

Institutional Arrangements for the U.S. Inventory of Fluorinated GHGs

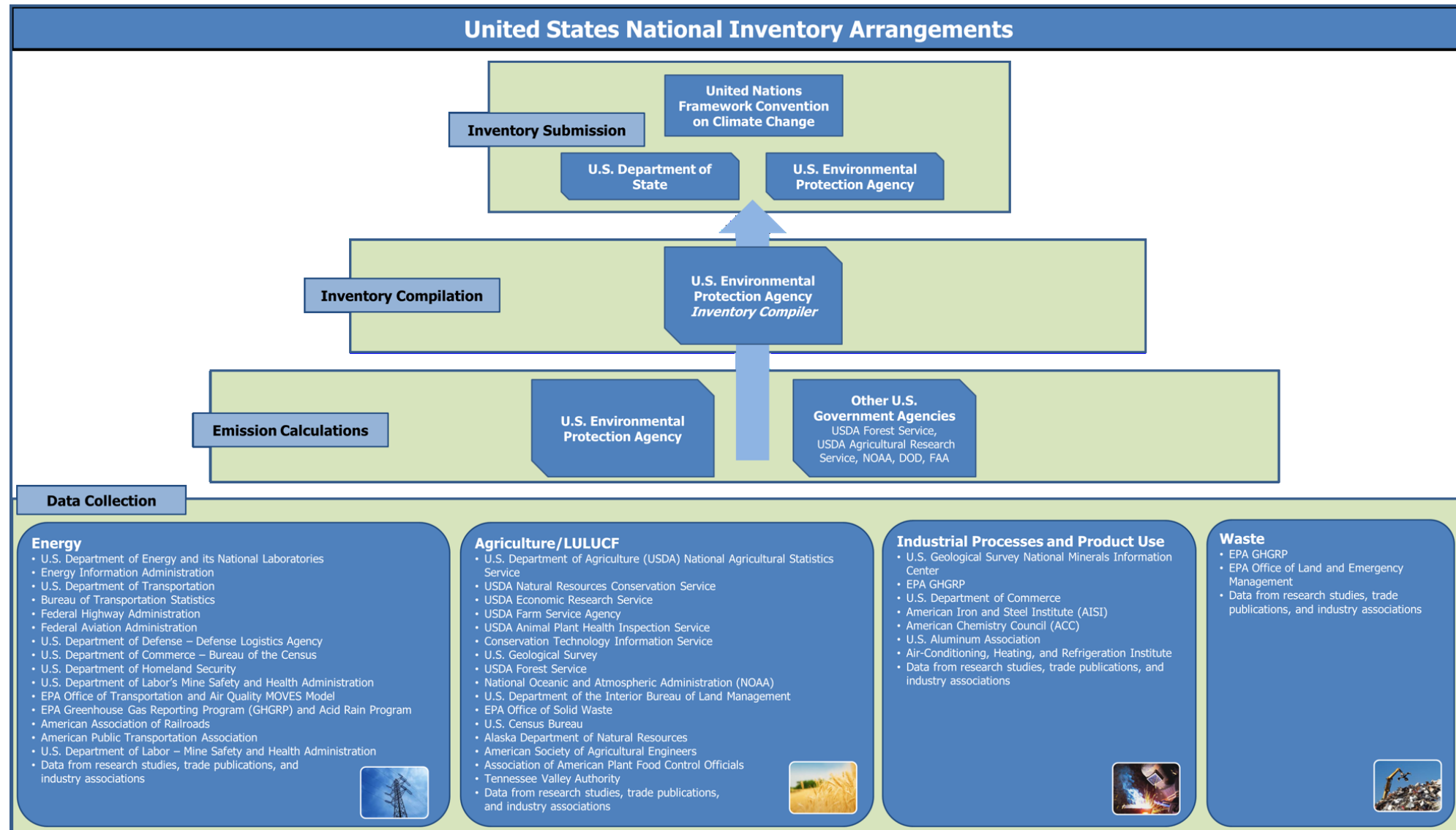
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Overview: US Inventory Arrangements



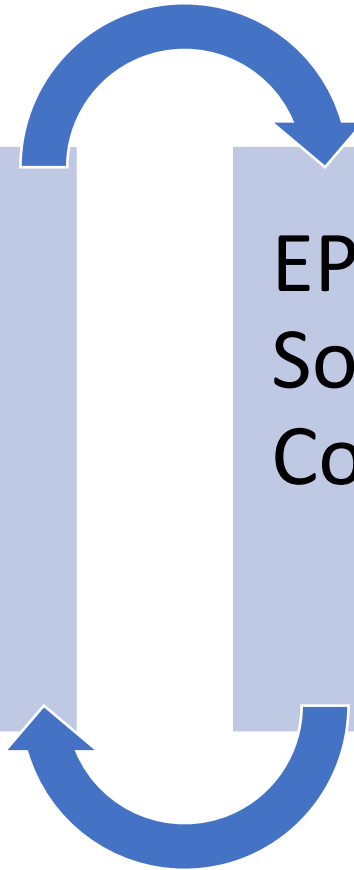
Inventory Agency (EPA) Management Arrangements: Complementary roles

