Template for submitting proposals related to GHG Protocol's *Corporate Standard, Scope 2 Guidance, Scope 3 Standard, Scope 3 Calculation Guidance* and market-based accounting approaches

(Optional)

Proposal instructions

GHG Protocol is conducting four related surveys in reference to the following GHG Protocol standards, guidance and topics:

1. Corporate Accounting and Reporting Standard (Revised Edition, 2004) ("Corporate Standard")
2. Scope 2 Guidance (2015)
3. Corporate Value Chain (Scope 3) Accounting and Reporting Standard (2011) ("Scope 3 Standard"), and Technical Guidance for Calculating Scope 3 Emissions, version 1.0, 2013 ("Scope 3 Calculation Guidance")
4. Market-based accounting approaches

The survey is open until March 14, 2023. To fill out the survey, click here.

As part of the survey process, respondents may provide proposals for potential updates, amendments, or additional guidance to the *Corporate Standard, Scope 2 Guidance, Scope 3 Standard, or Scope 3 Calculation Guidance*, by providing the information requested in this template. You may also use this template to provide justification for maintaining a current approach on a given topic.

Submitting proposals is optional. Respondents may submit multiple proposals related to different topics.

Proposals should be as concise as possible while providing the requested information. Submissions that are outside of the template may not be considered. Proposals may be made publicly available.

To submit the proposal, please save this file and fill out the fields below. When you've completed your proposal, please upload the file via this online folder. Please name your file STANDARD_Proposal_AFFILIATION, e.g., *Scope 2_Proposal_WRI*.

Respondent information

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If proposals are made publicly available, would you like your proposal to be made publicly available? Please write either "Yes" (make publicly available) or "No" (do not make publicly available).

Yes

If your proposal is made publicly available, would you like it to be made publicly available with attribution (with your name and organization provided) or anonymous (without any name or organization provided)? Please write either "With attribution" or "Anonymous".

With attribution

Proposal and supporting information

1. **Which standard or guidance does the proposal relate to (Corporate Standard, Scope 2 Guidance, Scope 3 Standard, Scope 3 Calculation Guidance, general/cross-cutting, market-based accounting approaches, or other)? If other, please specify.**

General/cross-cutting, Corporate Standard, Scope 3 Standard

2. What is the GHG accounting and reporting topic the proposal seeks to address?

Our proposal focuses on reporting practices for fluorinated greenhouse gases (F-gases), such as chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), and hydrofluorocarbons (HFCs).

Current GHG Protocol standards underrepresent the importance of these emissions to most footprints, leading to emissions underreporting and underinvestment in this category of emissions abatement.

We make four suggestions in this proposal, which address the following accounting and reporting topics:

1. Including side-by-side reporting of emissions using the 20-year Global Warming Potential (GWP_{20}) with a comparison to emissions with 100-year Global Warming Potential (GWP_{100}) (**Reporting GHG Emissions, *Corporate Standard; Scope 3 Standard***);
2. Mandating reporting of ozone-depleting refrigerant gases, such as CFCs and HCFCs in all reporting standards (**Tracking Emissions Over Time, Identifying and Calculating GHG Emissions, *Corporate Standard; Scope 3 Standard***);
3. Developing separate guidance for scope 3 refrigerant emissions from air conditioner manufacturers (***Scope 3 Standard***); and
4. Standardizing emissions guidelines for the use and emission of reclaimed refrigerant (**Identifying and Calculating GHG Emissions, *Corporate Standard; Scope 3 Standard***).

3. What is the potential problem(s) or limitation(s) of the current standard or guidance which necessitates this proposal?

HFCs are currently the fastest-growing greenhouse gas in the world, growing at 10 to 15 percent per year (Climate & Clean Air Coalition). As corporations and institutions work to reduce CO_2 emissions and as demand for cooling increases, refrigerants – and HFCs in particular – will become a larger portion of global greenhouse gas emissions.

Emissions of CFCs and HCFCs, the refrigerant gases covered under the Montreal Protocol, are widely underreported in scope 1 and scope 3 inventories. Underreporting occurs in part because standard greenhouse gas reporting guidance makes reporting of these gases optional (GHG Protocol *Corporate Standard*). Contrary to common belief, although new production of CFCs and HCFCs is prohibited across much of the globe, gases that have already been manufactured can continue to be used in perpetuity. Minx et al. 2021, for example, mentions that the percentage of fluorinated gases as a proportion of global emissions doubles when accounting for emissions of CFCs and HCFCs. This "bank" of ozone-depleting gas poses a large threat to the climate and atmosphere, especially as equipment containing these gases nears its end-of-life.

