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Refrigerants Impact on Sustainability and ESG Reporting

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Greenhouse Gas record-keeping and reporting advisory

US Refrigerant Emissions exceed 600 million pounds annually equivalent to +600 million tons of carbon. This exceeds the emissions from all domestic air passenger travel in the US annually.

Although standardized reporting requirements are under constant development, regulatory bodies are paying close attention to gaps in reporting because investors are demanding oversight.

In focus

There are several standards and/or protocols that provide guidance on reporting or quantifying site-based refrigerant emissions. This report is intended to provide any agency or entity with insights into the full scope of refrigerants' impact, record-keeping, and reporting needs. Note that other programs, including TCFD, SASB, and CDP, are all accepted frameworks.

- **ISO 14001 -** As a section of the International Standards Association, this section details principles and requirements for designing, developing, managing, and reporting organization or company-level GHG inventories.
- **GRI –** was founded to create the first accountability mechanism to ensure companies adhere to responsible environmental conduct principles. Section 305a addresses emissions into air, which are the discharge of substances from a source into the atmosphere. Types of emissions include: greenhouse gas (GHG), ozone-depleting substances (ODS).
- **SBTi -** The Science Based Targets initiative's framework allows specific market segments to set science-based targets to align their lending and investment activities with the Paris Agreement. This framework includes guidance on reporting all seven GHGs (CO2, CH4, N2O, HFCs, PFCs, SF6, and NF3) is required for scope 1 and 2 emissions. Considering data availability challenges, financial institutions should cover all GHGs for scope 3 if possible, with measurement of CO2 as the minimum requirement.
- **Climate Action Reserve -** GHG emissions reduction project protocols provide regulatory-quality guidelines for project development and the quantification of carbon. Developed through a rigorous, transparent process that involves participation from stakeholders representing a variety of sectors, including industry, government, science, academic, public, and environment.

Federal Regulatory Overview 40 CFR Part 82

Due to the high GWP impact from refrigerants, several Federal, State & local regulations affect use and handling in addition to GHG reporting requirements. The programs listed below do not require reporting the GHG values but instead are related to usage & maintenance.

- EPA 608 Effective 1993 and still in force (primarily ODS)
- AIM Act Effective December 2020 and still in force (affects HFCs)
- SNAP (Significant New Alternative Program) rules Effective 1995 and still in force
- California, ARB R3 Program as well as regional requirements for AQMD & CUPA
- Washington rule 1050

In the regulatory reporting process, the framework mentioned here is for reporting and record-keeping is based on 40CFR Chapter 1 Section C PART 82 — PROTECTION OF STRATOSPHERIC OZONE. Be advised that requirements under this obligation may be your original source of data, and although it may be incomplete, it can serve as a starting point.

Gaps in the Road Map

Misaligned record-keeping and reporting requirements between disparate programs may cause conflicts between regulatory and sustainability reporting.

Property owners and managers are required to collect records related to asset maintenance on any HVAC/R system 50 LBS and larger. Additionally, there is a requirement that appliances with 5-50# must keep records on "End of Life" disposition for all materials recovered from these systems. Implementation road map, including the design of a target state reporting framework, to address governance, data and resource challenges. The road map should include the tactical, interim solution while implementing the longer-term automated, strategic solution.

Implementation considerations in the road map should include reconciliation, controls and signoffs on balances and address differences between regulatory reporting functions and GHG data quality. The road map should also include the creation of a strong governance framework to drive accountability and operationalize goals.

Scoping your Refrigerant Reporting Program *Mandatory* GHG Reporting Requirements

There are several standards and/or protocols that provide guidance on reporting refrigerants or F-gases and one federal reporting requirement as well as several regional programs throughout the US.

