



Mr. Cooke is a Canadian international consultant. He has spent the past 28 years working globally for a range of IFIs, UN Agencies and the private companies on a wide range of international environmental investment and technical assistance assignments. Prior experience covered progressive engineering, project and executive management positions with private sector oil and gas, and hazardous waste management companies. He holds degrees in mechanical engineering and metallurgy.

Relevant assignments undertaken include development and supervision of solid and hazardous waste management investment projects involving contaminated sites, POPs stockpile elimination, qualification of halogenated waste treatment/destruction technologies, and ODS production and consumption phase out. He was the international consultant supporting Colombia's successful MLF project qualifying national End of Life ODS refrigerant and blowing agent destruction capability.

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WEBINAR SERIES

CLOSING THE LOOP: ENVIRONMENTALLY SOUND MANAGEMENT OF END-OF- LIFE ODS AND HFC

General Context and Overview of the EOL ODS/HFC Management Issue

Rick Cooke
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Group



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UNIDAD TECNICA OZONO
Colombia



This webinar is being organized within the
framework of a project funded by US EPA

Webinar Series Overview

- ❑ **Session 1 - Contextual introduction for ESM of EOL ODS/HFC and sustainable regulatory and institutional framework**
- ❑ **Session 2 - Development of required environmentally sound EOL ODS/HFC management infrastructure**
- ❑ **Session 3 - Sustainable financing mechanisms**

EOL ODS/HFC Issue Terminology

- ODS/HFCs refrigerants and blowing agents
- Controlled Substances under MP – production and consumption
- ODS/HFC Banks
- End of Life (EOL) ODS/HFCs
- Concentrated EOL ODS/HFCs
- Dilute EOL ODS/HFCs
- Other EOL ODS/HFCs

Role of the Montreal Protocol

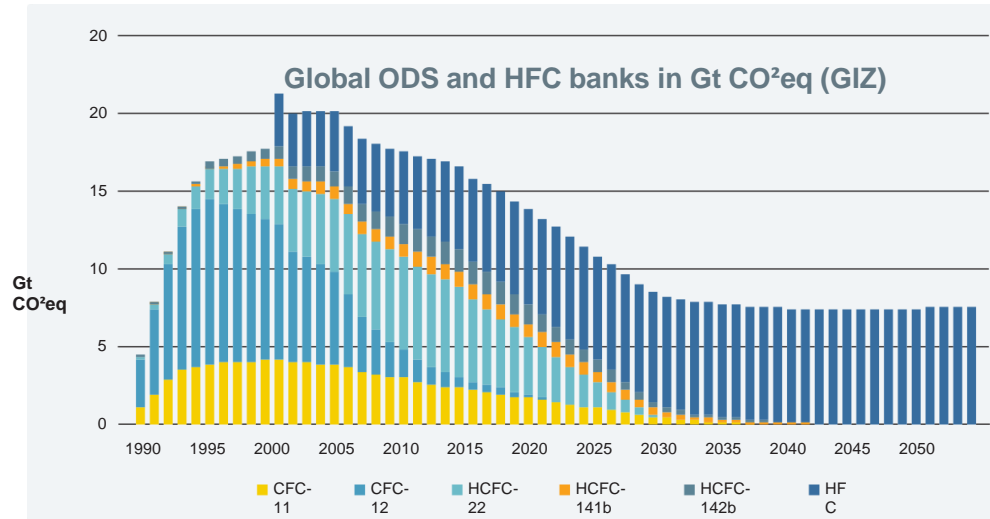
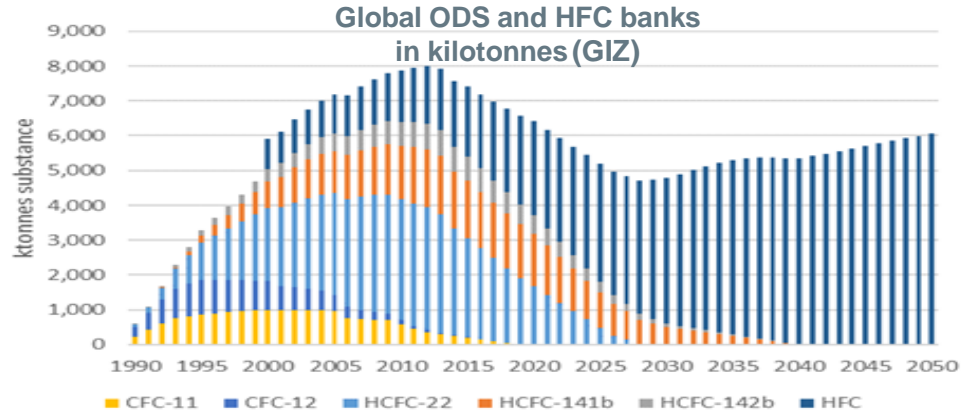
- **Achievements**
 - ❑ Elimination of CFC/HCFC production/new use
 - ❑ Impact 1989 to 2014 – 135 Gt CO₂ Eq.
- **Framework in place for production/new use of high GWP HFCs being substantially eliminated**
 - ❑ 80% reduction in production/new use by 2050 provides 0.4 oC global warming reduction
- **Assumption of release once produced and used**
- **No mandatory requirements on prohibiting release or requiring ESM at end of life**