EPA GHG
Inventory
Coordinator

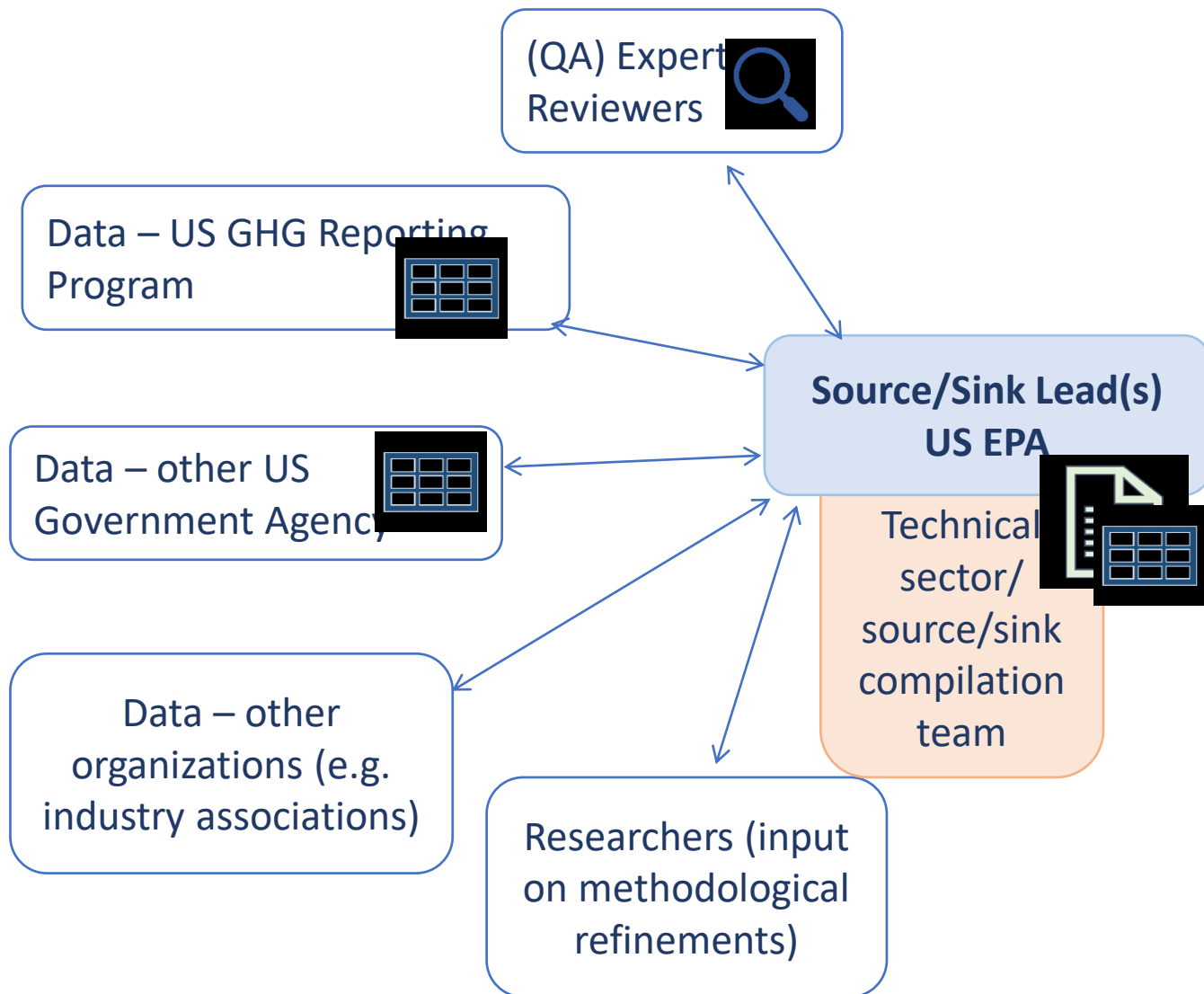
Leads and manages cross-cutting work to assemble national GHG emissions and removal estimates, report development and submission to UN, and overall inventory improvement tracking

EPA
Source/Sink
Coordinators

Lead and manage category-level estimate development and documentation, relevant sector/subsector analysis (QC, uncertainty), and improvement tracking



