# OzoNews

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## In this issue



UNEP

Multilateral Fund for the Implementation of the Montreal Protocol

A fortnightly electronic news update on ozone and climate protection and the implementation of the Montreal Protocol

## NEW! OzonAction Factsheet –

## The Kigali Amendment to the Montreal Protocol: HFC Phase-down

The phase-down of HFCs under the Montreal Protocol on Substances that Deplete the Ozone Layer has been under negotiation by the Parties since 2009 and the successful agreement on the Kigali Amendment at the 28th Meeting of the Parties on 15 October 2016 in Kigali, Rwanda to phase-down hydrofluorocarbons (HFCs) continues the historic legacy of the Montreal Protocol.

This factsheet summarises and highlights the main elements of the Amendment of particular interest to countries operating under Article 5 of the Protocol (Article 5 Parties).

# GLOBAL


### 1. MOP-28 Decision XXVIII/4 on the Establishment of Regular Consultations on Safety Standards

At the Twenty-Eighth Meeting of the Parties to the Montreal Protocol held in Kigali from 10 to 14 October 2016, parties agreed in decision XXVIII/4 on the establishment of regular consultations on safety standards. Paragraph 4 of the decision invites parties to submit to the Ozone Secretariat **by the end of 2016** information on their domestic safety standards relevant to the use of low-GWP flammable refrigerants. Please refer to the full text of the advance copy of the decision in the compilation of decisions here.

In due course and as customary, the Ozone Secretariat will send to the parties a letter informing them of the decisions that were adopted at the Twenty-Eighth Meeting of the Parties, focusing on those that require specific actions by the parties including the decision on safety standards. However, given the short time period for the submission of information under decision XXVIII/4, the Secretariat is bringing it to [the parties] attention in this separate email to enable timely consideration of the matter.

- UN Environment, Ozone Secretariat | the MOP 28 website

Photo by IISD/Kiara Worth

### 2. Final Text of the Kigali Amendment to the Montreal Protocol

Final text of the Kigali Amendment to the Montreal Protocol is now available in all the six official UN languages (A C E F R S)

- UN Environment, Ozone Secretariat | the MOP 28 website

### 3. Frequently Asked Questions Relating to the Kigali Amendment to the Montreal Protocol*

**1. What is the Kigali Amendment?**

The Kigali Amendment is an amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer. It was adopted by the 28th Meeting of Parties to the Montreal Protocol on 15 October 2016 in Kigali, Rwanda. The Amendment adds powerful greenhouse gases hydrofluorocarbons (HFCs) to the list of substances controlled under the Protocol to be phased down. The Amendment will enter into force when the conditions indicated under question 6 below are met.

The decision adopting the Amendment (to which the text of the Amendment is annexed) and the decision related to the amendment phasing down hydrofluorocarbons are posted on the Ozone Secretariat website at the following links:

- Decision XXVIII/1: Further amendment to the Montreal Protocol

- Decision XXVIII/2: Decision related to the amendment phasing down hydrofluorocarbons

**2. What is the expected impact of the Kigali Amendment?**

The Amendment will phase-down HFCs under the Montreal Protocol. Use of HFCs is increasing rapidly as substitutes for ozone-depleting substances. HFC phasedown is expected to prevent the emission of up to 105 million tonnes of carbon dioxide equivalent of greenhouse gases, helping to avoid up to 0.5 degree Celsius of global temperature rise by 2100, while continuing to protect the ozone layer.

**3. How will the Kigali Amendment work?**

Under the Amendment, Montreal Protocol parties are required to gradually reduce HFC use by 80-85 per cent by the late 2040s. First reductions by most developed countries are expected in 2019. Most developing countries will follow with a freeze of HFCs consumption levels in 2024, and in 2028 for some developing countries. Details of the elements of the agreed HFC phase-down schedule are provided in table 1 below:

Table 1: Phase-down schedule for HFCs in Article 5 and non-Article 5 parties

| | **A5 parties (developing countries)** - *Group 1* | **A5 parties (developing countries)** - *Group 2* | **Non-A5 parties (developed countries)** |
|---|---|---|---|
| **Baseline formula** | Average HFC consumption levels for 2020-2022 + 65% of hydrochlorofluorocarbon (HCFC) baseline | Average HFC consumption levels for 2024-2026 + 65% of HCFC baseline | Average HFC consumption levels for 2011-2013 + 15% of HCFC baseline* |
| **Freeze** | 2024 | 2028 | - |
| **1st step** | 2029 – 10% | 2032 – 10% | 2019 – 10% |
| **2nd step** | 2035 – 30% | 2037 – 20% | 2024 – 40% |
| **3rd step** | 2040 – 50% | 2042 – 30% | 2029 – 70% |
| **4th step** | | | 2034 – 80% |
| **Plateau** | 2045 – 80% | 2047 – 85% | 2036 – 85% |

* For Belarus, Russian Federation, Kazakhstan, Tajikistan, Uzbekistan, 25% HCFC component of baseline and different initial two steps (1) 5% reduction in 2020 and (2) 35% reduction in 2025

Notes:

1. *Group 1: Article 5 parties not part of Group 2*
2. *Group 2: Bahrain, India, the Islamic Republic of Iran, Iraq, Kuwait, Oman, Pakistan, Qatar, Saudi Arabia and the United Arab Emirates*
3. *Technology review in 2022 and every five years*
4. *Technology review four to five years before 2028 to consider the compliance deferral of two years from the freeze of 2028 of Article 5 Group 2 to address growth in relevant sectors above certain threshold.*

**4. What are the next steps after adoption of the Kigali Amendment?**

The Ozone Secretariat will forward the text of the Kigali Amendment, in all six authentic languages of the Montreal Protocol, to the Depositary, which is the Secretary-General of the United Nations. An advance copy of the text in all authentic languages will be made available on the Ozone Secretariat website by mid-November.

Upon receipt of the text of the Amendment, the Depositary will produce certified copies of the text, which will be communicated to the Parties.

**5. What is ratification?**

"Ratification" (or acceptance or approval) is the action taken by a party to an international treaty to confirm that it consents to be bound by the treaty. Ratification of the Kigali Amendment to the Montreal Protocol by at least 20 parties is required before the Amendment can enter into force.

The process by which parties ratify the amendment involves the following steps:

1. First, a party will take the necessary steps at the national level, as specified in their constitutional arrangements, to allow it to move ahead with ratification of the amendment at the international level.

2. The party will then execute an instrument of ratification (or acceptance or approval). The instrument includes a statement to the effect that the Government concerned ratifies the Amendment and undertakes to comply with its provisions. A model form for this instrument, based on the format provided by the United Nations Office of Legal Affairs, can be found here.

3. The party will then deposit its duly executed instrument of ratification (or acceptance or approval) with the Depositary. This is done by delivering the original instrument, by hand or by mail, through its Permanent Mission to the United Nations, to: Treaty Section Office of Legal Affairs United Nations New York, NY 10017 USA.

PLEASE NOTE: Instruments of ratification, acceptance or approval are not deposited with the Ozone Secretariat.

**6. What is required for the Kigali Amendment to enter into force?**

The Kigali Amendment will enter into force on 1 January 2019, provided that it is ratified by at least 20 parties to the Montreal Protocol. If that condition is not met by that date, the Amendment will become effective on the 90th day following the date of ratification by the 20th party.

**7. How can I find out if my country has deposited an instrument of ratification, acceptance or approval of the Kigali Amendment?**

The United Nations Treaty Collection website maintains all information on the status of ratification of international treaties, including the Kigali Amendment. The Ozone Secretariat also publishes the status of ratification on its website.

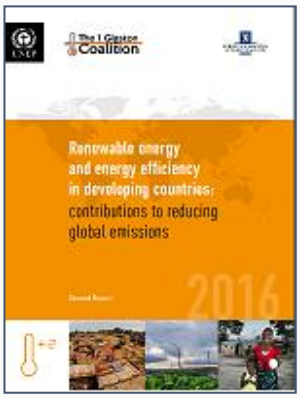
**8. Until when does my country have to complete this procedure?**

Ratification of the Kigali Amendment by parties to the Montreal Protocol should take place as soon as possible to enable full implementation of the amendment by 2019.

* This "Frequently Asked Questions" document was prepared by the Ozone Secretariat for public information purposes. Issued on 3 November 2016 as first version, it will be updated as necessary. The information contained in this document does not replace official documents and decisions relating to the Kigali Amendment.

For further information, please contact the Ozone secretariat

Photo by IISD/Kiara Worth




## 4. World Must Urgently Up Action to Cut a Further 25% from Predicted 2030 Emissions, Says UN Environment Report

- World is still heading for temperature rise of 2.9 to 3.4ºC this century, even with Paris pledges

- 2030 emissions will be 12 to 14 gigatonnes above levels needed to limit global warming to 2ºC

- Opportunities include enhanced pre-2020 action building on Cancun pledges, cost-effective energy efficiency and stimulating action by cities, companies and civil society

London, 3 November 2016 – The world must urgently and dramatically increase its ambition to cut roughly a further quarter off predicted 2030 global greenhouse emissions and have any chance of minimizing dangerous climate change, UN Environment said today as it released its annual Emissions Gap report.

