

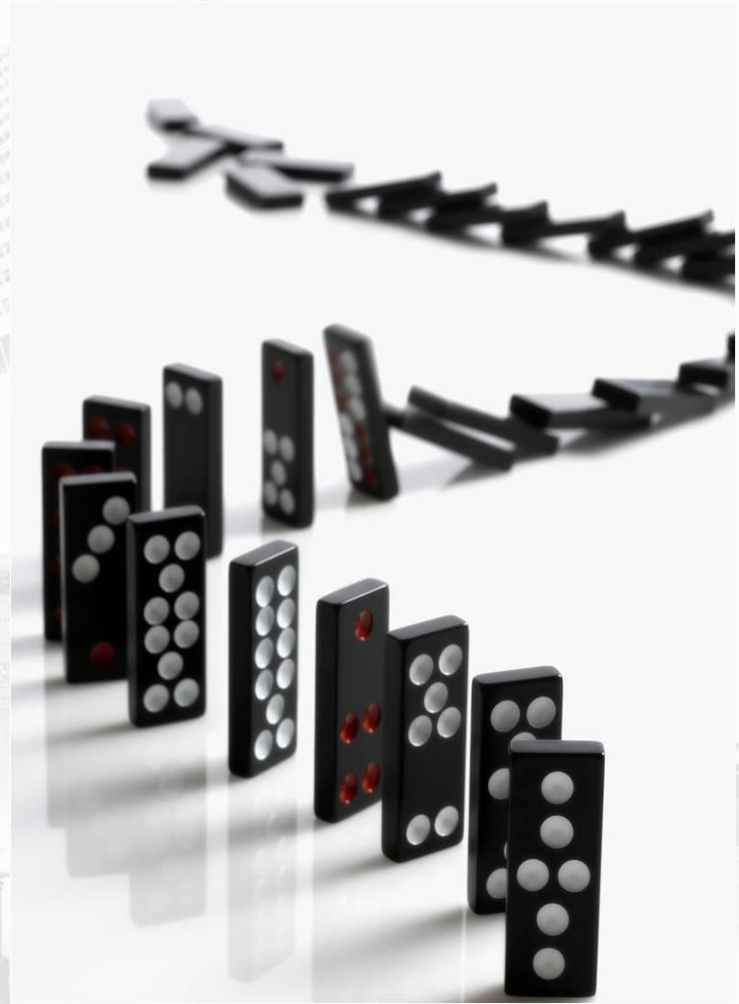


Cool Technologies: Working Without HFCs

Greenpeace : Janos Maté & Wolo Lohbeck



When one factor is changed, all others are affected: basic axiom of ecology, technology and all human affairs



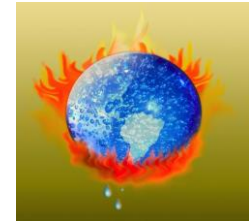
2010-2020: The Critical Decade



“This is the critical decade... We are on the cusp of some big changes... We can cap temperature rise at 2°C, or cross the threshold beyond which the system shifts to a much hotter state.”

-Dr. Will Steffen: Director of Australian National University Climate Change Institute

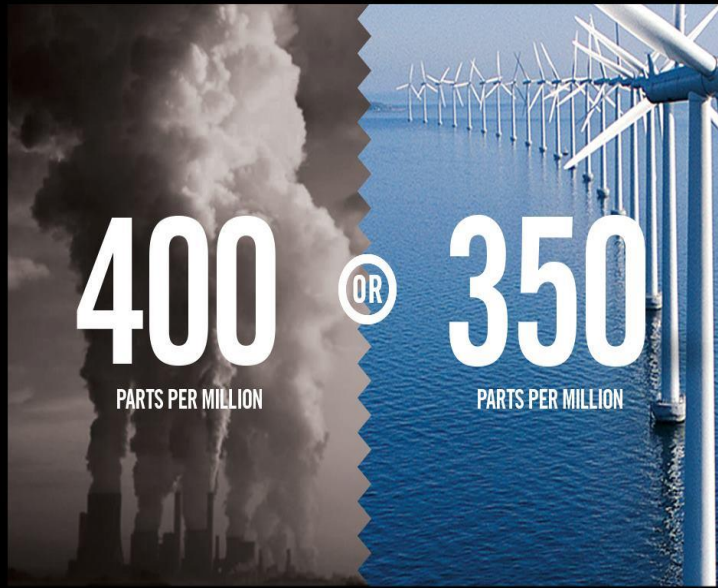
Climate change is happening now



Record breaking
climate disasters are
routine around the
world

Climate tipping points of no return

WHEN IT COMES TO CARBON POLLUTION WE, HAVE A CHOICE.




