

BEYOND WORDS:

A Framework for Responsible Private Sector
Action on Sustainable Cooling





TABLE OF CONTENTS

Introduction	1
Evaluating Previous Voluntary Commitments: Case Studies	3
Framework for Responsible Corporate Commitments	8
Recommended Commitments and Actions on HFCs	12
Conclusion	13
Annex I: 2022 Assessment of Company Actions Under 2014 and 2015 White House Roundtable Commitments	14
Annex II: Full Text of the White House Roundtable Commitments Made in 2014 & 2015	16
Annex III: Changes to the List of Companies from the 2014 and 2015 White House Roundtable	17

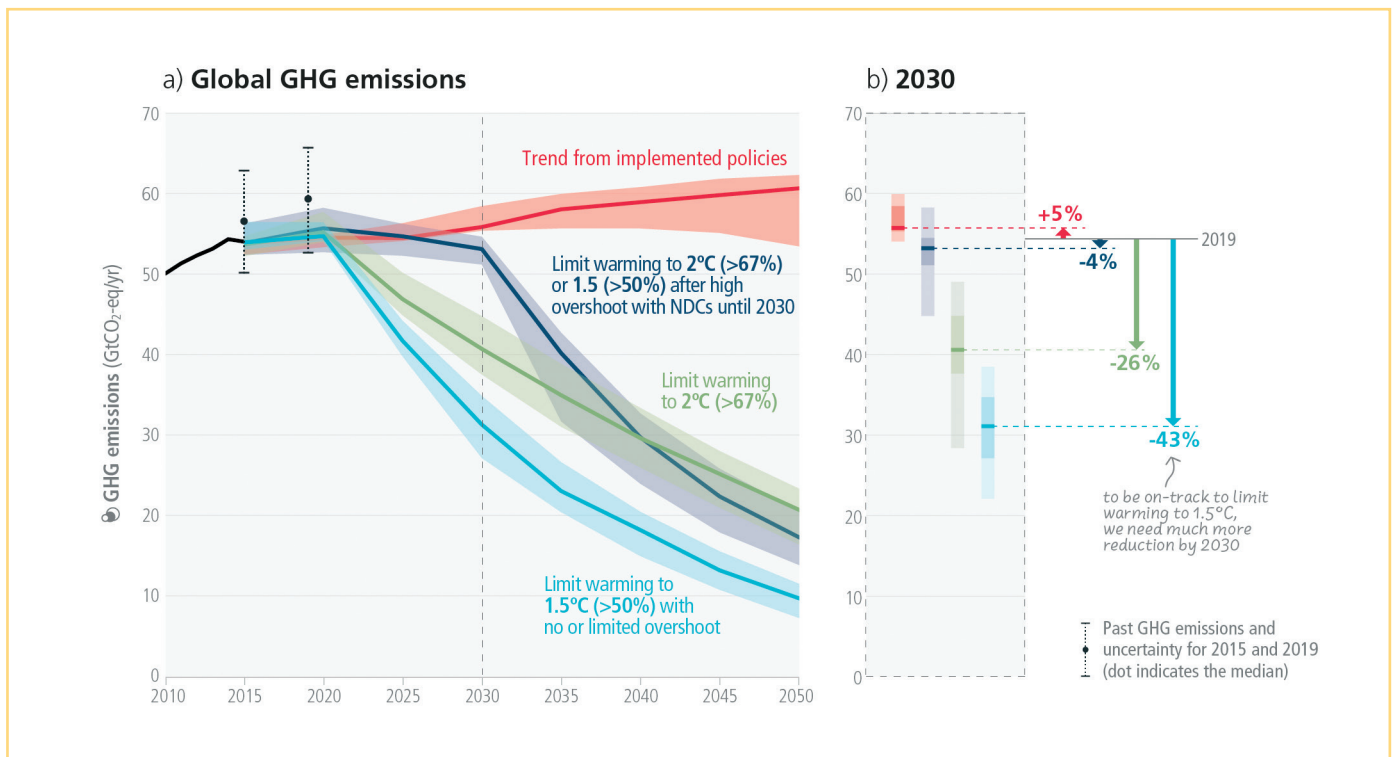
INTRODUCTION

While the number of countries and corporations that have pledged to reach net-zero by 2050 continues to grow, the Intergovernmental Panel on Climate Change (IPCC) sixth assessment report shows the current suite of Nationally Determined Contributions (NDCs) by governments to curb greenhouse gas emissions alone are not enough to put us on a path to limit warming to 1.5°C. Only with greater urgency and deeper emissions cuts can the world limit global temperature rise. This underscores the need for voluntary private sector commitments that are ambitious and transparent.

In a warming world, demand for cooling will continue to rise. Eliminating hydrofluorocarbons (HFCs), super potent greenhouse gases used primarily as refrigerants in the cooling sector, is central to achieving global climate goals. Phasing down production and use of HFCs under the Kigali Amendment to the Montreal Protocol on Substances that Destroy the Ozone Layer (Montreal Protocol), if fully implemented, will avoid up to 0.4°C of warming by 2100.¹ However, a more accelerated

reduction in HFCs beyond full implementation of the Kigali Amendment is necessary to retain hopes of staying under 1.5°C temperature rise.² Despite global action to phase down HFCs, another 61 Gigatonnes CO₂ equivalent of high global warming potential (GWP) fluorinated gases are expected to be produced or used by 2050. By 2100, the global total rises to approximately 90 Gigatonnes CO₂e – nearly equal to three full years of global energy-related carbon dioxide emissions today.³

Figure 1: Projected global GHG emissions from NDCs announced prior to COP26 would make it likely that warming will exceed 1.5°C and also make it harder after 2030 to limit warming to below 2°C.



At the 2023 United Nations Climate Conference of Parties (COP 28) in Dubai, sustainable cooling is expected to be a major focus. The UN Environment Programme (UNEP)-led Cool Coalition along with the United Arab Emirates' COP28 presidency is developing a Global Cooling Pledge bringing together governments, private sector, and other institutions for fairer cooling access in a warming world, while paving the way for sustainable cooling solutions.⁴ This presents a unique opportunity to advance action to fulfill the crucial role of phasing down and ultimately phasing out HFCs to tackle the climate crisis.

Private sector investment and actions can make vital contributions to this effort and yet must be developed within a framework that aligns with science-based targets and ensures transparency and accountability for meeting commitments. The cooling sector as a whole has been slow to adopt science-based emission reduction targets. As of

2020, only 22% in a group of 18 major cooling equipment manufacturers had set 2050 emission targets.⁵ Meanwhile, as HFC refrigerant prices continue increasing under the global phase-down, companies will benefit financially from expeditiously transitioning away from HFCs, while contributing to their climate targets.

This report examines previous voluntary private sector commitments related to HFCs and sustainable cooling to draw lessons and offer a framework for responsible corporate engagement on climate-friendly cooling. Our analysis finds that engagement in previous initiatives has been dominated by a relatively narrow segment of companies, particularly amongst end users. It should be noted that cooling end users include a broad array of sectors such as commercial real estate, data centers, healthcare facilities, hotel chains, shipping, and transportation. Commitments on cooling should reflect actions by all types of cooling end users, in addition to suppliers.

GLOBAL POLICIES ON HFC PHASE-DOWN

With the Kigali Amendment now in effect and ratified by over 148 countries, developed nations (non-Article 5 countries) are already undertaking measures to phase down HFCs while developing nations (Article 5 Parties) are preparing to meet the first freeze in HFC consumption in 2024 for Group I countries (2028 for Group II countries: India and the Middle East).⁶ There are three areas of regulatory measures that private sector is required to adhere to:

■ **HFC Licensing and Allowance Systems:**

Countries that have ratified the Kigali Amendment are required to establish licensing and allowance systems to limit production and trade in HFCs within their borders, in order to meet limits on consumption. The quantity of allowances are reduced over time in accordance with meeting the global phase-down schedule, or on a more advanced timeline, as is the case in the European Union. Regulatory agencies may be authorized to consider accelerating the phase-down schedule.

■ **Restrictions on HFC Use in Equipment:**

These regulations restrict HFC use above a certain

GWP limit in new or existing equipment or products for a given sector or subsector, thereby requiring equipment to transition to lower GWP substitutes.

■ **Lifecycle Management:** Policies and programs to minimize HFC emissions by reducing leaks and increasing their recovery and reuse can also reduce demand for new HFC production, thereby supporting the HFC phase-down. Such measures may include leak monitoring and repair requirements, extended producer responsibility schemes for increasing refrigerant recovery, and technician training and certification programs, among others.

The Kigali Amendment and various national regulations to implement it, are starting to tackle the rapid global growth in production and consumption of HFCs. However, significant progress is still required to transition new equipment and appliances to HFC-free refrigerants, reduce emissions of existing HFCs throughout their lifecycle, and prevent illegal trade that could undermine the climate benefits of the phase-down.

EVALUATING PREVIOUS VOLUNTARY COMMITMENTS: CASE STUDIES

The following case studies draw lessons and observations from three recent initiatives that convened private sector commitments and actions related to HFCs and cooling. The case studies are intended to inform recommendations toward a framework for development of transparent, measurable, and appropriate ambition of cooling commitments themselves with regard to reduction of refrigerant emissions, as well as updates on relevant progress to overcome the challenges faced in their implementation.

2014-2015 White House HFC Roundtable

In 2014 and 2015, the U.S. government convened roundtable meetings with the private sector on commitments and actions to reduce HFC emissions. Twenty-seven companies and industry associations, representing HFC producers, manufacturers of refrigeration and air conditioning equipment and foam products, and end users such as major food and beverage retailers, made commitments. At the time the cumulative effect of executive actions and private sector commitments, if fully met and implemented, was estimated to reduce global consumption of HFCs by the equivalent of more than one billion metric tonnes of CO₂ through 2025.⁷ These commitments and the actions that followed contributed positive momentum toward securing the global agreement to the Kigali Amendment in

2016, and subsequent widespread support for the bipartisan American Innovation and Manufacturing (AIM) Act in the United States.