Similarly, although the United States has started HFC phasedown, HFCs can continue to be produced and consumed at high levels. Most developing countries with the fastest-growing demand for HFCs have yet to enter phasedown. The global bank of all refrigerant gases, including CFCs and HCFCs, is expected to grow to 61 $GTCO_2e$ by 2050, up from 24 $GTCO_2e$ today (Theodoridi et al. 2022).

Although the GHG Protocol mandates reporting of HFC emissions, reporting guidance has not been updated to reflect the current state of HFC use, nor emerging science about the mitigation benefits of short-lived gases. Current practices of reporting greenhouse gas emissions using only GWP_{100} figures may obscure the large near-term benefits of F-gas mitigation. Broadly, we believe that updates to the GHG Protocol can fill blind spots around refrigerant emissions in the existing protocol.

4. Describe the proposed change(s) or additional guidance.

Over the coming years, WRI and WBCSD are planning to update their GHG Protocol. The Carbon Containment Lab hopes to play an active role in the revision of GHG Protocol guidelines, with a particular focus on refrigerant gases. Implementation of these suggestions will improve the way that corporations, institutions, and governments report emissions of fluorinated refrigerant gases.

We believe that some relatively simple updates to the GHG Protocol can fill blind spots around HFCs in the existing protocol.

Recommendations:

1) Including side-by-side reporting of emissions GWP_{20} with a comparison to emissions with GWP_{100};
2) Mandating reporting of ozone-depleting refrigerant gases, such as CFCs and HCFCs in *all* reporting standards;
3) Developing separate guidance for scope 3 refrigerant emissions from air conditioner manufacturers; and
4) Standardizing emissions guidelines for the use and emission of reclaimed refrigerant.

Each of these recommendations is explained in more detail below.

1) Side-by-Side Reporting of 20- and 100-Year Global Warming Potentials

In the summer of 2021, the Intergovernmental Panel on Climate Change (IPCC) warned that humanity must make "immediate, rapid, and large-scale reductions in greenhouse gas emissions" to keep a 2° C warming target within reach (IPCC, 2021).

The focus on large, near-term emissions reductions has thrust potent greenhouse gases with short atmospheric lifetimes, such as CH_4 and HFCs, into the climate spotlight (Zaelke and Dreyfus, 2021). The mitigation of these gases has the potential to create much larger near-term temperature reductions on a ton-for-ton basis compared with CO_2.

- GWP is typically measured over two different time horizons: 20 years (GWP_{20}), 100 years (GWP_{100}). These time horizons account for variability in the atmospheric lifetime of greenhouse gases. CO_2, for example, has a GWP of 1 and a lifetime of several centuries, while CH_4, HFCs, and other refrigerants have a lifetime of only several decades, but much higher climate forcing effects.
- Historically, governments and corporations – including in the GHG Protocol – have reported greenhouse gas emissions using *only* GWP_{100}. Although GWP_{100} is a reasonable middle ground in representing the impact of short-lived and long-lived greenhouse gases, it has the drawback of diluting the true near-term impact of short-lived greenhouse gases.

- In recent years, climate leaders such as the New York Department of Environmental Conservation have started to report emissions using GWP_{20}, which magnifies the impact of short-lived greenhouse gases (NYS DEC, 2021). As we explain in response to question 5D, reporting emissions using GWP_{20} poses very little additional burden to emitters.

The GHG Protocol should consider introducing side-by-side reporting of emissions calculated using GWP_{20}. These GWP_{20} figures will provide more complete and scientifically valid information to policymakers to inform their decarbonization decisions.

2) Mandated Reporting of CFCs and HCFCs

Most greenhouse gas inventories, as of March 2023, report *only* emissions of greenhouse gases regulated under the Kyoto Protocol: CO_2, CH_4, N_2O, HFCs, PFCs, SF_6, and NF_3. Non-governmental greenhouse gas reporting protocols do not mandate the reporting of CFCs and HCFCs, which are covered under the Montreal Protocol (GHG Protocol, *Corporate Standard*). EPA reports emissions of CFCs and HCFCs but in the annex to their annual greenhouse gas emissions inventory, out of immediate view of the public and policymakers.

It is not common practice to report emissions of CFCs and HCFCs among corporations and institutions, nor is it common for auditors to request this information, as it is considered optional. Recent research suggests that refrigerant emissions are vastly underreported at the corporate and national level, in large part due to excluding CFCs and HCFCs from mandatory reporting (Muyskens, 2021).