Made public the day before the Paris Agreement comes into force, the report finds that 2030 emissions are expected to reach 54 to 56 gigatonnes of carbon dioxide equivalent – far above the level of 42 needed to have a chance of limiting global warming to 2ºC this century. One gigatonne is roughly equivalent to the emissions generated by transport in the European Union (including aviation) over a year.

Scientists agree that limiting global warming to under 2ºC this century (compared to pre-industrial levels), will reduce the likelihood of more-intense storms, longer droughts, sea-level rise and other severe climate impacts. Even hitting the lower target of 1.5 ºC will only reduce, rather than eliminate, impacts.

The predicted 2030 emissions will, even if the Paris pledges are fully implemented, place the world on track for a temperature rise of 2.9 to 3.4 degrees this century. Waiting to increase ambition would likely lose the chance to meet the 1.5 ºC target, increase carbon-intensive technology lock-in and raise the cost of a global transition to low emissions.

"We are moving in the right direction: the Paris Agreement will slow climate change, as will the recent Kigali Amendment to reduce HFCs," said Erik Solheim, head of UN Environment. "They both show strong commitment, but it's still not good enough if we are to stand a chance of avoiding serious climate change.

"If we don't start taking additional action now, beginning with the upcoming climate meeting in Marrakesh, we will grieve over the avoidable human tragedy. The growing numbers of climate refugees hit by hunger, poverty, illness and conflict will be a constant reminder of our failure to deliver. The science shows that we need to move much faster."

The need for urgent action has been reinforced by the fact that 2015 was the hottest year since modern record keeping began. The trend is continuing, with the first six months of 2016 all being the warmest ever recorded.

Yet emissions continue to increase, the report says.

The Kigali Amendment to the UN Environment-hosted Montreal Protocol, agreed last month, aims to slash the use of hydrofluorocarbons. Early studies indicate this could cut another 0.5 degrees if fully implemented, although emissions won't begin to be reduced at any significant rate until 2025.

Also, while members of the G20 are collectively on track to meet their Cancun climate pledges for 2020, these pledges fall short of creating a sufficiently ambitious starting point to align with the temperature target of the Paris Agreement.

However, the Gap report presents an assessment of the technologies and opportunities to find the further cuts required, including through non-state actors, energy efficiency acceleration and crossover with the sustainable development goals.

Non-state actors (the private sector, cities, regions and other subnational actors like citizen groups) can cut several gigatonnes off the gap by 2030 in areas such as agriculture and transport, provided the many initiatives meet their goals and do not replace other action.

Energy efficiency is another area where investment could bring bigger gains. Investments in energy efficiency increased by 6 per cent to US$221 billion in 2015, indicating that action is already happening.

Studies show that for an investment of between 20 and 100 US$ per tonne of carbon dioxide, energy efficiency emissions reduction potentials (in gigatonnes) by 2030 are 5.9 for buildings, 4.1 for industry and 2.1 for transport.

A new report released by the 1 Gigaton Coalition shows that renewable energy and energy efficiency projects implemented in developing countries from 2005 to 2015 will reduce emissions by almost half a gigatonne by 2020, including action by countries that do not have formal Cancun pledges.

"Internationally supported projects on renewable energy and energy efficiency are making significant contributions to reducing global greenhouse emissions," said Mr. Børge Brende, Norway's Minister of Foreign Affairs. "Thanks to the work of the 1 Gigaton Coalition we can measure and report the impact of these projects to see how far we still have to go to reach the climate goal. This is how the coalition aims to inspire countries around the world to raise their action and ambition on climate change through the energy sector."

Finally, climate action is intertwined with the sustainable development goals. The earliest impacts of climate change may undermine our ability to deliver the goals by 2030, and failure to deliver on the climate action goal will have even larger implications for maintaining development progress post-2030.

Successful implementation of the Paris Agreement and the sustainable development goals agenda will depend on the ability of governments to develop national targets that serve both and take advantage of common opportunities.

- The Emissions Gap Report, the 1 Gigaton Coalition Report and a brief analysis the G20 Cancun Pledges can be downloaded from here once the embargo lifts.
- See also:

  - World must urgently up action to cut a further 25% from predicted 2030 emissions, says UN Environment report [Arabic] | [Chinese] | [Dutch] | [English] | [French] | [Norwegian] | [Russian] | [Spanish]

  - Developing countries can slash emissions by one gigatonne if international community lives up to commitments

  - Cancun Pledges Analysis from Emissions Gap Report 2016
- Contact:

  Shereen Zorba, Head of Science-Policy, UN Environment
  Michael Logan, Head of News and Media, UN Environment

## 5. UN Shipping Agency Announces Plans for Developing Emissions Reduction Strategy

The UN's shipping body has confirmed plans to develop a strategy for reducing greenhouse gas (GHG) emissions from the sector, with an initial version of this plan to be confirmed by 2018 and a final version due in 2023.

Negotiators met in London from 24-28 October for the International Maritime Organization's (IMO) Marine

Environment Protection Committee (MEPC), aiming to take steps that would help tackle the climate-warming risks from a growing demand in the maritime sector.

The planned strategy will be developed following a roadmap for the years 2017-2023, which will include taking on more research into the sector's greenhouse gas emissions, along with tying in these efforts and others with the ongoing work to implement previously-agreed steps on improving ships' energy efficiency. […]

**Climate governance context**

UN officials said that the developments at MEPC, while a promising start, still need to be followed by additional, concrete steps that will help answer the climate challenge.

"Welcoming these important steps, the Secretary-General calls for urgent and ambitious action to limit the greenhouse gas emissions from global shipping," said a spokesperson for outgoing UN Secretary-General Ban Ki-Moon.

Indeed, the past month has seen a series of other promising advances on climate action. These include the news that the Paris Agreement on climate change would enter into force on 4 November; the addition of hydrofluorocarbons (HFC), a potent climate-warming gas, to the Montreal Protocol on Substances that Deplete the Ozone Layer; and the agreement on an international carbon-offset system for civil aviation. […]

International Centre for Trade and Sustainable Development (ICTSD), 7 November 2016


## 6. The Consumer Goods Forum Announces New Refrigeration Resolution

Retailers and manufactures re-emphasize their commitment to phase out HFC refrigerants and build on initial successes from over the last six years

PARIS and NEW YORK, 6 October 2016 – The Board of The Consumer Goods Forum (CGF) today announced a new resolution on refrigeration, calling on all consumer goods companies to phase out harmful hydrofluorocarbons (HFCs). This ambitious new commitment is seen as a vital next step in helping to meet the goal of keeping the global average temperature rise to well below 2°C. HFCs represent 1.5% of total warming potential today, and are expected to increase to 6-9% of total GHG by 2050 unless action is taken.

The resolution focuses on four key areas; the installation of new refrigeration equipment in markets where viable, the engagement with key stakeholders to overcome barriers in markets where installation is not currently viable, the reduction of the environmental impact of existing refrigeration systems and the development of individual targets and action plans to measure the first three points.

The Board also recognizes the important role that regulation plays in ensuring the equitable global phase down of HFCs and thus calls for the inclusion of HFCs within the Montreal protocol.

Mike Coupe, CEO of Sainsbury's, said, "Once again CGF members are showing global and environmental leadership, and this latest move will play important role in achieving wider sustainability standards in the industry. As we move away from HFC gases and towards cleaner business practices, it's crucial that the consumer goods industry continues to lead the way and stay ahead of the curve".

Alan Clark, CEO of SABMiller, said, "Positive actions by leading global consumer goods companies over the last six years have proved the commercial and operational viability of low carbon refrigeration systems in many parts of the world. As part of our Prosper sustainable development ambition, SABMiller has a 2020 target to purchase no new HFC fridges. This new Refrigeration Resolution will help the whole industry move towards eliminating high global warming-potential refrigerants from our sector, as part of our active commitment to the Paris Climate Agreement".

Building on the Industry's Results Following the CGF's 2010 Refrigeration Resolution

Back in 2010, when the CGF's original Refrigeration Resolution was announced, refrigeration was already playing a key role in the consumer goods industry, but the low carbon technologies to replace HFCs were unproven. The CGF, therefore, decided to show leadership by taking the decision to commit to trialling new approaches to refrigeration by 2015.

As a consequence, CGF members have installed low carbon refrigeration systems in over 4,000 supermarkets, four million ice cream and drinks chiller units worldwide and industrial plants with the majority being natural refrigerants. The recently-published Refrigeration Booklet also highlights these successes and more. The 2010 Refrigeration Resolution was closed in January 2016.

The CGF, however, acknowledges that while the testing of pilots and introduction of natural refrigerants has been positive, the new resolution announced today is necessary to help drive further uptake and ensure HFCs are permanently removed from operational systems globally.

This second Refrigeration resolution is the fourth environmental resolution as part of the CGF Sustainability Pillar, complementing the other active resolutions on deforestation and food waste.

- The Consumer Goods Forum (CGF), 6 October 2016

## 7. OzonAction express deep sadness at the loss of Prof. Ralph J. Cicerone, president emeritus of the National Academy of Sciences and a renowned authority on atmospheric chemistry and climate change, died unexpectedly, on Saturday, Nov. 5, 2016

Prof. Cicerone's research was recognized on the citation for the 1995 Nobel Prize in chemistry awarded to his University of California, Irvine colleague Frank Sherwood Rowland. The Franklin Institute recognized his fundamental contributions to the understanding of greenhouse gases and ozone depletion by selecting Prof. Cicerone as the 1999 laureate for the Bower Award and Prize for Achievement in Science.

