UNFCCC COP21
December 5, 2015
Paris, France

Industry Support for Responsible Global HFC Management and Policies

The Alliance
for Responsible Atmospheric Policy

Climate Progress on HFCs

Kevin Fay, Executive Director
Alliance for Responsible Atmospheric Policy

Industry Support for Responsible Global HFC Management and Policies
UNFCCC COP21
December 5, 2015
Paris, France

Active Policy Support

- Alliance Policy Development and Statements, 2013-2014
  - International and Domestic Priorities
  - MP Amendment Support
  - Complementary Domestic Programs and Activities
- White House Roundtables
  - September 2014
  - October 2015
- Technology Announcements

The Alliance
for Responsible Atmospheric Policy

International Engagement

- Participation in Dialogue with China, India, Saudi Arabia, etc.
- CCAC actor-efforts to support MP amendment process, GFCCC, GRMI
- Participation in Canada, California, Japan, EU, Australia policy development process
- Montreal Protocol Meeting of the Parties (MOP)
  - October 29-30, 2015 in Dubai

The Alliance
for Responsible Atmospheric Policy

Montreal Protocol and HFCs

Nanette Lockwood
Ingersoll Rand

Industry Support for Responsible Global HFC Management and Policies
UNFCCC COP21
December 5, 2015
Paris, France

The Alliance
for Responsible Atmospheric Policy

Montreal Protocol

- 1987 international treaty that is effectively phasing out ozone depleting substances
- HFCs with high global warming potential (GWP) are being used as alternatives to ozone depleting substances
- Amending the treaty to include HFCs would effectively reduce the use of these high global warming potential substances globally
  - Provides market certainty which facilitates technology development
  - Creates market demand
  - Helps harmonize regional policies and decrease costs
  - Provides market flexibility

The Alliance
for Responsible Atmospheric Policy

Montreal Protocol
27th Meeting of the Parties

- November 1-5, 2015 in Dubai
- HFC Contact group
  - Key issues
    - Alternatives for high ambient temperature climates
    - Financing
    - HCFC Phase out timing
    - UNFCCC Relationship
- Decision
  - Parties agreed to “work within the MP to an HFC amendment in 2016”
  - Extraordinary Open Ended Working Group and Meeting of the Parties in 2016

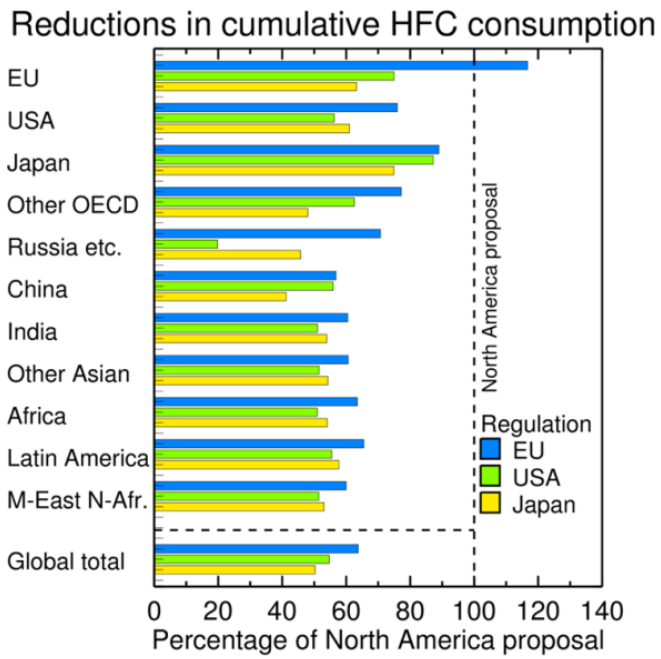
The Alliance for Responsible Atmospheric Policy