US GHG Inventory Preparation: Source/Sink Estimate Development



U.S. EPA Source/Sink Lead Tasks

Maintain proficiency in source/sink IPCC methods

Lead methodological choice, data collection and estimate compilation

Prepare/update GHGI category text and methodological annexes

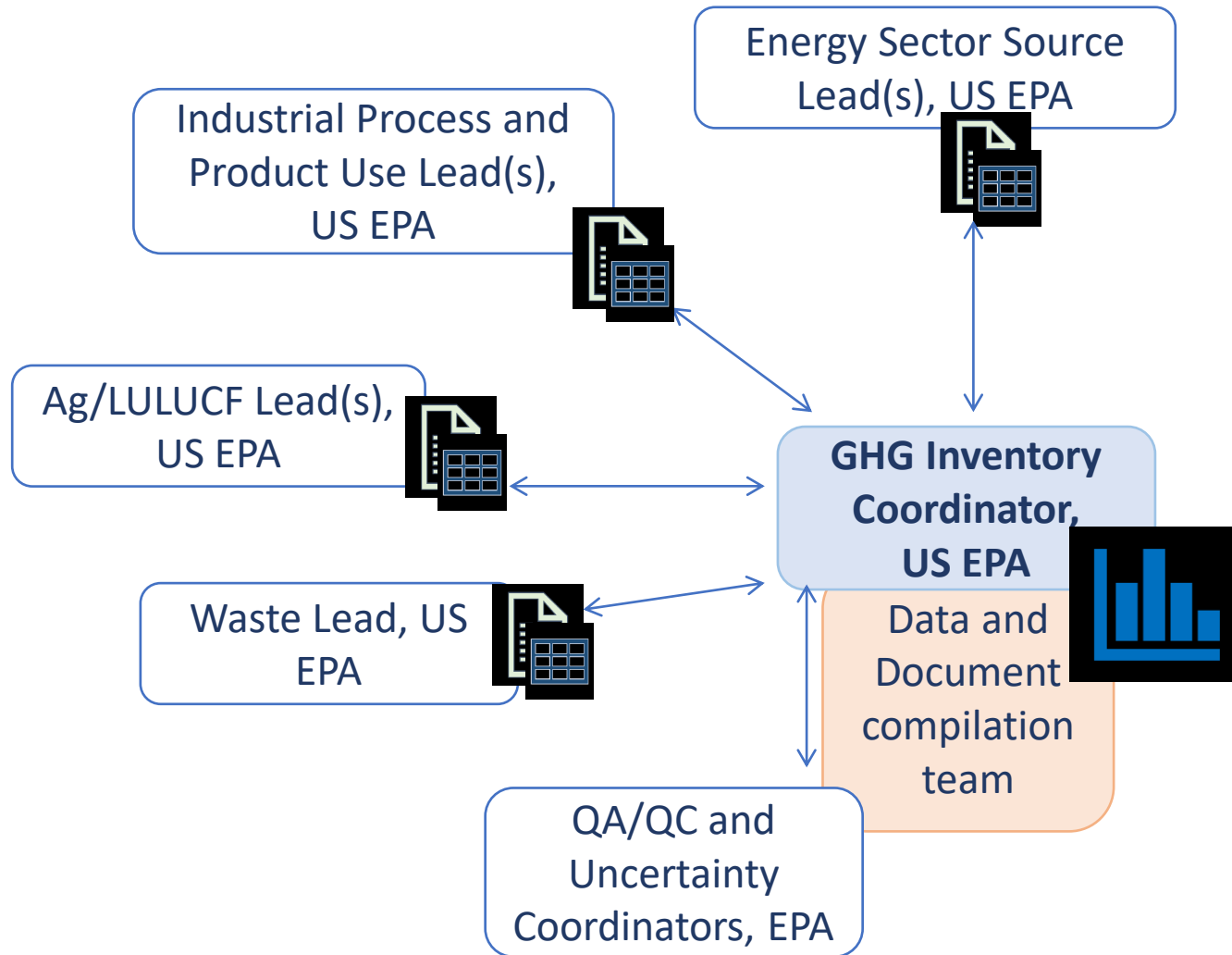
CRF input tables (i.e. sector, subsector, or category as applicable)

Uncertainty analysis (i.e. category-level)

Source/sink category QA/QC and improvements

Participate in UNFCCC processes (e.g. reviews)

US GHG Inventory Preparation: Estimate and Report Compilation



U.S. EPA Inventory Coordinator Tasks

Maintain proficiency in UNFCCC reporting, IPCC GL (in particular cross-cutting guidance)

Manage schedule/tasks, provide cross-cutting guidance on documentation, etc.

Assemble US total estimates

Cross-cutting analyses (e.g. key category analysis, overall inventory uncertainty analysis)

General QA/QC procedures and tracking improvements across Inventory

Coordinate reviews (i.e. domestic and UN)