However, as further review and analysis below elaborates, the commitments themselves lacked a coherent framework and standards for ensuring transparency, ambition, and clear metrics for follow up verification and reporting on implementation. Furthermore, participation skewed heavily toward producers and manufacturers with relatively narrow end user participation.

EIA conducted a review of each company's commitment to evaluate subsequent actions and reporting on their fulfillment, which included conducting written surveys and company interviews in addition

Table 1: Private Sector Participation* in White House Roundtable Commitments

INDUSTRY ASSOCIATIONS	The Alliance for Responsible Atmospheric Policy, Air Conditioning Heating and Refrigeration Institute (AHRI)
EQUIPMENT & PRODUCT MANUFACTURERS	Carrier, Emerson, Danfoss, Dow Chemical, DuPont De Nemours, Goodman Manufacturing, Hillphoenix, Ingersoll Rand, Emerson, Johnson Controls, Mission Pharmaceutical, SEVO Systems, NCFI Polyurethanes, True Manufacturing, Thermo-Fisher Scientific, Thermo King Corporation
END USERS	Target, Kroger, Pepsi, Coca-Cola, Red Bull
HFC PRODUCERS	Chemours, Honeywell, Arkema, Daikin

*Refer to Annexes II and III for more information.

to analyzing publicly available reporting. Detailed information on each company's actions taken to fulfill the White House Roundtable commitments is provided in Annex I and the full commitments text is contained in Annex II. While many of the commitments were fully or partially met, a number of companies failed to implement important aspects and in some cases, external challenges delayed full implementation. The lack of full follow through on HFC-23 by-product mitigation within the commitment time frame is particularly disappointing.

The commitments themselves were formulated without consistent metrics or standards for evaluating their ambition or impact, and in numerous cases, public reporting by companies on implementation was significantly lacking.

Perhaps even more importantly however, the commitments themselves were formulated without consistent metrics or standards for evaluating their ambition or impact, and in numerous cases, public reporting by companies on implementation was significantly lacking. The two main U.S. cooling industry associations played an important role in advancing domestic and international policy, particularly in supporting bipartisan U.S. legislation phasing down HFCs and ratification of the Kigali Amendment. The organizations also coordinated U.S. industry efforts to advance research, testing, and stakeholder discussions on the safe adoption of HFC alternatives. Industry investment in research and development and initiatives to update safety standards and codes was considerable, although public reporting and tracking of such investments against original commitments was not available. Finally, a new industry initiative to advance HFC reclamation and recovery did not materialize as originally committed, although it was included as a major element of the AIM Act.

Refrigeration sector equipment manufacturers showed particularly strong performance in meeting commitments to develop and adopt technologies using HFC alternatives, especially for natural refrigerants with ultra-low GWPs (<5). Manufacturers of chillers, air conditioners, and heat pumps saw more inconsistent results in adopting lower GWP refrigerants, in some

cases due to delays in adoption of revised standards and building codes in specific geographic regions. Overall the commitments themselves were significantly less ambitious in the air conditioners, heat pumps, and chillers sectors due to the higher global warming potentials and other potential environmental impacts of the HFC-HFO (hydrofluoroolefins) blend refrigerants that these companies committed to adopt. Equipment manufacturers of medical and scientific equipment reported meeting their stated goals to create products that do not contain super potent HFCs.

The HFC producers' results were mixed due to some companies exceeding Scope 1 and 2 emissions reductions targets, and others delaying or inconsistently implementing their commitments to ensure proper HFC-23 by-product emission controls. While the U.S. facilities covered by commitments have now implemented HFC-23 capture and destruction in accordance with regulatory requirements, it is unclear that stated commitments to ensure mitigation by global suppliers of feedstock materials have been fully verified.

The five retailers and end users of refrigerants reported achieving some of the commitments, however important targets to adopt ultra-low GWP refrigerants have been missed. Completed commitments among this sector include adopting ultra-low GWP natural refrigerants in stand-alone coolers, as well as commitments to join the U.S. EPA's GreenChill Partnership, a voluntary program to curb emissions by reducing refrigerant leak rates. The supermarket retailers that made commitments have been slow to adopt ultra-low GWP refrigerants and failed to make significant progress towards adopting HFC-free systems. No information is available to suggest that Kroger met its commitment to utilize advanced refrigeration technology in new and remodeled stores where feasible. Reportedly less than 1% of its total stores use ultra-low GWP refrigerants⁸ and Kroger's 2023 Climate Roadmap projects no decrease of its refrigerant emissions in the coming years.⁹ Similarly, Target has not reported on the number of stores using CO₂, despite claiming it "often" uses CO₂ or HFOs in larger systems. As of 2022, Coca-Cola reported being short of its goal for all new coolers to be HFC-free, with 88% transitioned.¹⁰ End users should prioritize reducing their climate impacts by focusing on adopting ultra-low GWP refrigerants across their operations.

Table 2 provides an overview on the types of commitments made, common challenges encountered as reported to EIA by the companies, and new opportunities to advance these areas of action.

Table 2: Overview of White House Commitments: Challenges & Opportunities

TYPE OF COMMITMENT	EIA ANALYSIS OF CHALLENGES & OPPORTUNITIES
<p>INVESTMENT IN RESEARCH & DEVELOPMENT, MANUFACTURING, AND ADOPTION OF HFC ALTERNATIVES</p>	<p>Commitments to transition equipment to new refrigerants varied, without a set standard for defining “low global warming potential” substitutes. The ambition of commitments in the air conditioning (AC) and heat pump sectors lagged behind those in the refrigeration sector, which included more pledges to adopt ultra-low GWP and HFC-free alternatives. While many companies met the pledges as outlined, barriers and challenges in specific cases included lagging standards and codes updates and delayed regulatory approval of new refrigerants in specific geographies.</p> <p>In terms of end users, the supermarkets and other food and beverage retailers in particular did not fully meet their commitments to adopt ultra-low GWP alternatives. There was no participation by major commercial end users of AC and heat pump equipment.</p>
<p>LIFECYCLE REFRIGERANT MANAGEMENT</p>	<p>Commitments to establish a cooperative industry effort to expand HFC recovery and reclamation in the U.S. were not followed through on, citing challenges due to a lack of regulatory incentives. New regulatory mechanisms and funding under the American Innovation and Manufacturing (AIM) Act and Inflation Reduction Act (IRA) present new opportunities for public-private actions to improve lifecycle management. End user commitments included fulfilling leak rate reduction goals and joining EPA’s GreenChill partnership.</p>
<p>HFC-23 BY-PRODUCT MITIGATION</p>	<p>Producers pledged to mitigate HFC-23 by-product emissions from production facilities in the U.S. and internationally, with at least one producer also committing to ensure mitigation by suppliers of feedstock materials globally. In several cases these commitments were either not met by the stated deadline, or insufficient information is available to confirm mitigation by global suppliers.</p>
<p>ADVANCING SAFETY STANDARDS AND CODES</p>	<p>Several companies, led by AHRI, committed to support fact-based research, testing, and outreach to advance updated safety standards and codes for alternative refrigerants. Significant resources were allocated to fulfilling these commitments. Updates to U.S. safety standards and codes for commercial refrigeration covered both Class A2L refrigerants, which covers HFC-HFO based alternatives, and Class A3 refrigerants, which includes ultra-low GWP natural alternatives such as propane and other hydrocarbons.</p> <p>Significant opportunity and need exists to focus additional efforts on research and testing for the AC and heat pump sectors to enable updated safety standards for A3 refrigerants with ultra-low GWPs in the U.S. and other markets.</p>
<p>ENERGY EFFICIENCY</p>	<p>Many companies across sectors included increasing energy efficiency in their commitments. This included increasing efficiency of refrigeration equipment, industrial systems and transportation temperature control systems, and producing retrofit systems for food retailers that improve efficiency and reduce refrigerant leaks. However, some companies did not provide metrics on the extent of their energy efficiency improvements.</p> <p>Energy efficiency is a key, measurable impact for reducing cooling emissions and companies should set more detailed and ambitious targets.</p>

The challenges and market hurdles faced in meeting previous commitments are now increasingly being overcome, including a lagging political and regulatory environment and outdated standards and codes. The opportunity now exists for companies to follow through on fully delivering and reporting on these self-imposed voluntary commitments. Future efforts to accelerate emission reductions through voluntary commitments should be developed within a coherent framework for ensuring consistent standards, metrics, and definitions, such as criteria for ultra-low GWP technology adoption, quantifiable emission reductions based on verifiable actions, and criteria and timeframe for reporting.

Consumer Goods Forum: 2010 and 2016 Refrigerant Resolutions

The Consumer Goods Forum (CGF), an international network of more than 400 of the world's largest manufacturers and retailers, developed two voluntary Refrigerant Resolutions in 2010 and 2016.¹¹ The 2010 resolution pledged to begin using HFC alternatives in new equipment from 2015 forward. The 2016 resolution reaffirmed and elaborated on the first resolution, committing its member companies to install new equipment using "natural or alternative ultra-low GWP refrigerants, effective immediately," as well as take other actions to engage with a range of public and private stakeholders to overcome remaining market hurdles, improve energy efficiency of equipment, and reduce refrigerant leaks.¹²

Excerpt of commitments from the 2016 CGF Refrigerant Resolution:

- In markets where viable, to install new equipment that utilize only natural refrigerants or alternative ultra-low GWP refrigerants, effective immediately;
- In markets where barriers to deployment exist, to engage with our suppliers, civil society, business partners and governments, to overcome remaining technical, regulatory and other barriers in certain geographies and sectors, to enable the purchase of new equipment that utilize only natural refrigerants or alternative ultra-low GWP refrigerants as soon as possible and no later than 2025;
- Work to reduce the total equivalent environmental warming impact of our existing and new refrigeration

systems, including (but not limited to) improving energy efficiency, optimizing refrigerant charge sizes, and minimizing refrigerant leaks;

- Develop individual targets and action plans to measure and achieve the above and regularly publish information on progress.