In 2001, Cicerone led a National Academy of Sciences study of the current state of climate change and its impact on the environment and human health. The American Geophysical Union awarded him the 2002 Roger Revelle Medal for outstanding research contributions to the understanding of the Earth's atmospheric processes, biogeochemical cycles, and other key elements of the climate system. In 2004, the World Cultural Council honored him with another of the scientific community's most distinguished awards, the Albert Einstein World Award in Science.

Prior to becoming NAS president, Cicerone was the chancellor of the University of California, Irvine from 1998 to 2005. He is a member of the American Academy of Arts and Sciences, and the American Philosophical Society. He has served as president of the American Geophysical Union, and he received its James B. Macelwane Award in 1979 for outstanding contributions to geophysics.

He has published about 100 refereed papers and 200 conference papers, and has presented invited testimony to the U.S. Senate and House of Representatives on a number of occasions.

Cicerone's subsequent work in both the scientific and public policy arenas was pivotal in bringing about the Montreal Protocol and the eventual international ban on CFCs.

- The Montreal Protocol Who's Who, Prof. Ralph J. Cicerone Profile
- See also: National Academy of Sciences

# ASIA PACIFIC

## 8. Strange Pumping Effect above Asia Threatens the Ozone Layer

An atmospheric mechanism is lofting Indian and Chinese pollution into the stratosphere

A weird phenomenon is happening high above the Tibetan Plateau and the Himalayas that could prove to be an atmospheric nightmare. Pollutants that gather from India and China in the lowlands around the mountains can be boosted as high as 18 kilometers, reaching the stratosphere - the atmospheric layer directly above the troposphere that contains most of Earth's ozone. That is far higher than aerosols from vehicles, power plants and fires usually reach. Once

aerosols are that high they can spread globally, destroy the ozone layer that protects us from ultraviolet radiation and exacerbate global warming, researchers warn.

Until a few years ago "we thought human activities had little impact on the stratosphere," says Jean-Paul Vernier, a remote-sensing expert at the NASA Langley Research Center. Scientists had previously thought only volcanoes could eject aerosols—tiny particles or droplets—to such heights. And most models looking at future climate change scenarios did not account for aerosols in the stratosphere. Special tests reported in September confirm the aerosols continue to collect over India, and the work reveals fresh insights into their composition.

The presence of aerosols was a big surprise when Vernier and his colleagues discovered them in 2009. Sieving through the data from CALIPSO—a satellite jointly launched by France and the U.S.—they found a thick layer of aerosols between 13 and 18 kilometers above sea level over a large area stretching across the eastern Mediterranean Sea, northern India and western China. The layer is most prominent in the summer and is unrelated to volcanic eruption, Vernier surmised then. He called it the Asian tropopause aerosol layer (ATAL) because it lies within the tropopause, a transitional zone spanning the upper troposphere and lower stratosphere. Last year the team reported in the *Journal of Geophysical Research* that the amount of aerosols in ATAL had tripled since 1996, the earliest time when they appeared in satellite observations.

The finding was provocative but there had been "lots of debates about whether it is genuine or merely an observational artifact," says William Lau, an atmospheric scientist at the University of Maryland, College Park, who was not involved in the study. The best way to prove ATAL existed, Vernier says, was to fly aircraft through the tropopause over Asia, which would allow researchers to sample particles over a large area. Neither NASA nor the European Space Agency got permission from any of the Asian countries involved to conduct such field campaigns, however.

Vernier's group resorted to the second-best option. Collaborating with Indian scientists, in 2014 they launched weather balloons into the tropopause from three locations across India. They repeated the experiments in 2015 and 2016. In September 2016 the team, while at an International Global Atmospheric Chemistry project meeting in Colorado, reported that the sensors onboard the balloons not only confirmed the existence of tropopause aerosols over India, but yielded fresh data into their composition.

For instance, the researchers found that 90 percent of the pollutants were tiny liquid droplets less than 0.2 micron in diameter. In the August 2016 campaign, conducted over the holy and notoriously polluted city of Veranasi, the team included a sampler in the payload that trapped tropopause aerosols on filters. Preliminary analyses show that most of the pollution was sulphate aerosols—along with dust and carbonaceous particles such as black carbon.

PUMP TO THE SKY

As Vernier's team was capturing pollutants, Lau and his colleagues tracked down the sources by feeding years of satellite measurements of pollution and meteorological conditions—taken as frequent as every few hours—into a new computer program developed by NASA called MERRA2. The team reconstructed the atmospheric processes and showed where ATAL aerosols came from and how they reached such heights.

As Lau explained to an audience at the International Workshop on Land Surface Multi-sphere Processes of the Tibetan Plateau and Their Environmental and Climate Effects Assessment—held in August in China—there are two pollutant transportation pathways into the tropopause, one from India and the other from central and eastern China. Pollutants piled up in the foothills of the Himalayas and eastern Tibetan Plateau in April and May, Lau explains. "They then got swept up into the tropopause at the onset of Asian monsoons."

This pumping phenomenon is unique globally, Lau says, largely due to the Tibetan Plateau's uncommon topography. It has an area of 2.5 million square kilometers (about a quarter of the U.S. landmass) and an average elevation of over 4,500 meters. Because the vast plateau at such altitudes absorbs a huge amount of solar radiation, the atmospheric layer above it in summer is much warmer than air at similar elevations over lower land or the oceans. This temperature differential, the engine of Asian monsoons, creates winds that blow from the Indian and Pacific oceans into Tibet, which drag with them the pollutants piled up in the foothills.

Due to the plateau's intense heating effects in the summer, the overlaying warm air can rise much higher into the atmosphere than over adjacent lowlands. "Consequently, the top of the troposphere above Tibet is much higher [than that over surrounding regions]," Lau says. "I think of it as a lid being pushed up by boiling water, protruding into the stratosphere." There, the pollutants can easily spill over into the adjacent stratosphere, Lau says. "And at the end of the summer, the 'lid' comes back down, which leaves aerosols in the stratosphere," he explains. The strong, horizontal wind that is a prominent feature in the stratosphere could then spread the pollutants around the world.

GLOBAL IMPLICATIONS

The observations “for the first time draw a direct link between surface pollutants in Asia and aerosols in the tropopause,” says Kenichi Ueno, a climate scientist at the University of Tsukuba in Japan, who is not involved in the study. And the timing makes sense, he says, because industrialization in China and India since the 1990s is in line with ATAL’s first appearance in 1996 and its thickening since then.

Ueno says that once aerosols are in the stratosphere they become very stable and can last for years, compared with days or weeks in the troposphere, and they can activate compounds such as chlorine that destroy the ozone layer. Aerosols in the tropopause also complicate climate projections; they are not taken into account in the latest assessment released in 2013 by the Intergovernmental Panel on Climate Change, says Yu Gu, a climate scientist at the University of California, Los Angeles. Aerosols that high in the sky “can change the amount of solar radiation reaching the Earth’s surface and affect rainfall through cloud formation,” she says. But until researchers gain more details about their chemical composition, she adds, “we cannot begin to assess their precise climate impact.”

More experiments would provide that detail. Meanwhile, “there should be more rigorous efforts to cut emissions in Asia,” Ueno says. “The findings really hit home the message that Asian pollution is a regional problem with global ramifications.”

Scientific American, 27 October 2016, By: Jane Qiu

# LATIN AMERICA AND CARIBBEAN

## 9. Instalan Moderno Sistema de Refrigeración de $CO_2$ Transcrítico (Brasil)

Brasil. Una reconocida cadena de retail abrirá este 27 de octubre un hipermercado equipado con un moderno sistema de refrigeración de $CO_2$ transcrítico en la ciudad brasileña de Sao Paulo.

El sistema - en un hipermercado 6,800m2 en el barrio de Cambuci, Sao Paulo - es la segunda instalación de $CO_2$ transcritico en Brasil. La primera fue encargada por el Grupo Carrefour para una tienda de la marca Atacadão cash & carry en Atibaia, Estado de Sao Paulo, que se abrió el 16 de junio. Otros sistemas se ejecutan en laboratorios de pruebas construidos por Bitzer y Eletrofrio, pero Carrefour son los primeros en el campo.

"Decidimos importar la tecnología. Nadie en Brasil está produciendo sistemas de $CO_2$ transcríticos. También faltan los componentes disponibles localmente para estos sistemas", dijo Martini.

Carrefour está decidido a tener éxito allí. Martini está convencido de que la instalación de sistemas de $CO_2$ transcríticas en Brasil ayudará a aumentar la conciencia de los beneficios de rendimiento de la tecnología. "El proceso fue suave gracias a Plotter Racks, el instalador del sistema para ambas tiendas. También tenemos un contrato de mantenimiento con ellos", dijo.

La tienda Cambuci está equipado con dos racks transcríticos reforzados de compresión CO2 en paralelo. Cada rack tiene una capacidad de 100 kW (a -8 ° C) para los usuarios de temperatura media y una capacidad de 45 kW (a -30 ° C) para los usuarios de baja temperatura.