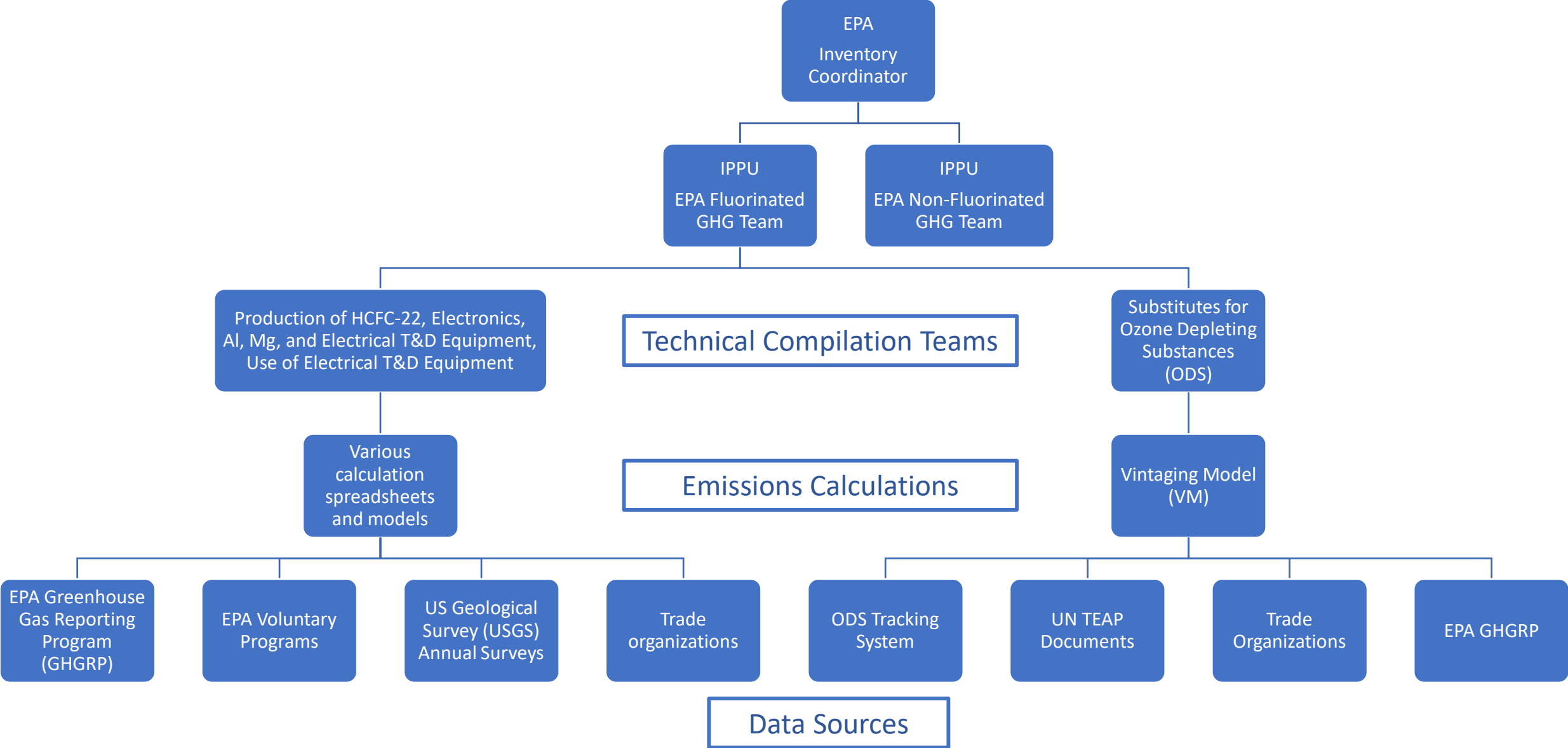
Prepare reporting tables and manage submission to UNFCCC

Maintain archives

Participate in related UNFCCC processes (e.g. reviews)



Overview: US IPPU Inventory Arrangements



EPA Inventory Arrangements: ODS Substitutes

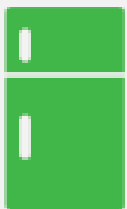
- Roles in Compilation

- EPA: Source Lead and Coordination
- Technical team (EPA experts and consultants) supports EPA lead in estimate preparation and uncertainty analysis

- Data Collection

- Vintaging Model (VM): EPA model supported by expert consultants
 - Tracks types of equipment and practices (“end-uses”) of ODS and substitutes across six sectors in the United States: refrigeration and air conditioning, foam blowing agents, fire suppression, aerosols, sterilants, and cleaning solvents

Refrigeration and
Air Conditioning



Foam Blowing
Agents



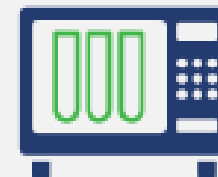
Fire
Suppression



Aerosols



Sterilants



Cleaning
Solvents



Summary of Methods and Data Sources

- EPA's Vintaging Model (VM)
 - Estimates annual chemical emissions from industrial sectors that have used ODS in their products across **67** independently modeled end-uses
 - Tracks chemical from when first produced and placed into equipment or product ("consumption") until finally recycled or released to atmosphere ("emissions")
 - The model requires information on the market growth for each of the end-uses, a history of the market transition from ODS to alternatives, and the characteristics of each end-use such as market size or charge sizes and loss rates
 - Synthesizes data from variety of sources (some CBI):
 - EPA's ODS Tracking System
 - EPA's Greenhouse Gas Reporting Program
 - Published documents from the Montreal Protocol's Technology and Economic Assessment Panel
 - Input and review from trade associations and individual companies