- **EPA Greenhouse Gas Reporting Program (GHGRP) -** (codified at 40 CFR Part 98) requires reporting of greenhouse gas (GHG) data and other relevant information from large GHG emission sources, fuel and industrial gas suppliers, and CO2 injection sites in the United States. (...) GHG emissions from covered sources exceed 25,000 metric tons CO2e per year.
- **Massachusetts Global Warming Solutions Act (GWSA) -** All facilities regulated under Title V of the federal Clean Air Act and Appendix C of 310 CMR 7.00: Air Pollution Control. Facilities emitting more than 5,000 tons per year of Carbon Dioxide Equivalent (CO2e) must report SF6, HFCs, & PFCs.
- **Regional Greenhouse Gas Initiative (REGGI) -** is a cooperative effort among the states of Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, Vermont, and Virginia to cap and reduce carbon dioxide (CO2) emissions from the power sector.
- **Western Climate Initiative (WCI) -** is an economy-wide cap-and-invest program currently linked between California and Quebec. • California Reporting of greenhouse gas (GHG) emissions by major sources is required by the California Global Warming Solutions Act of 2006 (AB 32) applicable to electricity generators, industrial facilities, fuel suppliers, and electricity importers.

Mark Carney, former Chair of the FSB, is now, as UN Special Envoy for Climate Action and Finance, pushing for worldwide mandatory climate disclosure ahead of the COP26 climate summit, elevating the concept of double materiality to a matter of global concern.

Scoping your Refrigerant Reporting Program *Voluntary* GHG Reporting Requirements

There are several standards and/or protocols that provide guidance on reporting refrigerants or F-gases and one federal reporting requirement as well as:

- **The Climate Registry -** is a non-profit organization that empowers North American organizations to do more in the fight against climate change by providing services and tools that help them reduce their emissions.
- **1605b -** Operated by the EIA - The Voluntary Reporting of Greenhouse Gases Program, required by Section 1605(b) of the Energy Policy Act of 1992, records the results of voluntary measures to reduce, avoid, or sequester greenhouse gas emissions.
- **GRI -** is an international independent standards organization that helps businesses, governments and other organizations understand and communicate their impacts on issues such as climate change, human rights and corruption.
- **CDP -** is a not-for-profit charity that runs the global disclosure system for investors, companies, cities, states and regions to manage their environmental impact.

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Refrigerants Impact

Greenhouse gas lifetimes, radiative efficiencies, and metrics are constantly changing for refrigerants. As our skills, knowledge, and technology for measuring refrigerants improve, so does our accuracy and awareness about their impact. Many factors influence the revision of GWPs, including new estimates of each GHG's lifetime, radiative efficiency, and impulse response functions (the development of atmospheric concentration caused by a pulse of emissions).

The IPCC, the primary authority on climate change science, updated the GWP values several times over the years, each adjustment the result of advances in scientific understanding. Most recently, they published **AR6**; the results on several popular refrigerants are listed below in red. Although these results will not be used for reporting in 2021, they indicate the significance of actual emissions caused by refrigerants. Many refrigerants do not have a lifetime that reaches 100 years, so being aware of the 20-year GWP is important when planning your future investments in HVAC/R equipment. 20-year GWPs attach more weight to short-lived greenhouse gases, such as HFCs, which only stay in the atmosphere for a couple of decades, as opposed to CO2, which stays in the atmosphere hundreds of years and continues to cause warming.

Real 20 Year GWP vs 100 Year

Refrigerant Type	20 year GWP	100 year GWP
R404A	7,208	3,936
R22	5,690	1,760
R407A	4,890	2,085
R410A	4,715	2,100
R407C	4,457	1,700
R134a	4,140	1,120
R448A (Solstice N40)	3,322	1,321
R449A (Opteon XP40)	3,383	1,315
R32	2,530	704
R123	325	90
R452B (Opteon XL55)	2,100	710
R513A (Opteon XP10)	1,823	600

The "real" impact of refrigerants on the environment over the next 20 years. Source: IPCC AR6 published August 2021

EPA & EIA use AR4 for reporting & benchmarking purposes

Material Type	AR4	AR5	Category
R-22	1810	1760	HCFC
R-410A	2088	1725	HFC
R134-A	1430	1300	HFC
R-404A	3922	3260	HFC
R-125	3400	3500	HFC
R-407C	1774	1624	HFC
R-32	675	677	HFC
SF6	22800	23500	PFC

IPCC published AR4 in 2007 and AR 5 in 2021, the AR4 numbers are based on 100 year values ad AR5 on 20 year

Methods & Data Used to Score Quality

Methods are the technical aspects of inventory preparation. Public organizations should select or develop methods for estimating emissions that accurately represent the characteristics of their source categories. Voluntary and mandatory reporting programs specify calculation methodologies, so pay close attention and make sure to accommodate specific report requirements.

