Climate Change Regulation and the Next Generation of Refrigerants

Mike Thompson
Global Leader of Refrigerant Strategy
Ingersoll Rand

1913 TRANE 2013

Increasing Global Threats to the HFC's

- R-134a banned from autos in Europe in 2013
- R-134a "incentivized" out of use in autos in US in 2016
- European countries such as Denmark, Austria, and Switzerland have already banned most uses of HFC's.
- Refrigerant manufacturers are aggressively working to develop a new generation of lower GWP refrigerants (HFO's) to replace current generation of HFC's (R-134a, R-410A, R-407C)
- USA/Mexico/Canada proposal to the Montreal Protocol to phase down HFC's (70% reduction by 2029)
- US formation of CCAC (Climate and Clean Air Coalition)- now with 50 member nations
- Aggressive "GWP" taxes in Australia, Norway, Denmark, Sweden, Germany
- EU proposing phase down/phase out of HFC's in EU, calls to reduce HFC's 79% by 2030
- Foam manufacturers making transition now out of high GWP HFC's



Why Go After HFC's?

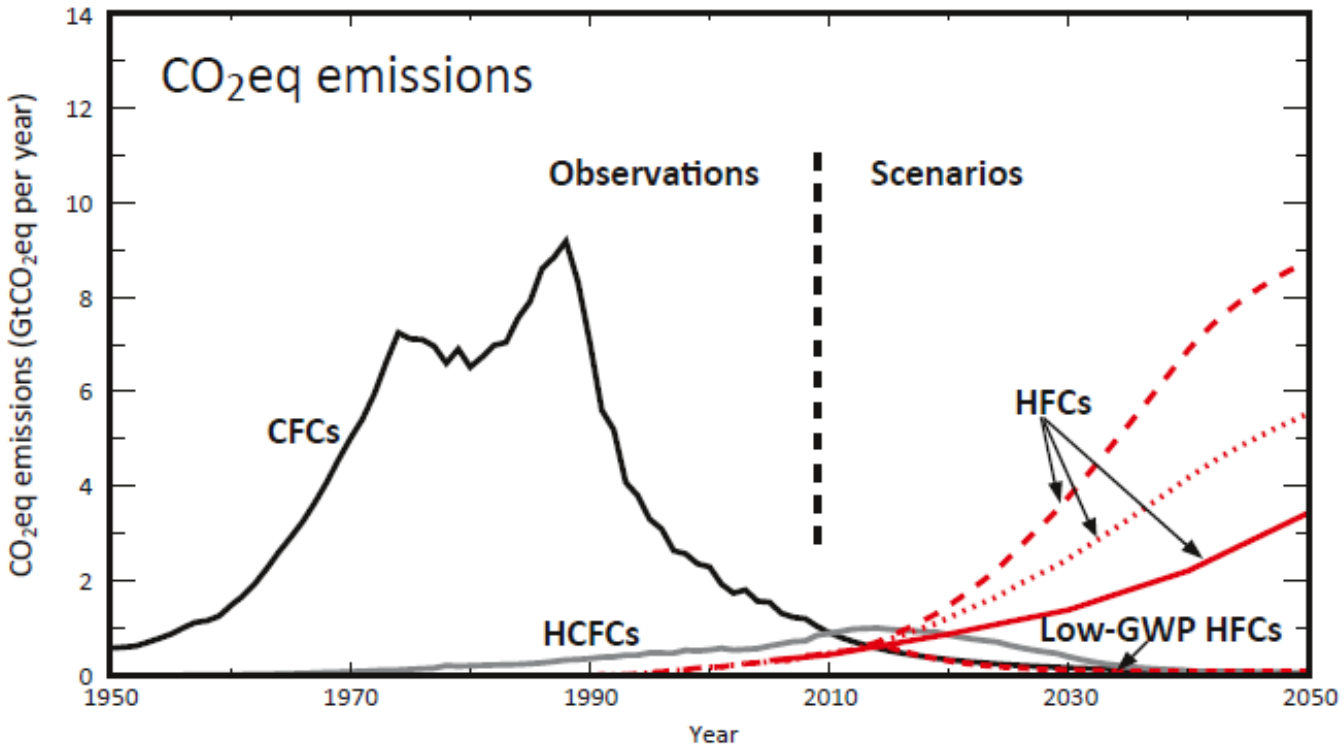


Figure ES 2. Trends in CO_2eq emissions of CFCs, HCFCs, and HFCs since 1950 and projected to 2050. The HFC emissions scenarios are from Velders et al. (2009) and Gschrey et al. (2011). The low-GWP HFC line represents the equivalent HFC emissions for a scenario where the current mix of emissions (with an average lifetime of HFCs of 15 years and an average GWP of 1600) was replaced by a mix of low GWP HFCs (with an average lifetime of less than 2 months or GWPs less than 20).