2015 Montreal Protocol HFC Phase-down Proposals

	North American		EU				India		Senegal		Pacific	
A5 Baseline	2011-2013: avg. HFC prod./consump. + 50% avg. HCFC prod./consump.		Prod.: 2009-2012 avg. HFC + 70% HCFC		Consump.: 2015-2016 avg. HFC and HCFC		2028-2030 avg. HFCs + 32.5% HCFC baseline		Appropriate		2015-2017 avg. HFC consump. + 65% HCFC baseline	
A5 Schedule	2021	100	2019	100	2019	100	2031	100	TBD	100	2020	85
	2026	80							*by TEAP		2025	65
	2032	40									2030	45
	2046	15	2040	15			2050	15			2035	25
											2040	10
Non-A5 Baseline	2011-2013: avg. HFC prod./consump. + 75% avg. HCFC prod./consump.		2009-2012 avg. HFC prod./consump. + 45% avg. HCFC prod./consump.				2013-2015 avg. HFCs + 25% HCFCs baseline		Appropriate		2011-2013 avg. HFC consump. + 10% HCFC baseline	
Non-A5 Schedule	2019	90	2019		85		2016	100	TBD	100	2017	85
	2024	65	2023		60		2018	90	*CBDR		2021	65
	2030	30	2028		30		2023	65			2025	45
	2036	15	2034		15		2029	30			2029	25
							2035	15			2033	10
HFCs Included	19		19				19		All		22 HFCs (incl. 3 HFOs)	
MLF Financing	Yes, incremental costs		Yes, incremental costs				Yes, full conversion costs		Yes, sufficient		Yes, incremental costs	
Cumulative HFC Emissions Avoided by 2050	77,400-98,900 MMTCO2e		79,000 MMTCO2e				Does not state		Does not state		Does not state	

The Alliance for Responsible Atmospheric Policy

Technology-Driven Phase-down



"Global adoption of technologies required to meet national regulations in EU, USA, and Japan reduce cumulative (2015-2050) consumption and emissions by 50% or more compared to the North American proposal. Regulations have been adopted in the EU, USA and Japan in 2014/2015 that are projected to reduce the HFC emissions in these regions. It is likely that this will drive global technological developments and thereby also reduce emissions in other regions. " †

† Source: Velders, Guus, et al. "Future Atmospheric Abundances and Climate Forcings from Scenarios of Global and Regional HFC Emissions." Factsheet from study of same name, Atmospheric Environment (2015), doi: 10.1016/j.atmosenv.2015.10.071.

The Alliance for Responsible Atmospheric Policy

Global Refrigerant Management Initiative

William F. McQuade,P.E., Executive Director of Global Energy and Sustainability Policy
Johnson Controls
Side Event 48: Industry Support for Responsible Global HFC Management and Policies
December 5, 2015

The Issue

- Reducing CO2 equivalent emissions from our industry's equipment is a significant opportunity.
  - *US EPA estimates that a typical supermarket refrigeration system with 3,000 to 3,500 lbs. of refrigerant leaks approximately 25% of its charge annually*
  - Units that are properly charged and maintained run at peak efficiency, further reducing CO2 emissions.
  - The US bank of CFCs, HCFCs and HFCs in the installed base is estimated to be 2.3 billion lbs; if released into the atmosphere, that would have a global warming impact equivalent to approximately 2 Gigatons of CO_2. Worldwide, these refrigerants have a global warming potential equivalent to approximately 7 Gigatons of CO_2.

GLOBAL REFRIGERANT MANAGEMENT INITIATIVE

The Issue (cont.)

- Regulation and legislation that address improvements in energy efficiency and promote low-GWP refrigerant technology only address new equipment entering the market place.
  - A much larger opportunity exists ***today*** to make significant cost-effective emission reductions from the existing installed base through effective refrigerant management practices.

- Immediate action can empower industry with education on best practices, economic incentives, and new information technologies related to leak monitoring, supply chain/inventory tracking and integration, recycling/reclamation, and appropriate end-of-life capture and destruction.

Developing a Solution

National industries must consider:

- The nature of their installed base
- The capacity of their industry to generate solutions to refrigerant leaks and inventory/supply chain inefficiencies
- The capacity of their government to generate and enforce solutions to refrigerant leaks and incentivize lifecycle emission reductions
- How to coordinate industry and government initiatives to maximize impact

GLOBAL REFRIGERANT MANAGEMENT INITIATIVE

An Industry Response

ABRAVA
Brazilian Association for HVAC-R

AHRI
we make life better®

The Alliance
for Responsible Atmospheric Policy

What: ABRAVA, AHRI, and the Alliance, with the support of the Climate and Clean Air Coalition (CCAC), initiated an industry-led Global Refrigerant Management Initiative (GRMI) in September 2014

Purpose: to identify and explore opportunities to educate the industry's global supply chain on ways to improve the management of refrigerants to reduce leak and service emissions and to promote the re-cycling, recovery, reclaiming and end of life destruction of refrigerants.