Data are the basic information on activity levels, emission factors, processes, and operations. Although methods need to be appropriately rigorous and detailed, data quality is as important. No method can compensate for poor quality input data. The design of an organization's inventory program should facilitate the collection of high-quality inventory data and maintenance.

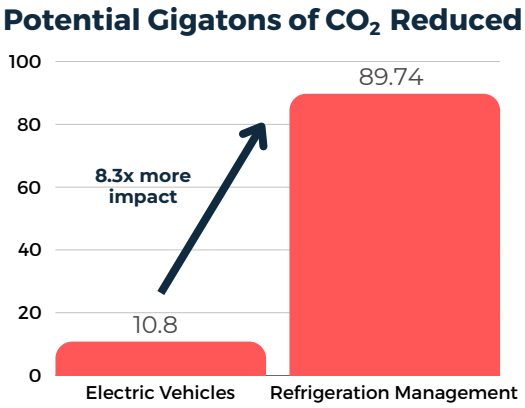
Inventory - These are the institutional, managerial, and technical procedures for preparing GHG inventories and should include the installed capacity for all AC & Refrigeration systems. Establish processes with the goal of producing a high-quality inventory. To streamline GHG inventory quality management, these processes and systems should be integrated into your operational processes. Set disclosure boundaries within your operational process that are aligned with your reporting disclosure. (Hint, size matters)

Documentation - This is the record of methods, data, processes, systems, assumptions, and estimates used to prepare an inventory. It includes everything employees need to prepare and improve an organization's inventory. Because estimating GHG emissions is inherently technical (involving engineering and science) and data-intensive, high-quality, transparent documentation is particularly important for credibility.

If information is not credible or fails to be effectively communicated to internal and external stakeholders, it will not have value.

Why Refrigerants?

Refrigerant leaks are very common and are often underreported. In the US, we leak nearly 600 million pounds of refrigerant annually in a marketplace with an estimated 2.5 billion pounds of refrigerants installed. The leak rate is estimated to be approximately 25% or approximately 600 Mt of carbon.



A team of scientists at Project Drawdown created a list of the 100 methods that have the greatest potential for removing or reducing greenhouse gases, and refrigerants are listed in the top 3 each year because emissions are so high. Refrigerant emissions exceed CO2 emissions related to air passenger travel by 300% (per the ICCT 2019 study showing total emissions in passenger air travel at 179 Mt).

Reporting requirements

Report refrigerant emissions as part of Scope-1 emissions, which includes all unintentional leaks from spills or maintenance from sources owned or controlled by your organization (i.e., within the organizational boundary).

1. Report refrigerant emissions as part of Scope 1 emissions, which includes all unintentional leaks from spills or maintenance.
2. From sources owned or controlled by your organization (i.e., within the organizational boundary).

Note: No limit on system size is defined in any of the protocols.

How can Trakref help?

Trakref has developed a services and software approach that addresses the governance framework, business processes, data quality, data governance, and technology architecture to support the regulatory reporting processes. We understand both short- and long-term priorities and have proven methodologies to address the regulatory reporting requirements for these needs.

Short-term priorities include data sourcing and a gap analysis of assets, standardization of data capture, and engaging the workforce in the data capture process.

Long-term priorities include the centralization of regulatory reporting data, establishing business rules to improve traceability and engagement with vendors, and the establishment of a change control process that will enhance record keeping, reporting integrity controls, auditability, and transactional testing to verify data integrity.

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The Calculus

Your service teams are tracking material usage by weight, but you are reporting the carbon value, which can lead to confusion or conflict. Also, you need to make sure your capturing data is aligned with your record-keeping and reporting needs.