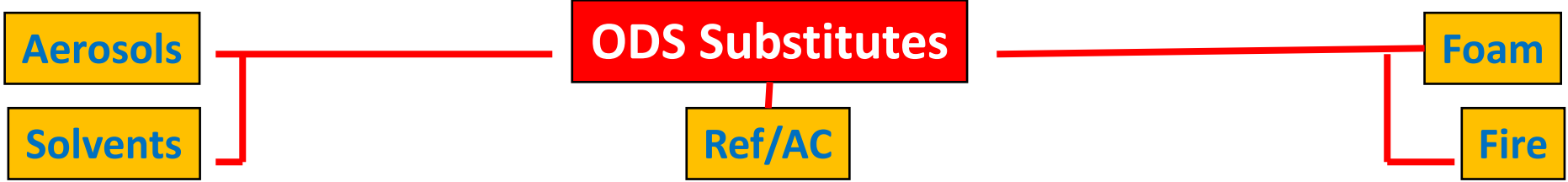


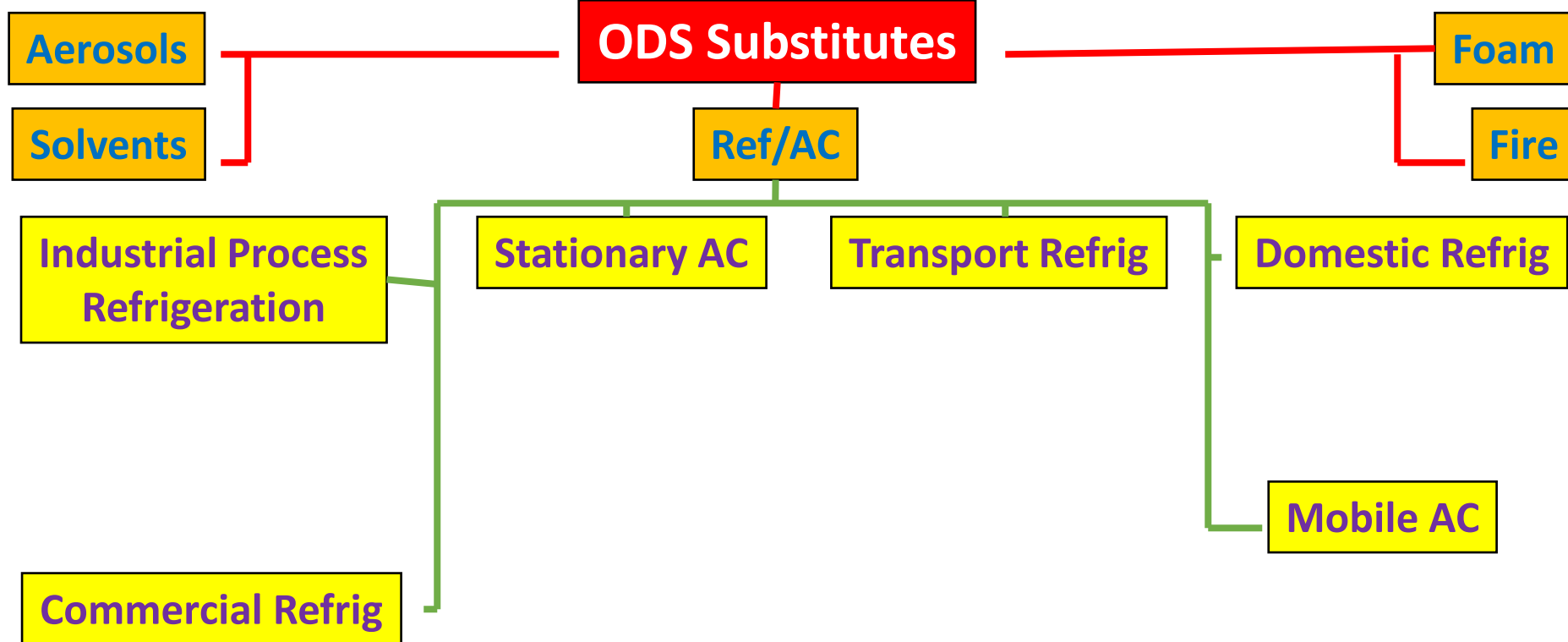
MACs Example

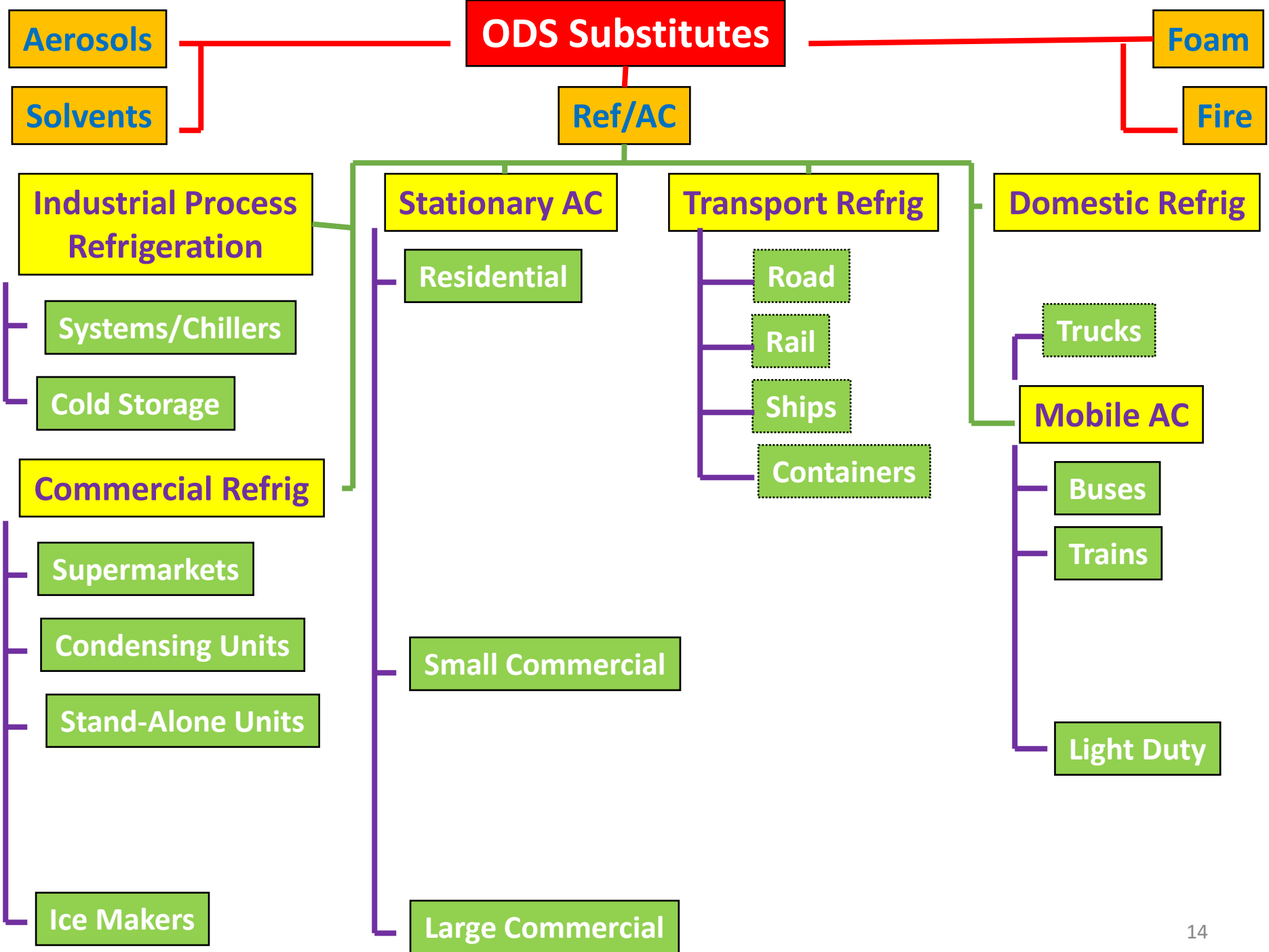
Parameter	Example Data Sources
Market division between light duty vehicles and trucks	Ward's sales data
Vehicles manufactured by year	Ward's sales data
Fraction of vehicles with AC	Air-Conditioning and Refrigeration Institute, Automobile industry groups, Ward's
Lifetime of AC system	IPCC Guidelines, Montreal Protocol TEAP Reports
Transition to alternatives (refrigerant, start date, rate of penetration)	Industry experts
Charge size	Mobile Air-Conditioning Society publications
Emission rates from leaks, service, and disposal	IPCC Guidelines, MP TEAP Reports