Goal: **Achieve a *30 – 50 % reduction in HFC emissions from refrigerant servicing within 10 years***

GLOBAL REFRIGERANT MANAGEMENT INITIATIVE

Areas of Focus

- Education and Training
- Certification
- Equipment Standards
- Policy Proposals, Model Laws
- Ongoing Industry Workshops
- Equipment Supply
- Monitoring and Recordkeeping
- Chain of Custody Tracking/Asset Optimization
- Development of and Participation in Existing Regional Organizations
- Availability of Recovery Equipment
- Maintenance and Repair Standards
- Coordination with UN Implementing Agencies

Current Steering Committee

ABRAVA
ASSOCIAÇÃO BRASILEIRA DE REFRIGERAÇÃO, AR CONDICIONADO, VENTILAÇÃO E AQUECIMENTO

AHRI
we make life better®

The Alliance
for Responsible Atmospheric Policy

AREMA
Airconditioning and Refrigeration Equipment Manufacturers Association of Australia

EPEE
European Partnership for Energy and the Environment

HRAI
YOUR ENVIRONMENT OUR EXPERTISE

AREA

GLOBAL REFRIGERANT MANAGEMENT INITIATIVE

Current GRMI Supporters

ABRAVA
ASSOCIAÇÃO BRASILEIRA DE REFRIGERAÇÃO, AR CONDICIONADO, VENTILAÇÃO E AQUECIMENTO

ANFIR
Asociación Nacional de Fabricantes para la Industria de la Refrigeración

acaire

JRAIA
The Japan Refrigeration and Air Conditioning Industry Association

AHRI
we make life better®

CRAA

Korea Refrigeration and Air Conditioning Industry Association
KRAIA
한국에이치백산업협회

The Alliance
for Responsible Atmospheric Policy

EPEE
European Partnership for Energy and the Environment

AREMA
Airconditioning and Refrigeration Equipment Manufacturers Association of Australia

HRAI
YOUR ENVIRONMENT OUR EXPERTISE

AREA

GLOBAL REFRIGERANT MANAGEMENT INITIATIVE

GRMI already has the support of industry associations from 9 countries and the EU, representing 4 continents, and will expand further in 2016

Current GRMI Activity

- AHRI Research
- Survey of Training and Education Programs
- Memorandum of Understanding Re: Reclaimed HFC Credit Bank
- COP21 Engagement
- Refrigerant Drivers License synergies
- Expand membership

Global Food Cold Chain Council

Expanding the food cold chain for a healthier planet

John Mandyck
United Technologies Corporation
Industry Support for Responsible Global HFC Management and Policies
December 5, 2015

Food Cold Chain

A supply chain where refrigeration is necessary for moving food products from field to market through the steps of food processing, transportation of refrigerated food products, and sale in retail food establishments

Market Sectors

- Agriculture
- Processing and Storage
  - Includes lg. pumped system, small/med. DX, chiller + secondary fluid
  - Typically use ammonia, HCFC-22, HFC-404A, HFC-134a, HCFC-123
  - Typical annual leakage is 2 to 10%
- Retail
  - Includes sealed integral, condensing unit, large centralized pack
  - Typically use R-404A, HFC-134a, HCFC-22
  - Typical annual leakage is <1 to 30%
- Food Service
  - Includes sealed integral, condensing unit
  - Typically use HFC-134a, R-404A
  - Typical annual leakage rate is ,1 to 20%
- Refrigerated Transport
  - Includes road vehicles and intermodal containers
  - Typically use R-404A, HFC-134a, HCFC-22
  - Typical annual leakage is 3-20%

Source: Gluckman, Ray. "Refrigeration equipment and refrigerants used in the cold chain." Presentation, Advancing Ozone & Climate Protection Technologies & Policies: The Food Cold Chain, Montreal, November 21, 2015.