Mass Balance Simplified

If you do not have the necessary data to use the mass balance approach outlined below, you should use the simplified mass balance approach. This method may be used either by entities that service their own equipment or by entities that have contractors service their equipment.

Calculating Emissions of Each Type of Refrigerant

$$\text{Total Annual Emissions (mt)} = \frac{(P_N - C_N + P_S - P_R + C_D - R_D)\ \text{kg}}{1000\ \text{kg/mt}}$$

Where:

PN = Purchases of refrigerant used to charge new equipment
*CN = Total full charge of the new equipment
*PS = Quantity of refrigerant used to service equipment
PR = Quantity of refrigerant recycled
CD = Total full charge of retiring equipment
RD = Refrigerant recovered from retiring equipment

Omitted if the equipment has been pre-charged by the Manufacturer

Mass Balance - Preferred Method

Mass Balance calculations should account for purchases or acquisitions, sales or disbursements, and changes to your installed capacity. Not every purchase is to fill a leak, and refrigerant systems may have their refrigerant extracted and/or changed as part of routine maintenance.

Calculating Emissions of Each Type: HFC, HCFC, CFC and PFC Using the Mass Balance Method

$$\text{Total Annual Emissions (mt of HFC or PFC)} = \frac{(A - B + C - D - E)\ \text{kg}}{1000\ \text{kg/mt}}$$

formulas shared are from Climate Action Reserve

Calculating Emissions of Each Type of Refrigerant		Amount (kg)
Base Inventory - cylinders		
A	Refrigerant in inventory (storage) at the beginning of the year	
B	Refrigerant in inventory (storage) at the end of the year	
Additions to Inventory		
1	Purchases of refrigerant (including refrigerant in new equipment)	
2	Refrigerant returned to the site after off-site recycling	
→ C	Total Additions (1+2)	
Subtractions from Inventory		
3	Returns to supplier	
4	HFCs taken from storage and/or equipment and disposed of to a certified facility	
5	HFCs taken from storage and/or equipment and sent off-site for recycling or reclamation	
→ D	Total Subtractions (3+4+5)	
Net Increase in Full Charge/Nameplate Capacity		
6	Total full charge of new equipment	
7	Total full charge of retiring equipment	
→ E	Change to nameplate capacity (6-7)	

Phantom Emissions

Emissions that are not leaks; however, they appear on your balance sheet because of bad source data or inaccurate record-keeping.

The difference between a leak & a loss

Leaks: should be equipment-based and are related to gas that leaves a system through a weakness or flaw in the asset.

Losses: are related to transfer or handling losses that are unrelated to leaks or equipment.

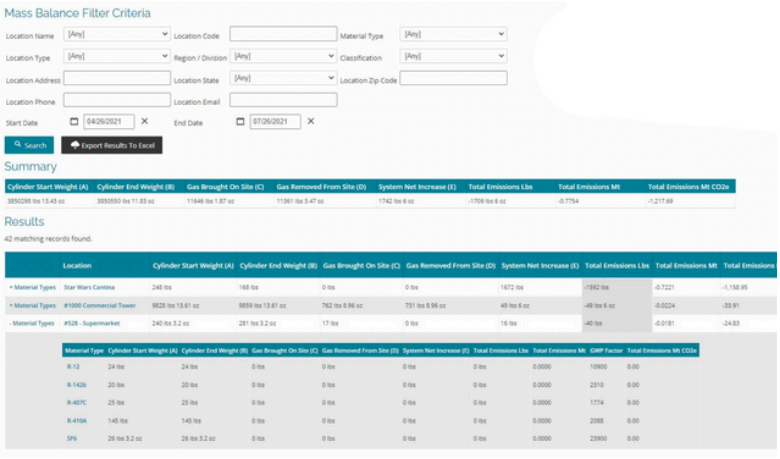
Reporting

Here are the **three reports** that will provide your operation with the most value when determining emissions.

1. Mass Balance Report

The mass balance approach generally measures the carbon exiting the process through products and entering the process through feedstocks, calculates the difference between these two values, and assumes that unaccounted-for carbon is either directly released or oxidized and released as CO2. From the technical viewpoint, this approach enables the integration of various sources that occur at facilities. Since any material not properly tracked will be assumed to be a leak, it is important to pay close attention.

