



OzonAction

OZONNEWS



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



GLOBAL

1. GWP-ODP Calculator SmartPhone Application

Now also available for **free** on the **Apple IOS store** - as well as the **Google PlayStore**



The application allow you to easily convert ODP, CO₂-eq and metric quantities of refrigerants and other chemicals

- **Helps in understanding and reporting under the Montreal Protocol** (and future commitments under the Kigali Amendment)
- **The calculator will automatically perform the conversion between metric tonnes, ODP tonnes and/or CO₂-equivalent tonnes (or kg) and display the corresponding converted values**
- **The app includes both single component substances and refrigerant blends**
- **The components of a mixture and their relative proportions (metric, ODP, CO₂-eq) are also displayed.**

Available for **free** from the **Apple IOS store** and **Google PlayStore**
Search for **“GWP ODP CALC”** in the **Playstore** to install!



2. Presentations of the International Symposium, Paris, France, 19 - 20 September 2017- on the Occasion of the Montreal Protocol 30th Anniversary Celebration!

The International Symposium organized by the Academy of Sciences, the Observatory of Versailles Saint-Quentin en Yvelines and the International Commission on Ozone, and sponsored by the Institut Pierre-Simon Laplace, WMO, NASA, CNES, Mariolopoulos-Kanaginis Foundation and UN Environment brought together the most eminent players working towards the success of this Protocol.

The Symposium developed the following themes:

- Science of the ozone layer: historical perspective and current issues
- Impact of the destruction of the ozone layer on health, ecosystems and climate; Impact of ODS and their substitutes

on climate

- Role of industry in the Montreal Protocol
- Geo-engineering and potential impacts on the ozone layer
- Controversies on climate and the destruction of the ozone layer

For more information: <http://montreal30.io3c.org>

Symposium replay: [On Youtube](#)



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3. UNGA High-Level Event on the Ratification of the Kigali Amendment



Ministers and top UN leaders urged the world's nations to quickly ratify the Kigali Amendment to the Montreal Protocol during a high-level event held on 18 September 2017 on the sidelines of the UN General Assembly in New York.

Under the Kigali Amendment, all countries will gradually phase down hydrofluorocarbons, a policy move that would avoid up to 0.5°C of global warming by the end of the century, while continuing to protect the ozone layer.

Rwanda's Minister of Environment Vincent Biruta and Canada's Minister of Environment and Climate Change Catherine McKenna hosted the high-level event.

“We have come together to encourage quick ratification of the Kigali Amendment, in doing so we send a strong signal that the world is united in ending the use of HFCs and protecting our climate,” said Biruta.

“We need to get this done... and if everyone just asks one friend...one other minister of environment to encourage them to ratify, we will be able to have a great celebration,” said McKenna.

Ozone Secretariat Executive Secretary Tina Birmpili added: “2017 marks the 30th anniversary of the Protocol’s life and there is no better way to celebrate this anniversary than by seeking country support to ratify the Kigali Amendment and build on the next 30 years.”

- ▶ [Watch event video recording here](#)
- ▶ [View event photos here](#)
- ▶ [Read Minister Biruta's statement](#)
- ▶ [Interview with Minister Biruta on the Kigali Amendment](#)
- ▶ Press release: [Canada and Rwanda urge rapid ratification of the Kigali Amendment](#)

4. Thirty Years after Montreal Pact, Solving the Ozone Problem Remains Elusive

Despite a ban on chemicals like chlorofluorocarbons, the ozone hole over Antarctica remains nearly as large as it did when the Montreal Protocol was signed in 1987. Scientists now warn of new threats to the ozone layer, including widespread use of ozone-eating chemicals not covered by the treaty.

Did the Montreal Protocol fix the ozone hole? It seemed so. With chlorofluorocarbons (CFCs) and other ozone-eating chemicals banned, many scientists said it was only a matter of time before the ozone layer recharged, and the annual hole over Antarctica healed for good.

But 30 years on, some atmospheric chemists are not so sure. The healing is proving painfully slow. And new discoveries about chemicals not covered by the protocol are raising fears that full recovery could be postponed into the 22nd century – or possibly even prevented altogether.

In mid-September, the United Nations is celebrating the protocol’s 30th anniversary. It will declare that “we are all ozone heroes.” But are we patting ourselves on the back a bit too soon?

The ozone layer is a long-standing natural feature of the stratosphere, the part of the atmosphere that begins about six miles above the earth. The ozone layer filters out dangerous ultraviolet radiation from the sun that can cause skin cancer and damage many life forms. It may have been essential for the development of life on Earth.