El fabricante del sistema, Advansor - que trabaja con Plotter Racks en el mercado brasileño – ensambló los racks en Dinamarca antes de enviarlos a Brasil. También importaron los intercambiadores de calor (thermofin), mientras que Danfoss proporcionó los controladores de rack. Tras la llegada de los racks Brasil, Plotter Racks ensambló los refrigeradores de gas: adicionando su sistema adiabático 'Breeze '.

La tecnología adiabática restringe el consumo de agua a la cantidad requerida, reduciendo la temperatura de entrada de aire del enfriador de gas y mejorando así el rendimiento y la fiabilidad del sistema.

ACR_LatinoAmerica, 25 Octubre 2016

# NORTH AMERICA

## 10. What the Pact on HFCs Will Mean for Builders

The rising global demand for air conditioning and refrigeration helped push through an amendment to the Montreal Protocol that will limit the use of hydrofluorocarbon refrigerants.

The phase-out of hydrofluorocarbons will usher in new versions of foam insulation and updated air conditioners and heat pumps — but not in the immediate future

The agreement earlier this month among 170 countries to phase in strict limits on the use of a common type of refrigerant will mean changes to many products used by residential builders, including foam insulation and heating and cooling equipment, but consumers probably won't be seeing wholesale changes for a number of years.

The accord reached in Kigali, Rwanda, commits the countries to a gradual phase-down of the production and consumption of hydrofluorocarbons (HFCs), a class of chemical used as refrigerants and as blowing agents in foam insulation, beginning in 2019.

A conversion to environmentally friendlier chemicals has been anticipated for years in the foam insulation industry, and in some cases already is underway, but makers of extruded polystyrene (XPS) insulation don't expect to be weaned off HFCs until 2021. On the heating and cooling side, one major manufacturer doesn't expect a switch to newer refrigerants for residential equipment such as ductless minisplits for a number of years.

The pact is an amendment to the 1987 Montreal Protocol and will be put into place gradually. The U.S. and the European Union are on a faster timetable than other nations, according to an article posted at *The Guardian*. In 2019, the U.S. pledges to cut its HFC use to no more than 90% of its baseline (an average from the years 2011 through 2013). By 2024 that drops to 60%, and then to 15% of the baseline by 2036.

Unlike the refrigerants they replaced, HFCs don’t damage the ozone layer in our planet’s atmosphere. But they are powerful greenhouse gases with 1,000 times or more the potential of carbon dioxide to trap heat. As the demand for refrigeration and air conditioning has shot up, so has the use of HFCs.

In addition to their use as refrigerants, HFCs also are used as blowing agents for extruded polystyrene insulation, a rigid foam common to many high-performance buildings, and in some types of spray polyurethane foam. Their high global warming potential (GWP) has steered some builders away from these products even though they excel as thermal insulation.

**Insulation changes are already underway**

A conversion to other chemicals for making insulation is already in the works in both the U.S. and Europe. The most likely replacement looks like hydrofluoroolefins (HFOs). They have a global warming potential of less than 1 and could be used in both spray polyurethane and XPS. Manufacturers still need to solve a few technical issues related to the conversion.

Prodded by the EPA’s Significant New Alternatives Policy (SNAP), U.S. manufacturers already are facing a phase-out of HFCs in the years ahead. Most formulators of spray polyurethane insulation are planning a conversion to HFOs in anticipation of tougher EPA rules, according to one industry insider. Lapolla Industries Inc. already has such a product on the market.

“Those that I’ve talked to in the foam industry seem to have this well in hand,” Alexander Hillbrand, a technical analyst with the Natural Resources Defense Council, said in a telephone interview. “I think we see much more environmentally friendly alternatives on the market. They have better thermal performance by and large. They blow pretty well.

“I have not heard any particular response [to the amendment] from the foam side,” he continued. “I haven’t heard of any particular holdups there.”

Timing remains a question. The EPA has mandated a transition away from HFCs in XPS insulation by 2021, and Hillbrand said it’s still not completely clear how the Kigali agreement will be implemented.

“We are waiting for the State Department’s guidance on how the U.S. can formally become party to the treaty, including this amendment,” Hillbrand said. “Perhaps additional steps need to be taken. We certainly

have ratified or at least become a part of all the previous amendments. We have existing Clean Air Act authority to carry out all the control measures that we've agreed to under the HFC amendment. But in terms of the formal process we're still waiting for some guidance on exactly how that will happen."

**XPS industry hasn't made the switch**

Dow, Owens Corning, and Kingspan are the major manufacturers of XPS available in the U.S. and none has announced a switch from HFC to HFO blowing agents.

When asked about a change, Kingspan sent GBA a two-sentence statement: "Kingspan is fully supportive of the plans to reduce HFC use agreed in the Rwanda Accord. International political agreements like this are crucial if we are to address successfully the threats posed by climate change." The Extruded Polystyrene Foam Association (XPSA) issued a similar statement.

Owens Corning said by email it would comply with regulations in the U.S. and Canada, meaning an end to HFC blowing agents in 2021, but presumably not before, adding, "The Kigali amendment does not affect the timing of the North American regulations or our compliance plans." The company said it "fully supports" the intent of the Kigali agreement.

EPA had originally sought a 2017 phase-out of HFCs in insulation, but the industry said the effective date was unrealistic. In its final rule, the EPA delayed the transition until 2021. Until then, HFCs will remain "acceptable" for use in XPS.

In August, XPSA said it supported the phase-down of HFCs, calling it "an important accomplishment for the industry's stewardship and sustainability objective and a natural step in the ongoing search for better technologies to serve our customers."

But, the association added, blowing agents are "not interchangeable" and that it took the industry 10 years to successfully complete each of the last two conversions from one blowing agent to another.

The association says that the refrigeration industry is much bigger player in the debate than insulation. The use of HFCs in foam accounts for only 16% of total HFC production in North America, it said; just 7% of the HFC-134a produced here goes into foam insulation. A "significant" amount of the blowing agent remains in the foam at the end of its service life, with typical in-use emission rates between 0.5% and 1% per year, the association said.

Plus, the trade group adds, energy savings resulting from the use of XPS are significant. "For every 1 lb. of C02 equivalent created to make an XPS foam board, 233 lb. of C02 equivalent are saved because of the energy spared throughout the life of the building," the association said.

**Refrigerants may be a tougher problem**

The phase-down is a bigger deal for makers of air conditioners and heat pumps because components such as valves and compressors often must be altered or even completely redesigned when manufacturers switch from one kind of refrigerant to another.

"There definitely will be an impact on refrigeration and air conditioning based on the amendment that was agreed on in Kigali," Hillbrand said. "When that will happen is less clear."

The EPA, he said, has yet to approve an alternative to the R410a refrigerant used in central air conditioners, ductless minisplits, rooftop AC units, and high-pressure chillers. Alternatives are coming to market, but they're not here yet.

"We are definitely seeing a lot of movement of industry toward a couple of alternatives, but the products that use these refrigerants are still under design, and the safety standards and codes are still in the process of being updated," Hillbrand said.

In the past, the industry has approached conversions by looking for alternatives that are as compatible as possible with current equipment.

"That is to say, chemical producers have worked closely with manufacturers of equipment to minimize the equipment redesign that will be required when transitioning to the new refrigerants," Hillbrand said.

"All of the major manufacturers have been supportive of the amendment to the Montreal Protocol," he continued. "Most manufacturers do need to make some changes, of course, and there is real engineering that has to be done and changes to production and design. But the manufacturers have found time and time again they are left with better products that are more energy efficient and so they have supported these transitions and have continued to do so."

**Mitsubishi sees changes years out**

Mitsubishi Electric Cooling & Heating, maker of a popular and efficient line of ductless minisplits used for both heating and cooling, said that the industry is hard at work on an alternative to R410a. Exactly when the industry will phase out its use of HFC refrigerants, however, ultimately depends on the EPA.

"It's probably going to be 2023 or 2024 for a changeover, but that's not even definite," said Paul Doppel, the senior director of industry and government affairs at Mitsubishi. "Everything is pretty much dependent on the EPA's SNAP program."

EPA hasn't hinted it will delist R410a for use in home heating and cooling systems anytime soon, and the agency may target other industries first to meet terms of the Rwanda accord, he said.

The global warming potential of R410a is about 2,000, and Mitsubishi expects an interim step will be to develop refrigerant blends of HFCs and possibly some HFOs that get the GWP to no more than 750 before further development takes that value into the single digits. But an outright switch to an HFO refrigerant isn't in the cards.

"Development cycles are long," Doppel said. "It's going to take a while. It's around the corner, but not right around the corner."

When the industry does move away from HFCs, he added, Mitsubishi doesn't expect the efficiency of its heating and cooling equipment would suffer, and doubts there would be much of an impact on consumer pricing. In fact, an earlier conversion from R22 to R410a helped Mitsubishi introduce its inverter-driven compressors, a technical innovation that improved performance.

**Deal has broad support**

A statement issued on October 19 by David Doniger, director of clean air programs at the Natural Resources Defense Council, and Stephen Yurek, CEO and president of the Air-Conditioning, Heating and Refrigeration Institute, praised the new pact on HFCs.

Because of the growing worldwide demand for air conditioning and refrigeration, they said, HFCs are “the fastest growing of the gases damaging our climate.”

