communication tools (i.e., newsletters, e-mail) to notify personnel on ODS purchasing/disposal process

# Late Breaking News…

## RULE UPDATE

**Sep. 2018:**
Proposed to limit leak repair provisions to ODS refrigerants & requested comments

**Oct. 4, 2019:**
Revised rule sent to OMB (has 90 days to complete review). Final early 2020?

Rolling back the leak repair provisions to only ODS refrigerants?
(even though they have been in place since Jan. 1, 2019)


225.346.4003 | chaman@trinityconsultants.com