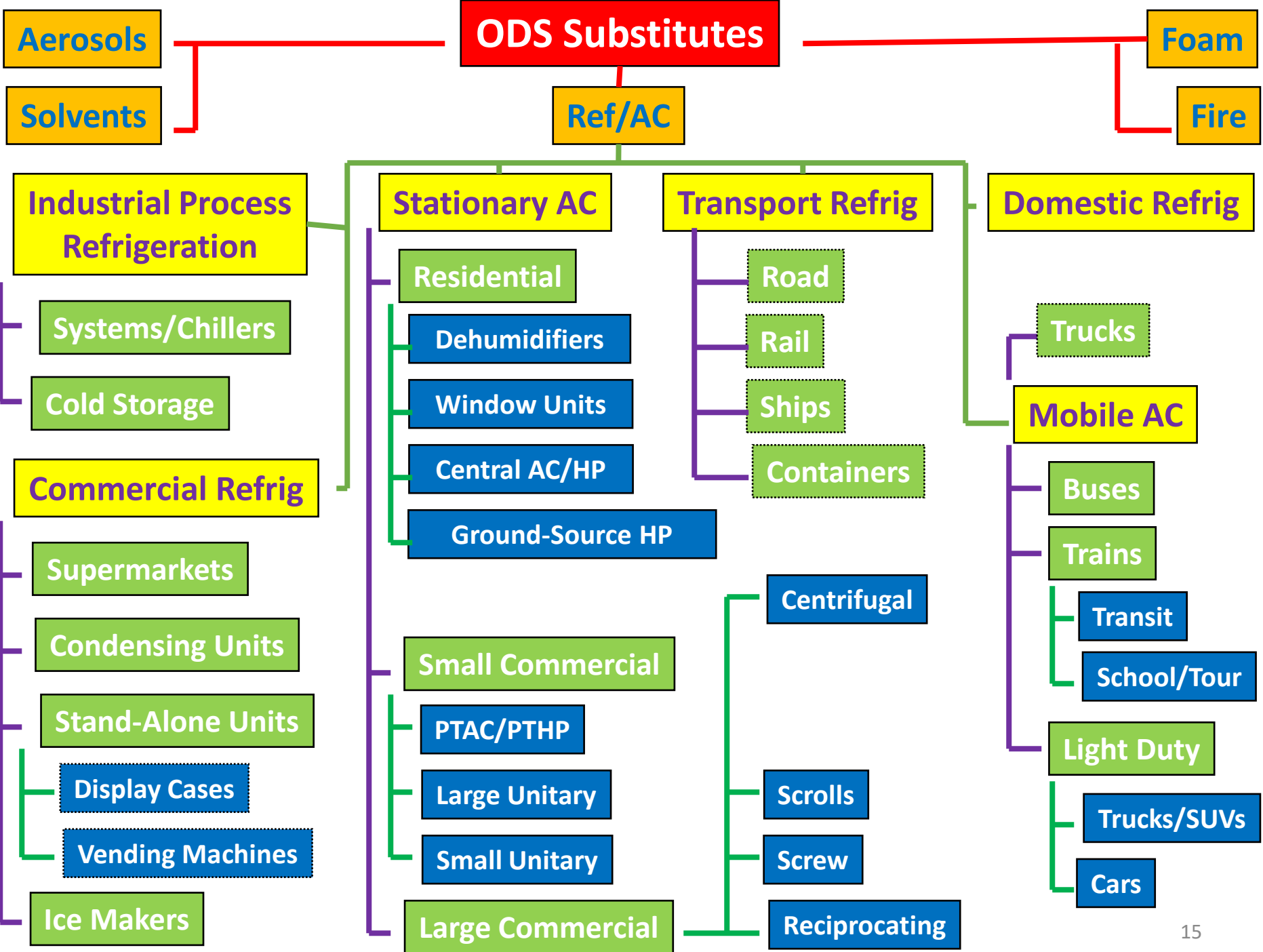
History of the Vintaging Model

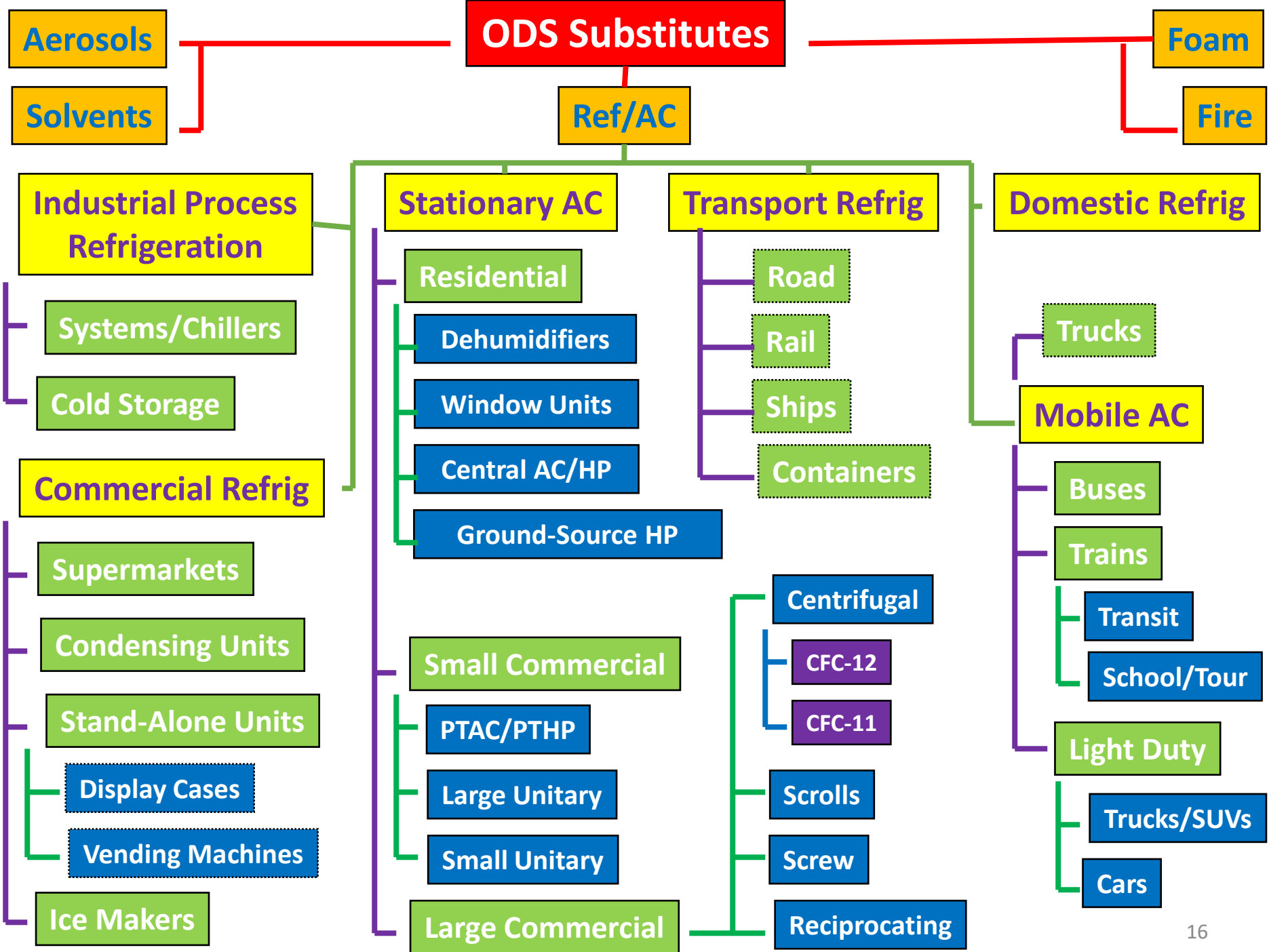
- Originally developed to track emissions and consumption of ozone-depleting substances
- Substitutes (e.g., HFCs) tracked to monitor transition from ODSs and to support policy development and UNFCCC reporting.
- Has grown to include an increasing number of compounds and end-uses over time.