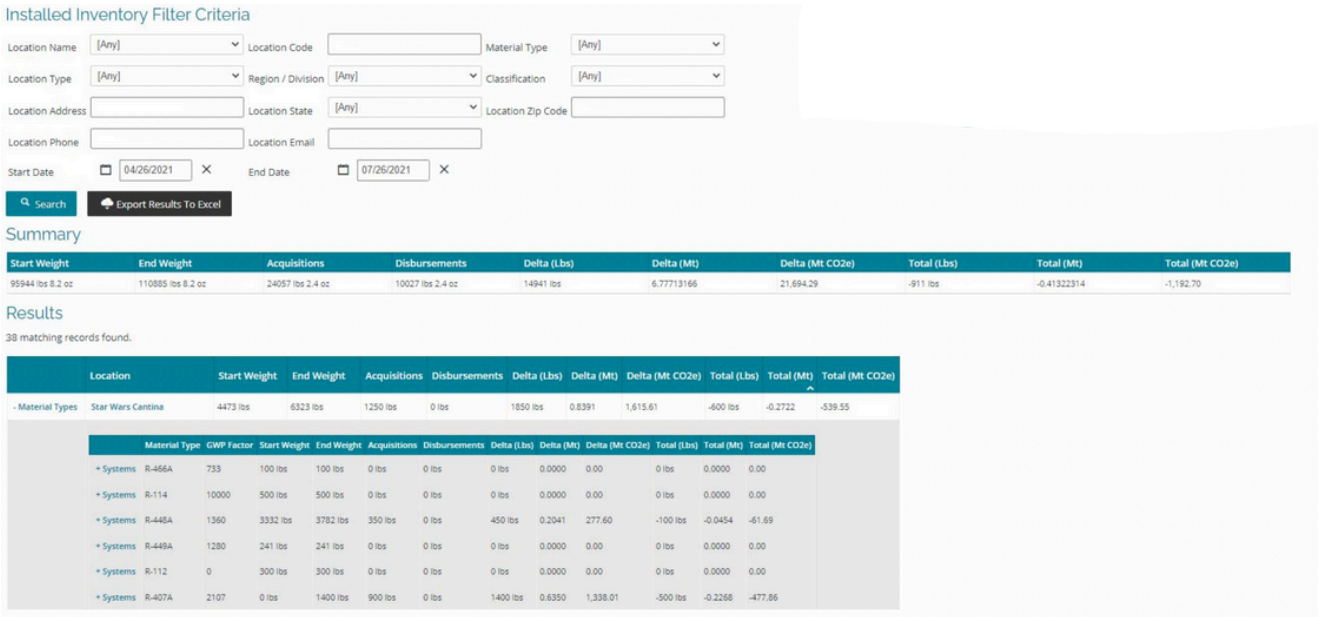
- Cylinder weights - pay attention to reweighing, or mis-weighed or unaccounted cylinders
- Verify installed system weights to ensure material was not improperly applied during a service event
- Standardize data capture so activity can be recorded the same way across the entire work empire.



2. Installed Inventory

Starting with the refrigerant charge installed in your systems, this report will provide you with visibility into your refrigerant Carbon Footprint. Key things to consider:

- 5-7% of all systems are changed annually, requiring you to be aware of system adjustments.
- 5 key changes to appliances that will impact results: salvaging, replacing, installing, or retrofitting, each has a unique impact on your emissions calculations.
- The information on this form enables your team to drill into transactional history and audit changes to materials.



3. Refrigerant Usage

Refrigerant Usage report - the data for this category will be taken from the service transaction reports. Phantom emissions in this category are commonly recorded when service providers overcharge systems or fail to report leaks, recovery, or proper charge information. Make sure controls are in place to stop this from happening. This report will provide your team with 3 key pieces of information:

- Installed capacity for all systems, and it should be flexible enough to enable you to isolate system types, regions, dates, and specific equipment sizes.
- An ability to drill into and audit each refrigerant type.
- A weighted value to share with your team so you can compare refrigerant weight to CO2-related impact.