Case Study 1: Since 2020, Yale University has been conducting the first refrigerant emissions inventory of its depth and scale among American institutions of higher education. Through its inventory, Yale discovered that it had been underreporting refrigerant emissions by excluding HCFC emissions from power plant chillers in its greenhouse gas inventory. In 2021, Yale would have underreported emissions from its power plant chillers by more than 25 percent if it had excluded HCFCs from the inventory. Facilities managers noted that including these gases could encourage faster retirement of HCFC chillers.

In Minx et al. (2021), researchers estimated annual global emissions of HFC, SF_6, PFC, and NF_3 at 1.3 $GtCO_2e$. However, authors note that "emissions from excluded F-gas species such as chlorofluorocarbons (CFCs) or hydrochlorofluorocarbons (HCFCs) are *cumulatively larger than the sum* of the reported species [of F-gases]."

Emissions of ozone-depleting substances are particularly high in developing countries, such as India and China, which follow a delayed phaseout schedule compared with developed countries under the Montreal Protocol. In fact, in conversations with a company recovering fluorinated gases in the developing world, we learned that most common gas that the company recovers is HCFC-22. This fact is relevant to both scope 1 and scope 3 standards.

The Yale Carbon Containment Lab analyzed U.S. emissions of refrigerant gases in 2021, the recent year for which greenhouse gas emissions data are available. The EPA reports emissions of gases covered under the Kyoto Protocol in its main report but lists emissions of CFCs and HCFCs separately in the report's Annex. Inclusion of CFCs and HCFCs almost doubles the percentage of refrigerants in

the U.S. greenhouse gas inventory, using both GWP_{20} and GWP_{100} figures (Table 1). **If using GWP_{20} figures, fluorinated refrigerant gases make up 8 percent of the country's emissions.**

Table 1. Emissions Breakdown in the 2021 U.S. GHG Inventory (note: DRAFT publication of inventory).

Gas/Source	2021 ($MMTCO_2e$, GWP_{100})	% Share (GWP_{100})	2021 ($MMTCO_2e$, GWP_{20})	% Share (GWP_{20})
CO_2	5,048.2	78.27%	5,255.80	61.79%
CH_4	727.4	11.28%	1,899.9	25.64%
N_2O	384.8	5.97%	443.3	4.57%
HFCs	175.1	2.71%	391.1	4.80%
HCFCs	78.2	1.21%	284.5	2.68%
CFCs	23.8	0.37%	71.6	0.41%
PFCs	3.5	0.05%	3.8	0.04%
SF_6	8.0	0.12%	4.2	0.07%
NF_3	0.6	0.01%	0.4	0.01%

Source: Analysis from Yale Carbon Containment Lab. Data from Table ES-2 of the 2023 U.S. Greenhouse Gas Inventory and from A-235 of Annex 6 to the U.S. Greenhouse Gas Inventory. Some data, even for past years, may differ from year to year due to EPA revisions.

The proposed requirement to report CFC and HCFC emissions will increase transparency in greenhouse gas reporting and emphasize the continued need to mitigate emissions of ozone-depleting substances.

3) Scope 3 Guidelines for Emissions from Residential and Commercial Air Conditioning

Currently, there is no standard guidance for manufacturers to report scope 3 emissions from air conditioning equipment. However, these refrigerant emissions are a significant contributor to scope 3 emissions of global air conditioning manufacturers both upstream and downstream of their operations.

In our understanding, refrigerant product emissions occur via two pathways: leakage and venting. It is commonly understood that HFCs from small appliances are not recovered at equipment end-of-life. Some original equipment manufacturers (OEMs), such as Daikin, have used the assumption of 0 percent recovery in their own scope 3 emissions reporting (Daikin). OEMs should also report expected emissions from leaked refrigerant, in addition to emissions from refrigerant venting at equipment end-of-life.

The GHG Protocol does not list standard parameters to use for refrigerant emissions calculations, which introduces variability in emissions accounting. One key parameter that varies among companies and agencies is the end-of-life loss rate, the expected percentage of refrigerant that escapes into the atmosphere from product disposal. This number ranges from 50 percent in the case of EPA's refrigerant vintaging model to 100 percent in Daikin's scope 3 emissions guidelines (Daikin).