"Unlikely as it may seem, this global HFC phase-down has the backing both of leading environmental groups and the industry that makes and uses these chemicals," they said. "With their support, the Obama administration pushed hard for the Kigali deal to reduce and replace HFCs. Coming after last December’s Paris climate agreement, an HFC pact is the biggest step we can take this year to significantly reduce human impact on the environment.

“The HFCs avoided over the next 35 years will amount to the heat-trapping equivalent of 70 billion tons of carbon dioxide,” the statement continued. “That is equal to stopping the entire world’s fossil-fuel carbon dioxide emissions for more than two years.”

They said the agreement also will lead to better technology.

"Cooperation on HFCs shows that we can still govern — locally and globally — and can solve the challenges of climate change,” they said. "We all can and must do more to beat the heat and the HFC success story is a victory for common sense and the environment."

- Green Building Advisor, 25 October 2016, By: Scott Gibson

## 11. AHRI Applauds Agreement to Include HFCs in Montreal Protocol

**Arlington, Va. -** The Air-Conditioning, Heating, and Refrigeration Institute (AHRI) applauded the agreement reached early this morning in Kigali, Rwanda, by the Parties to the Montreal Protocol (MP) to include hydrofluorocarbon (HFC) refrigerants in the treaty’s purview. Acknowledging the success of the MP in phasing out hydrochlorofluorocarbons (HCFCs), AHRI has long supported including HFCs in a global phasedown plan under the treaty.

“While the freeze dates and step down levels are ambitious, the HVACR industry is confident we can meet them and continue to provide quality, innovative, energy efficient products and equipment for the benefit of the world’s citizens,” said AHRI President and CEO Stephen Yurek, who attended the Kigali meeting.

“The agreement is just the first step in a multi-step process,” Yurek said. “Our industry is hard at work doing the research on the HFC alternatives that will be used in the world’s air conditioners, heat pumps, and refrigeration equipment, and getting that right is certainly as important as reaching agreement. Also very important are the education and training initiatives that will have to occur to ensure safe, efficient installation of the equipment that will contain these new refrigerants. Some of this is already being undertaken by AHRI

in cooperation with the United Nations Environment Program and other global organizations," he added.

AHRI, U.S. government agencies, and energy efficiency advocacy groups have all worked diligently for many years to ensure a phasedown of these chemicals. In 2011, AHRI initiated a global refrigerant research program, known as the Low-Global Warming Potential Alternative Refrigerants Evaluation Program (Low-GWP AREP), to identify the most promising HFC alternatives. After two phases of research, the most promising alternatives are currently classified as mildly flammable or flammable, so additional field research is being undertaken to determine their suitability in different applications. That research is being sponsored by AHRI, ASHRAE, the U.S. Department of Energy, the state of California, and Johnson Controls, Inc.

- The Air-Conditioning, Heating, and Refrigeration Institute (AHRI), 15 October 2016

# EUROPE & CENTRAL ASIA

## 12. Thematic Meeting on Implementation of HCFC Phase-out Management Plans (HPMPs), Chisinau, Republic of Moldova, 8-10 November 2016

Heads of national refrigeration associations and Montreal Protocol focal points from 11 Central Asian and Caucasus countries enhance ozone layer protection and sustainable management of climate gases: The experts shared highlights, challenges and lessons learnt from the implementation of their respective hydrochlorofluorocarbon (HCFC) phase-out strategies and from the surveys on ozone-friendly alternatives during the thematic meeting in Chisinau, Republic of Moldova, 8-10 November 2016.

Ms. Inga Podoroghin, State Secretary of the Ministry of Environment, opened the meeting and reiterated commitments that the Republic of Moldova has under the Montreal Protocol. She highlighted the importance of the recent adoption of the Kigali Amendment, which is expected to prevent 0.5 degree C raise in temperature by the end of the century. Thus, the Protocol will provide a significant contribution to targets of UNFCCC Paris Agreement, which entered into force on 4 November 2016. Also, she encouraged countries of the ECA region to join global efforts and explore the alternatives replacing hydrofluorocarbons (HFCs).

Ms. Svetlana Bolocan, Montreal Protocol and Vienna Convention Focal Point of the Ministry of Environment, who participated in the negotiations of the Kigali Amendment, emphasized the importance of adequate and enforceable legislation and standards to ensure the sustainable management of ozone-depleting and climate gases.

Mr. Georgi Arzumanyan, Cluster Leader for Energy, Environment and Climate Change of UNDP Moldova, warned that the demonstrated steady growth in consumption and emissions of HFCs - a group of potent climate gases – would jeopardize the international efforts in reducing the impact of climate change not only in the context of the Montreal protocol but also across all climate-related international initiatives. In this line, HFC phase-down is among the priorities.

The meeting focused on the HCFC phase-out strategies and the surveys on ozone-friendly alternatives in the participating countries. The results of the surveys will provide a better understanding of the current use and consumption trends of high global warming HFCs as well as climate friendly HFOs and natural refrigerants by sector and by substance. Such data will be useful for informed policy making and sustainable refrigerant management. The voluntary inclusion of HFCs and possibly other refrigerants in the national import / export licensing system and the informal Prior Informed Consent mechanism might enhance data accuracy. Several

participants highlighted the importance to involve the national climate focal points in the surveys, in particular because of their experience of calculation emission inventories.

Several sessions were dedicated to the strengthening of legislation, the adoption safety and performance standards, training and certification of technicians and companies, the promotion of ozone and climate-friendly technologies and the role of RAC associations in implementing the Montreal Protocol. Following the suggestion by the Russian RAC association, the attending RAC associations spontaneously signed a Memorandum expressing their interest in establishing close cooperation, sharing information and providing mutual support with regard to above mentioned topics. Concrete suggestions include the setting up of a steering committee, study tours to demonstration projects and training centers as well as periodic virtual and face-to-face meetings e.g. in the margin of the 13th International Specialized Exhibition Climate World in Moscow, Russia, 28 February – 3 March 2017.

Armenia, Kyrgyzstan and Russia expressed interest in the Refrigerant Driving License – an initiative of UN Environment OzonAction in cooperation with the Air-conditioning, Heating, Refrigeration Institute (AHRI) and interested refrigeration & air-conditioning (RAC) associations. The aim of this initiatives is the development of a globally recognized and industry-driven certification scheme for RAC service technicians allowing them to work safely with ozone and climate-friendly refrigerants. Interested RAC associations are invited to participate in the steering committee and countries might participate in the pilot phase in 2017 (subject to regional distribution) or the global launch in 2018. China included the Refrigerant Driving License in its HCFC phase-out strategy and this might also be a viable option for countries without an operational certification system.

Armenia briefed the participants on the status of the regional training center currently being established in Yerevan as a Russian bilateral project with UNIDO as implementing agency. The aim of this "center of excellence" is the promotion of climate-friendly RAC technologies in the developing (Article 5) countries of the ECA network. A lyceum has been selected as the training facility and it is equipped among others with a classroom, a conference room, a computer room, work stations, a library, and a canteen. A website provides more detailed information and the start of the actual training activities is scheduled for beginning of 2017.

Public procurement is increasingly recognized as a strategic tool to promote wider Government policies including environment protection, innovation, job creation and promoting small and medium-sized enterprises (SMEs). In average, it accounts for 12% GDP in OECD countries and 14% GDP in European Union countries and thus represents an immense purchasing power. Countries like China and India have included green public procurement in their HCFC phase-out strategies (stage II). This might be a powerful tool to promote ozone and climate-friendly technologies in the RAC sector.

For the first time, the agenda included a session on gender considerations in project implementation. There has been some discussion on how to apply gender analysis and statistics to projects addressing global environmental problems such as ozone layer depletion and global warming. The future mandate of the Montreal Protocol addressing both ozone depletion and global warming will increasingly require addressing social dimensions and gender issues. This is already an eligibility criteria for several donor including the Green Climate Fund.

The programme included also technical visits of a cold store for fruits and vegetables in Bucobet as well as another cold store and a wine factory in Romanesti. One cold store used refrigerant HFC-404a and the other HCFC-22, which is an ozone-depleting and global warming gas.

At the end of the meeting, the priorities of the UN Environment's Regional Ozone Network for Europe & Central Asia (ECA network) were agreed. Next year's network meeting will take place in Ohrid, Macedonia FYR, in May 2017. It will be held in parallel to the bi-annual congress of the International Institute of Refrigeration focusing on ammonia and carbon dioxide technologies to allow the refrigeration experts of the network countries to participate in selected sessions of the congress. Albania and Georgia agreed to host thematic meetings in autumn 2017.

The meeting has been organized by UN Environment OzonAction in cooperation with the Ministry of Environment of the Republic of Moldova and UNDP Chisinau, as part of the work programme of the ECA network and funded by the Multilateral Fund for the Implementation of the Montreal Protocol.

Participants included Montreal Protocol focal points and refrigeration experts Armenia, Azerbaijan, Belarus, Georgia, Kyrgyzstan, Republic of Moldova, Russia, Tajikistan, Turkmenistan, Ukraine and Uzbekistan as well as representatives of the implementing agencies UNDP, UN Environment and UNIDO and additional resource persons from Russia and the USA.