So there was alarm in the 1970s when researchers first warned that extremely stable man-made compounds like CFCs, used in refrigerants and aerosols, were floating up into the stratosphere, where they released chlorine and bromine atoms that break down ozone molecules. In the 1980s, Antarctic researchers discovered that these chemical reactions went into overdrive in the super-cold polar stratospheric clouds that formed over the frozen continent. They had begun creating a dramatic “hole” in the ozone layer at the end of each austral winter.

The ensuing panic resulted in the signing of the Montreal Protocol on September 16, 1987. It and its successors have phased out production of a range of man-made chlorine and bromine compounds thought to persist for the several years needed for them to reach the stratosphere. Besides CFCs, they include carbon tetrachloride, hydrochlorofluorocarbons (HCFCs), and methyl bromide, a fumigant once widely used to kill pests.

So far so good. The amount of ozone-depleters in the atmosphere has dropped by more than 10 percent since peaking in the late 1990s. In response, the total ozone in the atmosphere has been largely unchanged since 2000.

But in the past five years, evidence has emerged that potential ozone-eating compounds can reach the ozone layer much faster than previously thought. Under some weather conditions, just a few days may be enough. And that means a wide range of much more short-lived compounds threaten the ozone layer – chemicals not covered by the Montreal Protocol.

These compounds are all around us. They are widely used as industrial solvents for tasks like degreasing and dry cleaning. And their releases into the atmosphere are increasing fast.

These new ozone-busters include dichloromethane (DCM), a common and cheap paint stripper, also used in foam-blowing agents and, ironically, in the manufacture of “ozone-friendly” alternatives to CFCs. With emissions now exceeding one million tons a year, the concentration of DCM in the lower atmosphere has more than doubled since 2004. Even so, it has not been regarded as a threat to the ozone layer, because its typical lifetime in the atmosphere before it is broken down in photochemical reactions is only about five months. It should, atmospheric chemists concluded, remain safely in the lower atmosphere.

But that view collapsed in 2015, when Emma Leedham Elvidge at the University of East Anglia in England examined air samples taken on board commercial aircraft cruising at the lower edge of the stratosphere. She found high levels of DCM, especially over the Indian subcontinent and Southeast Asia, and particularly during the Asian monsoon season, when strong updrafts fast-track air from the ground to the stratosphere. It seems they were taking DCM along for the ride.

Alarm bells are ringing about dozens of other short-lived ozone-destroying chlorine compounds accumulating in the atmosphere.

How much should we worry? Ryan Hossaini, an atmospheric chemist at Lancaster University, recently did the math. He calculated that DCM currently contributes less than 10 percent of the chlorine in the ozone layer. But on current emission trends, it could be that could delay the ozone hole's recovery by 30 years, until at least 2095, he suggested.

Others share that concern. "Growing quantities of DCM are leaking into the stratosphere, where it is exceptionally effective in destroying the ozone," says David Rowley, an atmospheric chemist at the University College London, who was not involved in the research. "The potential for DCM to affect the global ozone budget is profound."

Alarm bells are ringing about dozens of other short-lived, potentially ozone-destroying chlorine compounds accumulating in the atmosphere as a result of fast-rising global manufacturing. They include 1,2-dichloroethane, a chemical widely used in the manufacture of PVC pipes. There are few atmospheric measurements of this compound yet, "but sporadic data suggest it is a significant source of chlorine in the atmosphere," says Hossaini.

The risks of such chemicals reaching the ozone layer are greatest in the tropics, where manufacturing is booming in fast-industrialising countries such as China and India, and where, as luck would have it, atmospheric circulation patterns are favorable. The Asian monsoon can propel the gases to the stratosphere in as little as ten days, according to unpublished research seen by *Yale Environment 360*.



The movement of ozone-depleting chemicals through the atmosphere, shifting from the tropics and concentrating in Antarctica. NASA GODDARD SPACE FLIGHT CENTER

Thirty years on, the Montreal Protocol has not begun to come to grips with these chemicals, warns Rowley. "The naïve view until recently," he says, "was that short-lived [chemicals] didn't present a threat to stratospheric ozone. Wrong."

Other loopholes in the protocol are concerning researchers as well. In 2014, colleagues of Leedham Elvidge's at the University of East Anglia warned that three CFCs supposedly banned under the protocol were turning up in increasing amounts in the clean air blowing round the Southern Ocean and captured at Cape Grim in Tasmania. Johannes Laube, an atmospheric chemist at the University of East Anglia, calculated that global emissions of CFC-113a, once an important feedstock in manufacturing both refrigerants and pyrethroid pesticides, doubled in two years.