400
PARTS PER MILLION

OR

350
PARTS PER MILLION

The daily average of carbon dioxide in our atmosphere has reached 400 parts per million, a level not seen before in human history. It's time to put a price on carbon.



The Climate Reality Project

2013: 1st time in human history, atmospheric CO₂ concentrations have reached 400 parts per million

Climate tipping points are reached when subsequent climate events push global warming beyond human capacity to restore nature's balance.

Poisoned Planet



- Each day we emit 90 million tons of global warming pollution including CFCs, HCFCs and HFCs
- 85,000 new chemicals in five decades – most untested for health and safety
- Fluorocarbons nearly ended life on Earth: damaged the ozone layer and the climate: cost trillions of dollars
- **Natural working fluids can meet human needs**

Working definition of “natural refrigerants”

- Refrigerants which occur naturally in the biosphere, in significant abundance, in a steady state and are easily absorbed by nature
- Air, water, carbon dioxide, ammonia, hydrocarbons



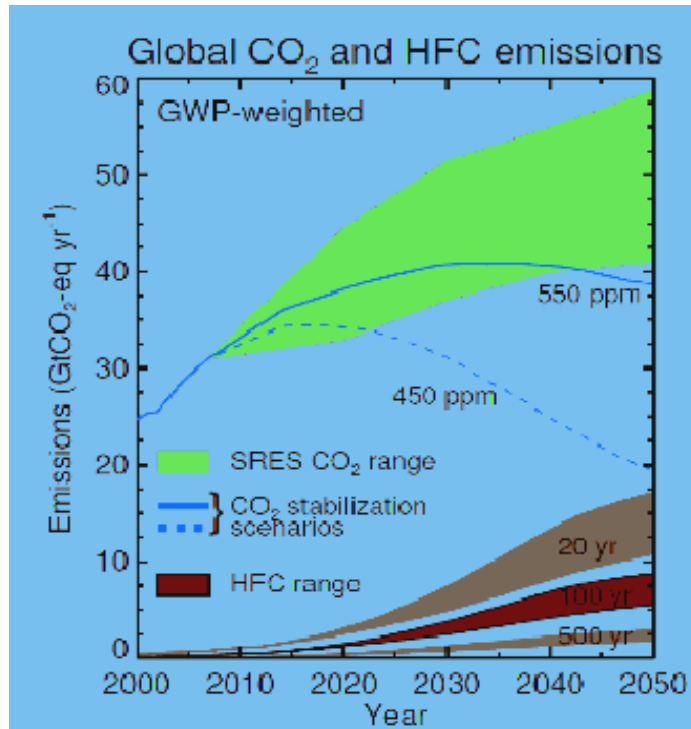
GWP Metrics of HFCs

- By using the 100 GWP as a measure of the potency of HFC refrigerants, their impact is being averaged over a much longer timescale than they are actually in the atmosphere.
- The average lifetime of the HFCs in use today is 21.7 years... better suited to the 20 year GWP metric.
- The 20 year GWP metric better reflects the true potency of HFCs during their actual time in the atmosphere.

Substance	Atmospheric Lifetime Years	100 year GWP	20 year GWP
HCFC-22	12	1,810	5,160
HCFC-141b	9.3	725	2,250
HFC-32	4.9	675	2,330
HFC-125	29	3,500	6,350
HFC-134a	14	1,430	3,830
HFC-152a	1.4	124	437
HFC-245fa	7.6	1030	3,380
HFC-404a	34.2	3922	6010
HFC-410a	16.9*	2088	4340
HFC-407c	15.6*	1774	4115
CO ₂	150+	1	1
Hydrocarbons	<1	<3	<3
Ammonia		0	0

IPCC Fourth Assessment Report- 2007 * Wikipedia

Global CO₂ & HFC emissions



The absolute annual HFC emissions weighted by GWP₂₀ is roughly double the absolute annual HFC emissions weighted by GWP₁₀₀.