GHG Emissions from Refrigeration

Direct Emissions

- Due to refrigerant leakage
- Current HCFC and HFC refrigerants have GWPs of 1000-4000

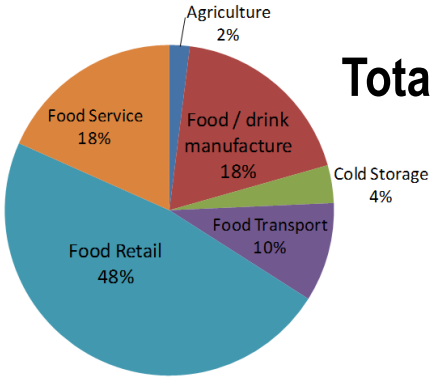
Indirect Emissions

- Due to energy use from refrigeration system operation
- Mostly CO2 (GWP of 1) from electricity generation

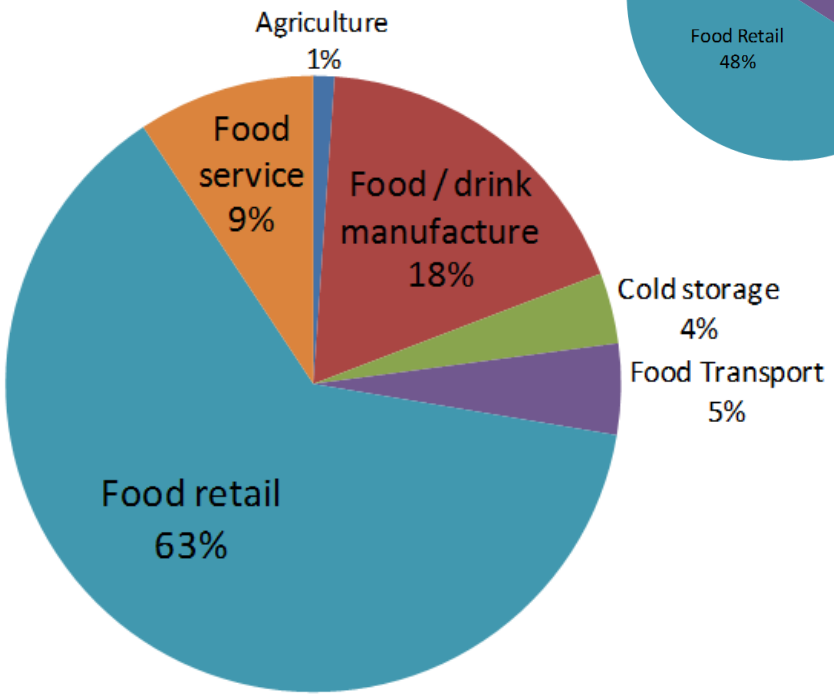
Source: Gluckman, Ray. "Refrigeration equipment and refrigerants used in the cold chain." Presentation, Advancing Ozone & Climate Protection Technologies & Policies: The Food Cold Chain, Montreal, November 21, 2015.