Specific guidelines for the air conditioning industry may also help manufacturers craft improved scope 3 emissions reduction targets. The following details potential challenges in reporting scope 3 refrigerant emissions using current guidelines:

- Current scope 3 guidelines from the GHG Protocol recommend target setting compared with base year emissions. If companies had not reported emissions from CFCs and HCFCs, current calculation guidelines will result in an underestimate of baseline emissions. Companies would also be at risk to exclude lifetime emissions from products sold over the last two decades using CFCs and HCFCs.
- The allocation technique in reporting scope 3 emissions may translate poorly to the air conditioning sector. Allocation involves assigning proportional chunks of total emissions to products based on efficiency, energy consumption, or cost. Cost, efficiency, and energy consumption vary based on the type of refrigerant used in equipment. This association between refrigerant used and allocation measures may introduce error into scope 3 emissions estimates.

The GHG Protocol should develop standardized guidance for calculating refrigerant emissions at product installation, use, and disposal stages.

4) Guidelines for the Use and Emission of Reclaimed Refrigerant

As countries enter HFC phasedown in line with the Kigali Amendment, the use of reclaimed refrigerant will become more important (Theodoridi et al. 2022). Reclaimed refrigerant is reused refrigerant that meets AHRI 700 purity standards for virgin refrigerant. Reclaimed refrigerant is an important product used to decrease demand for virgin chemical manufacturing and to support a refrigerant recovery ecosystem.

The use of reclaimed refrigerant may pose a challenge for emissions accounting. Recovering and reclaiming refrigerant may in practice prevent emissions that are accounted for on a fluorocarbon producer or original equipment manufacturer's scope 3 tab. But when sold, used, and ultimately emitted via leakage or venting, reclaimed refrigerant would also appear on the equipment owner's scope 1 tab. These factors may lead to double counting of emissions.

Alternatively, this situation has led to some prominent refrigerant reclaimers such as Hudson Technologies to claim that reclaimed refrigerant is a "nearly zero GWP solution" when, in reality, reclaimed refrigerants have the same climate damages as virgin refrigerant gas if emitted.

Therefore, the GHG Protocol should standardize emissions guidelines for the use and emission of reclaimed refrigerant.

5. Please explain how the proposal aligns with the GHG Protocol decision-making criteria and hierarchy (A, B, C, D below), while providing justification/evidence where possible.

A. GHG Protocol accounting and reporting approaches shall meet the GHG Protocol accounting and reporting principles (see Annex for definitions):

- Accuracy, Completeness, Consistency, Relevance, Transparency
- Additional principles for land sector activities and CO_2 removals: Conservativeness, Permanence, and Comparability if relevant

Accuracy: Mandating the reporting of CFCs and HCFCs ensures that these gases are not undercounted in emissions inventories and are properly and accurately reported. By enabling transparency and comparison across emission types, mandated reporting can also enable decision makers to encourage faster retirement of equipment that uses higher GWP gases (see Case Study 1). Similarly, revising guidance on scope 3 emissions and emissions of reclaimed refrigerant ensures that emissions are not undercounted nor overcounted.

Completeness: Mandating reporting of CFCs and HCFCs improves GHG Protocol's coverage of major greenhouse gases.

Consistency: Mandating reporting of CFCs and HCFCs standardizes emissions inventories across emitters. Previously, emitters may choose to report these emissions, creating inconsistent comparisons between emitters' scope 1 (and potentially scope 3) inventories.

Relevance: Reporting side-by-side emissions data using GWP_{20} brings the GHG Protocol into alignment with recent research stressing the importance of mitigation of short-lived climate pollutants. Furthermore, our suggestions about reclaimed refrigerant and scope 3 accounting look forward at the potential consequences of HFC phasedown and rapid air conditioning uptake for greenhouse gas reporting.

Transparency: Reporting CFCs and HCFCs, as well as side-by-side emissions data with GWP_{20}, improves transparency in emissions reporting.