**Contact:**

**Ministry of Environment of the Republic of Moldova**
Svetlana Bolocan, Montreal Protocol and Vienna Convention Focal Point
Anatol Tarita, Ozone Office Coordinator

**UN Environment OzonAction**
Halvart Koeppen, Coordinator of the ECA network

## 13. Uzbekistan: On the Road to Adopt Ozone Friendly Technologies


"In 2000 I happened to read a newspaper article on new technologies, equipment and machinery with cooling agents, which are harmless to the Earth's ozone layer. Never before I thought about the detrimental damage to the Earth's ozone layer caused by the use of ozone-depleting cooling agents. It dawned on me that my work has an important role in the protection of the stratospheric ozone layer.

The newspaper article talked about the initiatives and programmes in Uzbekistan in the area of ozone layer protection, and I became involved in this work as an engineer of air conditioning and refrigeration equipment. Realizing that these new ozone-friendly technologies conform to international standards and modern-day requirements, our company started to explore opportunities and perspectives of introducing them as the consumer market of refrigerators and air-conditioners was steadily growing. This required a lot of learning and reconsideration of old approaches so we could effectively use modern and ozone friendly technologies and equipment. Our efforts allowed our enterprise to solve a number of technical issues related to removal and replacement of compressors, repair, mounting, etc. so the ozone friendly refrigerants can be effectively utilized. And I started to hold trainings and master classes to educate specialists in our discipline and to increase their professional capacity to adopt and use the technologies friendly to the ozone layer.

In 2012, the UNDP Bratislava Regional Centre jointly with the State Committee for Nature Protection of the Republic of Uzbekistan started the collection of data on consumption of hydrochlorofluorocarbons (HCFC) in the country, within the scope of development of the first project UNDP in Uzbekistan on reduction of HCFC consumption. Our company "Hladomontaj" provided all required data as it was one of the key centres for CFC 12 recycling (CFC - 12) in the country.

Objectives of the new project included the upgrading of existing recycling centres, equipping them with up-to-date equipment on removal of cooling agents and training of the company personnel. I was thrilled about the opportunity to participate in the preparation and implementation of this new UNDP project funded by the Global Environment Facility (GEF) and implemented in cooperation with the State Committee for Nature Protection of Uzbekistan. The project is called "Initial Implementation of Accelerated HCFC Phase-out in the CEIT Region - Uzbekistan".

In 2015, myself and four other representatives from Uzbekistan attended and successfully completed training in the international Galileo Centre in Italian Casale Monferrato, where we earned European A-category certificates granting the qualifications to maintain cooling and climate equipment. After our return, we held a series of lectures for mechanics in Syrdarya region of Uzbekistan. We also provide consultation to companies in Andijan region on selection, installation and use of new equipment.

We are now a totally different company with a strategic vision and our priority is to provide first class environment friendly services to our clients."

About the project:

Uzbekistan ratified the Vienna Convention and the Montreal Protocol in 1993 and, accepting all amendments to the Protocol on a phased basis, the country is in full compliance with the applicable requirements and regulations. As of today, 99.95% of ODS have been fully phased out in the country.

The "Initial Implementation of Accelerated HCFC Phase-out in the CEIT Region – Uzbekistan" project is implemented through two interrelated components:

The regional component supports the country in exchanging best experiences with the governments of other

countries in the region, and thus enables improvements of approaches to manage HCFCs at the national level.

The national component is dedicated to strengthening the capacities of public and private sectors to gradually reduce their dependence on imports of HCFCs. Currently modern equipment to extract and recycle HCFCs is being delivered to the country and the practices of maintaining refrigeration equipment and air conditioning systems are being improved.

The project is operating in all regions of Uzbekistan. More than 100 public and private enterprises are the beneficiaries of the project activities. Provision of modern service equipment, tools, and expertize for capacity development to these enterprises is currently underway.

Search for innovations for the purpose of gradual phasing out of ODS in household, industrial and agricultural use is now underway. To ensure progress in phasing out of ODS in the Republic of Uzbekistan, the Cabinet of Ministers of Uzbekistan has adopted the Resolution "On improvement of regulation of import and export of ODS and ODS-containing products to/from Uzbekistan", which bans the import and export of ODS and ODS-containing products with countries, which are not parties to the Vienna Convention and the Montreal Protocol. In addition, the system for regulating the import/export of ODS and ODS-containing products have been introduced and put into effect.

Ashurov Anvar is a graduate of Fergana Polytechnic Institute and spent 23 years working in the field of cooling equipment in his native Andijan region. Currently he is a director of the private enterprise "Hladomontaj" which services refrigeration and air conditioning equipment in Andijan.

Click here for more information about UNDP work on Montreal Protocol.

## 14. Advancing Nationally Determined Contributions (NDCs) through Climate-Friendly Refrigeration and Air-conditioning - New GIZ guidance paper for policymakers

By aligning mitigation efforts on phasing down hydrofluorocarbons (HFCs) and enhancing energy efficiency, the refrigeration, air conditioning and foam blowing (RAC&F) sector can make a significant contribution to countries' NDCs. Following recent development in the UN Framework Convention on Climate Change (UNFCCC) and the Montreal Protocol (MP), GIZ Proklima developed a new guidance paper to assist policymakers in their work.


The guiding paper developed by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH is a product of the project Cool Contributions fighting Climate Change, funded by the International Climate Initiative (IKI) supported by the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB).

It helps policymakers in designing greenhouse gas (GHG) mitigation strategies for their RAC&F sector in order to contribute towards meeting the increasing ambition levels expected as they revise their NDCs. Specifically, this guide is useful for:

- Political decision makers who act as focal points to the UNFCCC and who administer the overarching national policy framework for climate change mitigation, in particular the national GHG emissions accounting and the NDC planning and implementation.
- National Ozone Officers who coordinate the HCFC Phase-out Management Plan (HPMP) and are now confronted with the further development of HFC phase-down schedules and related regulations as part of the Kigali Amendment.
- Ministries or departments which are responsible for policies and regulations relating to the energy performance of RAC appliances in the national market, as well as finance related policies and regulations addressing the RAC&F sector, including NAMAs.

With a growing population, an increasing middle class, changing lifestyles and rising ambient temperatures, the global demand for RAC&F products has grown rapidly in the last decades and will grow even more in the ones ahead. This development causes a rapid growth of $CO_2$ emissions from electricity consumption and HFC emissions from released refrigerants which could both contribute up to 13 per cent of global GHG emissions by 2030 (Green Cooling Initiative, 2014).

With the objective to hold the increase in global average temperature well below 2°C and the ambition to limit it to 1.5°C, parties to the UNFCCC agreed at the 21st Conference of the Parties in Paris in December 2015 to undertake and communicate more ambitious efforts to contribute to the global response to climate change. They are now asked to review and update their intended nationally determined contributions (INDCs) and submit them as NDCs until the global agreement officially starts in 2020.

At the 28th Meeting of the Parties to the Montreal Protocol (MP) in October 2016 in Kigali, parties agreed to phase down HFC emissions until 2050 and to amend the MP accordingly. A successful implementation could prevent nearly 90 per cent of the 0.5°C temperature increase that HFCs could have caused (Velders et al, 2016), thereby building a fundamental pillar to achieving the ultimate goal set out in the Paris Agreement.

- Contact: Philipp Munzinger, GIZ
- The guidance paper is available for download here. Feedback and comments are most welcome.

# FEATURED

## OZONE SECRETARIAT

**28th Meeting of the Parties to the Montreal Protocol**

Resumed meeting of the thirty-eighth Open-ended Working Group of the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer and Twenty-Eighth Meeting of the Parties Kigali, Rwanda, 8 October and 10-14 October 2016

Click here to access MOP 28 documents, General information …etc.

The theme for the 2016 International Day for the Preservation of the Ozone Layer to be marked on 16 September is: ***Ozone and climate: Restored by a world united.*** The theme is complemented by the tagline: ***Working towards reducing global-warming HFCs under the Montreal Protocol.*** Download the theme and tagline in the six official UN languages

The theme for this year's International Ozone Day recognizes the collective efforts of the parties to the Vienna Convention and the Montreal Protocol towards the restoration of the ozone layer over the past three decades and the global commitment to combat climate change. As a result of concerted international efforts, the ozone layer is healing itself and is expected to recover by the middle of this century. In addition, the Montreal Protocol has significantly contributed to the mitigation of climate change by averting the emission of more than 135 billion tonnes of carbon dioxide equivalent into the atmosphere by simply phasing out ozone-depleting substances…More

- Browse through the Ozone Secretariat "In Focus" to learn about latest updates.