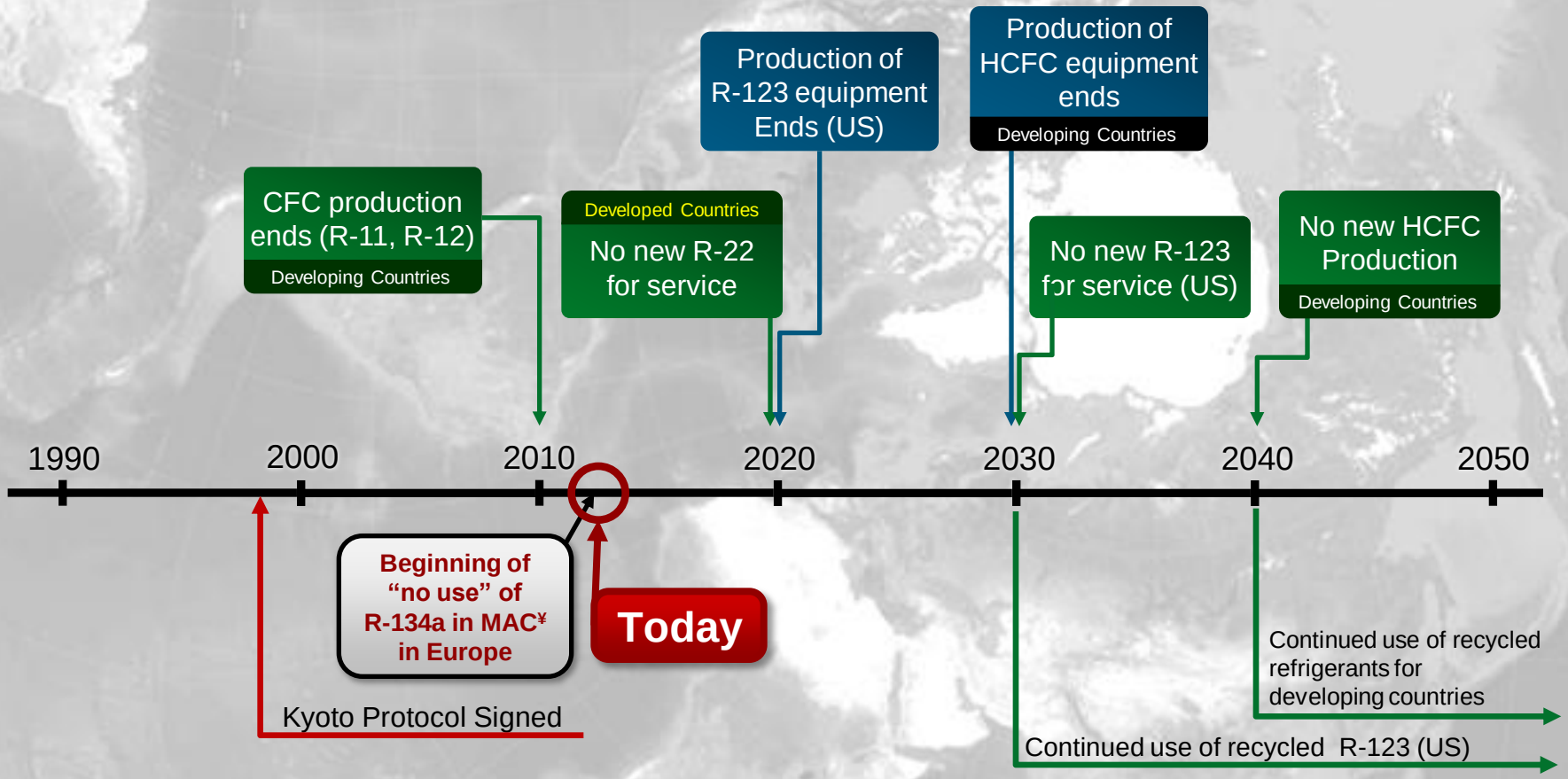
EU Proposed Regulation

- Combination of bans and phase downs
  - Aggressive where alternative already exist (Domestic Refrigerators)
  - Aggressive on very high GWP fluids (R-404A)
- Specific Bans
  - Domestic refrigerators (GWP>150) ban on 1/1/15
  - Commercial ref and freezers (GWP>2500) ban on 1/1/17
  - Service for comm. ref and freezers (GWP>2500) ban on 1/1/20
  - Moveable room A/C (GWP>150) ban on 1/1/20
  - Ban on pre-charged equipment 3 years after law passes
  - No specifics yet on stationary A/C
- General HFC phase dow

2015	100%
2016-2017	93%
2018-2020	63%
2021-2023	45%
2024-2026	31%
2027-2029	24%
2030	21%

- Agreement expected before summer 2014

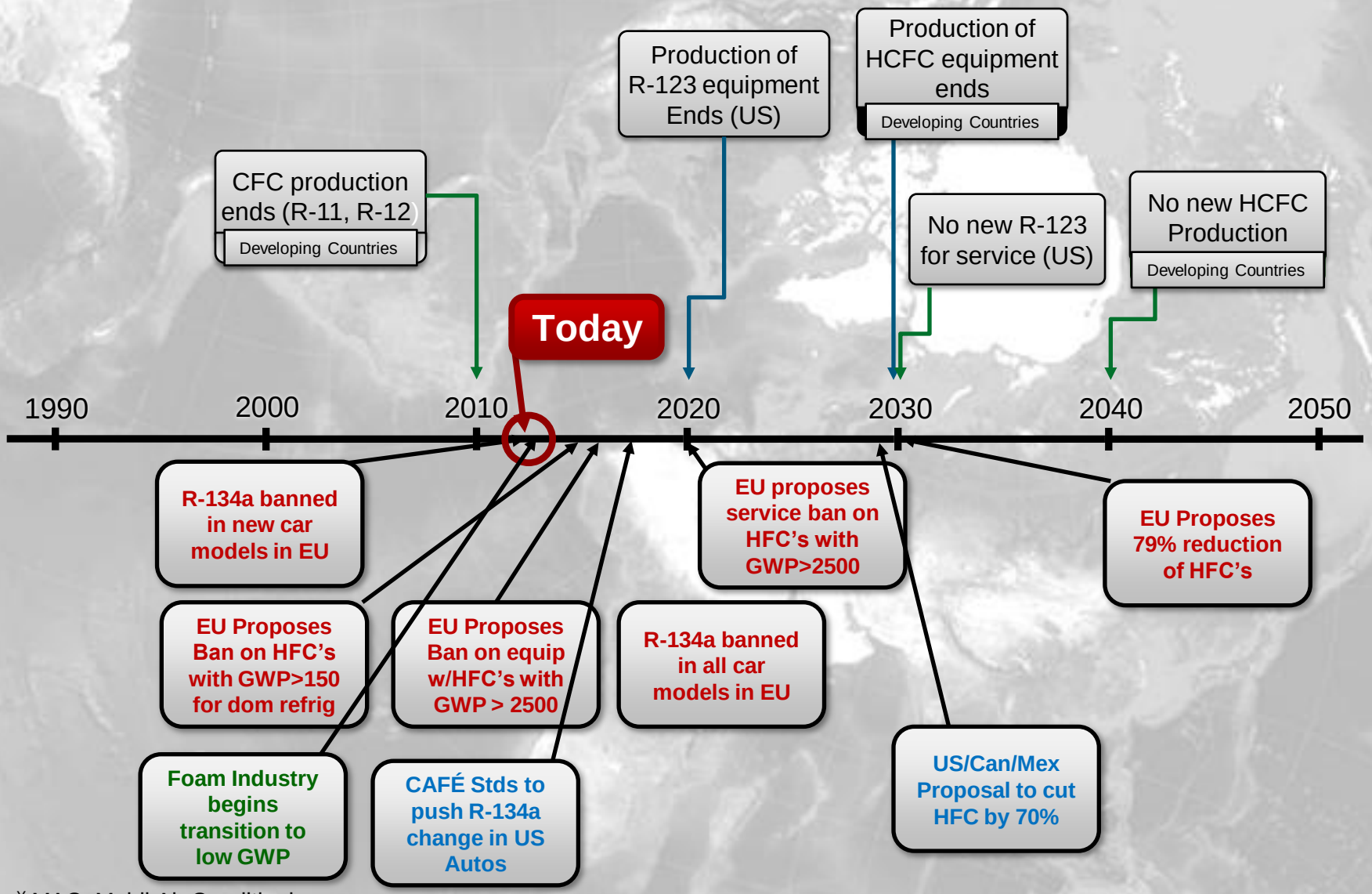
Timeline of Refrigerant Usage



¥ MAC: Mobil Air Conditioning

Note: Included in the use of "recycled" refrigerants is also the use of stockpiled supplies of the refrigerant produced before the phase out date. In addition, there is no restriction on the importation of recycled and recovered supplies of refrigerants.

Timeline of HFC Phasedown Regulations and Proposals



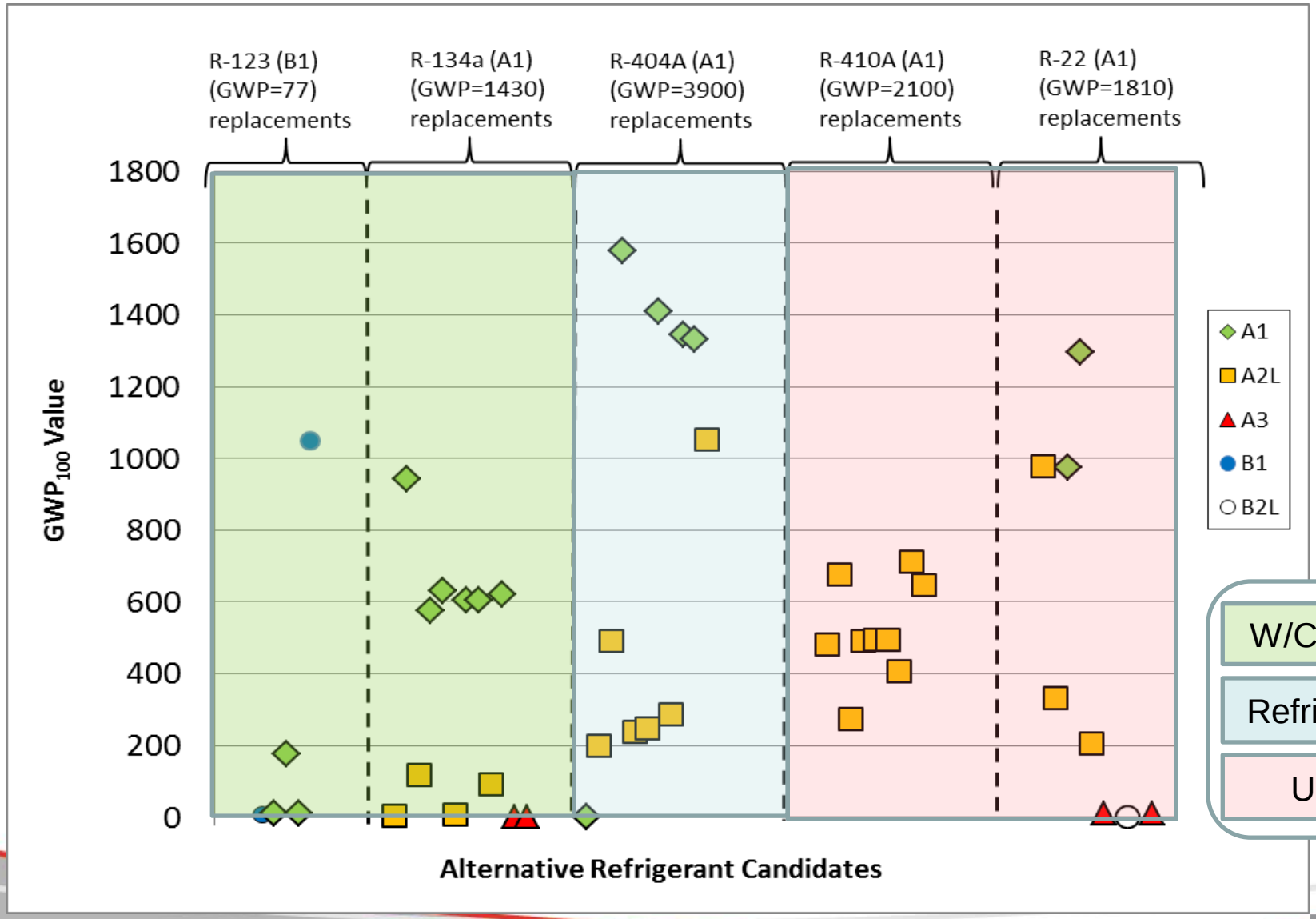
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Considerations for a New Refrigerant

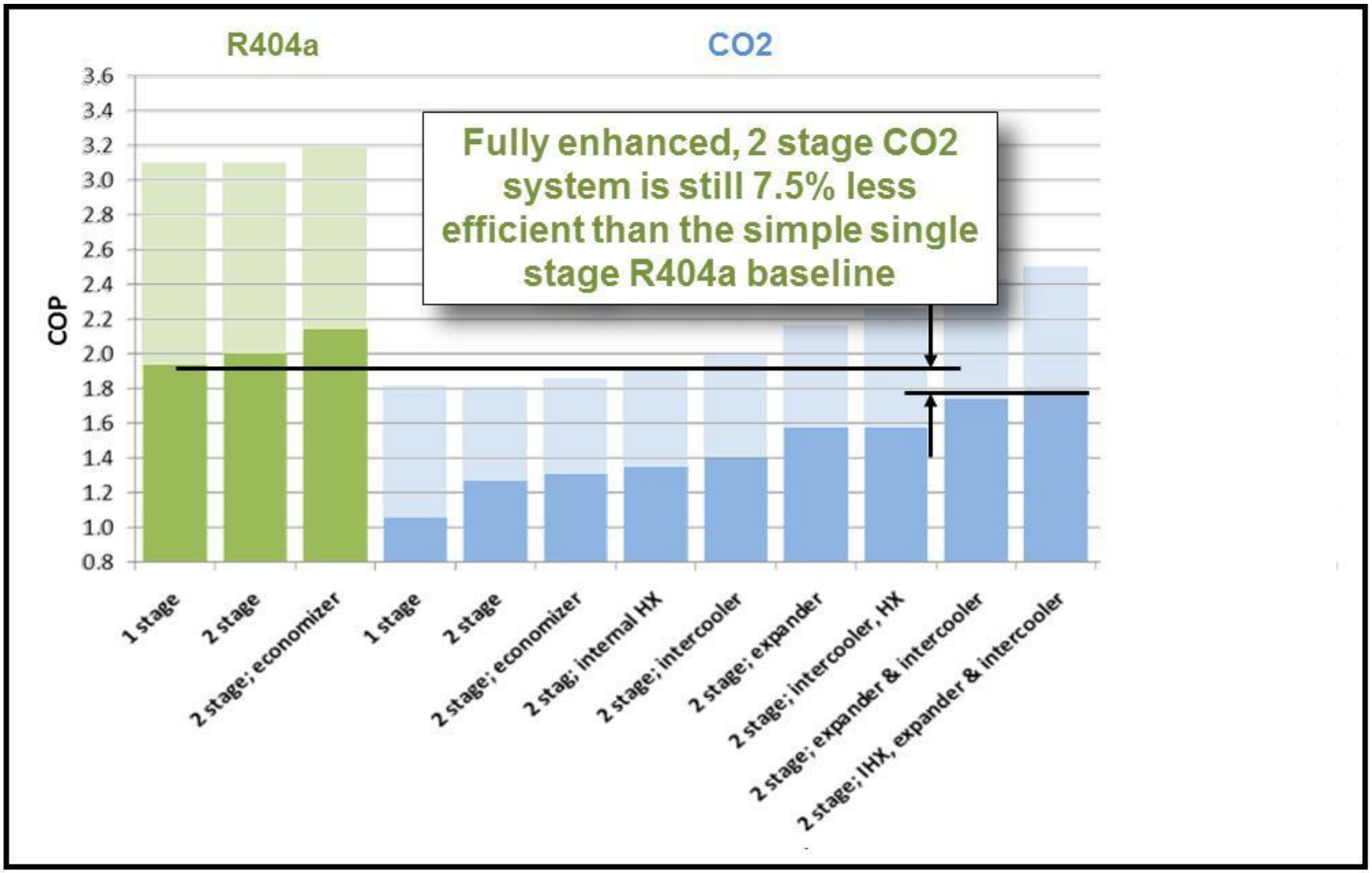


Are There Low GWP Options?

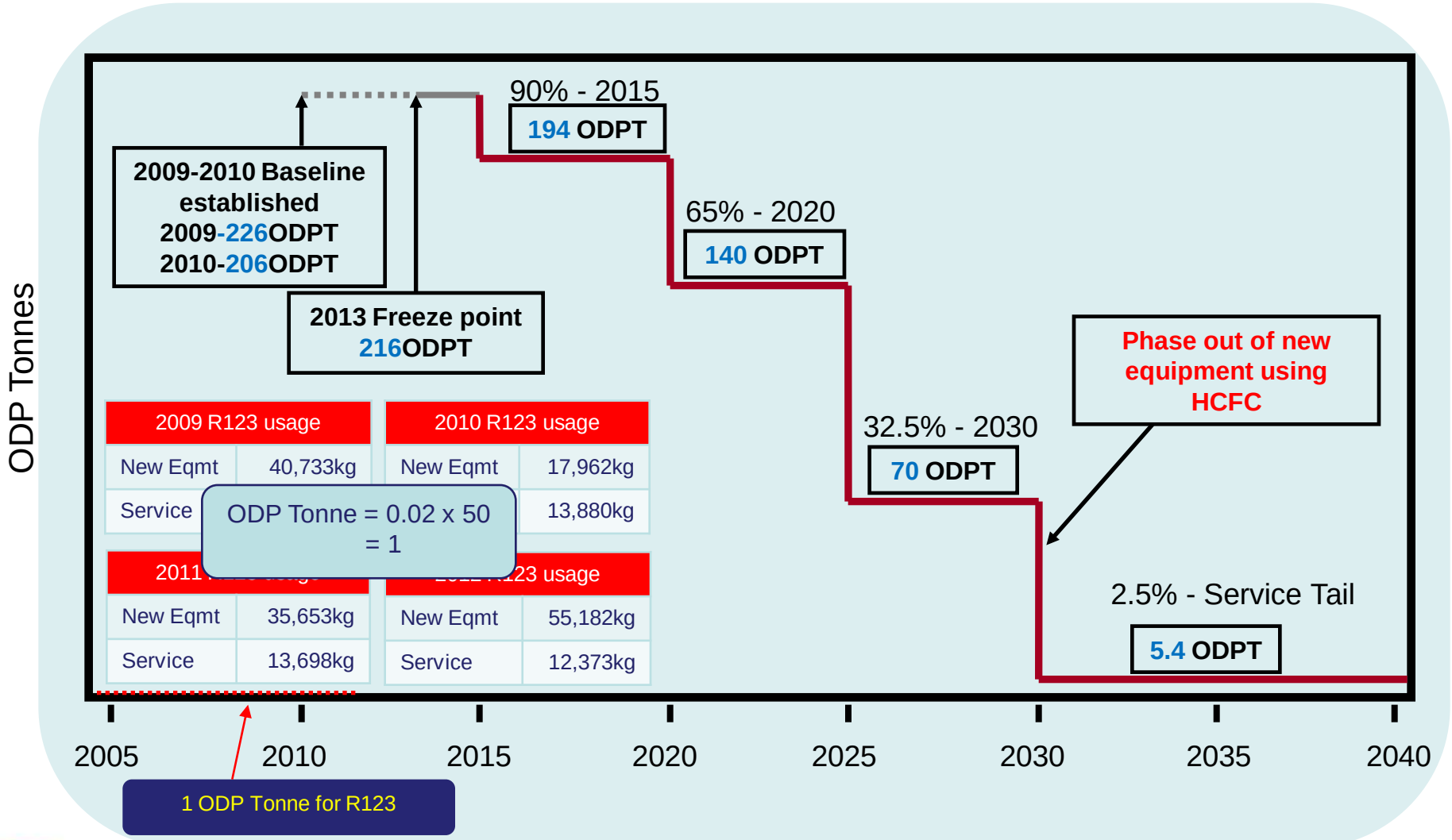


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What About Natural Refrigerants like CO2?

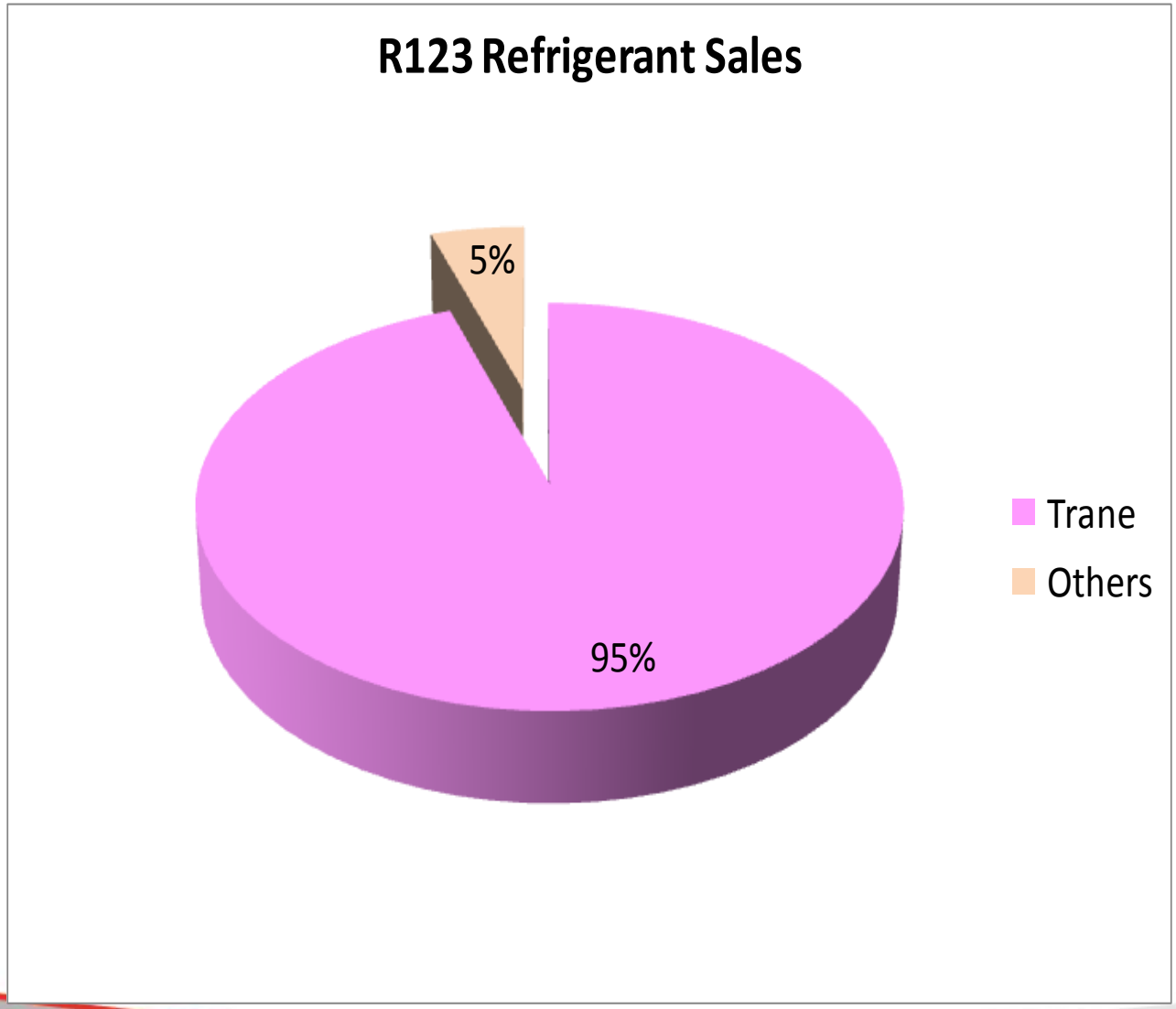


Trane HCFC-123 Consumption (Singapore)



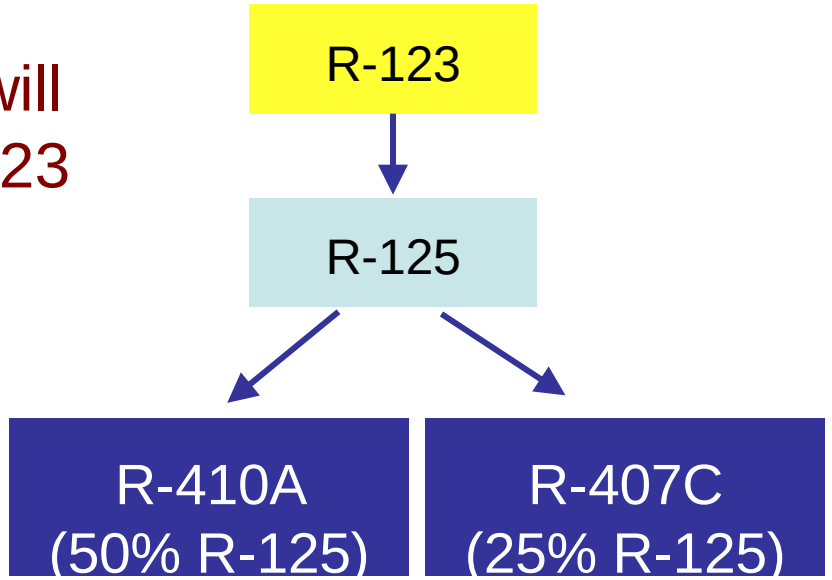
Reclaimed/Stockpiled HCFCs are NOT subjected to phase-out!

R123 Consumption in Singapore



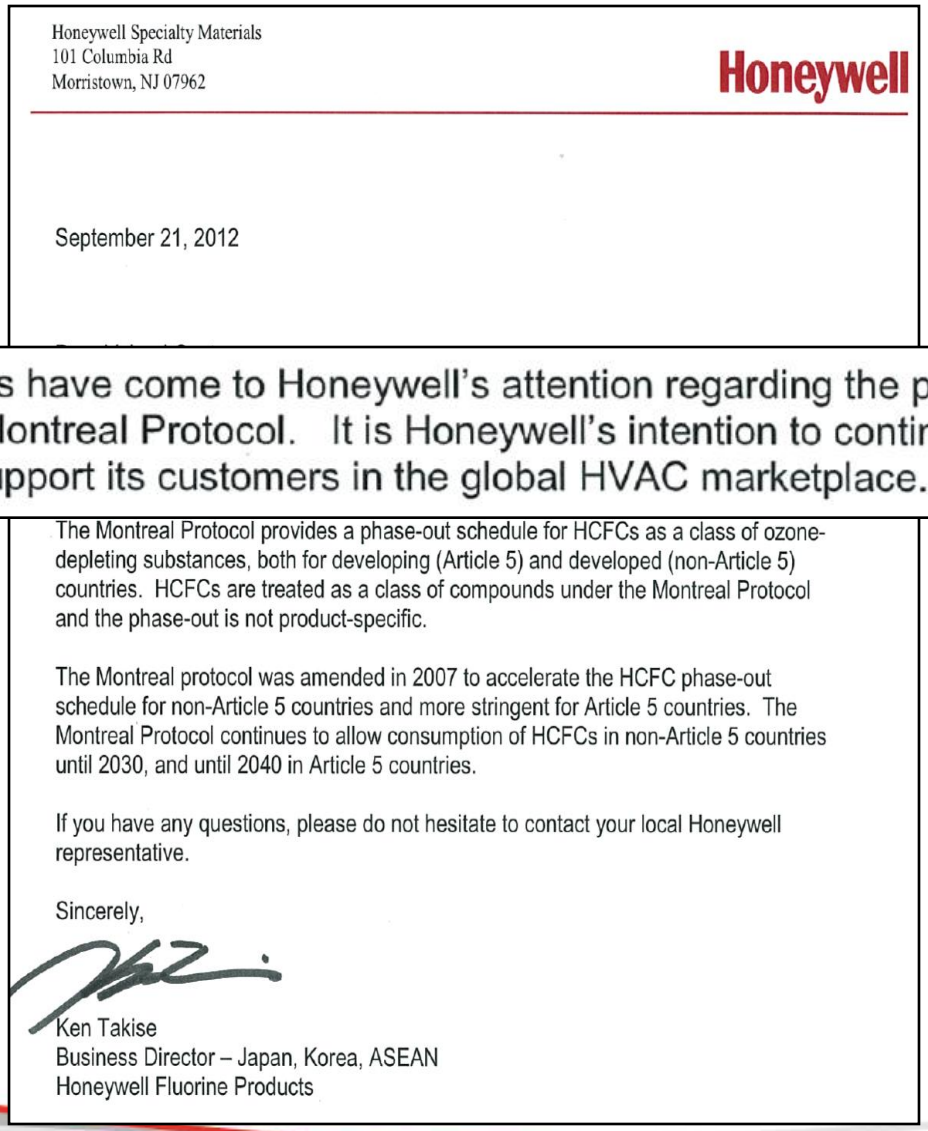
R123 production will continue

Refrigerant manufacturers will continue to manufacture R123 even beyond 2040



- R-123 is a significant feedstock (ingredient) in other refrigerants
- R-125 capacity will expand drastically in the coming years
- Most facilities producing R-125 will be able to produce R-123
- The Montreal Protocol doesn't restrict HCFC production when it's used as an ingredient in other refrigerants.

Letter by Refrigerant Manufacturers



Honeywell Specialty Materials
101 Columbia Rd
Morristown, NJ 07962

Honeywell

September 21, 2012

Recent concerns have come to Honeywell's attention regarding the phase-out of HCFC-123 under the Montreal Protocol. It is Honeywell's intention to continue supply of HCFC-123 to support its customers in the global HVAC marketplace.

The Montreal Protocol provides a phase-out schedule for HCFCs as a class of ozone-depleting substances, both for developing (Article 5) and developed (non-Article 5) countries. HCFCs are treated as a class of compounds under the Montreal Protocol and the phase-out is not product-specific.

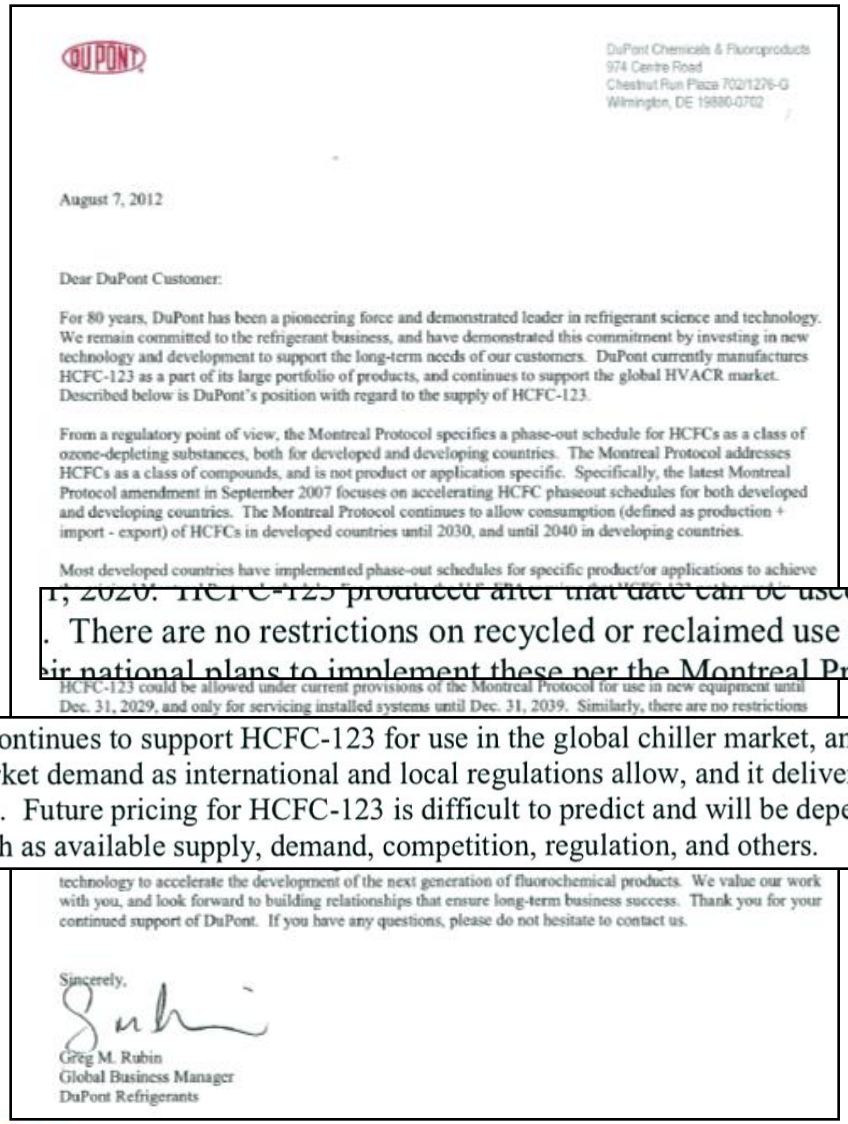
The Montreal protocol was amended in 2007 to accelerate the HCFC phase-out schedule for non-Article 5 countries and more stringent for Article 5 countries. The Montreal Protocol continues to allow consumption of HCFCs in non-Article 5 countries until 2030, and until 2040 in Article 5 countries.

If you have any questions, please do not hesitate to contact your local Honeywell representative.

Sincerely,

Ken Takise
Business Director – Japan, Korea, ASEAN
Honeywell Fluorine Products

Letter by Refrigerant Manufacturers



DuPont Chemicals & Fluoroproducts
974 Centre Road
Chestnut Run Plaza 702/1276-G
Wilmington, DE 19880-0702

August 7, 2012

Dear DuPont Customer:

For 80 years, DuPont has been a pioneering force and demonstrated leader in refrigerant science and technology. We remain committed to the refrigerant business, and have demonstrated this commitment by investing in new technology and development to support the long-term needs of our customers. DuPont currently manufactures HCFC-123 as a part of its large portfolio of products, and continues to support the global HVACR market. Described below is DuPont's position with regard to the supply of HCFC-123.

From a regulatory point of view, the Montreal Protocol specifies a phase-out schedule for HCFCs as a class of ozone-depleting substances, both for developed and developing countries. The Montreal Protocol addresses HCFCs as a class of compounds, and is not product or application specific. Specifically, the latest Montreal Protocol amendment in September 2007 focuses on accelerating HCFC phaseout schedules for both developed and developing countries. The Montreal Protocol continues to allow consumption (defined as production + import - export) of HCFCs in developed countries until 2030, and until 2040 in developing countries.

Most developed countries have implemented phase-out schedules for specific product/or applications to achieve

1, 2020. HCFC-123 produced after that date can be used to service

. There are no restrictions on recycled or reclaimed use of HCFC-123.

ir national plans to implement these per the Montreal Protocol schedule

HCFC-123 could be allowed under current provisions of the Montreal Protocol for use in new equipment until Dec. 31, 2029, and only for servicing installed systems until Dec. 31, 2039. Similarly, there are no restrictions

DuPont has and continues to support HCFC-123 for use in the global chiller market, and intends to continue to do so to meet market demand as international and local regulations allow, and it delivers satisfactory financial returns to DuPont. Future pricing for HCFC-123 is difficult to predict and will be dependent on traditional market forces such as available supply, demand, competition, regulation, and others.

technology to accelerate the development of the next generation of fluorochemical products. We value our work with you, and look forward to building relationships that ensure long-term business success. Thank you for your continued support of DuPont. If you have any questions, please do not hesitate to contact us.

Sincerely,

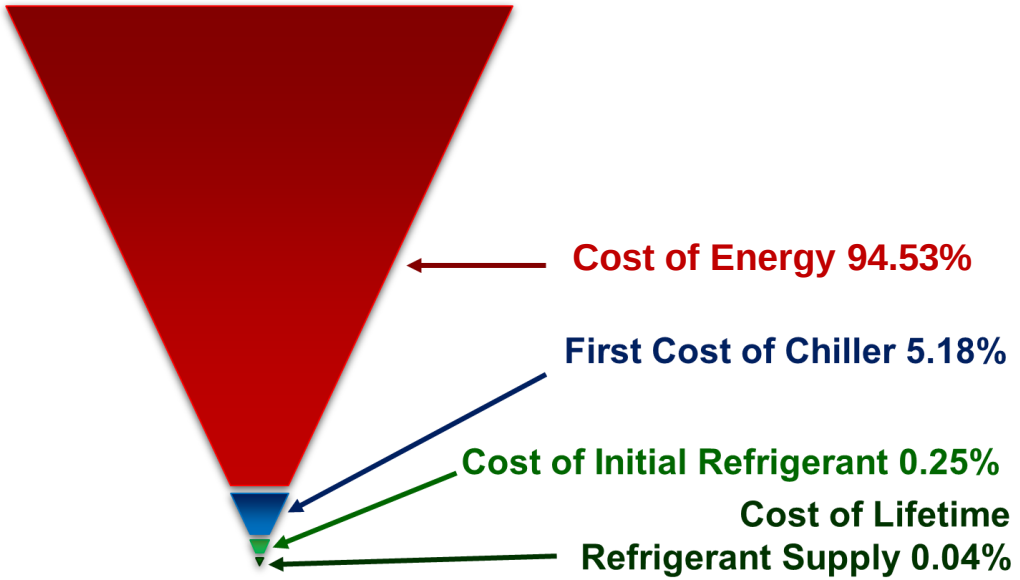
Greg M. Rubin
Global Business Manager
DuPont Refrigerants

Trane HCFC-123 Supply Plan Summary

1. Refrigerant Availability Warranty
2. MOU with major HCFC-123 suppliers
3. High efficiency Refrigerant Recovery Unit
4. Refrigerant Recycling Centre
5. No charge on HCFC-123 for all contracted customers

Question 11

Summary

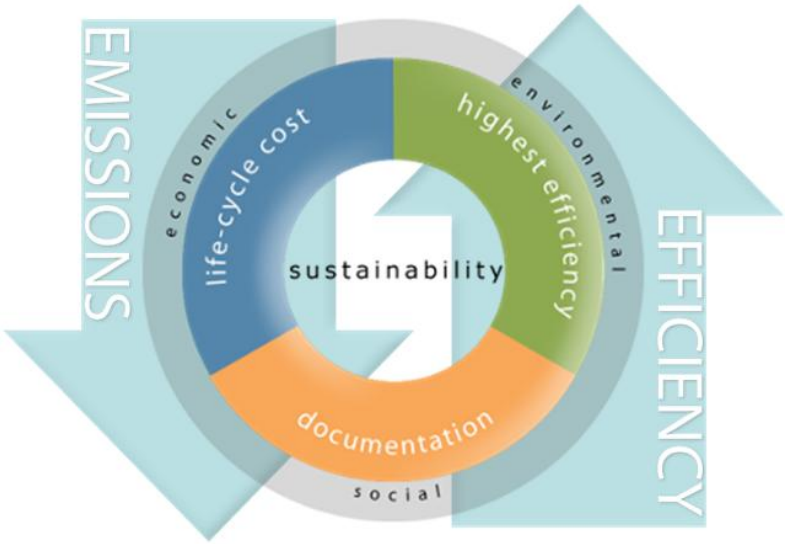


Base Chiller Purchases on:

- Efficiency
- Reliability
- Reputation and service
- Environmental Performance

Refrigerant selection has minor impa on overall life cycle, especially when

- Leakage rate are low
- Refrigerant charge is low
- Chillers are properly maintained



Balanced Approach with a Focus on Efficiency