Velders et al, 2009 –
unpublished graph)

Projections for global HFC consumption (Mt CO₂-eq) expressed in GWP₁₀₀ and GWP₂₀ metrics

100 GWP	2010	2020	2030	2040	2050
Developed	637	909	1,047	1,137	1,253
Developing	163	1,179	2,570	3,802	5,008
Global	800	2,088	3,617	4,939	6,261

20 GWP	2010	2020	2030	2040	2050
Developed	1,395	1,992	2,323	2,537	2,807
Developing	379	2,546	5,539	8,209	10,875
Global	1,558	4,538	7,862	10,746	13,182

Phasing-out HFCs by 2020 is possible



CFCs-HCFCs-HFCs-HFOs

The time is now to
get off the
fluorocarbon
treadmill

Greenpeace Report: “Cool Technologies: Working without HFCs”

Documents companies and facilities around the world that produce or use cooling HFC-free equipment

Documents the availability of natural refrigerants and foaming agents for nearly the full spectrum of applications, such as:

- Domestic Refrigeration and Air-Conditioning
- Commercial Refrigeration and Air-Conditioning
- Mobile Air-Conditioning
- Industrial Processes
- Insulation Foam Blowing

Greenpeace Report provides examples and details

Greenfreeze domestic refrigeration	Dessicant coolin	Transport cooling (under review)
SolarChill	Evaporative cooling	Foam blowing
Commercial cooling	Absorption cooling	Efficiency comparisons
Refrigerants, Naturally	Co-generation cooling	HC refrigerant producers
Consumers Goods Forum	District cooling	HC safety equipment (under review)
Companies using NR equipment	Passive cooling	Global estimates of A/C production
Manufacturers of NR equipment	Converting from R-22 to propane	Contact list of companies
Hydrocarbon & CO2 domestic & commercial A/C	MACs & hydrocarbons (50 million cars with HCs)	
Ammonia A/C	MACs & CO2	
Solar NR air-conditioning	MACs & HFOs	

Examples of Supermarkets Working with Natural Refrigerants

AEON	DRAKES	MARKS& SPENCER	SOBEYS	WAREHOUSE
ALDI SUD	EDEKA	METRO	STAR MARKET	WEGMANS
ASDA	EUROSPAR	MIGROS	SURPERVALU	WOOLWORTHS
AUCHAN	FAKTA	MORRISONS	TESCO	
BOOTH'S	FOODLAND	NETTO	TENGLEMAN	
CARREFOUR	HARRODS	PICK N PAY	TEGUT	
CONDOR	ICA SWEDEN	PRODEGA	VERDEMAR	
COOP	LIDL	REWE	WAITROSE	
COUNTDOWN	MAKRO SOUTH AFRICA	SAINSBURY'S	WALMART	

Countries with supermarkets working with natural refrigerants

Austria	Germany	New Zealand
Australia	Global	South Africa
Brasil	Hungary	Sweden
Canada	Hong Kong	Switzerland
China	Japan	United Kingdom
Denmark	Malaysia	USA
France	Mexico	Thailand

ON-LINE SEARCHABLE DATA BASE

“Cool Technologies: Working Without HFCs”



- THE NEED FOR CLIMATE FRIENDLY COOLING
- USING THIS WEBSITE
- REFRIGERATION
- COOLING
- COMPRESSORS
- FOAMS & INSULATION
- SPECIAL PROJECTS
- BACKGROUND
- EFFICIENCY COMPARISONS
- HYDROCARBON REFRIGERANT PRODUCERS
- COMPANY CONTACTS

LEXICON

Download report
[COOL TECHNOLOGIES: WORKING WITHOUT HFCS](#)
by Janos Maté, Claudette Juska and Sultan Latif (PDF 3.2MB)

“COOL TECHNOLOGIES: WORKING WITHOUT HFCS” report and website present a sample of companies using HFC-free technologies. It is not meant to be all-inclusive, nor is the inclusion of any enterprise an endorsement by Greenpeace of any company or its products.