Note: Determine how your team will monitor and report on inactive equipment that leaked during the reporting period; this can affect between 5-15% of your result.

I. General Partner Information

Company Name:	This Reporting Date:	Number of Corporate Locations:	Starting year
Your Company	12/31/2018	261	2010

Region Name:	Number of Corporate Regions:
	3

II. Corporate-Wide Installed Refrigerant

Note: Report aggregate information for all retail stores under the same Partner and/or banner name. Include offices, break-rooms, etc. co-located inside retail stores. Do not include separate office buildings, distribution centers, warehouses, etc. Do not include refrigerant stored in cylinders on or off site. Include other refrigerants not listed by using extra lines at the bottom of the table.

Refrigerant	Commercial Refrigeration		Air-Conditioning
	Charge ≥ 50 Pounds	Charge < 50 Pounds	
	REQUIRED	OPTIONAL	OPTIONAL
EP-88			
R-11			
R-12		45	
R-123			
R-134a	200	6,372	
R-143a			
R-22	31,253	3,425	19,661
R-23			
R-290		375	
R-401A			
R-401B			
R-402A	630		
R-402B			
R-404A	509,209	6,775	6,750
R-407A	174,721	25	4,125

III. Corporate-Wide Refrigerant Emissions

Note: Report aggregate information for all retail stores under the same Partner and/or banner name. Include offices, break-rooms, etc. co-located inside retail stores. Do not include separate office buildings, distribution centers, warehouses, etc. Do not include refrigerant recovered/recycled from equipment retired, but do include known emissions from those systems. Do not include first-fill charging when installing new systems or after remodels. Include other refrigerants not listed by using

Refrigerant	Commercial Refrigeration		Air-Conditioning
	Charge ≥ 50 Pounds	Charge < 50 Pounds	
	REQUIRED	OPTIONAL	OPTIONAL
EP-88			
R-11			
R-12		0	
R-123			
R-134a	0	36	
R-143a			
R-22	780	2	7
R-23			
R-290		0	
R-401A			
R-401B			
R-402A	0		
R-402B			
R-404A	41,671	43	24
R-407A	6,065	0	675

The Securities and Exchange Commission (SEC) & ESG: The Intersection of Climate Change and Financial Regulations

"No single issue has been more pressing at the SEC than confronting the risks and opportunities that climate and ESG reporting pose for investors, the financial system, and the economy."

Commissioner Allison Herren Lee, Washington D.C. June 28, 2021 Keynote Address at the 2021 Society for Corporate Governance National Conference

The Business Roundtable, which represents CEOs from more than 100 of the nation's largest companies, has formed a coalition committed to making sure that capitalism serves workers, investors, shareholders, and the environment. Together, they represent over $100 trillion in assets under management committed to the UN's Principles for Responsible Investment, which advocates for a greater focus on environmental, social, and governance issues in investing.

Investors, employees, consumers, vendors, suppliers, and numerous other stakeholders look to companies to design and implement long-term, sustainable policies that support growth and address the environmental impacts. Therefore, the SEC recently solicited input in light of demand for climate change information and questions about whether current disclosures adequately inform investors. Additionally, the SEC has formed a task force to evaluate the best solution to use their power to provide oversight.

This year, 98 percent of General Electric shareholders approved a resolution asking the company to explain how it intends to achieve net zero emissions in accordance with the Paris Agreement. At ConocoPhillips, 58 percent of

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Shareholders approved a measure requesting Scope 3 emissions reductions. Sixty-five percent of shareholders at United Airlines voted in favor of a resolution seeking more information on how the company's corporate lobbying aligns with the goals of the Paris Agreement. The SEC recognizes that not all claims made by companies are always accurate, and this undermines shareholder confidence.

CDP, GRI, and three other NGO groups focused on ESG reporting have signed a letter of intent to work together called the Intent to Work Together towards Comprehensive Corporate Reporting. Although we do not expect a harmonized set of protocols any time soon, there is a pattern beginning to form that suggests in the future, the ability to publish accurate ESG results will be aligned so reporters, investors, shareholders, and stakeholders will use a common awareness when developing and reviewing reports.