How come? It turns out that the Montreal Protocol never completely banned CFCs. "CFC-113a is covered by a loophole that allows industries to apply for exemptions," Laube says. Confidentiality clauses in the treaty about these exemptions mean that "we simply don't know if we have found exempted emissions, or if they are from some illegal manufacture somewhere. Either way, they are increasing fast, which makes this worrying." Trade in banned ozone-depleting chemicals has declined in the past decade, but remains a problem, and has been documented particularly for hydrochlorofluorocarbons.

Scientists knew recovery of the ozone layer would take time because of the long lifetimes of many of the dangerous compounds we unleashed in past decades. But last year, Susan Solomon of MIT – who back in the 1980s became one of the world's most celebrated scientists for uncovering the chemistry of the polar stratospheric clouds — declared that

she had detected the first “fingerprints” of the hole closing. “The onset of healing of Antarctic ozone loss has now emerged,” she wrote.

“The signature of ozone recovery is not quite there yet,” says one expert.

But other researchers remain cautious. There have been some recent bumper springtime holes in Antarctic ozone. The 2015 hole was the fourth largest since 1991, peaking at an area larger than the continent of North America. It was also deeper than other recent holes and lasted longer. 2016 was also worse than average and 2017 is expected to be severe, too.

Solomon blamed 2015 on the Calbuco volcano in Chile, which ejected sulphur particles that enhanced the ozone-destroying properties of polar stratospheric clouds. But Susan Strahan of NASA’s Goddard Space Flight Center warns that the size of the hole in any given year is still dominated by year-to-year variations in the temperature of the stratosphere and the vagaries of meteorology. “The signature of ozone recovery is not quite there yet,” she says, adding that day will come, but we may have to wait until the 2030s.

Meanwhile at the other end of the planet, ozone losses over the Arctic may still be worsening. The Arctic is less susceptible to the formation of ozone holes than Antarctica, because the weather is messier. The stable air that causes the ultra-cold conditions where polar stratospheric clouds form in Antarctica is much less likely. But it does happen whenever temperatures get cold enough for polar stratospheric clouds to form.

A deep hole briefly formed over the Arctic in 2011. In places, more than 80 percent of the ozone was destroyed, twice the loss in the worst previous years, 1996 and 2005. In both the past two winters, researchers saw polar stratospheric clouds over parts of Britain, says Jonathan Shanklin of the British Antarctic Survey. But they were brief and did not lead to major ozone loss.

Shanklin says an important reason for the sluggish recovery of the ozone layer is global warming. As increased levels of greenhouse gases such as carbon dioxide trap more solar heat radiating from the Earth’s surface, less warmth reaches the stratosphere, which cools as a result. This trend has been evident for almost 40 years. A colder stratosphere improves conditions for ozone loss. Climate change “could delay the recovery of the ozone hole well into the second half of this century,” he says.

Protecting the ozone layer “presents a much greater industrial and political challenge than previously thought,” says one researcher.

Should we be frightened? Some of the crazier hype in the early days of the ozone hole – like blind sheep in Patagonia and collapsing marine ecosystems – proved nonsense. But the raised risk of skin cancers from the extra ultraviolet radiation streaming through the thinned ozone layer is real enough – particularly for reckless white-skinned sunbathers. The ozone layer is still as thin as it was 30 years ago.

The good news is that without the Montreal Protocol things would have been a great deal worse, says Martyn Chipperfield, an atmospheric chemist at the University of Leeds. The Antarctic hole would be 40 percent bigger than it is; the ozone layer over Europe and North America would be 10 percent thinner; the 2011 Arctic hole would have been Antarctic-sized; and we would be looking at about two million more cases of skin cancers by 2030, according to research conducted by Chipperfield and colleagues.

Even so, the idea that the Montreal Protocol is doing its job and the recovery is under way begins to look complacent. If emissions of uncontrolled ozone-depleting chemicals such as DCM continue rising, then the gains could be lost. The answer is obvious. “We should be looking into controlling DCM and other solvents, much in the same way as we did CFCs,” says Leedham Elvidge.

The World Meteorological Organization and other UN agencies overseeing the protocol acknowledge that DCM and other short-lived ozone depleting substances “are an emerging issue for stratospheric ozone,” but the government signatories have yet to take action to limit their emissions.

That would involve getting rid of a far wider range of chemicals than so far done under the protocol. Protecting the ozone layer “presents a much greater industrial and political challenge than previously thought,” says Rowley. Thirty years on, there is evidently still a lot to do.