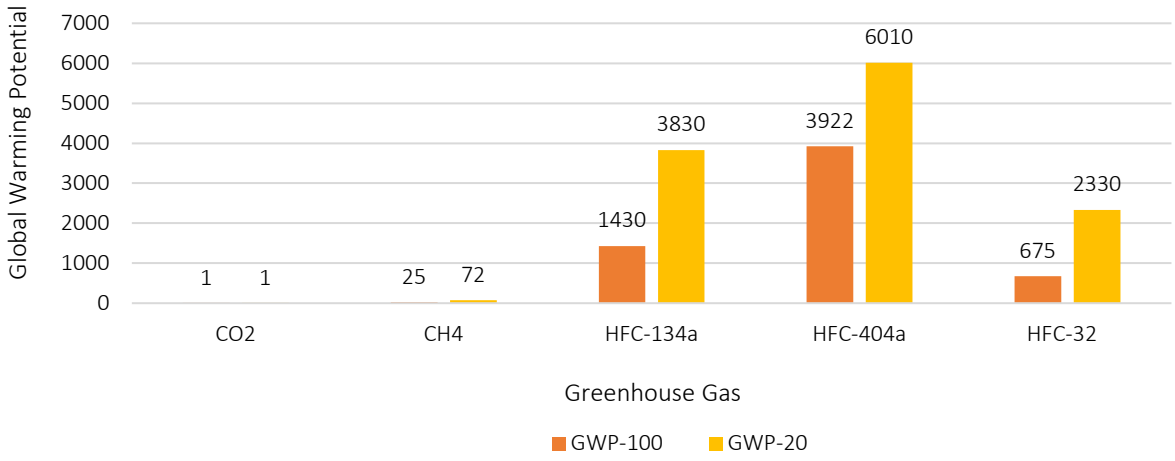
B. GHG Protocol accounting and reporting approaches shall align with the latest climate science and global climate goals (i.e., keeping global warming below 1.5°C). To support this objective (non-exhaustive list):

- Direct emissions reported in a company's inventory should correspond to emissions to the atmosphere. Reductions in direct emissions reported in a company's inventory should correspond to reductions in emissions to the atmosphere.
- Indirect emissions reported in a company's inventory should in the aggregate correspond to emissions to the atmosphere. Reductions in indirect emissions reported in a company's inventory should in the aggregate correspond to reductions in emissions to the atmosphere.

While important, reporting emissions using only GWP_{100} obfuscates some of the key patterns driving near-term climate change. Incorporation of short- and long-term GWPs will be more scientifically aligned with global climate strategies to keep 1.5° C within reach.

- Figure 1 provides key insights about the challenges of refrigerant emissions mitigation. HFC-32, a new-generation refrigerant touted for its lower GWP, is *still* 2,330 times more potent than CO_2 over 20 years. The use of GWP_{20} exposes the continued risk of refrigerant emissions even in a lower-GWP world.

Figure 1. Global Warming Potential Variation by Time Horizon
Source: UNEP.



- Furthermore, as seen in Table 1 (listed under response to question 4), HFCs, CFCs, HCFCs, and CH_4 become more significant portions of the United States greenhouse gas inventory when reported using GWP_{20} figures. We believe that this information may cause emitters to modify their emissions reduction strategies to prioritize the mitigation of short-lived greenhouse gases. We believe that such a strategy would be aligned with best science and strategies necessary to limit warming to 1.5° C.

Lastly, other suggestions included in this proposal -- such as mandating reporting of CFCs and HCFCs -- ensure that emitters bring the GHG Protocol into alignment with the climate imperative to mitigate *all* greenhouse gas emissions, whether or not gases are covered by the Kyoto Protocol.

C. GHG Protocol accounting frameworks should support ambitious climate goals and actions in the private and public sector.

- Would this proposal enable organizations to pursue more effective GHG mitigation/decarbonization efforts as compared to the existing standards and guidance? If so, how?
- Would this proposal better inform decision making by reporting organizations and their stakeholders (e.g. related to climate-related financial risks and other relevant information associated with GHG emissions reporting)?

Yes. Currently, refrigerant management efforts remain an under-investigated form of climate change mitigation. Much of the thoughts in this proposal have emerged from Yale University's own efforts to inventory refrigerants, from which we concluded that refrigerant emissions are typically underreported in greenhouse gas inventories. Such information would allow policymakers and emissions managers to craft better emissions reduction strategies, targeting low-cost and effective mitigation options.

D. GHG Protocol accounting frameworks which meet the above criteria should be feasible. (For aspects of accounting frameworks that meet the above criteria but are difficult to implement, GHG Protocol should provide additional guidance and tools to support implementation.)

- What specific information, data or calculation methods are required to implement this proposal (e.g., in the case of scope 2, data granularity, grid data, consumption data, emission information, etc.)? Would new data/methods be needed? Are current data/methods available? How would this be implemented in practice?
- Would this proposal accommodate and be accessible to all organizations globally who seek to account for and report their GHG emissions? Are there potential challenges which would need to be further addressed to implement this proposal globally? What would be the potential solutions?