Direct v. Indirect GHG Emissions

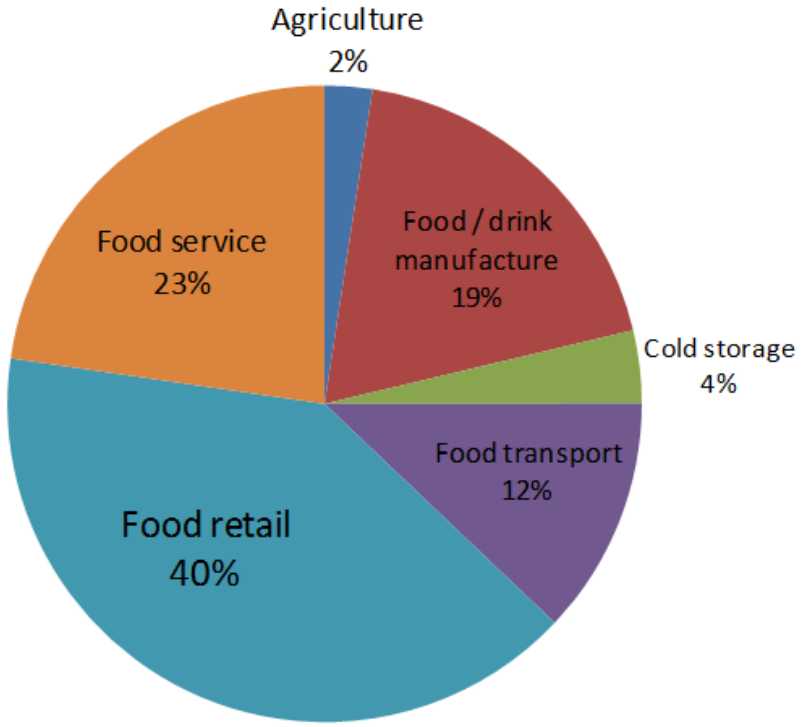
Total Emissions



Direct Emissions

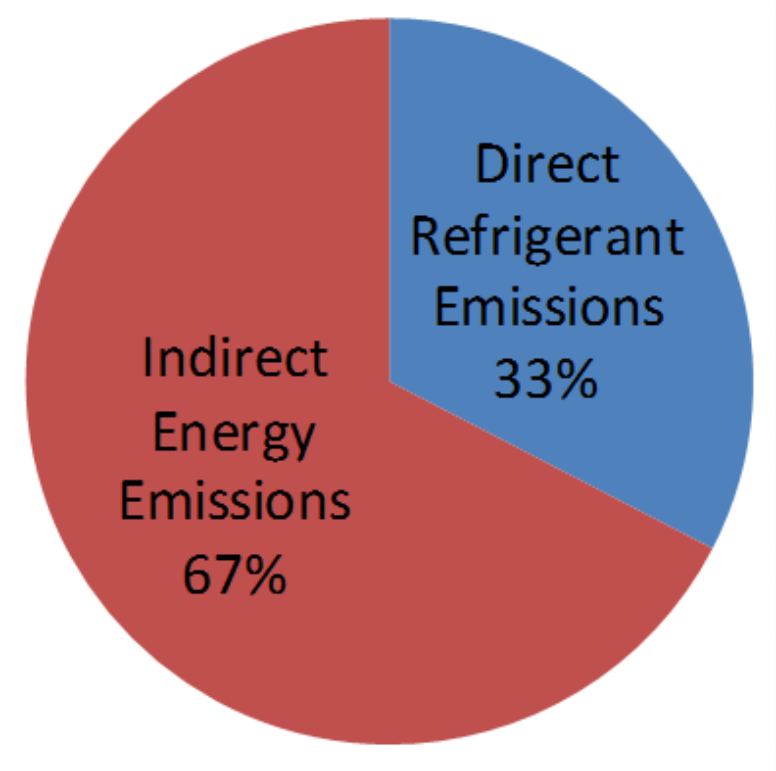


Indirect Emissions



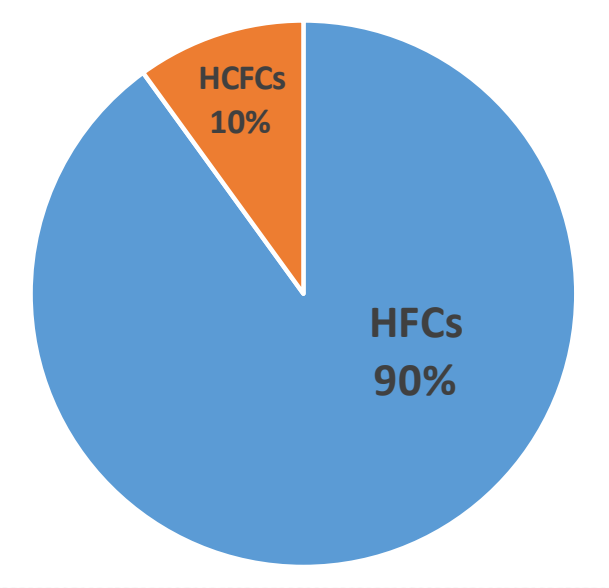
Source: Gluckman, Ray. "Refrigeration equipment and refrigerants used in the cold chain." Presentation, Advancing Ozone & Climate Protection Technologies & Policies: The Food Cold Chain, Montreal, November 21, 2015.