Welcome

Just as there was no single “magic bullet” to replace [CFCs](#), there is no single solution to replace [HFCs](#). However, there is a wide variety of environmentally superior and technologically proven [HCFC](#) and [HFC](#)-free alternatives to meet our cooling needs. These alternatives include [natural refrigerants](#) (CO₂, [hydrocarbons](#), ammonia, water, etc.), secondary cooling systems, [desiccant cooling](#), [evaporative cooling](#), [absorption cooling](#), and innovative building designs that can eliminate the need for mechanical cooling. [Natural refrigerants](#) and [foaming agents](#), in contrast to [fluorocarbons](#), abundantly occur in the biosphere, they maintain a steady state, and are easily absorbed by nature.



New [HFC](#)-free products are entering the market almost on a weekly basis. There is a domino effect in cooling technologies. When one company achieves a breakthrough others soon replicate. Technological innovations in one sector soon impact on innovations in other sectors. At the present time, technologies with natural substances are primarily used in industrialized countries, but there is no reason why they cannot be used worldwide. Developing countries would greatly benefit by leapfrogging [HFCs](#) altogether.

This website includes a sampling of companies and enterprises using [HFC](#)-free technologies. It was created to demonstrate there is already a wide array of safe and commercially proven [HFC](#)-free technologies available to meet nearly all those human needs that were formerly met by [fluorocarbons](#).

Refrigeration

Cooling

Compressors

Foams & Insulation

Simple Design: Easy to Navigate

THE NEED FOR CLIMATE FRIENDLY COOLING

USING THIS WEBSITE

REFRIGERATION

Domestic GreenFreeze

Commercial

Industrial

Mobile

COOLING

COMPRESSORS

FOAMS & INSULATION

SPECIAL PROJECTS

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HYDROCARBON REFRIGERANT PRODUCERS

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Commercial Refrigeration

Application	Techonology Type	Manufacturer/User	Manufacturer	Manufacturer Country	End User Country
- Any -	- Any -	- Any -	- Any -	- Any -	- Any -

SEARCH

THE NEED FOR CLIMATE FRIENDLY COOLING

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Domestic GreenFreeze

Commercial

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Commercial Refrigeration

Application	Techonology Type	Manufacturer/User	Manufacturer	Manufacturer Country	End User Country
- Any -	- Any -	- Any -	- Any -	- Any -	- Any -

- Any -
- Cold Rooms
- Food & Beverage Cabinets
- Ice Rink
- Icemakers
- Office
- Restaurant
- SolarChill
- Supermarket
- Warehouse

Refrigerant Number: R744

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Commercial Refrigeration

Application	Technology Type	Manufacturer/User	Manufacturer	Manufacturer Country	End User Country
- Any -	- Any -	User	- Any -	- Any -	- Any -

AEON Supermarket

Category: Refrigeration
Sector: Commercial
Application: Supermarket
Technology Type: Carbon Dioxide
Refrigerant Number: R744
User Country: Japan China Hong Kong Malaysia
User Name: AEON
Manufacturer/User: User

[Read more](#)

Aldi Sud Supermarket

Category: Refrigeration
Sector: Commercial
Application: Supermarket
Technology Type: Carbon Dioxide
Refrigerant Number: R744
User Country: Germany
User Name: Aldi Sud
Manufacturer/User: User

[Read more](#)

Alpiq Intec

Category: Refrigeration
Sector: Commercial
Application: Food & Beverage Cabinets
Technology Type: Carbon Dioxide
Refrigerant Number: R744
Manufacturer Name: Alpiq Intec
Manufacturer Country: Switzerland
User Country: Switzerland
User Name: COOP
Manufacturer/User: User

[Read more](#)

Commercial Refrigeration

Application	Technology Type	Manufacturer/User	Manufacturer	Manufacturer Country	End User Country
- Any -	- Any -	- Any -	- Any -	- Any -	- Any -

AEON Supermarket

Category: Refrigeration
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Technology Type: Carbon Dioxide
Refrigerant Number: R744
User Country: Japan China Hong Kong Malaysia
User Name: AEON
Manufacturer/User: User

[Read more](#)

AEON Supermarket

AEON is one of the largest retailers in Asia and is also a member of the Consumer Goods Forum. The company operates stores under several brands, including JUSCO and MaxValu. Since 2009 the company has been testing and optimizing a Sanyo CO2 direct expansion refrigeration system for supermarket showcases in Japan. In 2012, the company unveiled an orderly plan to go HFC-free with natural refrigerants: 10% of all new stores in 2012, 15% of all new stores in 2013, 25% of all new stores in 2014 and 100% of all new stores in 2015. The company also plans to gradually convert the refrigeration systems in its existing 3500 stores.

Category: Refrigeration
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Company Contacts

Company	Country	Contact Information
ABN Amro	Netherlands	http://www.abnamro.com/en/index.html
AEG	Germany	http://www.aeg.co.uk/
AEON	Japan, China, Hong Kong, and Malaysia	http://www.aeon.info/en/index.html
Aerowolle	Germany	http://www.aerowolle.de/
AGA	Europe	http://www.aga.com/international/web/lg/aga/like35agacom.nsf/docbyalias/homepage
AHT Austria	Austria	http://www.aht.at/en/home/home.asp ; franz.bernkopf@aht.at
AHT UK	United Kingdom	http://www.ahtcooling.co.uk/ ; technical@uk.aht.at
Aldi Sud	Germany	http://www.aldi-sued.de/
Alpiq Intec	Switzerland	http://www.alpiq-intec.ch/en//index.jsp ; info.ecoservices@alpiq.com
Angle Vale Drakes	Australia	http://www.drakes.com.au/home
Arcelik	Turkey	http://www.arcelik.com.tr/default.aspx?lang=en-US
AS Trust Holding	United States	Contact: A.S. Trust & Holdings, 44-129 Mikiola Drive, Kaneohe, HI 96744, Email: Richard@astrust.com, tel: 808 235 1890.
Asda	United Kingdom	http://www.asda.com/
Atlas Roofing	United States	http://www.atlasroofing.com/general2.php?section_url=141
Autosal	Argentina	http://www.autosal.com.ar/
Auchan	Hungary	http://www.auchan.hu/
AUX	China	http://www.cnaux.com/

Routinely Updated Website Input invited from Stakeholders

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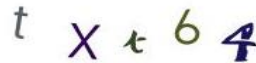
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Your e-mail address *

Subject *

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What code is in the image? *

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Send message

Domino Effect in Cooling

- There is a domino effect in cooling technologies.
- When one company achieves a breakthrough others soon replicate.
- Technological innovation in one sector impacts on innovations in other sectors.



Greenfreeze Revolution

20th Anniversary



- 1992-93 Greenpeace develops 'Greenfreeze' hydrocarbon technology for domestic refrigeration
- Greenpeace promotes Greenfreeze in Europe, China, Japan, South America
- 1997 -Greenpeace receives UNEP Ozone Award for giving Greenfreeze to the world
- Greenfreeze impacts on commercial refrigeration

Wolo Lohbeck
"Papa Greenfreeze"



Greenfreeze Revolution



- Over 700 million Greenfreeze refrigerators in the world today
- 40% of global annual refrigerator production (2012)
- 95% of EU & 75% of Chinese production
- 80% of global production by 2020



Refrigerants, Naturally!

- Greenfreeze campaign led to Greenpeace's work with corporations that eventually formed Refrigerants, Naturally!
- Current participants include: Coca Cola, Unilever, PepsiCo, Red Bull with support from Greenpeace and UNEP
- Refrigerants, Naturally! led the Consumer Goods Forum to commit to start phasing out HFCs by 2015.

SolarChill Vaccine Cooler & Refrigerator

Health+Environment+Development

- Hydrocarbon
- Battery free
- Solar powered
- Clean: no kerosene
- Commercialized
- GEF SolarChill Projects in Kenya, Colombia and Swaziland



SolarChill Project Partners: DTI, GIZ ProKlima, Greenpeace, PATH, UNEP, UNICEF, WHO

GREENPEACE



 **ATMO**
sphere
technology summit
natural solutions
3 - 4 June 2013 in Vienna

Thank you very much for your attention