Climate Impact of ODS/HFC ESM

- Accelerated production/use elimination and ESM management at EOL ODS/HFCs offer the potential for large climate change mitigation gains.
- Overall, one of the most effective overall global warming mitigation measures available to limit global temperature increase
- In comparison to other commonly targeted types climate change mitigation measures, refrigerant replacement, in service emission management, and EOL destruction reduction provide among the largest reductions

ODS/HFC Banks

- Banks of ODS/HFCs in use which will be released eventually if not managed at EOL.
- Recognized as sustaining ozone depletion and global warming into the future.
- Extensively modelled over the last 20 years (TEAP, IPCC, GIZ, Academia)
- Starting point for addressing EOL management
- Differentiation between:
 - ❑ Active Banks
 - ❑ Inactive Banks



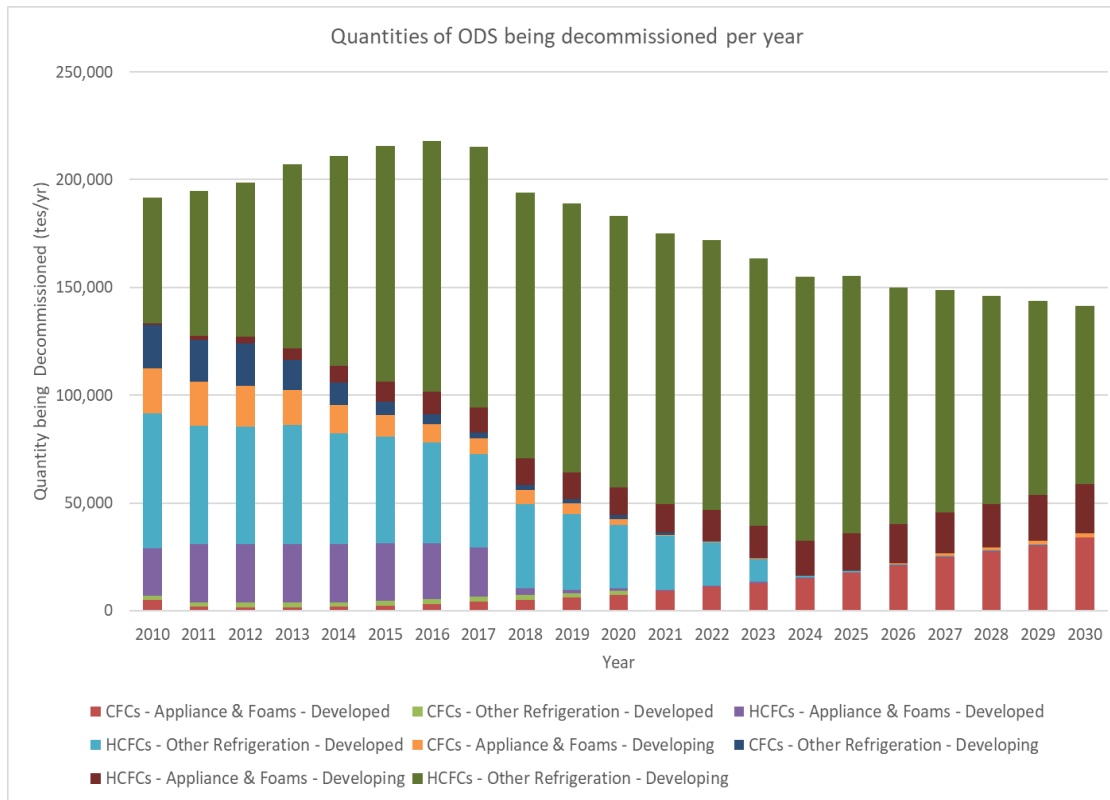
Key Points – Bank Projections

- Largest portion of reachable CFCs now emitted except for building insulation foam.
- Largest current Bank in quantity are HCFCs particularly HCFC-22
- HCFCs replaced in quantity and impact over the next decade by HFC, primarily refrigerants.
- Illustrates the transition from an ozone depletion to climate change as the priority in ESM of Banks

EOL ODS/HFC Waste Generation

- Accessible EOL ODS/HFCs reaching the waste stream annually - critical parameter for ESM of EOL ODS/HFC in practice.
- TEAP estimates that 435 Kt/yr. of EOL ODS/HFC, split equally between developed and developing countries would be generated in 2030
- ODS generated globally would be 175 Kt/yr. in 2020, declining to 140 Kt/yr. in 2030, predominantly HCFC refrigerants in developing countries

**Estimated annual quantities of ODS entering the waste stream, 2010 to 2030 (tonnes)
(based on data from the Decision XX/7 TEAP Task Force)**



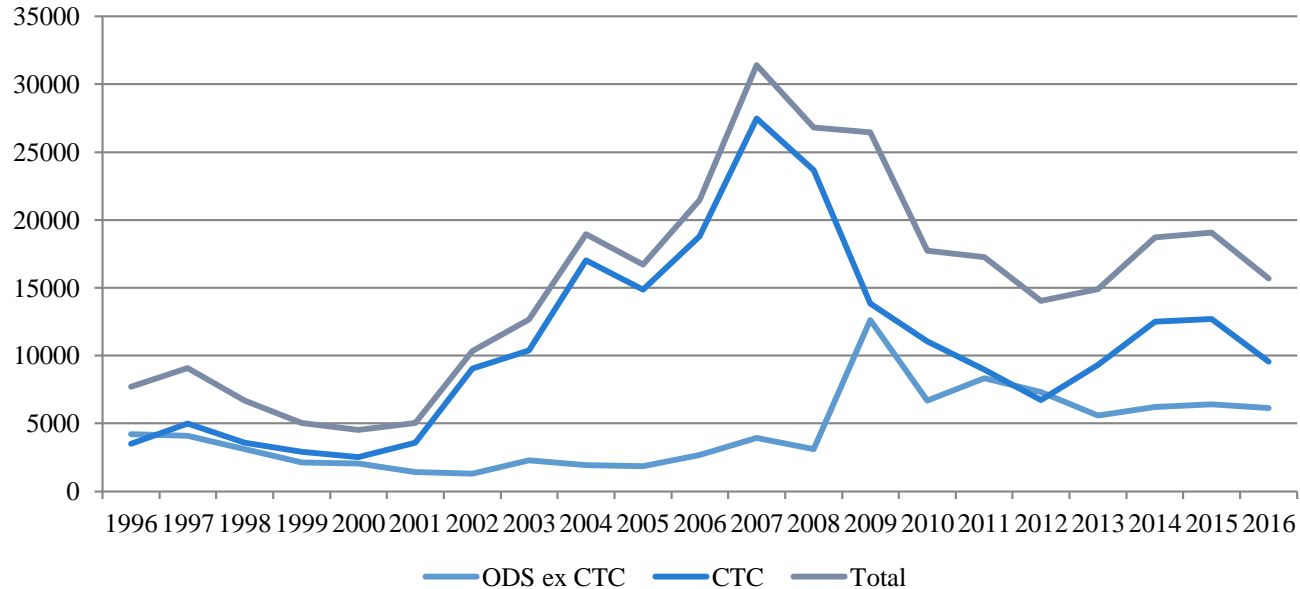
The “Appliance and Foams” category includes all refrigerants and blowing agents available from domestic refrigerators and other hermetic refrigeration appliances (e.g., freezers, stand-alone display cabinets etc.) and all other foams, such as building insulation foams. The “Other Refrigeration” category includes refrigerants from other refrigeration applications, including commercial, industrial, transport, mobile air conditioning and stationary air conditioning (e.g., CFC-11 centrifugal chillers).

Actual EOL ODS/HFC Destruction

- **MP 2020 reporting from 24 countries (18 NA5, 6 A5)**
- **ODS report destroyed was relatively constant over the last decade - 18,170 t in 2019 including CCl₄**
- **Estimated 2019 Annex A1 and Annex C chemicals (including CFC-11, CFC-12, HCFC-22, and HCFC-141b) destroyed -approximately 4,600 t primarily in NA5 countries and mainly in EU, Japan, Korea and US.**

Reported MP ODS Destruction

Total ODS & CTC destruction reported by Parties
(in metric tonnes)



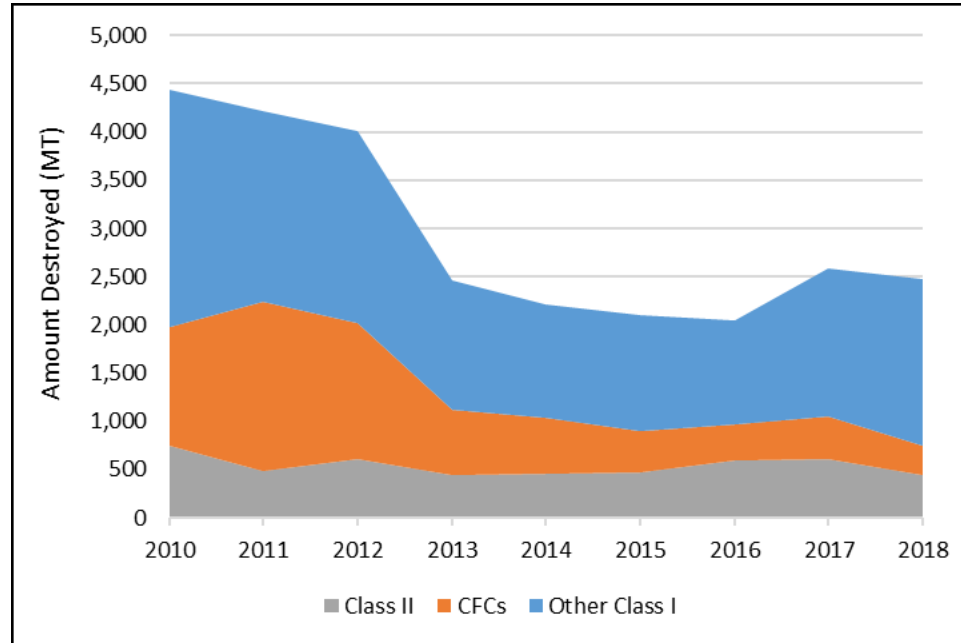
NA5 EOL ODS/HFC Destruction

- **European Union (2019)**
 - ❑ 918 HCFCs, 835 Mt CFCs, 700 Mt HFCs (other than HFC-23)
 - ❑ Impact of F-Gas Reg.

- **Japan (2019)**
 - ❑ 4,822 Mt - all controlled substances
 - ❑ Increase over recent period
 - ❑ 40% of all EOL F-gasses, 2030 target of 70%
 - ❑ Linkage to net zero 2050 target policy

- **United States (2018)**
 - ❑ 300 Mt CFCs, 600 Mt HCFC

U.S. Destruction of Class I and Class II ODS (2010-2018)



Source: EPA (2019). (USEPA ODS Destruction Report April 2021)

a "Other Class I" includes CCl₄

Summary Observations

- Large Banks of ODS and into the future HFCs remain
- Amounts generated available for ESM at EOL (measured in 100s of Kt)
- However what is actually captured globally for destruction is two orders of magnitude less.
- Past opportunities have been missed but a significant opportunity exists over the next several decades to make a significant impact, particularly on stabilizing global warming.

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Thanks for your attention

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