Total Refrigeration System GHG Emissions

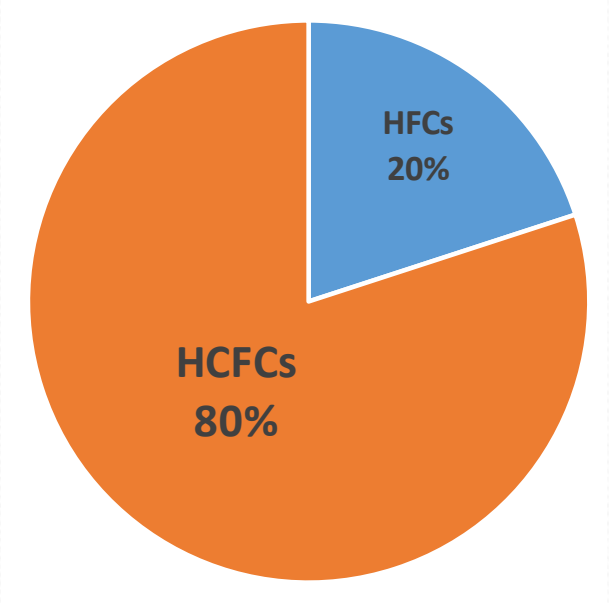


Source: Gluckman, Ray. "Refrigeration equipment and refrigerants used in the cold chain." Presentation, Advancing Ozone & Climate Protection Technologies & Policies: The Food Cold Chain, Montreal, November 21, 2015.

Direct Emissions: HFCs v. HCFCs



UK in 2015



Typical A5 in 2015

Source: Gluckman, Ray. "Refrigeration equipment and refrigerants used in the cold chain." Presentation, Advancing Ozone & Climate Protection Technologies & Policies: The Food Cold Chain, Montreal, November 21, 2015.

Reducing GHG Emissions from Refrigeration Systems

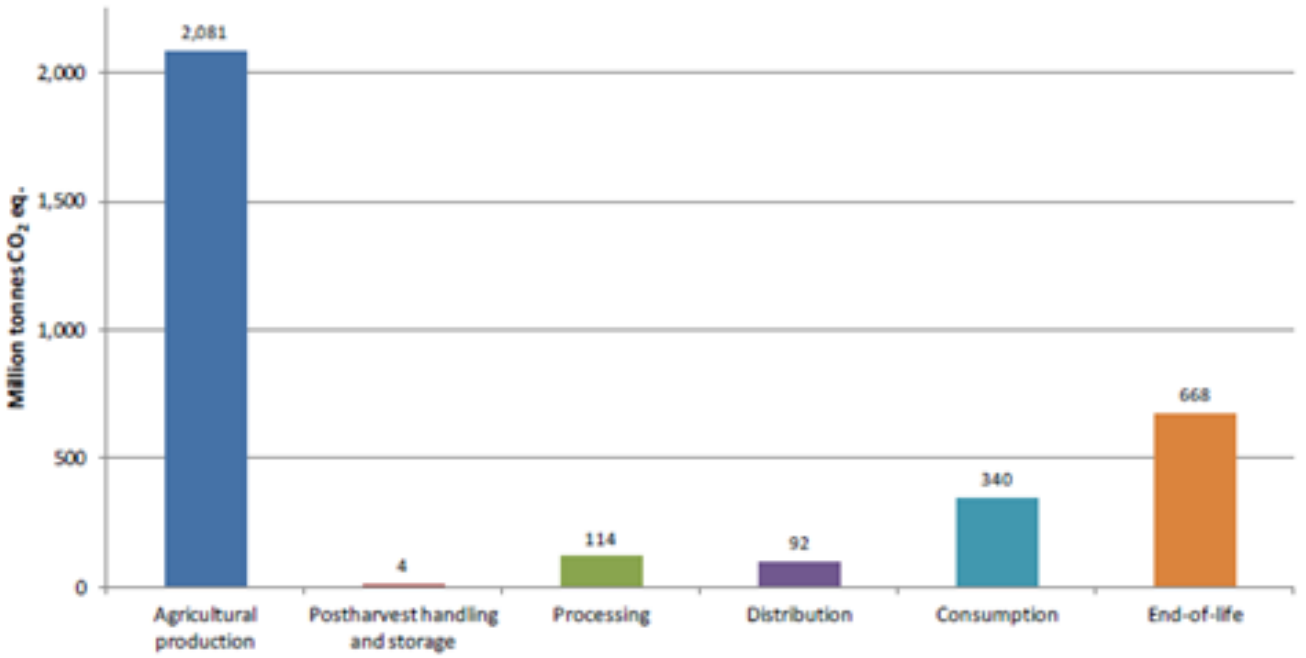
- Consider refrigerant usage variation by sub-sector
- Consider refrigerant leakage variation by sub-sector
- Consider direct v. indirect emissions

Source: Gluckman, Ray. "Refrigeration equipment and refrigerants used in the cold chain." Presentation, Advancing Ozone & Climate Protection Technologies & Policies: The Food Cold Chain, Montreal, November 21, 2015.