Inventory Arrangements: Other F-GHG Source Categories

- Roles in Compilation
 - EPA: Source Lead and Coordination
 - Technical team (EPA experts and consultants) supports EPA in estimate preparation and uncertainty analysis
- EPA obtains data from a diverse set of sources:
 - Facility-level data from EPA Greenhouse Gas Reporting Program (GHGRP)
 - Facility- or industry-level data from EPA/Industry Voluntary F-GHG Reduction Partnerships (especially before 2011)
 - US Government (e.g., US Geological Survey)
 - Industry associations (e.g., Aluminum Institute)
 - Purchased databases (e.g., World Fab Forecast for electronics)

Key Elements of the GHGRP

- Annual reporting of GHGs by 41 source categories, accounting for about 85-90% of U.S. GHG emissions
 - 33 types of direct emitters
 - 6 types of suppliers of fuel and industrial GHGs
 - Facilities that inject CO₂ underground for geologic sequestration, enhanced oil recovery, or any other purpose
- 25,000 metric tons CO₂ equivalent (CO₂e) or more per year reporting threshold for most sources
- Direct reporting to EPA electronically
- EPA verification of GHG data

Summary of Data Sources

- GHG Reporting Program data available from 2010-2016.
 - Facilities from most F-GHG source categories were not required to collect data until 2011, but data is available for aluminum and HCFC-22 production for 2010.
 - EPA only uses verified estimates from reporting facilities when estimating U.S. emissions.
- Voluntary Partnership data available for earlier years and, for some electric power systems that don't report to GHGRP, for 2010 and later.
 - Depending on industry, emission estimates from partners available beginning from early to late 1990s.
 - Industry participants in EPA's emissions reduction partnerships ("partners") developed and submitted their emissions estimates based on EPA/IPCC methods.
 - Most partners switched reporting to GHGRP in 2010 or 2011.

EPA Extrapolates U.S. Emissions from Reported Emissions

- Depending on source category, GHGRP reporters represent 65% to 100% of the activity resulting in emissions.
 - Partners represented similar shares
- For non-reporters (do not meet the GHGRP reporting threshold) need to identify and quantify
 - activity resulting in emissions; and
 - appropriate emission factors
- Assume that non-reporters emit at same rate as reporters.

Estimation Methods

Source Category	Emissions Calculation Method for Reporting Facilities (IPCC 2006 GL Tier)	Emissions Calculation Method to Account for Non-Reporting Facilities
Aluminum Production	Al production x anode effect mins per cell day x facility slope coefficient (Tier 3)	All facilities report
HCFC-22 Production	Measured [HFC-23] in process stream x mass flow rate (Tier 3)	All facilities report
Semiconductor Manufacturing	Consumption of F-GHGs by Process Type and Wafer Size x Default Emission Factors (Tier 2b+)	Develop and apply EF based on Si area x layers
Magnesium Production	Emissions = Consumption SF ₆ (Tier 2)	Develop and apply EFs based on production
Electrical Equipment	Emissions = Consumption SF ₆ – Net Increase in Nameplate Capacity of Equipment (Tier 3)	Develop and apply EFs based on length of transmission lines (>35kV)

Thank you for your attention!

- Questions?