- Resumed 38th Meeting of the Open-ended Working Group of the Parties to the Montreal Protocol, Vienna, Austria, 18 - 21 July 2016
- Third Extraordinary Meeting of the Parties to the Montreal Protocol, Vienna, Austria, 22 – 23 July 2016
- 56th Meeting of the Implementation Committee Under the Non-Compliance Procedure of the Montreal Protocol, Vienna, Austria, 24 July 2016
- Click here for more Montreal Protocol Meetings Dates and Venues

- Methyl Bromide Technical Options Committee 2014 Assessment Report
- Medical Technical Options Committee 2014 Assessment Report

Progress & Quadrennial Assessment Reports:

- Environmental Effect Assessment Panel (EEAP)
- Scientific Assessment Panel (SAP)
- Technology and Economic Assessment Panel (TEAP)

Halon Technical Options Committee Reports:

- Halons Technical Options Committee 2014 Assessment Report (Volume 1)
- Halons Technical Options Committee 2014 Supplementary Report #1 - Civil Aviation (Volume 2)
- Halons Technical Options Committee 2014 Supplementary Report #2 - Global Halon 1211, 1301, and 2402 Banking (Volume 3)
- Technical Note #1- Revision 4 - Fire Protection Alternatives to Halon - 2014
- Technical Note #2 - Revision 2 - Halon Emission Reduction Strategies - 2014
- Technical Note #3 - Revision 2 - Explosion Protection - Halon Use and Alternatives - 2014
- Technical Note #4 - Recommend Practices for Recycling Halon and Halocarbon Alternatives - 2014
- Technical Note #5 - Halon Destruction - 2014

## THE MULTILATERAL FUND FOR THE IMPLEMENTATION OF THE MONTREAL PROTOCOL

**Report of the 76th Meeting of the Executive Committee**, 9 - 13 May 2016 in Montreal.

The Executive Committee decided to continue convening two meetings per year from 2015 onwards with the possibility of holding an additional brief meeting, if required, between those meetings to consider project proposals.

On this basis the second meeting in 2016 could be scheduled to take place in November/December 2016 taking into account decision XXVII/1 of the Parties (MOP) to the Montreal Protocol, in which it was decided inter alia to hold a series of Open-ended Working Group (OEWG) and other meetings, including an Extraordinary Meeting of Parties in 2016.

Learn more

## OZONACTION

UNEP, OzonAction highlights

**NEW! OzonAction Factsheets:**

**OzonAction Factsheet**: Refrigerant Blends: Calculating Global Warming Potentials (post-Kigali update)

**OzonAction Factsheet**: Global Warming Potential (GWP) of Refrigerants: Why are Particular Values Used? (post-Kigali update).

**OzonAction Factsheet**: Tools Commonly used by Refrigeration and Air-Conditioning Technicians

New **OzonApp eDocs+** launched in Android Play Store and Apple Store - This new application launched by OzonAction on February 12, includes publications, videos, fact sheets and other awareness materials to help National Ozone Units (NOUs) and other stakeholders to build their capacity to implement the Montreal Protocol in a sustainable manner and at the same time to derive climate benefits. Now available in the Android Play Store and Apple Store/iTunes.

(*Just search for "UNEP OzonAction" and install the application, or scan the QR code*)


OzonAction News Drops - UNEP OzonAction is presenting a series of short video "**News Drops**" which focus on ozone layer protection, climate change and the importance of continuing ozone observations.

**Regional News Drops**

The Regional Networks of National Ozone Units (NOUs) under the Multilateral Fund are a path-breaking mechanism for North-South and South-South cooperation. Networking provides a platform for NOUs from Article 5 countries to exchange experiences, develop their skills and tap the expertise of their peers in both developing and developed countries. Conducted at the regional level, the Networking activity builds the Ozone Officers' skills for implementing and managing their national ODS phase-out activities. During 2016 these videos were filmed at the regional network meetings around the world.

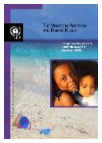
The NOUs were asked about their success stories, alternative refrigerants selected and their personal messages for national ozone celebrations…

Click here to access the News Drops

**OzonAction Recent Publications:**

**Lower-GWP Alternatives in Commercial and Transport Refrigeration: An expanded compilation of propane, $CO_2$, ammonia and HFO case studies** - This booklet presents an expanded compilation of case studies on lower-GWP alternatives in commercial and transport refrigeration and provides an update to the first set of case studies which was published in 2014 by UNEP DTIE OzonAction/CCAC (Low GWP Alternatives in Commercial Refrigeration: Propane, $CO_2$ and HFO Case Studies.

**NATIONAL CERTIFICATION SCHEMES FOR RAC SERVICING TECHNICIANS** - This publication aims to provide introductory information for institutions in developing countries to better understand the issue of certification in the field of refrigeration and air conditioning, to assist in the creation of such certification and training schemes and to demonstrate to service technicians and enterprises why it is in their interest to participate. Read/Download



**THE MONTREAL PROTOCOL AND HUMAN HEALTH** - This booklet summarizes how the successful implementation of the Montreal Protocol has protected human health. It describes how ozone depletion would have led to increases in UV radiation and, based on current understanding of the mechanisms by which UV affects biological processes, how that would have led to a dramatic increase in skin cancers, cataracts and affected human health in other ways. It also covers recent progress in understanding the 'World Avoided' – that is the world we would have lived in without a successful Montreal Protocol. Read/Download

**FINANCING THE CLIMATE CO-BENEFITS OF THE HCFC PHASE-OUT** - A guide for Low Volume Consuming Countries - Hydrochlorofluorocarbons (HCFCs) are being phased out worldwide under the Montreal Protocol on Substances that Deplete the Ozone Layer. The Parties to this treaty encouraged countries to promote the selection of alternatives to HCFCs that minimise environmental impacts, in particular impacts on climate. The Protocol's Multilateral Fund encourages developing countries to explore potential financial incentives and opportunities for additional resources to maximise the environmental benefits from HCFC Phase out Management Plans (HPMPs). This booklet explains how Ozone Officers in low volume consuming countries can explore such opportunities for climate co-benefits. Read/Download in English | French | Spanish

**SAFE USE OF HCFC ALTERNATIVES IN REFRIGERATION AND AIR CONDITIONING** - An Overview for Developing Countries - Many of the alternative refrigerants to hydrochlorofluorocarbons (HCFCs) have particular characteristics in terms of toxicity, flammability and high pressure which are different from those used previously. It is therefore important that the

refrigeration and air-conditioning industry adapts to both the technical and safety issues concerning these refrigerants. This publication provides an overview of the alternatives, their general characteristics and their application in the context of the safety issues. It provides guidance for National Ozone Units (NOUs) and other interested parties in developing countries on how they can advise and assist their national stakeholders in the selection and implementation of alternative refrigerants. Read/Download

**PHASING-OUT HCFCS IN SMALL AND MEDIUM-SIZED ENTERPRISES** - This booklet aims to assist foam enterprises, especially SMEs, to better understand policies on HCFC phase-out, access to assistance from the Multilateral Fund for the Implementation of the Montreal Protocol and access alternative technologies in different foam applications taking into account challenges in converting to alternative technology. It also discusses some tips on how to identify enterprises that may use HCFCs and verify the HCFCs consumption of enterprises. Read/Download

**INTERNATIONAL STANDARDS IN REFRIGERATION AND AIR-CONDITIONING** - This guide provides an introduction and simple overview of the issues related to international standards in the refrigeration and air-conditioning sector and how they can be useful in the context of the phase-out of hydrochlorofluorocarbons (HCFCs) in developing countries as required by the Montreal Protocol on Substances that Deplete the Ozone Layer. Read/Download in English | French | Spanish

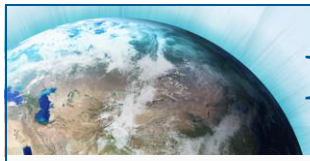
Guide on Good Practices: Phasing out HCFCs in the Refrigeration and Air-conditioning Servicing Sector

Phasing out HCFCs in Small and Medium-sized Foam Enterprises

Demonstrating the feasibility of R-290 based AC manufacturing: China's Midea and Meizhi case

Low-GWP Alternative for Small Rigid PU Foam Enterprises

**Learn more** about OzonAction publications



# EVENTS

## 2016

**47th International HVAC&R Congress and Exhibition**, 30 Nov – 2 Dec 2016, Belgrade, Serbia

## 2017

**Refrigeration Standards Update, Safety and Environmental Requirements**, AIRAH and Standards Australia are pleased to present a seminar series on the recently adopted and published refrigeration safety and environmental standards; AS/NZS/ISO 817:2016 Refrigerants – Designation and safety classification which replaces AS/NZS 1677.1:1998 and AS/NZS 5149 Refrigerating systems and heat pumps – Safety and environmental requirements: Parts 1 to 4, which replaces AS/NZS 1677.2:1998. Each of these new adoptions have had major modifications and revisions over the previous AS/NZS1677 series and are critical as we move to low global warming potential refrigerants. AIRAH will be holding the update seminars throughout Australia in February and March 2017 to provide an introduction and overview to the main changes that will affect the HVAC&R industry.

**International Ground Source Heat Pump Association (IGSHPA) Technical**

**Conference and Expo**, 14-16 March 2017, Denver, USA

**AIRAH's Refrigeration 2017 Conference calls for abstracts**, 27–28 March 2017, Melbourne, Australia. **The conference committee is now calling for abstracts**.

**Sustainable Management of Refrigeration Technologies in Mobile Marine and Fisheries Sectors**, co-organized by UNEP, ASHRAE, IIR and UNIDO with the kind support of the Government of the Kingdom of Thailand and the Department of Industrial Works, 6-8 April 2017, Bangkok, Thailand

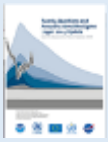
**5th IIR International Conference on Thermophysical Properties and Transfer Processes of Refrigerant**, 23-26 April 2017, Seoul, South Korea

**7th Conference on Ammonia and $CO_2$ Refrigeration Technologies**, 11-13 May 2017, Ohrid, Macedonia

**12th Heat Pump Conference**, 15-18 May 2017, Rotterdam, the Netherlands

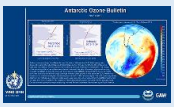
**9th International Conference on Compressors and Coolants**, 6-8 September 2017, Bratislava, Slovakia

# READING



Twenty Questions and Answers About the Ozone Layer, presents complex science in a straightforward manner. It complements the 2014 Scientific Assessment Report of Ozone Depletion by WMO and the U.N. Environment Programme.