Soon, SEC examinations will include a review of the firm's written policies and procedures and their implementation, compliance oversight, and review of ESG investing practices and disclosures because that is what they are being asked to do, and it leads to improved integrity in the investment community.

A recent report published by S&P suggested that the way companies are valued is heavily weighted by results "Beyond the balance sheet". Over the past two decades, the ESG ratings and research have helped set a new global standard for corporate sustainability performance. As a result, investors are expected to be better informed of sources of intangible value. Leading asset managers and asset owners are investing in the resources to improve disclosure and standardization of impact metrics, educating both companies and investors in the process. Therefore, the SEC recognizes the importance of ESG and intends to uphold integrity in the market by providing oversight similar to those of financial disclosures.

Statement from EPA on why they continue to use AR4 instead of AR6 (20 years versus 100 years)

IPCC AR4 was published in 2007 and is among the most current and comprehensive peer-reviewed assessments of climate change. AR4 provides revised GWPs of several Greenhouse Gases (GHGs) relative to the values provided in previous assessment reports, following advances in scientific knowledge on the radiative efficiencies and atmospheric lifetimes of these GHGs and of CO. Because the GWPs provided in AR4 reflect an improved scientific understanding of the radiative effects of these gases in the atmosphere, the values provided are more appropriate for supporting the overall goal of organizational GHG reporting than the Second Assessment Report (SAR) GWP values previously used in the Emission Factors Hub.

While EPA recognizes that Fifth Assessment Report (AR5) GWPs have been published, in an effort to ensure consistency and comparability of GHG data between EPA's voluntary and non-voluntary GHG reporting programs (e.g., GHG Reporting Program and National Inventory), EPA recommends the use of AR4 GWPs. The United States and other developed countries to the UNFCCC have agreed to submit annual inventories in 2015 and future years to the UNFCCC using GWP values from AR4, which will replace the current use of SAR GWP values. Utilizing AR4 GWPs improves EPA's ability to analyze corporate, national, and sub-national GHG data consistently, enhances communication of GHG information between programs, and gives outside stakeholders a consistent, predictable set of GWPs to avoid confusion and additional burden.

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Refrigerants, ESG and the concept of *Double Materiality*

Double materiality is an extension of the key accounting concept of materiality of financial information. Information on a company is material and should therefore be disclosed if "a reasonable person would consider it [the information] important," according to the US Securities and Exchange Commission. Thanks to the work by the TCFD, it is now widely accepted within financial markets that climate-related impacts on a company can be material and therefore require disclosure.

Financial markets are demanding clear, comprehensive, high-quality information on the impacts of climate change. This includes the risks and opportunities presented by rising temperatures, climate-related policy, and emerging technologies in our changing world. The Financial Stability Board at TCFD created the Task Force on Climate-related Financial Disclosures to improve and increase reporting of climate-related financial information. The concept of double materiality takes this notion one step further: it is not just climate-related impacts on the company that can be material but also impacts of a company on the climate – or any other dimension of sustainability, for that matter (often subsumed under the environmental, social and governance, or ESG, label). Basically, if a company is reporting how climate would negatively or positively affect their operations in addition to disclosing all the associated costs, they would also report how their operations are affecting the environment.

The traditional financial definition of materiality is pertinent but too narrow. Investors want reporters to acknowledge that longer-term issues, such as the impact of climate change on a company, are material to the value of an enterprise.

By promoting "double" materiality, the investors are asking companies and the financial community to acknowledge that a much broader range of issues and events affect an enterprise. The regulators are siding with sustainability advocates who have long argued this case. And what's more, the actions of companies affect society and the environment too. The concept of double materiality acknowledges that interconnection – hence double.

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Learn how Fexa Trakref's solutions can streamline your refrigerant management, support compliance, and advance your sustainability goals.

Schedule a demo today to see how we can simplify the complexities of regulatory adherence by visiting **https://info.fexa.io/lp/tr-request-a-demo.**