► [Yale Environment 360](#), 14 August 2017, By: Fred Pearce

5. Cutting emissions of HFCs along with other short-lived climate pollutants could avoid 1.2°C of global warming by 2100, according to new research

Two teams of climate scientists working in conjunction announced that it is still possible to meet the goals of the Paris Agreement if important measures are implemented now.

The groups of work, one published in [the *Proceedings of the National Academy of Science \(PNAS\)*](#) and another by [the Institute for Governance & Sustainable Development \(IGSD\)](#), outline three science-based strategies that could limit warming to well under 2°C and cite short-lived climate pollutants (SCLPs) being a key “climate lever” to keep the Earth well below catastrophic warming levels.

Reducing HFCs along with other SCLPs could avoid 0.6°C warming by 2050 and 1.2°C by 2100, state *Ramanathan and Xu* in the PNAS paper entitled ‘Well below 2°C: Mitigation strategies for avoiding dangerous to catastrophic climate changes’.

The researchers from IGSD agree and see HFCs as a low-hanging fruit of climate mitigation that can be implemented quickly.

The Kigali Amendment to the Montreal Protocol, agreed last October in the Rwandan capital, will phase down hydrofluorocarbons (HFCs) once it is ratified. IGSD believes it does not go far enough and calls on policymakers to “eliminate high-GWP HFCs ahead of the schedule in the Kigali Amendment” to make sure that warming is avoided as soon as possible.

More work to be done

"Climate change is an urgent problem requiring urgent solutions," said Dr. Mario Molina, Nobel Laureate and lead co-chair of the IGSD report. "We have less than a decade to put these solutions in place around the world to preserve nature and our quality of life for generations to come. The time is now."

The second lever to achieve carbon neutrality identified by the IGSD and PNAS studies is decarbonising the global energy system by 2050. They believe this could reduce warming by 2.8°C by 2100. They predict that CO₂ emissions will peak in 2020 and reach zero by 2050.

If levers one and two are both implemented, the authors suggest there is less than a 20% probability of exceeding 2°C.

If these reductions are not met, several catastrophic events could happen, including “exposing about seven billion people to deadly heat stress; 2.5 billion people to viruses such as Zika and chikungunya; and expose close to 20% of species to dangers of extinction," says Professor V. Ramanathan, who is a co-chair of the IGSD report along with Nobel Laureate Mario Molina and IGSD President Durwood Zaelke, Ramanathan also co-authored the PNAS study.

The third lever, carbon extraction, would be an extra insurance against surprises. If emissions continue to increase on their trajectory until 2030, a staggering one trillion tons of carbon would then need to be extracted.

"To put it in perspective, how many of us would choose to buckle our grandchildren to an airplane seat if we knew there was as much as a 1 in 20 chance of the plane crashing? With climate change that can pose existential threats, we have already put them in that plane. The good news from our two studies is that there is still time to avoid catastrophic changes," says Ramanathan.

"These papers show in the starkest possible terms that what we do in the next 15 to 20 years will determine what the world looks like for the next few hundred if not few thousand years—and it won't be pretty if we don't step up our game," says Zaelke.

"While time is short, we can still avoid catastrophic and the potential existential risks, though we'll have to really kick these strategies into high gear—akin to a war footing," he adds.

▶ [Hydrocarbon21](#), 20 September 2017, By Charlotte McLaughlin



ASIA PACIFIC

6. Representatives from local governments in Southeast Asia detailed the current state of HFC phase-down plans and highlighted the natural refrigerant projects currently underway in the region



Bitul Zulhasni, Ministry of Environment and Forestry of Indonesia

Showing that international agencies, local governments and the private sector are already working together to implement the Kigali Amendment to the Montreal Protocol in Southeast Asia, representatives from the region detailed ongoing natural refrigerant projects at ATMOSphere Asia held in Bangkok, Thailand on 6 September, 2017.

Bitul Zulhasni, representing the Ministry of Environment and Forestry of Indonesia, provided an overview of the current state of the HFC phase-down – governed at international level by Kigali – in Indonesia and introduced a pilot project currently being carried out by local convenience store chain Alfamidi.

The project is a joint collaboration with Japan-based Panasonic Corporation who provided the equipment and Lawson, Inc. who provided project management services.

Supported by the Joint Crediting Mechanism programme, a financing scheme jointly implemented by the Japanese and Indonesian governments, Alfamidi installed Panasonic's CO₂ systems at 12 locations in Indonesia.

Zulhasni detailed the main challenges that lie ahead for natural refrigerants in Indonesia.

"Education for the industry is important. How are we going to influence the market in Indonesia? We really need to make natural refrigerant alternatives more available to reduce the cost and make people more comfortable with this technology," