



THE FUTURE OF REFRIGERANTS

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Agenda

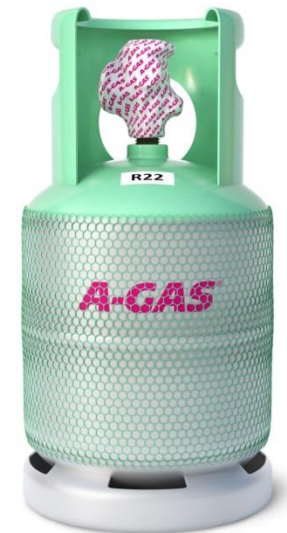
- R22 Phase out update
- Montreal Protocol – HFC phase down
- ODSSGG Act review
- Low GWP alternatives
- Opteon[®] HFO retrofit gases



The R22 Phase Out

R22 is an Ozone Depleting substance and is subject to phase out under the 'Ozone Depletion and Synthetic Greenhouse Gas Management Act 1989'

- Based on the framework of the Montreal Protocol
- R22 is going to be available until 2030
 - Import quota for virgin HCFC has hit lowest 'residual' level
 - 2016 to 2030 – total import quota = 45 tonnes R22 p/a
 - Recycling and re-use will significantly increase this volume
- Options available to end users
 1. Replace equipment?
 2. Retrofit to an interim product?
 - Drop in type: R438A, R434A, R428A
 - Mainstream HFC: R407F, R407C, R427A
 3. Remain on R22 and put a plan in place around supply/ recycling



The Options Considered

1. Replace equipment?

- Most expensive option – CAPEX
- Tangible benefit in improved energy efficiency
- Choice of new refrigerant important

2. Retrofit to an interim product?

- Drop in style or mainstream HFC?
- Capacity
- Mass Flow
- Seals (elastomeric)
- Energy efficiency
- Oil return

3. Remain on R22 and put a plan in place around supply/ recycling

- R22 is only expensive if it leaks...
- Stockpile/ recycling
- Increased maintenance/ leak checking regime
- Allows new technology to reach the market allowing future proof retrofit/ new equipment



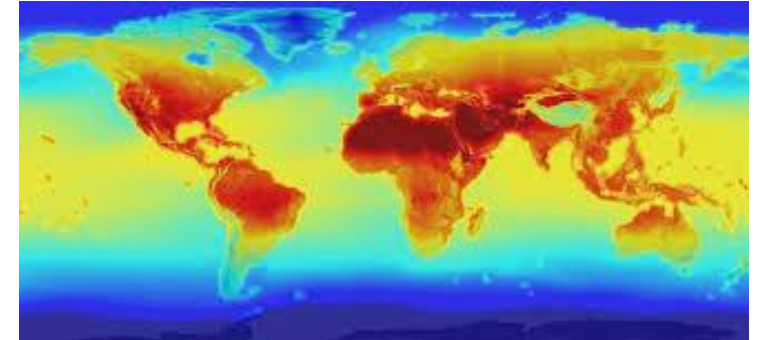
Retrofit Recommendation

Air-conditioning	= R438A/ R407C
Medium Temperature	= R438A/ R407F
Low Temperature	= R407F
One to consider	= Opteon XP40



Montreal Protocol Update

- 27th Meeting of the Parties to the Montreal protocol – Dubai, UAE 1st to 5th Nov 2015
 - Preliminary agreement by all parties that Montreal Protocol will phase down HFC's
- Four proposals on the table:
 - **USA (North American Amendment) – FAVORITE**
 - European Union (in line with F-Gas Directive)
 - India (much slower phase down for Article 5 + financial compensation)
 - Federal States of Micronesia
- Primary agreement reached which has taken 8 years of negotiation!
- The next step is to decide the framework of how to implement
 - Likely to be much faster
 - Most parties have done the work and know exactly what they can achieve



Montreal Protocol could be ratified by the end of 2016



The Ozone Depletion and Synthetic Greenhouse Gas Management Review

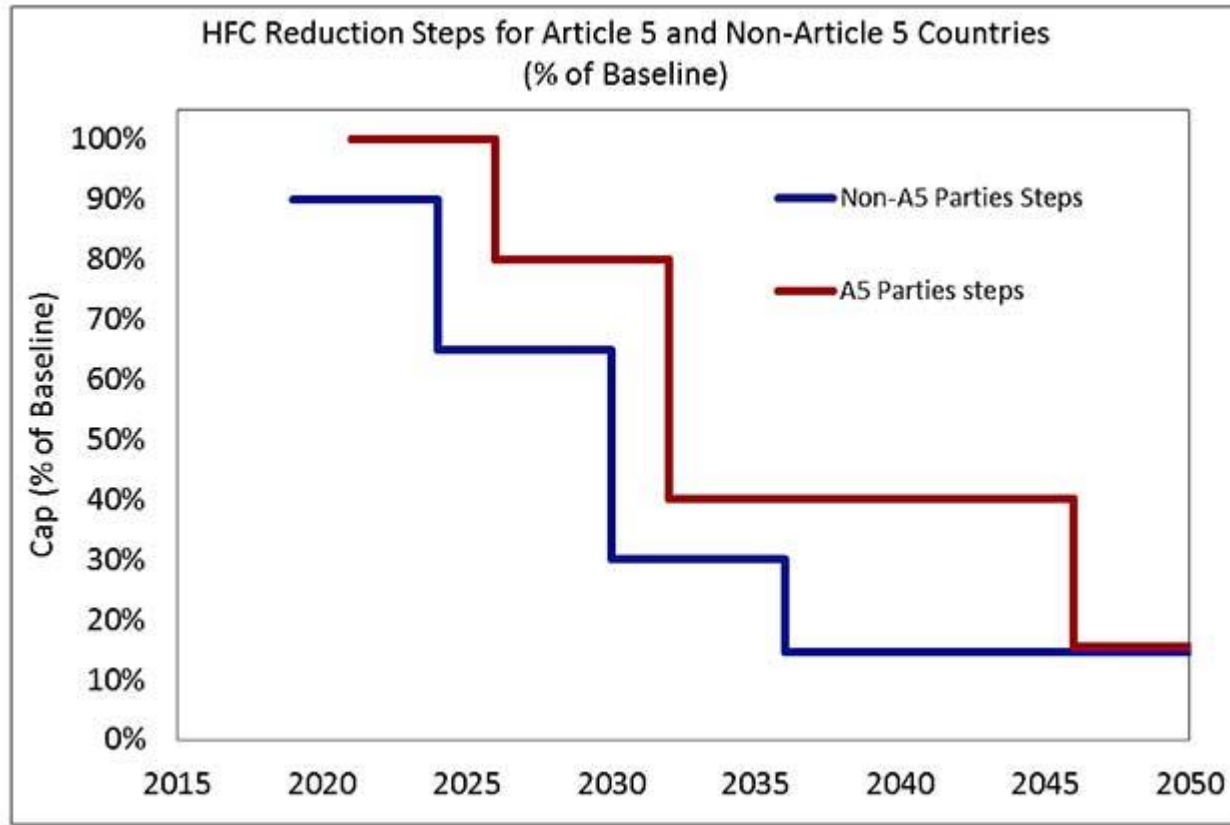
- Hon Greg Hunt announced a review of the Ozone Depletion and Synthetic Greenhouse Gas Management Program on the 24th May 2014
 - Identify opportunities to reduce ODS and SGG emissions in line with international efforts
 - Improve and streamline legislation to reduce compliance cost
- Industry feedback submitted to the DOE in Nov 2015 – in response to white paper
- Final report to be submitted to Government in early 2016. Due to be tabled and implemented in Winter 2016 – before the election
- Likely focus:
 - HFC Phase Down starting 2018 (Quota driven)
 - HFC equipment bans (new equipment)
 - System maintenance requirements (reporting)
 - Leak Detection



The clear aim is to bring in local legislation before any international treaty is signed

NAA in comparison to Australian Proposal

North American Amendment Proposal

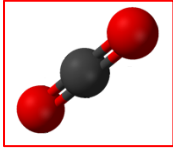


2015 NAA Proposal		Accelerated Australian Proposal	
2019	90%	2017	100%
2024	65%	2018	90%
2030	30%	2020	86%
2036	15%	2022	78%
		2024	68%
		2026	58%
		2028	49%
		2030	35%
		2032	29%
		2034	24%
		2036	17%

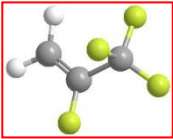
Reduction to 15% of baseline CO₂^(EQ) by 2036

Low GWP Alternatives

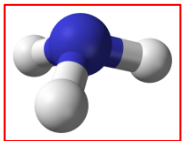
A Montreal Protocol Phase down of HFCs will produce an economic penalty on high GWP



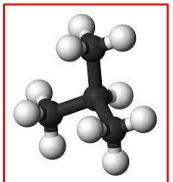
- R744 likely to surge again in popularity
 - Proven technology
 - High installation cost v inexpensive gas



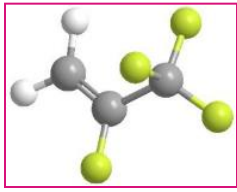
- HFO technology - medium sized system and chiller area
 - HFO blends – Flammability / GWP
 - OEM replacements – lowest possible GWP, A2L rated (ASHRAE 34)
 - Retrofit gases – lower GWP than current HFCs, A1 rated (ASHRAE 34)



- R717 will remain strong in industrial application (largest equipment)
 - Proven technology
 - High installation cost v inexpensive gas



- Hydrocarbons
 - Popular in Europe for small charge systems (domestic refrigerators)
 - **Not** suitable for retrofitting into A1 rated systems



GWP = 1

HFO Retrofit Gases

- HFO gases are now being stocked in Australia
- With legislation round the corner, trialing and considering new gases is recommended

Opteon XP10 (R513A)

- R134a retrofit replacement
- Non Flammable (A1 rated)
- GWP = 573 (AR5)

Opteon XP40 (R449A)

- R404A retrofit replacement
- Non Flammable (A1 rated)
- GWP = 1397

Opteon XP44 (R452A)

- R404A retrofit replacement
- Non Flammable (A1 rated)
- GWP = 2141

Leading the Market and reacting to change can create opportunity

Opteon YF (R1234yf)

- R134a OEM replacment
- Mildly Flammable (A2L rated)
- GWP = <1

Market Leadership



Opteon®
STATIONARY REFRIGERANTS

A-GAS®