Food Waste

- According to the United Nations Food and Agriculture Organization (FAO), food waste contributes more than 3 billion MTCO2e annually in greenhouse gas emissions.
- If food waste were a country, it would be the **3rd highest emitter of GHGs in the world**.
- To reduce these emissions, industry can promote greater access to food preservation technology and the development and utilization of cost-effective and energy-efficient equipment.

Food Waste Carbon Footprint



3.3 Gigatonnes CO2e annual carbon footprint of food waste by life-cycle phase

Source: http://www.fao.org/docrep/018/ar429e/ar429e.pdf

A Sustainable Food Cold Chain

- As a result of the ODS phase-out and growing global RAC demand, HFC use and its climate change contribution are rapidly increasing. Unabated, HFCs are expected to increase from the current 1% to greater than 10% of GHG emissions by 2050. The food cold chain represents about 20% of all HFC use today.
- There are low-GWP alternatives to high-GWP HFCs in each aspect of the food cold chain; some companies are already taking action to replace high-GWP HFCs.
- Industry can build on these successes and deploy low-GWP compounds and technologies as the food cold chain is expanded and existing equipment is replaced.
- A cold chain using low-GWP technologies will reduce its own carbon footprint while better protecting food supplies to feed more people.

Industry Responds

- Sept. 2014, UN Secretary-General's Climate Summit, New York City: a coalition of major companies from around the world announced the organization of the **Global Food Cold Chain Council (GFCCC)**
  - to reduce greenhouse gas emissions in the processing, transportation, storage and retail display of cold food and
  - to stimulate global demand for energy-efficient low-GWP technology.
- GFCCC committed to work with the Climate and Clean Air Coalition (CCAC) to advance broad-based public and private sector collaborative solutions to reduce HFC emissions in the food cold chain across developed and developing countries.
- Successful implementation will increase human health, increase food supply, reduce consumption of water, promote more sustainable agricultural practices and reduce GHG emissions.

Mission and Goals

Mission: to simultaneously reduce food waste and its related emissions by expanding and improving the food cold chain.

Goals include the following:

- Identify, develop and promote technology-neutral policies and actions to reduce the food cold chain waste contribution to GHG emissions;
- Support solutions that are energy efficient and reliant on low-GWP compounds and equipment that increase access to food cold chain and reduce food waste;
- Identify and develop standards and practices to increase access to the food cold chain and reduce food waste; and
- Align with and influence international and national bodies, organizations and governments, including the FAO, CCAC, the UN Framework Convention on Climate Change (UNFCCC), and the Montreal Protocol.

First Year Achievements

- ✓ Established steering committee to draft bylaws and develop, implement and track progress to achieve reductions in use of high-GWP HFCs.
  - ✓ Steering Committee developed an initial plan of work, approved bylaws and a start-up budget, and is identifying additional member candidates.
- ✓ Sponsored Nov. 21 “Advancing Ozone & Climate Protection Technologies & Policies: The Food Cold Chain” in Montreal
- ✓ Co-commissioned a major study of the anticipated climate impact of the expanded use of refrigeration equipment in the food cold chain.
  - ✓ Even an expanded use of current technology would result in an annual net savings of 180 – 550 Mtons of CO2e globally when considering added energy demand and food loss reduction.

Sustainable Food Cold Chain

- Includes:
  - Focus on right equipment for task
  - Continuous energy efficiency improvements
  - Reliance on low-GWP refrigerants
  - State of the art refrigerant management practices

Food Cold Chain Cooperation

- Capacity building for developing country economies
- Assessment of agricultural practices and opportunities
- Adoption of complementary policies
- Funding for sustainable food cold chain expansion

Contact

Kevin Fay, Executive Director
Alliance for Responsible Atmospheric Policy
2111 Wilson Boulevard, 8th Floor
Arlington, VA, USA 22201
fay@alliancepolicy.com
+1(703)243-0344

The Alliance for Responsible Atmospheric Policy

ICCP INTERNATIONAL CLIMATE CHANGE PARTNERSHIP EST. 1991

GLOBAL FOOD COLD CHAIN COUNCIL

GLOBAL REFRIGERANT MANAGEMENT INITIATIVE