UNEP and USEPA: Promoting ozone and climate-friendly technologies in public procurement - a scoping study of Asia Pacific



WMO Antarctic Ozone 2016 Bulletins - Containing information on the state of the ozone layer in the Antarctic at roughly two week intervals from August to November. The bulletins are based on data provided by WMO Members which operate ozone monitoring stations in the southern hemisphere and satellites to observe ozone globally.

The EU F-Gas Regulation Handbook, Keeping Ahead of the Curve as Europe Phases Down HFCs - a free online resource for climate media and other concerned parties, published by the London-based Environmental Investigation Agency (EIA).

Alternative Refrigerant Evaluation for High-Ambient-Temperature Environments: R-22 and R-410A Alternatives for Mini-Split Air Conditioners

AREA Guidance on minimum requirements for contractors' training & certification on low GWP Refrigerants - AREA has updated its Guidance on minimum requirements for contractors' training & certification on low GWP Refrigerants.


Free guide to F-gas changes The European contractors association AREA has produced a timely guide to the F-gas regulations which clarifies the new rules, their impact and their practical application…Read more

The recent Alternatives to HCFCs/HFCs in developing countries with a focus on high ambient temperatures" study carried out by Öko-Recherche for the European Commission stresses that the refrigerant and blowing agent demand is expected to triple by 2030 in developing countries as a result of economic growth. A sector by sector analysis shows that a climate-friendly replacement for current and future of HCFCs and high GWP HFCs is possible in most applications …

Primer on Hydrofluorocarbons, Fast action under the Montreal Protocol can limit growth of HFCs, prevent up to 100 billion tonnes of $CO_2$-eq emissions by 2050, and avoid up to 0.5°C of warming by 2100. IGSD, January 2014, Lead authors: Durwood Zaelke, Nathan Borgford-Parnell, and Danielle Fest Grabiel. Contributing authors: Stephen O. Andersen, Xiaopu Sun, Dennis Clare, Yuzhe Peng Ling, and Alex Milgroom.


Flammable Refrigerants Safety Guide, AIRAH - Many of the refrigerants traditionally used in refrigeration and air conditioning systems in Australia have been non-flammable, non-toxic, synthetic greenhouse gases (SGGs) that have a high global warming potential (GWP). These were typically synthetic refrigerants including CFCs, HCFCs and HFCs. Due to the growing national and international concern regarding the resulting atmospheric effects of SGGs, the use of alternative low GWP refrigerants is increasing. …

Recent Trends in Global Emissions of Hydrochlorofluorocarbons and Hydrofluorocarbons: Reflecting on the 2007 Adjustments to the Montreal Protocol. S. A. Montzka *†, M. McFarland ‡, S. O. Andersen §, B. R. Miller †‖, D. W. Fahey †, B. D. Hall †, L. Hu †‖, C. Siso †‖, and J. W. Elkins †

† Earth System Research Laboratory, National Oceanic and Atmospheric Administration, Boulder, Colorado 80305, United States ‡ DuPont Chemicals & Fluoroproducts, Wilmington, Delaware 19805, United States § Institute for Governance & Sustainable Development, Washington, D.C. 20007, United States‖ Cooperative Institute for Research in Environmental Sciences, University of Colorado, Boulder, Colorado 80309, United States

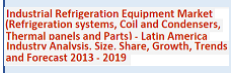
Geothermal Heating and Cooling: Design of Ground-Source Heat Pump Systems-ASHRAE

Principles of Heating, Ventilating and Air-Conditioning, 7th Ed. ASHRAE


A first edition, the IIR guide "$CO_2$ as a Refrigerant" highlights the application of carbon dioxide in supermarkets, industrial freezers, refrigerated transport, and cold stores as well as ice rinks, chillers, air conditioning systems, data centers and heat pumps. This guide is for design and development engineers needing instruction and inspiration as well as non-technical experts seeking background information on a specific topic. Publication, IIR Technical Guide, 2014.


FREE HVAC Optimisation Guide released by AIRAH and the NSW Office of Environment & Heritage outlines 20 HVAC optimisation strategies and how they can be applied to the vast majority of commercial systems, both in older and modern buildings…


[Organic Bromine Compounds—another threat to the ozone layer]




[Latin America Industrial Refrigeration Equipment Market Benefits from Region Flourishing Food and Beverage Production and Processing Market] – Trends and forecast 2013-2019.


[Solvents & Bio Solvents Market Outlook - Global Trends, Forecast, and Opportunity Assessment (2014-2022)]

[R444B tops high ambient R22 drop-in test]


[Chlorofluorocarbon Market: Global Industry Analysis and Forecast 2015 to 2021]

[Getting The World Off the Chemical Treadmill: A per capita convergence framework for an ambitious phase-down of HFCs under the Montreal Protocol], By: Umang Jalan, Research Associate, Climate Change Programme, Centre for Science and Environment

[Refrigeration on Fishing Vessels]


[Global Market for Natural Refrigerants to Reach 1,408.20 Million by 2020, Growing at CAGR of 11.0% by 2020]


ASHRAE [2016 Handbook] Focuses on HVAC Systems and Equipment…

MOPIA New [2016 Regulatory Compliance Guide] summarizes regulatory controls (*Manitoba and Canada*) and provides some other useful links and references...

[The Importance of Ambition in the 2016 HFC Phase-Down Agreement] - Following the adoption of the Dubai Pathway on HFCs, Parties to the Montreal Protocol are set to negotiate and adopt an HFC amendment in 2016, the first major test of the Paris Climate Agreement and global commitment to "pursue efforts to limit the [average global] temperature increase to 1.5 degrees Celsius." The level of climate ambition in the agreed HFC phase-down will be crucial in determining whether or not Montreal Protocol passes the test. In preparation for the next instalment of Montreal Protocol meetings, known as the Open Ended Working Group, set for July 2016 in Vienna, the Environmental Investigation Agency (EIA) has produced a briefing, [The Importance of Ambition in the 2016 HFC Phase-Down Agreement]. Download the full report [here].

[Update on the Illegal Trade in Ozone-Depleting Substances] – The Environmental Investigation Agency (EIA) briefing to the 38th meeting of the Open-Ended Working Group of Parties to the Montreal Protocol, in Vienna, Austria, from July 18-21, 2016.

Environmental Investigation Agency (EIA) briefing, [The Importance of Ambition in the 2016 HFC Phase-Down Agreement], outlining key aspects of the proposals and calling on Parties to seek an agreement securing the highest climate ambition.

October Edition of [Accelerate America!] By shecco

"The Road to Competence in Future Green Technologies", the International Special Issue 2016-2017 of Centro Studi Galileo.

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# MISCELLANEOUS

US EPA GreenChill webinar on: "**Piggly Wiggly's Experiences Using a $NH_3/CO_2$ System**",

**Date**: Tuesday, December 6, 2016 | **Time**: 2:00 pm to 3:00pm (Eastern time)

**Description**: Representatives from Piggly Wiggly and Kysor Warren will be discussing how the two companies collaborated on a recent project to install an ammonia-$CO_2$ cascade refrigeration system at a Piggly Wiggly store in Columbus, Georgia. The store has earned GreenChill Platinum certification, and recently received GreenChill's "Best of the Best" award.

**To join the webinar**: 1. Go to http://epawebconferencing.acms.com/pigglywiggly/ 2. Select "Enter as a Guest". It is important that you select the option to enter as a guest. 3. Enter your name. 4. Click "Enter Room". 5. Click "OK".

**For audio**: 1. Call the toll free call-in number: 1-866-299-3188 (706-758-1822 from outside the U.S.) 2. Use Conference Code: 202 343 9185#

**Paris Agreement Enters into Force – Celebration and Reality Check**, 4 November 2016, By Patricia Espinosa, UNFCCC Executive Secretary & Salaheddine Mezouar, President of COP22 and Minister of Foreign Affairs and Cooperation of the Kingdom of Morocco.

Humanity will look back on November 4, 2016, as the day that countries of the world shut the door on inevitable climate disaster and set off with determination towards a sustainable future. The Paris Climate Change Agreement – the result of the most complex, comprehensive and critical international climate negotiation ever attempted – came into force today. The Agreement is undoubtedly a turning point in the history of common human endeavor, capturing the combined political, economic and social will of governments, cities, regions, citizens, business and investors to overcome the existential threat of unchecked climate change. Its early entry into force is a clear political signal that all the nations of the world are devoted to decisive global action on climate change. […]

The International Institute of Refrigeration (IIR) is delighted to announce **IIR new Working Group on Careers in Refrigeration "CaRe"**, chaired by Dr Catarina Marques. Learn more

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**Prepared by:** Samira Korban-de Gobert, OzonAction

**Reviewed by:** Shamila Nair-Bedouelle, Head OzonAction Branch, and Ezra Clark, OzonAction

If you wish to submit articles, invite new subscribers, please contact:

Mrs. Samira Korban-de Gobert,

Tel. (+33) 1 44.37.14.52, samira.degobert@unep.org

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