CGF members include a number of major multi-national supermarket retailers, which are particularly significant end users and emitters of HFCs. Despite these commitments, too many supermarkets are still installing HFC systems today, and global progress in adopting ultra-low GWP technologies has been uneven. The commitment defined ultra-low GWP technologies as <150 GWP, a metric which while consistent with regulatory requirements to adopt "low-GWP" alternatives in the European Union and United States, does not conform to accepted definitions of ultra-low GWP as either <10 or <5 under more recent regulations and initiatives.¹³

While adoption of ultra-low GWP and natural refrigerant technologies has advanced significantly across Europe and has accelerated recently in other regions including North America and Japan, available data suggests that uptake remains low across most regions globally.¹⁴ As of 2022, most major U.S supermarkets utilize ultra-low GWP refrigeration systems in less than 1% of their total stores.¹⁵ Uptake has also been limited across other regions including South America, Southeast Asia, and Africa. By comparison, the 55,000 European stores using transcritical CO₂ represent a food retail market penetration of 18.4% out of an estimated market of 299,025 food retail stores in Europe.¹⁶

Walmart, CGF member and major retailer, has reported little substantial progress to reduce HFC emissions for years. The company's HFCs emissions increased in the years following the CGF pledge.¹⁷ This prompted public pressure from EIA and other NGOs and investors.¹⁸ In 2020, Walmart set a new goal to reach zero emissions by 2040 across operations, without the use of carbon offsets, by scaling up renewable energy, shifting to "low-impact" refrigerants, electrifying transportation fleets, and working with suppliers to reduce emissions.¹⁹

At first, details for Walmart's refrigerant plan were lacking, particularly given the company had not defined "low-impact" or what its global warming

potential limit would be for new refrigerants. Walmart has since announced its first HFC-free store in the U.S. and engaged in policy advocacy for strong regulations on HFCs.²⁰ The company has stated that to achieve its ambitious zero emissions target, it must phase out high-GWP refrigerants, including HFCs, to be replaced by refrigerants with low and ultra-low GWP for new systems. For existing systems, Walmart has also taken steps to transparently report refrigerant leaks and reports an average leak rate less than half of the estimated U.S. supermarket average of 25%.²¹ The company has yet to publish a detailed plan for scaling up ultra-low GWP refrigerants across its operations to meet its 2040 climate goals.

Race to Zero and Other Corporate Net-zero Commitments in Cooling

The Race to Zero campaign is a UN-backed initiative to catalyze leadership and support from non-state actors toward the goal of halving emissions by 2030 and achieving net zero emissions by 2050 at the very latest.²² The minimum criteria for companies joining the Race to Zero include:²³

- Setting an interim target for achieving a 50% reduction in emissions by 2030 as set out in the IPCC Special Report of 1.5°C;
- Targets must cover all Scopes of emissions, including Scope 3;
- Must limit any residual emissions in net-zero targets to emissions that are not feasible to eliminate;
- Requires annual public reporting against actions and targets.

The initiative has included a focus on the cooling sector recognizing participation by cooling suppliers in accepted partnership programs including the Climate Pledge and the Science-Based Targets initiative (SBTi). While the initiative has recognized the importance of adopting ultra-low GWP technologies (<5 GWP) and includes strong criteria for setting targets and reporting, it does not include specific metrics or a cohesive framework for specific qualifying actions in the cooling sector that are considered consistent with achieving these targets.²⁴

Cooling sector companies have been slow to join the

initiative as a whole, with a 2021 assessment by the Carbon Trust of 54 cooling suppliers showing that only five had joined.²⁵ Eight months later by the start of COP 26, nine more companies had joined the Race to Zero.²⁶ Cooling sector manufacturers identified as having joined the Race to Zero by taking part in one of these partnership programs in the Cooling Sector are Advansor, Danfoss, Electrolux, GEA, Godrej & Boyce, Hitachi, Johnson Controls, Orbia Advanced Corporation, Philips, Schneider Electric, and Trane Technologies.²⁷ Companies participating in the Race to Zero that exhibit particularly strong targets and actions in the cooling sector include:

Electrolux

Electrolux reported meeting its 2025 goal to reduce Scope 1 and 2 emissions by 80%, and Scope 3 emissions by 25%, ahead of its 2025 timeline. A complete phase out of HFCs is included in the company's plans, building upon the use of hydrocarbons in all refrigeration appliances in North America, hydrocarbon heat pump dryers in Europe, and ongoing HFC phase outs in Australia and several countries in Asia. Electrolux has also set a target to phase out the use of hydrofluoroolefins (HFOs) by 2030.²⁸

Godrej & Boyce

The company first developed highly energy efficient commercially available hydrocarbon ACs in India back in 2000, and sold more than 600,000 units as of 2018.²⁹ The company also committed to set science-based targets and advance energy efficiency, in line with their overall ambition to achieve carbon neutrality by 2050.³⁰ It has set targets for Scope 1, 2, and 3 emissions to the Science-based Targets Initiative and reports a 42% reduction in Scope 1 and 2 emissions as of FY22.^{31, 32}

Unilever

Unilever set a net-zero value chain target for Scope 1, 2, and 3 emissions by 2039 and reported it has reduced operational emissions (Scopes 1 and 2) by 64% since 2015. The company stated it plans to eliminate any remaining high-GWP HFC refrigerants from Unilever cooling systems by transitioning to low-GWP refrigerants including hydrocarbons, ammonia and CO₂.³³ In addition to relying on natural refrigerants for the company's cooling emission reductions, Unilever is pursuing hydrocarbon-based aerosol products and technology that allows for other non-HFC compressed gases.³⁴

FRAMEWORK FOR RESPONSIBLE CORPORATE COMMITMENTS

As the HFC phase-down ramps up, industry has both an opportunity and the obligation to follow through on previous commitments, and to develop enhanced actions to reduce the use and emissions of HFCs. However, without greater ambition and transparency in commitments, these efforts may not maximize potential climate benefits toward meeting climate goals under the Paris Agreement and Montreal Protocol. There is ample potential for companies to address HFC emissions from R&D through end-of-life, and to incorporate these actions

into ESG initiatives to implement science-based targets and transparent reporting.³⁵

Drawing on lessons and challenges from earlier commitments, we present a framework to encourage robust new commitments related to HFC use in the cooling sector that are consistent with science-based climate goals. Key elements to improving on previous commitments in the cooling sector should include both enhancing the ambition and scope of actions, as well as improving their measurability and transparency.



Photo credit: Cyril Ndegeya/Agence France-Presse - Getty Images

I. Scope and Ambition

Expanding the scope and enhancing the ambition of future actions and commitments on HFCs will be essential to meet the Paris Agreement climate goals to reach net-zero emissions by mid-century, in line with preventing warming of more than 1.5°C. Ensuring full implementation of the Kigali Amendment will prevent 80 billion metric tonnes of CO₂ equivalent emissions by 2050, but requires robust implementation and enforcement to ensure these climate benefits are fully realized.³⁶ Actions to accelerate the transition out of HFCs and reduce emissions through enhanced lifecycle refrigerant management have the potential to prevent an additional 60 billion tonnes of CO₂ equivalent emissions by 2050.³⁷ Each of these elements should be incorporated into corporate initiatives to reduce emissions in the cooling sector:

Phasing out HFCs in New Equipment Globally

New commitments in the cooling sector must be consistent with a roadmap to eliminate the installed base of HFCs in equipment and their emissions by no later than 2050, with a 50% emission reduction target by 2030. As most cooling equipment has a lifetime of 15-20 years, achieving these targets requires urgent action to stop installing and manufacturing new HFC-based equipment.

Appropriately ambitious corporate pledges must accelerate adoption of ultra-low (<5) or zero GWP alternatives. Energy efficient ultra-low GWP natural refrigerant cooling is already widely available in most sectors and has been further unlocked by recent changes to international air conditioning and heat pump standards. Recognizing this, manufacturers and end users of this equipment should commit to immediately transition. With regard to refrigerant alternatives, EIA advocates for the adoption of ultra-low GWP natural refrigerant alternatives.

Due to emerging concerns surrounding toxic breakdown products of substances classified as per- and poly-fluoroalkyl substances (PFAS),³⁸ and due to the continued emissions of ozone depleting substances and fluorinated greenhouse gases as by-products and feedstocks used in production of

Appropriately ambitious corporate pledges must accelerate adoption of ultra-low (<5) or zero GWP alternatives.

HFOs,³⁹ commitments to adopt natural refrigerants over fluorinated alternatives such as HFOs are considered to be the most environmentally sustainable and future proof.

Enhanced Lifecycle Refrigerant Management

Existing equipment installed today using HFCs and HFC-HFO blends will remain in operation for decades, contributing to mounting emissions from leaks and improper disposal at end-of-life, if not mitigated. Cooling sector actions aimed at addressing lifecycle emissions should include enhanced product stewardship initiatives to support recovery, reclamation, and destruction of refrigerants from existing equipment. End users of refrigerants can advance enhanced LRM by committing to prevent and repair leaks, and to purchase only reclaimed HFC refrigerants to service equipment.

Preventing and Detecting Illegal Trade in HFCs

As governments seek to implement robust monitoring and enforcement programs restricting HFC production and trade, corporate and non-state actors can take steps to support robust implementation of the Kigali Amendment and stop illegal HFCs from entering the market. This includes supporting enforcement efforts to prevent illegal trade, such as banning non-refillable cylinders which are typical vehicles for illegal trade due to lack of traceability, using QR codes or other means to enable real time tracking and traceability of legal shipments, and information sharing on any suspicious or illegal activities. Halting the use of HFCs in new equipment is also a major contributor to reducing long term market demand for HFCs to service equipment thus reducing market pressures which drive illegal trade.

II. Measurability and Transparency

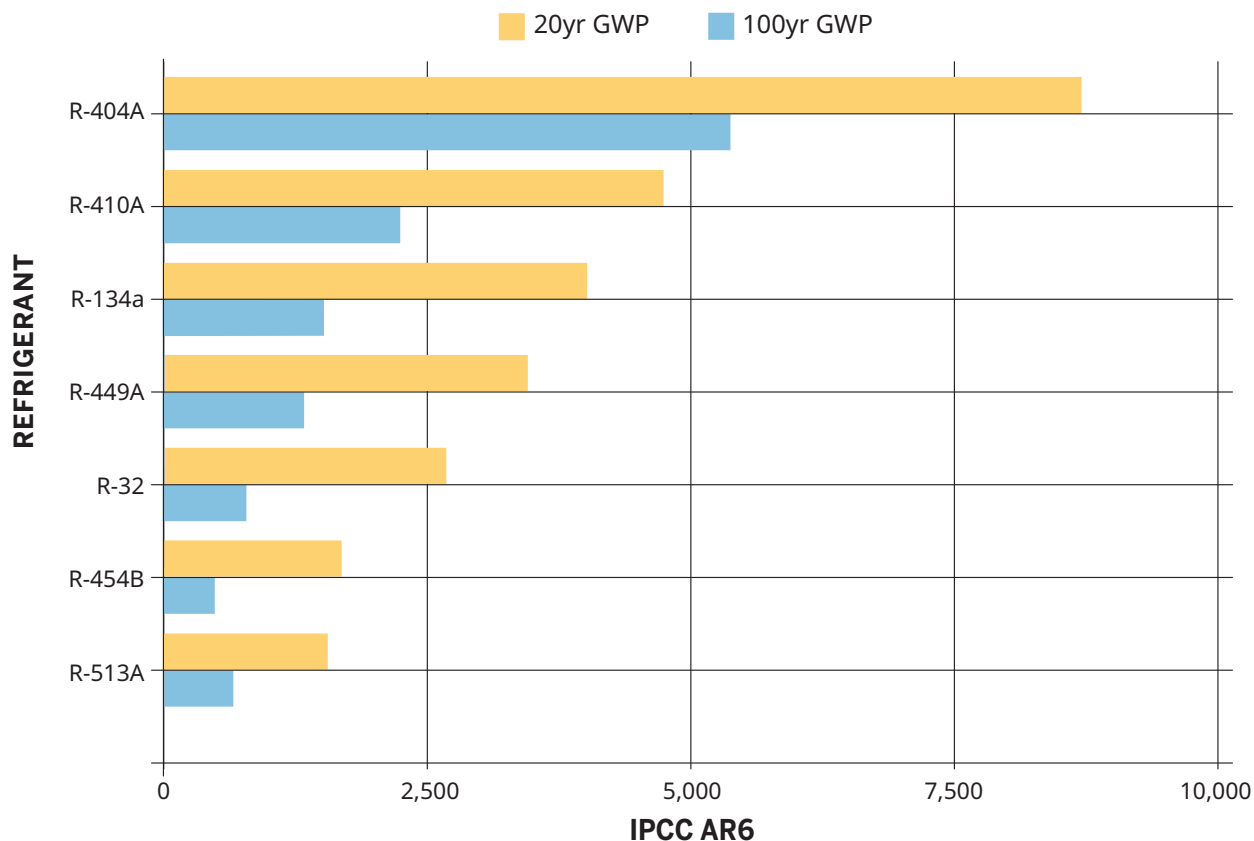
Publicly disclosed, measurable targets encourage continued innovation and improvement as well as elevating accountability. All commitments should be measurable, with specific quantifiable and time-bound targets embedded. EIA recommends that companies set science-based targets that capture Scope 1, 2, and 3 emissions covering all lifecycle HFC emissions from cradle to grave. Additionally, EIA recommends that companies publicly report on

commitments and greenhouse gas emission targets through a third-party verification process, such as that required by the Carbon Disclosure Project.

Companies should report their progress annually, and include data quantifying reductions in use and emissions. Key metrics include total HFC use and emissions reported by volume and carbon dioxide equivalent, as well as proportion of new equipment or facilities utilizing ultra-low GWP natural refrigerants. Reporting on improvements

Figure 2: Global Warming Potentials (GWPs) of common refrigerants over 20 and 100 years⁴⁰

REFRIGERANT	100 YEAR GWP (IPCC AR6)	20 YEAR GWP (IPCC AR6)	REFRIGERANT	100 YEAR GWP (IPCC AR6)	20 YEAR GWP (IPCC AR6)
R-404A	5,278	8,698	R-513A	673	1,822
R-410A	2,255	4,715	R-454B	531	1,853
R-134a	1,530	4,140	R-290	<1	<1
R-449A	1,281	3,382	R-744	1	1
R-32	771	2,690	R-717	0	0



in lifecycle refrigerant management should include metrics such as corporate average leak rates, and quantities of HFC refrigerants verified as recovered, reclaimed, and destroyed.

Companies should publicly report on commitments and greenhouse gas emission targets through a third-party verification process, such as that required by the Carbon Disclosure Project.

III. Continuous Improvement, Collaboration and Advocacy

It is important to strive for continuous improvement by regularly reviewing and updating the commitment framework based on technological advancements, industry best practices, and evolving safety and sustainability standards. Incorporating feedback from diverse stakeholders and learning from successful case studies or pilot projects would drive innovation and progress.

EIA recommends that companies enact processes to regularly review and identify best practices across geographies in their industry, and collaborate with industry peers, research institutions, and government agencies to share knowledge and actively raise the bar on their sustainability goals. Companies already utilizing ultra-low GWP refrigerants should advocate for their use throughout the sector. Active participation by company cooling representatives in relevant initiatives, conferences, and working groups could also contribute to further collaboration and innovation.

EIA recommends that companies set science-based targets that capture Scope 1, 2, and 3 emissions covering all lifecycle HFC emissions from cradle to grave.

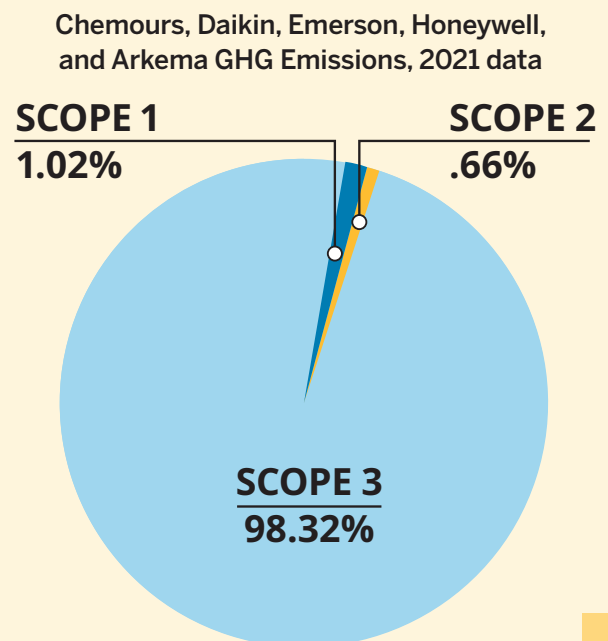
REPORTING SCOPE 3 EMISSIONS OF GREENHOUSE GASES

The companies involved in the 2014-15 White House HFC Roundtable are responsible for an estimated 1.9 billion metric tonnes of CO₂ equivalent of self-reported greenhouse gas emissions.⁴¹ This is an underestimate, since several of the companies do not report their greenhouse gas emissions publicly at all, and an even greater number do not fully report Scope 3 emissions, which make up a vast majority of their total impact.

Scope 3 emissions include all emissions that take place upstream or downstream of a company's activities within a company's supply chain and subsequent product distribution and use. This includes purchased goods, transportation and distribution, travel, and sold products end-of-life. The bulk of HFC emissions contributed by major producers of HFCs and manufacturers of cooling equipment take place when those gases are released from the products containing them, during use and end-of-life.

As shown in Figure 3, using five companies that fully report on all emissions as examples, Scope 3 emissions could make up over 98% of a company's total GHG emissions. It is imperative that companies publicly report Scope 3 emissions, including from the HFCs used in products and incorporate these emissions into science-based targets and ESG goals.

Figure 3: Total GHG Breakdown for the Five Companies Reporting Scope 3 Emissions



RECOMMENDED COMMITMENTS AND ACTIONS ON HFCS

All Sectors

- Commit to eliminating all HFC emissions by 2050 under science-based targets that cover Scope 1, 2, and 3 emissions;
- Develop industry led product stewardship initiatives to enhance the reverse supply chain for increasing end-of-life recovery and reclamation of high GWP refrigerants;
- Support enforcement and prevention of illegal trade, for example, producers could take up early piloting of refrigerant labeling and tracking systems before 2024.

Producers and Manufacturers

- Undertake additional investments in research and development of energy efficient cooling equipment utilizing ultra-low GWP refrigerants, particularly in the air conditioning and heat pump sector;
- Adopt a time-bound commitment to phase out all HFCs in new equipment beginning in 2025 in markets and applications where feasible, and to transition entirely to ultra-low GWP natural refrigerants;

- Use reclaimed refrigerant in newly manufactured equipment;
- Improve leak-tight equipment design and installation standards and/or offer emission prevention warranties to cover leak detection and repair costs;
- Reduce refrigerant charge sizes and develop less refrigerant reliant equipment designs.

End Users

- Accelerate adoption of ultra-low GWP technologies, and develop time-bound commitments to phase out HFC equipment;
- Use only reclaimed refrigerants to service existing equipment using HFCs or other high GWP refrigerants;
- Ensure policies and procedures are in place to ensure proper recovery and reclamation or destruction of refrigerants at equipment end-of-life;
- Implement upgrades to leak monitoring and repair best practices and adopt a zero-leak tolerance policy;
- Enhance transparency and reporting of metrics related to HFC emissions and mitigation actions, including through recognized best practices.



Photo credit: UNFCCC

CONCLUSION

The IPCC's AR6 leaves no doubt that this is the decisive decade for climate action, urgently and at an unprecedented scale. Corporations and governments need to go above and beyond their current paths, and commit to action commensurate with the scale of our climate crisis.

While greater action and urgency to complete the HFC phase-down is required from all sectors, the private sector has a real but narrow window of opportunity to chart a more ambitious path forward. Previous voluntary climate commitments and actions by the private sector, albeit successful in some ways, have lacked ambition, additionality, measurability and transparency. Additional commitments to sustainable cooling must be developed within a framework of action and accountability consistent with achieving our global climate goals, to give ourselves a fighting chance for a safer future.

Annex I: 2022 Assessment of Company Actions Under 2014 and 2015 White House Roundtable Commitments
A summary of each entity's progress to meet their commitments is presented below as of 2022.

ENTITY	SUMMARY OF COMMITMENT PROGRESS
ASSOCIATIONS	
Air Conditioning, Heating, & Refrigeration Institute (AHRI)	Public information indicates AHRI has advanced work on the safe use of A2L refrigerants and funded safety research and testing. There is a lack of information regarding whether member companies' \$5 billion investment target in R&D was achieved.
The Alliance for Responsible Atmospheric Policy	The Alliance provided support for significant climate policy, namely the AIM Act domestically and the Montreal Protocol and the Kigali amendment internationally. The association has not yet created the promised HFC Reclamation Bank.
REFRIGERANT PRODUCERS	
Arkema S.A.	Arkema commercialized Hydrofluoroolefin (HFO)-1233zd with a GWP of 1. The company reported meeting its 2020 operation emission reduction and net energy purchase targets and set science-based targets in line with the Paris agreement. Arkema reported limiting HFC-23 by-product emissions in line with the Montreal Protocol.
The Chemours Company	Chemours has introduced lower-GWP refrigerant production and reported being on track to meet its 2025 CO ₂ e reductions. In the committed timeframe, the company failed to ensure the destruction of HFC-23 by-product. Chemours finally installed HFC-23 mitigation at its Louisville Kentucky facility at the end of 2022.
Daikin Industries, Ltd.	The Daikin facility in the US reported destroying the HFC-23 by-product emissions. No information is available on the company's mitigation of worldwide HFC-23 emissions estimated at 6.7 MMTCO₂ per year.
Honeywell International Inc.	Honeywell reported reducing the HFC production of high-GWP HFCs by 50%, and introduced lower-GWP products. The company made specific science-based targets with regard to Scope 3 emissions, reported spending \$1 billion toward R&D, and using a lower-GWP product in a range of applications. Honeywell reported their U.S. plant controls the by-product emissions of HFC-23 and reported it verified the major supplier abroad destroys HFC-23 by-product.
EQUIPMENT/FOAM MANUFACTURERS	
Carrier Global Corporation	Carrier has lower-GWP products available today, including the ultra-low GWP refrigerant solutions of the CO ₂ OLtec, NaturaLINE and PUREtec product lines. The company did not commercialize HFC-free refrigerant options for road transportation by its 2020 deadline.
Danfoss	Danfoss reported partnering with AHRI to form the Safe Refrigerant Transition Task Force. Danfoss also reported fulfilling commitments to open a development and testing center in 2016 and a mobile CO ₂ training unit that was used in the US to educate supermarket contractors and end users on how to apply CO ₂ refrigerant systems in supermarkets.
Dow Chemical Company (covered product lines are now owned by DuPont de Nemours Inc.)	DuPont reported eliminating HFCs in its largest spray foam product line. The company stated a lack of available HFO refrigerant as a barrier to development of HFC-free specialty foams. The company reported its two HFC spray foam products contribute a low single-digit percentage of the total end of life emissions of sold products (6,451,000 MTCO ₂ e). The commitment to the elimination of high-GWP HFCs in the spray foam adhesive product line was not met as the company still manufactures two spray foam products, inherited from The Dow Chemical Company, that contain HFCs.
Emerson Electric Co.	Emerson has reported releasing a full line of fixed and modulated compressors compatible with lower-GWP A1 options with efficiencies improved up to 20% over previous models. The company produces scroll and semi-hermetic compressors, valves and controls for both subcritical and Transcritical CO ₂ applications. The company's R&D facility was opened in 2016.
Goodman Manufacturing	Goodman uses lower-GWP refrigerant in air-conditioners and heat pumps and has participated in efforts to finalize building code updates in order to remove remaining market barriers to lower-GWP substitutes.
Hillphoenix, Inc.	Hillphoenix introduced a CO ₂ transcritical booster system for small format and large format food retailers. The company has Close the Case retrofit systems created for use in supermarkets. Hillphoenix also has two CO ₂ based ice rink systems.

ENTITY	SUMMARY OF COMMITMENT PROGRESS
EQUIPMENT/FOAM MANUFACTURERS (CONTINUED)	
Ingersoll Rand Inc.	The company reported meeting the spending target with R&D and its commitment to the Clean Energy Ministerial Advanced Cooling Challenge. Ingersoll Rand stated it achieved its commitment to reduce its own greenhouse gas footprint by 35% by 2020. It reported exceeding its goal to reduce refrigerant-related emissions from products by 50% by 2018.
Johnson Controls International	JCI reported meeting commitments to standardize technician training and utilizing equipment which can be retrofitted. The company donated \$100,000 towards ASHRAE research into updating standards and building codes and reported spending over its \$50 million target for lower-GWP products. JCI also reported using lower-GWP refrigerants in some chiller. Information is not available on the company's use of the lowest GWP refrigerants specific for each application, particularly in replacing HFC-134a.
Mission Pharmacal Company	The company reported introducing a skin protectant spray for adults and babies with an ultra-low GWP of less than 1.
NCFI Polyurethanes	NCFI reported it transitioned to lower-GWP products for roofing applications, open cell insulation, and skin foams. Information is not available on commitments to convert its entire commercial construction product line to low-GWP alternatives and if the self-imposed deadlines were met.
SEVO Systems, Inc.	SEVO Systems reported its transition to low-GWP alternatives in its fire suppression systems had reduced over 13 MMTCO ₂ e as of 2020. The company has since committed to reduce an additional 5 MMTCO ₂ e by 2025 by utilizing low-GWP alternatives in fire and life safety systems.
Thermo Fisher Scientific	The company reported meeting its energy reduction target and converting over 99% of its cold storage product portfolio to natural alternatives as of 2021
Thermo King Corporation (owned by Trane Technologies plc)	Thermo King EMEA reported using the lower-GWP refrigerant since January 2014. The company states its lower-GWP option has been available since the EPA's SNAP approval of R-452A in 2017. Trane began commercializing its lower-GWP refrigerant portfolio in 2014, with the exception of scroll chillers. The company confirmed to EIA its intent to transition scroll chillers in the near future following the recent SNAP listing.
True Manufacturing Co., Inc.	True Manufacturing reported only using very low GWP (<10) blowing agents since prior to 2008 and all new models of Commercial Refrigeration Equipment are using natural refrigerant propane (R-290).
RETAILERS & OTHER END USERS	
The Coca-Cola Company	Coca-Cola reported 88% of its new coolers are HFC-free as of 2022. There remains a lack of information as to why it failed to meet its commitment to 100% HFC-free cooling equipment.
The Kroger Company	Kroger joined EPA's GreenChill and reported a 10% reduction in its average annual leak rate. Information is not available to suggest that Kroger met its commitment to utilize advanced refrigeration technology in new and remodeled stores where feasible. There is also a lack of information on Kroger's efforts to collaborate across the industry on emissions reduction practices.
PepsiCo, Inc.	Pepsi reported that all coolers purchased in the U.S. since 2020 use 100% HFC-free refrigerants, with the exception of two individual units. These HFC-free coolers represent the majority of new point-of-sale equipment and 90% of purchases globally. Pepsi stated restrictions on placing HFC-free vending machines in areas of building egress and ingress was removed in 2019 and should allow the company to progress on this aspect. Pepsi cited external challenges to its goal, stating there is no standard or approval in place for soda fountain equipment with HFC-free refrigerants, so none of this equipment is in use.
Red Bull GmbH	Red Bull reported purchasing over 42,000 ECO-Coolers in 2015. It also reported mandating and providing training for technicians on repairs and end-of-life maintenance. The company states having more than one million ECO-Coolers worldwide and ordering guideline mandates to install ECO-Coolers where possible.
Target Corporation	Target reported installing 15,000 HFC-free units, which it states represents 57% of its stand-alone cases. Target also reported using R-290 in many self-contained units. The company has not reported on the number of stores using CO₂, despite claiming it "often" uses CO₂ or HFOs in larger systems. There is also no public information available on Target's partnerships to test HFOs or HFC-free beverage coolers.

Annex II: Full Text of the White House Roundtable Commitments Made in 2014 & 2015⁴²

2014 COMMITMENTS

The Alliance for Responsible Atmospheric Policy, an industry coalition representing more than 95% of U.S. HFC production and a significant majority of the user industries, is announcing actions today that support a Montreal Protocol amendment to phase down the production and consumption of HFCs. The Alliance also announced today that it commits to take actions and support policies with a goal to reduce global HFC greenhouse gas contribution by 80% by 2050 relative to current emissions. This will be accomplished by advancing technologies; improving servicing practices; increasing recovery, reclamation, and reuse; and conducting technology assessments and workshops.

Air Conditioning Heating & Refrigeration Institute, an industry association representing 90% of U.S. air conditioning manufacturing and 70% of the global industry, announced today that its member companies will commit to spending \$5 billion in new R&D and capital expenditures to develop and commercialize low global warming potential (GWP) technologies over the next ten years. During the past decade, the Institute has worked diligently to reduce the potential impact of refrigerants on the Earth's climate, including spending close to \$2 billion since 2009 researching low-GWP refrigerants and technologies.

Arkema, a diversified worldwide manufacturer of specialty industrial chemicals and high-performance materials for use in renewable energies and other sectors, announced today that it is committed to the development of climate-friendly products to provide a timely and adequate global supply base. Arkema commits to reduce GHG emissions from its operations by an additional 30% by 2020, as well as its net energy purchases by 1.5% on average each year through the year 2020. Finally, Arkema agrees to control, and to the extent feasible, eliminate byproduct emissions of HFC-23, the most potent HFC, at all its fluorochemical production facilities worldwide.

Coca-Cola, the world's largest beverage company, has set a goal for 100% of its newly purchased cold drink equipment to be HFC-free. To date, Coca-Cola has more than one million units of HFC-free refrigerated equipment in use throughout its global system, achieving 30% use of HFC-free refrigeration equipment this year. In the U.S., Coca-Cola has already purchased 20,000 HFC-free units in 2014. The company is also increasing the energy efficiency of its refrigeration equipment, which has improved by more than 50% since 2000.

Carrier, a global manufacturer and distributor of high-technology heating, air conditioning and refrigeration solutions and part of United Technologies Corp., announced today its commitment to pursue the commercialization of HFC-free refrigerants in road transportation refrigeration by 2020, building on its expertise with HFC-free carbon dioxide refrigerant in marine container and food retail refrigeration. Carrier's Syracuse, New York facility developed the world's first carbon dioxide technology for marine container refrigeration and is pursuing similar technology for road transport refrigeration. Carrier's CO₂tec commercial refrigeration systems using carbon dioxide refrigerant are installed in nearly 1,000 supermarkets across Europe.

Danfoss, an international manufacturer of high efficiency products used in air-conditioning and refrigeration systems, announced today that it is championing a stakeholder task force to accelerate adoption of standards and building codes for next generation, low-GWP refrigerants. Danfoss will partner with the Alliance for Responsible Atmospheric Policy to establish this task force.

DuPont, the science company that invented fluorinated refrigerants and has helped lead the global transition to continually more sustainable refrigerants, announced today that its new products are anticipated to reduce greenhouse gas content of refrigerants by some 90 million tons carbon dioxide equivalent in the U.S., and 245 million tons worldwide by 2025, reducing greenhouse gases by a similar amount. This includes five products already in the market or soon to be introduced that provide alternatives in applications as varied as insulating foam production, commercial and retail refrigeration, automobile and building air conditioning, refrigerated transport, and industrial energy efficiency.

Emerson Climate Technologies, a global manufacturing and technology company in the heating, air conditioning and refrigeration industry, today announces its 2015 environmental stewardship initiatives, reinforcing its commitment to the development of low-GWP refrigerants and higher efficiency technologies. Emerson will launch a full line of compressors, flow and electronic controls approved with three non-flammable low-GWP HFCs. These refrigerants are 50% lower in GWP compared to today's choices. Emerson will also expand its full line of Scroll compressors for commercial refrigeration use in supermarkets and convenience stores that will be 15% more efficient than today's products. In July 2015, Emerson will expand its solutions offering for use with carbon dioxide, a non-HFC and energy-efficient refrigerant, with its complete line of compressors, flow controls, discrete and system electronic controls. Emerson invests nearly two-thirds of its global R&D resources on developing low-GWP and energy efficient products, solutions and services, and will continue increasing its investment in 2015 with the opening of its new global innovation center in Dayton, Ohio. The center will focus on ways to solve energy and environmental challenges affecting everything from homes to data centers.

Goodman Manufacturing Company, an air conditioning and heating equipment manufacturer, announced today its commitment to have a full product line of low-GWP air conditioners and/or heat pumps after completion of working with EPA and other stakeholders to permit low-GWP refrigerants in both building codes and EPA's SNAP program.

Hillphoenix, a Dover Company and manufacturer of commercial refrigerated display cases and specialty products, refrigeration systems, integrated power distribution systems and walk-in coolers and freezers, announced today that it is commercializing a 100% HFC-free, carbon dioxide booster system now commercially viable for all climate regions. Hillphoenix is also introducing an HFC-free hydrocarbon self-contained door case and a recently re-engineered service called "Close the Case" that utilizes the company's door technology to retrofit existing open display cases.

Honeywell, a global technology and manufacturing company, serving customers worldwide with aerospace products and services; control technologies for buildings, homes, and industry; turbochargers; and performance materials, plans to transition the majority of its high-GWP HFC production to new low-GWP production. These changes will reduce Honeywell's annual production of high-GWP HFCs by nearly 50% on a carbon dioxide equivalent basis prior to 2020, with a cumulative elimination of more than 350 million metric tons of carbon dioxide equivalent by 2025. To achieve this goal, Honeywell anticipates spending a total of more than \$880 million for research and development and new capacity, mainly in the United States. Honeywell has commercialized a wide range of Solstice®-brand HFC replacements for use as refrigerants, insulating agents, aerosols, and solvents, which are being rapidly adopted. Honeywell also announced today the start-up of two new Solstice production plants in Baton Rouge, Louisiana, to manufacture these materials. Honeywell also agrees to strictly control and, to the extent feasible, eliminate byproduct emissions of HFC-23, the most potent HFC, at Honeywell fluorochemical production facilities.

Johnson Controls, a global multi-industrial company, announced today that it commits to using the lowest GWP option for each application that best fits the needs of its customers from the standpoint of safety, efficiency, reliability, availability, and economy. Johnson Controls also commits to spend \$50 million over the next three years to develop new products and improve and expand its existing low-GWP portfolio, of which a significant portion of that investment will address products that traditionally use HFC refrigerants. The company has spent more than \$26 billion over the past three years in the development of low-GWP technologies.

Kroger, one of the world's largest retailers, announced today that it will join U.S. EPA's GreenChill program. Kroger, in joining GreenChill, commits to establishing a refrigerant inventory and set emissions reduction targets; using advanced refrigeration technologies in new and remodeled stores where feasible; collaborating across the industry to identify and share service and operational practices that reduce emissions. Kroger is committed to reducing climate-damaging refrigerant emissions and exploring new designs that reduce the potential for these emissions.

Lapolla, a manufacturer and global distributor of spray foam insulation and reflective roof coating technology, announced today that it commits to transitioning its entire product line of foam and coating systems to no longer use high-GWP HFCs by 2016. Lapolla will also provide more than 18 seminars on the importance of eliminating high-GWP HFCs from the environment.

Los Angeles Department of Water and Power (LADWP), the largest municipal utility in the U.S., plans to include a criterion for low-GWP HFCs in its energy efficiency incentives for residential refrigerators, which would begin the market transformation to phase down high-GWP HFC use by sending the right signal to both manufacturers and consumers. Combating climate change is a top priority for LADWP, which has recently adopted an aggressive new energy efficiency goal to supply 15% of expected power needs in 2020 through energy efficiency, and has also committed to eliminate coal fired generation from its electricity supply by 2025, two years ahead of California mandates.

Mission Pharmacal, a third-generation, family-owned and operated healthcare company whose focus is to bring safe, innovative and high-quality products to physicians, patients and consumers, announced today the introduction of a Dr. Smith's® zinc oxide diaper rash spray that uses a new low-GWP aerosol technology. Mission Pharmacal is also announcing the introduction of a rash and skin spray and an adult barrier spray that utilize the same technology. Mission Pharmacal commits to continued development of aerosol products that help curb emissions of HFCs.

PepsiCo, Inc., one of the world's largest food and beverage companies, announced today a goal that all of its future point of sale equipment (coolers, vending machines and fountain dispensers) purchased in the United States, will be HFC-free by 2020. To meet this goal, PepsiCo will begin purchasing new HFC-free equipment starting in 2015. Outside of the United States, PepsiCo has already begun this process by buying more than 290,000 HFC-free pieces of equipment since 2009. To minimize the impact of existing equipment, PepsiCo has innovated its coolers and vending machines to improve their energy efficiency by 60% compared with a 2004 baseline and since 2010 has been using a 100% HFC-free insulation/foam for all new equipment. PepsiCo reports that the new insulation/foam eliminates 75% of HFC based direct emissions and that these combined efforts have reduced total GHG emissions by 18% since 2007.

Red Bull, the creator of the energy drink category, announced today that it will order an estimated 32,000 climate-friendly hydrocarbon coolers for 2015. Red Bull will also implement ongoing training of cooler service technicians from six partner companies for the repair and proper disposal of these coolers. Red Bull has committed to 100% procurement of ECO-Coolers for the cooling of its beverages where technically and legally feasible. Red Bull's ECO Coolers use up to 45% less energy than previous generations of cooling equipment and have an average energy saving of 23% compared to other conventional refrigerators.

SEVO Systems, a global manufacturer of non-HFC fire system technologies, announced today that it commits to enabling a reduction of the equivalent of 12 million metric tons of carbon dioxide by 2020 by transitioning to a low-GWP alternative. This technology will be released using innovative fire suppression systems utilizing the unique properties of 3M™ Novac™ 1230 Fire Protection Fluid.

Target, an upscale discount retailer with approximately 1775 stores in the US, recently opened two new cold storage facilities expanding its refrigerated warehouse space by nearly one million square feet. These new facilities, designed with ammonia, an HFC-free refrigerant, also eliminate the use of HFC refrigerants in their heating, ventilating, and air conditioning systems and reduce their carbon impact by 900 metric tons of CO₂. The company also has five stores that use carbon dioxide refrigeration systems and commits to expanding this technology to two additional sites in 2015. Target is also partnering with chemical producers to test a new generation of refrigerants, hydrofluoroolefins (HFOs) that do not affect the ozone layer and have at least a 60% lower-GWP than the products they are replacing. In addition, Target is working with the manufacturer of beverage coolers to test HFC-free solutions this fall.

Thermo King, a brand of Ingersoll Rand that manufactures transport temperature control systems, is announcing that it will offer its customers safe, reliable, and energy efficient product alternatives and retrofit services for marine, truck and trailer applications using a refrigerant with about half the GWP compared to what is currently used. These new offerings will be available in 2015-2016 in Europe, the Middle East, and Africa, and to the United States upon EPA approval of the alternative refrigerant. Thermo King reports that this alternative would avoid the equivalent of approximately 1.6 million metric tons of CO₂ in the U.S. by 2020.

True Manufacturing, the largest manufacturer of self-contained commercial refrigeration in the nation, announced today that it commits to using only climate-friendly, low-GWP refrigerants and low-GWP blowing agents, in all future general use and refrigeration product development. Over the next five years True Manufacturing will develop low-GWP replacements for its existing products. True Manufacturing reports that these improvements will reduce emissions of climate-damaging HFCs by more than 200,000 million metric tons of CO₂ equivalent.

2015 COMMITMENTS

Chemours today announced that its Opteon™ family of low-GWP products is anticipated to reduce greenhouse gas emissions globally by 300 million tons of CO₂ equivalent by 2025, which represents more than a 20% increase from its September 2014 projections. In addition, Chemours today agreed to control and, to the extent feasible, eliminate by-product emissions of HFC-23 at all its fluorochemical production facilities worldwide. Furthermore, Chemours today agreed to use in the U.S. only feedstock HCFC-22 from producers that control and, to the extent feasible, eliminate by-product emissions of HFC-23 at their production facilities in North America. Chemours was created through the spin-off of DuPont Performance Chemicals in July 2015, and it continues to facilitate the global transition to more sustainable refrigerants as the largest global supplier of HFO-1234yf.

Daikin Industries Ltd. today announced its commitment to strictly control and, to the extent feasible, eliminate by-product emissions of HFC-23 at its fluorochemical production facilities worldwide. Daikin's plant in Decatur, Alabama, was the first plant in the U.S. that committed to the destruction of HFC-23 when it started operations in 1994. Today's commitment extends to all Daikin facilities worldwide and is estimated to reduce global emissions by almost 7 million metric tons of CO₂ equivalent per year. Daikin recently also announced that it is offering companies worldwide free access to 93 patents in order to encourage the development and commercialization of comfort cooling and heating technologies that use R-32 – a refrigerant with a lower global warming impact than most common refrigerants in use today – as a single-component refrigerant. Daikin is one of the world's largest air conditioner and refrigerant manufacturers.

Danfoss today announced its multi-million dollar investment in a state-of-the-art application development and testing center in North America that will help to facilitate the transition to low-GWP refrigerants through providing air conditioning and refrigeration manufacturers with additional capacity to test new equipment using low-GWP refrigerants for performance and safety. The center is anticipated to come online in 2016 and it will accommodate equipment sizes up to 150 tons of refrigeration. Danfoss is an international manufacturer of high-efficiency products used in air-conditioning and refrigeration systems.

Dow Chemical today announced its commitment to the elimination of high-GWP HFCs in its spray foam adhesive product line. More specifically, Dow Building Solutions is reformulating their one component spray foam adhesive product line for the commercial roof adhesive market to use low-GWP blowing agents instead of HFCs. In addition, its tile roof spray foam adhesive product line will be transitioned to low-GWP blowing agents in the next two to three years. Together, these actions will avoid approximately 200,000 metric tons of CO₂ equivalent per year. Dow Chemical is a global advanced materials, specialty chemicals, and plastics company.

Hillphoenix today announced that it will launch in Q4 2015 a CO₂ booster system that is intended for stores with a smaller footprint. In addition, it announced that it has completed its second commercial installation of an ammonia / CO₂ cascade system for use in supermarket applications. Furthermore, based on its successful installation of the first two CO₂ ice rinks in Anchorage, Alaska, Hillphoenix is planning for the future introduction of this CO₂ booster system technology, contingent on EPA approval of CO₂ as a refrigerant in ice rink applications. Hillphoenix is a Dover Company and a manufacturer of commercial refrigerated display cases and specialty products, refrigeration systems, integrated power distribution systems, and walk-in coolers and freezers.

Honeywell today announced that its Solstice® line of low-GWP products is anticipated to reduce greenhouse gas emissions globally by 475 million tons of carbon dioxide equivalent by 2025, which represents a 36% increase from its September 2014 projections. In addition, Honeywell today committed that, to the extent possible, it will use feedstock HCFC-22 from producers that strictly control and, to the extent feasible, eliminate by-product emissions of HFC-23 at their production facilities worldwide. Honeywell is a global technology and manufacturing company that serves customers worldwide with aerospace products and services; control technologies for buildings, homes, and industry; turbochargers; and performance materials.

Ingersoll Rand has announced that it will reduce its refrigerant-related emissions from products by 50% and emissions from its operations by 35% by 2020. It will also invest \$500 million on research and development (R&D) for long-term emissions reductions. As part of this commitment, Ingersoll Rand today announced that Thermo King trailer, self-powered truck, and marine refrigeration products with strong efficiency performance and a lower-GWP refrigerant will be available to U.S. customers by 2017, contingent on SNAP approval. In addition, the Trane high-performance chiller portfolio with low-GWP refrigerant alternatives will be available in the U.S. by the end of 2018, with commercial availability dependent on receiving SNAP approval for some new refrigerants. Ingersoll Rand is focused on creating comfortable, sustainable, and efficient environments.

Johnson Controls, Inc. today announced multiple actions that it is committed to taking over the course of the next year. In response to changing market conditions and the preferences of some of its customers, Johnson Controls will expand the availability of high-efficiency, low-GWP refrigerant options in its commercial air conditioning and industrial refrigeration product portfolio; offer new equipment that can be readily retrofitted in the future with high-efficiency, low-GWP options for customers who are concerned that they will not receive the full economic and environmental benefit over the entire life of their HFC equipment; and develop aftermarket retrofit services to address the installed base of HFC equipment for customers that want to convert their existing equipment to low-GWP refrigerants. To support the safe use of some mildly-flammable, low-GWP refrigerants, Johnson Controls is pledging up to \$100,000 to accelerate and fund independent, third-party, peer-reviewed research to help develop practical and fact-based safety standards related to the use of these refrigerants. In addition, it is making a commitment to support and participate in the development and standardization of service technician and operator training for the safe use of these refrigerants. Johnson Controls' Building Efficiency business delivers products, services, and solutions that increase energy efficiency and lower operating costs in buildings.

NCFI Polyurethanes today announced several commitments in support of its goal to convert its entire commercial construction product line to low-GWP products. First, it announced that it will complete the formulation of roofing foams to use low-GWP blowing agents by 3Q 2015. Second, NCFI Polyurethanes announced that it will complete the formulation of open- and closed-cell polyurethane foam wall spray with climate-friendly blowing agents by 4Q 2015. Third, it announced that it will complete the formulation of an entire construction products line with low-GWP blowing agents by the end of 2016. Finally, NCFI Polyurethanes announced that it will complete the formulation of low-GWP custom formulated product foams (taxidermy, automobile, marine, and medical) by the end of 2016. Reformulation will also be complete for rigid molding and integral skin foams in the same time period, prior to their transition compliance dates. NCFI Polyurethanes is a division of Barnhardt Manufacturing Company and a leader in the manufacturing of flexible polyurethane foam. It offers a complete line of flexible foams for furniture seating, transportation seating, bedding, carpet underlay, and packaging. In addition, it innovates polyurethane foam solutions for spray foam insulation, roofing, marine flotation, packaging, specialty molding, and many other uses.

Target today announced that all of the new stand-alone coolers in its stores with a compressor capacity below 2,200 btu/hr will be HFC-free starting in January 2016. This action has Target moving out of HFC refrigerants in these applications long before the SNAP requirement comes into place in 2019. Target also announced its commitment to expand the use of CO₂ refrigeration systems in new stores, and it currently has seven systems operating in Target stores and two additional stores under development that will use these refrigeration systems. In addition to using CO₂ refrigeration systems, Target announced its plans to expand its use of HFO blends in refrigeration systems that are good candidates for this technology. Furthermore, Target announced that its College Park, Maryland, location received GreenChill certification. Target is an upscale discount retailer with more than 1,800 stores in the U.S.

Thermo Fisher Scientific today announced that it will transition its entire platform to hydrocarbons by 2020. In particular, 20% of its entire medical and laboratory cold storage portfolio will be HFC-free by the end of 2016, 65% of its refrigeration systems will be HFC-free by the end of 2017, and it will be 80% HFC-free on blowing agents by the end of 2017. At the same time, it will reduce the energy consumption of its entire cold storage portfolio by more than 50% by 2020. Thermo Fisher Scientific is one of the world's largest manufacturers of scientific and medical cold storage equipment.

The Alliance for Responsible Atmospheric Policy today announced that it will work with the Air Conditioning, Heating and Refrigeration Institute (AHRI); ACCA – The Indoor Environment and Energy Efficiency Association; Heating, Air-Conditioning and Refrigeration Distributors International (HARDI); and EOS Climate to develop and implement a Reclaimed HFC Credit Bank that can be a component of the Global Refrigerant Management Initiative (GRMI) that was announced at the United Nations Secretary General's 2014 Climate Summit. GRMI is developing initiatives aimed at reducing global HFC emissions by 30% to 50% within 10 years. The Reclaimed HFC Credit Bank aims to utilize an HFC reclaim protocol under the American Carbon Registry to provide certified carbon credits for reclaimed HFC material, thereby helping to realize GRMI's commitment. The goal is to implement a market mechanism that allows building owners, manufacturers, and industry participants to expand the use of reclaimed HFCs. There will be a pilot project in 2016, with full implementation in the U.S. in 2017. The Reclaimed HFC Credit Bank is envisioned as being both consistent with, and further supportive of, domestic regulations concerning refrigerant management, including the extension of regulations issued under Section 608 of the Clean Air Act to HFCs.

The Air Conditioning, Heating and Refrigeration Institute (AHRI) today announced that it has formed a committee of experts to identify and prioritize research projects needed to fill critical knowledge gaps for the safe use of mildly-flammable refrigerants, and that it will commit \$1 million to this new research effort to support code and standard activities related to the use of such refrigerants.

Annex III: Changes to the List of Companies from the 2014 and 2015 White House Roundtable

Since the 2014 and 2015 private-sector commitments, several businesses have changed ownership or been absorbed by other entities. These include: Fomo Products, Roundy's, Lapolla, and Demilec. Huntsman Building Solutions now owns Demilec and Lapolla. Roundy's Supermarket is now a subsidiary of Kroger. ICP Group acquired Fomo Products. Dow Chemical made commitments in 2015 regarding its spray foam and blowing agent product lines, however Dow's product line was moved to E. I. du Pont de Nemours following their 2017 merger with Dow Chemical.

REFERENCES

- 1 Atmospheric Chemistry and Physics. ACP, 22, 6087–6101, 2022. Projections of hydrofluorocarbon (HFC) emissions and the resulting global warming based on recent trends in observed abundances and current policies. Guus J. M. Velders, John S. Daniel, Stephen A. Montzka, Isaac Vimont, Matthew Rigby, Paul B. Krummel, Jens Muhle, Simon O'Doherty, Ronald G. Prinn, Ray F. Weiss, and Dickon Young. (10 May 2022), <https://acp.copernicus.org/articles/22/6087/2022/>
- 2 Nature Climate Change. "Achieving Paris Climate Goals Calls for Increasing Ambition of the Kigali Amendment." 12. Purohit, Pallav, Nathan Borgford-Parnell, Zbigniew Klimont, and Lena Höglund-Isaksson. p.339–342, (March 2022), <https://doi.org/10.1038/s41558-022-01310-y>
- 3 EIA, IGSD, NRDC. "The 90 Billion Ton Opportunity: Lifecycle Refrigerant Management." (2022), <https://us.eia.org/wp-content/uploads/2022/10/Refrigerant-Lifecycle-FullReport-6Spreads-PRINT.pdf>
- 4 United Nations Environment Program, "Partners announce new ambition on sustainable cooling for COP28." (2023), <https://www.unep.org/news-and-stories/press-release/partners-announce-new-ambition-sustainable-cooling-cop28>
- 5 CDP, Playing it cool. Carole Ferguson, Kane Marcell, Alice Newman, Jinxi Chen and Emma Amadi.. Executive Summary. Which cooling companies are ready for the low-carbon transition? (June 2020)
- 6 UNEP. All Ratifications as of 12 May 2023, <https://ozone.unep.org/all-ratifications>
- 7 White House Archives. "FACT SHEET: Obama Administration Partners with Private Sector on New Commitments to Slash Emissions of Potent Greenhouse Gases." Statements & Releases. (16 September 2014), <https://obamawhitehouse.archives.gov/the-press-office/2014/09/16/fact-sheet-obama-administration-partners-private-sector-new-commitments->
White House Archives. "FACT SHEET: Obama Administration and Private-Sector Leaders Announce Ambitious Commitments and Robust Progress to Address Potent Greenhouse Gases." (15 October 2015), <https://obamawhitehouse.archives.gov/the-press-office/2015/10/15/fact-sheet-obama-administration-and-private-sector-leaders-announce>
- 8 EIA, 2022 Supermarket Scorecard, <https://www.climatefriendlysupermarkets.org/scorecard>
- 9 Kroger, Climate Roadmap, (2023), https://www.thekrogerco.com/wp-content/uploads/2023/02/Kroger-GHG-Goal-Roadmap_Feb-2023.pdf
- 10 CDP Disclosure Insight Action. "Section C 4.1." in The Coca-Cola Company - Climate Change 2021, (2021), <https://www.coca-colacompany.com/content/dam/journey/us/en/policies/pdf/sustainability/2021-cdp-climate-response.pdf>
- 11 Consumer Goods Forum, Current Members of the Consumer Goods Forum, (2023), <https://www.theconsumergoodsforum.com/who-we-are/our-members/>
- 12 Consumer Goods Forum, Board Approved Resolutions and Commitments (2018), <https://www.theconsumergoodsforum.com/wp-content/uploads/2017/11/2018-CGF-Resolutions-and-Commitments.pdf>
- 13 Ultra-low GWP is defined as <10 by California legislation, SB1206, and <5 by the UNFCCC Race to Zero. See EIA SB 1206 Fact Sheet. <https://us.eia.org/report/20221003-sb1206-fact-sheet/>. See also, Race to Zero: <https://climatechampions.unfccc.int/the-heat-is-on-coolings-race-to-zero/>
- 14 EIA, Climate Friendly Supermarkets, Global Trends, (2022), <https://www.climatefriendlysupermarkets.org/global-trends>
- 15 EIA, Climate Friendly Supermarkets. United States Supermarket Scorecard, (2022), <https://www.climatefriendlysupermarkets.org/scorecard>
- 16 EIN News. ATMOSphere Estimates 55,000 Stores Using Transcritical CO₂ Refrigeration in Europe. (2022), [https://www.einnews.com/pr_news/596904085/atmosphere-estimates-55-000-stores-using-transcritical-co₂-refrigeration-in-europe](https://www.einnews.com/pr_news/596904085/atmosphere-estimates-55-000-stores-using-transcritical-co2-refrigeration-in-europe)
- 17 Based on Walmart reports to CDP from 2005-2019 <https://www.cdp.net/en/Graph-of-annual-emissions-from-these-CDP-reports-here>: https://us.eia.org/wp-content/uploads/2023/04/NGO-Investor-Brief_Walmart-Shareholder-Resolution-4_HFCs.pdf
- 18 EIA and Green America, Walmart Investor Brief, (2021h), <https://us.eia.org/report/brief-to-shareholders-of-walmart-re-shareholder-proposal-to-improve-and-report-on-refrigerant-management-and-associated-emissions>
- 19 Walmart, Zero Emissions White Paper, (2022), https://www.walmartsustainabilityhub.com/media-library/document/zero-emissions-by-2040-white-paper/_proxyDocument?id=00000174-ad59-d343-a17d-bffd7bba0000
- 20 EIA, 2022 Supermarket Scorecard, <https://www.climatefriendlysupermarkets.org/scorecard>
- 21 Walmart, Zero Emissions White Paper, (2022), https://www.walmartsustainabilityhub.com/media-library/document/zero-emissions-by-2040-white-paper/_proxyDocument?id=00000174-ad59-d343-a17d-bffd7bba0000
- 22 Cooling Specific FAQ to Join Race to Zero, <https://racetozero.unfccc.int/wp-content/uploads/2021/10/Cooling-Race-to-Zero-FAQ.pdf>
- 23 Race to Zero Criteria, Starting Lineup and Leadership practices - 2.0, (2021), <https://racetozero.unfccc.int/wp-content/uploads/2021/04/Race-to-Zero-Criteria-2.0.pdf>
- 24 Race to Zero, The heat is on: cooling's Race to Zero, (2021), <https://climatechampions.unfccc.int/the-heat-is-on-coolings-race-to-zero/>
- 25 Carbon Trust, Cooling Suppliers: Who's winning the Race to Zero? (2021), https://ctprodstorageaccount.blob.core.windows.net/prod-drupal-files/documents/resource/public/Cooling_suppliers_Race_to_Zero_Carbon_Trust_KCEP_report.pdf
- 26 UNEP. Cooling community announces steps to beat global warming with GBP 12 million boost from UK. (11 November 2021), <https://www.unep.org/news-and-stories/press-release/cooling-community-announces-steps-beat-global-warming-gbp-12-million>
- 27 Carbon Trust, Cooling Suppliers: Who's winning the Race to Zero? (2021), https://ctprodstorageaccount.blob.core.windows.net/prod-drupal-files/documents/resource/public/Cooling_suppliers_Race_to_Zero_Carbon_Trust_KCEP_report.pdf
- 28 Electrolux Group, Sustainability Report. (2022), <https://www.electroluxgroup.com/wp-content/uploads/sites/2/2023/03/sustainability-report-2022.pdf#page=47>
- 29 ATMOSphere Asia Interview with Godrej, (2018), <https://hydrocarbons21.com/sales-of-r290-rac-units-hit-600000-says-godrej/>
- 30 UNFCCC, Climate Ambition Builds Momentum for COP26 (2020), <https://unfccc.int/news/climate-ambition-summit-builds-momentum-for-cop26>
- 31 Godrej Group submits Science Based Targets initiative (SBTi) for emission reduction (2022), <https://www.pnnews.com/in/news-releases/godrej-group-submits-science-based-targets-initiative-sbti-for-emission-reduction-837199923.html>
- 32 Godrej, Sustainability Report, <https://godrejcp.com/sustainability/green-supply-chain>
- 33 Unilever, Climate Transition Action Plan. (2021), <https://www.unilever.com/files/92ui5eqz/production/56a097ca6baaa654e78dfa8a820257d9a9edabf0.pdf>
- 34 Ibid.
- 35 CDP. Playing it cool. Carole Ferguson, Kane Marcell, Alice Newman, Jinxi Chen and Emma Amadi.. Executive Summary. Which cooling companies are ready for the low-carbon transition? (June 2020), <https://www.cdp.net/en/investor/sector-research/cooling-report>
- 36 U.S. Environmental Protection Agency, Recent International Developments Under the Montreal Protocol. (2022), <https://www.epa.gov/ozone-layer-protection/recent-international-developments-under-montreal-protocol>
- 37 EIA, NRDC, IGSD: Lifecycle Refrigerant Management: The 90 Billion Ton Climate Opportunity. (2022), <https://us.eia.org/report/20221020-the-90-billion-ton-opportunity/>
- 38 Most HFCs and HFOs used in refrigerants and foams have at least one fully fluorinated carbon bond, meeting the criteria for being categorized as PFAS by the Organization for Economic Cooperation and Development (OECD), and are included in proposed regulations banning PFAS under the European Union REACH Proposal. See European Chemicals Agency (ECHA), <https://echa.europa.eu/hot-topics/perfluoroalkyl-chemicals-pfas>
- 39 EIA, Chemical Nightmare: Ending emissions of fluorochemical greenhouse gases. (2022), <https://us.eia.org/report/chemical-nightmare-ending-emissions-of-fluorochemical-greenhouse-gases/>
- 40 The Earth's Energy Budget, Climate Feedbacks, and Climate Sensitivity Supplementary Material. In Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. 7.SM.6 Tables of Greenhouse Gas Lifetimes, Radiative Efficiencies and Metrics Table 7.SM.7 | Greenhouse gas lifetimes, radiative efficiencies, global warming potentials (GWPs), global temperature potentials (GTPs) and cumulative global temperature potentials (CGTPs). Smith, C., Z.R.J. Nicholls, K. Armour, W. Collins, P. Forster, M. Meinshausen, M.D. Palmer, and M. Watanabe, 2021: [Masson-Delmotte, V., P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.)]. (2021), https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_Chapter07_SM.pdf
- 41 EIA compiled this estimate based on publicly available information of those who report emissions.
- 42 White House Archives. "FACT SHEET: Obama Administration Partners with Private Sector on New Commitments to Slash Emissions of Potent Greenhouse Gases." Statements & Releases. (16 September 2014), <https://obamawhitehouse.archives.gov/the-press-office/2014/09/16/fact-sheet-obama-administration-partners-private-sector-new-commitments->
White House Archives. "FACT SHEET: Obama Administration and Private-Sector Leaders Announce Ambitious Commitments and Robust Progress to Address Potent Greenhouse Gases." (15 October 2015), <https://obamawhitehouse.archives.gov/the-press-office/2015/10/15/fact-sheet-obama-administration-and-private-sector-leaders-announce>