We believe that our proposal can be implemented without significant new data sources nor calculation methods.

First, mandating reporting of CFCs and HCFCs emissions should not be burdensome to companies and institutions participating in the GHG Protocol Corporate Standard and/or Scope 3 Standard. Collecting emissions data for CFCs and HCFCs is an identical process to HFCs, requiring either a survey of equipment or analysis of refrigerant purchasing logs. Often, these surveys and logs already include data on CFCs and HCFCs.

Second, reporting side-by-side figures using 20-year Global Warming Potentials involves a simple change to emissions factors used in calculations. These emissions factors -- which are 100-year Global Warming Potential figures currently -- could be expanded to use correct parameters for a 20-year time horizon. These parameters are available in Table 8.A in IPCC AR5.

6. Consistent with the hierarchy provided above, are there potential drawbacks or challenges to adopting this proposal? If so, what are they?

We imagine that other stakeholders may advocate for reporting standards that grant emitters reductions for using reclaimed refrigerant. Although the CC Lab supports scaling the use of reclaimed refrigerant, we do not believe that it is scientifically defensible to treat reclaimed refrigerant as a lower emission product compared with virgin HFC. However, proper incentives should exist for the recovery and reclamation of used refrigerants. We look forward to discussion on this issue as the use of reclaimed refrigerant grows and as we broaden our understanding of lifecycle impact of reclaimed refrigerant.

We also expect some pushback against our proposal to report emissions using GWP_{20} side-by-side with emissions of GWP_{100}. One expected argument is that reporting GWP_{20} emissions would differ from standard practices used in the IPCC and EPA Greenhouse Gas Inventory. However, we believe that best practice in emissions inventories, as seen in New York State, include the side-by-side reporting of both emissions figures.

7. Would the proposal improve alignment with other climate disclosure rules, programs and initiatives or lead to lack of alignment? Please describe.

The GHG Protocol brings corporate greenhouse gas reporting and mitigation efforts into alignment with the Montreal Protocol, which aims to phase out ozone-depleting substances and to phase down HFCs. Currently, since the GHG Protocol mandates reporting for only Kyoto Protocol gases, it creates the adverse effect of discouraging mitigation of ozone-depleting substances that continue to be in use. **We believe that mandating the reporting of emissions of ozone-depleting substances represents low-hanging fruit for greenhouse gas reporting -- with few new data requirements and very little downside, if any.**

We believe that other suggestions in our proposal do not lead to misalignment with other climate disclosure rules, programs, and initiatives.

8. Please attach or reference supporting evidence, research, analysis, or other information to support the proposal, including any active research or ongoing evaluations. If relevant, please also explain how the effectiveness of the proposal can be evaluated and tracked over time.

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9. If applicable, describe the process or stakeholders/groups consulted as part of developing this proposal.

Since March 2022, the Carbon Containment Lab has intermittently engaged with the World Resources Institute on the topic of improving reporting of fluorinated gases.

These suggestions draw from Yale University's own efforts to report its refrigerant emissions more accurately. Yale's understanding of refrigerant emissions has substantially improved over the last several years thanks to the student-run Yale Refrigerants Initiative, which conducted a refrigerant inventory of campus cooling equipment. This inventory showed that under standard reporting practices, refrigerants were being underreported, in large part because of the exclusion of mandatory reporting from CFCs and HCFCs.

We have also interviewed refrigerant and OEM manufacturers, carbon market methodology developers, refrigerant reclamation companies, the US EPA, select environmental NGOs and retailers on the topic of improving refrigerant management and reporting.

10. If applicable, provide any additional information not covered in the questions above.

The Yale Carbon Containment Lab at the Yale School of the Environment is a nonprofit lab aimed at accelerating the adoption of carbon removal and abatement activities. In addition to projects related to carbon removal and methane capture, we also have several active workstreams on management of fluorinated refrigerant gases (F-gases). These workstreams include:

1. Implement end-of-life containment strategies for F-gases, with a specific focus on consumer white goods in developing countries.
2. Research on undercounting and underreporting of refrigerant gases in emissions inventories, including collaboration with the World Resources Institute (WRI) and World Business Council on Sustainable Development (WBCSD) on revising the Greenhouse Gas Protocol to make F-gas reporting more robust;
3. Collaboration with strategic partners in the air conditioning manufacturing sector to accelerate the production and deployment of energy-efficient and low-global warming potential air conditioners in global markets;
4. Advance thought leadership on HFC policy and strategy, in collaboration with NGOs and private sector stakeholders.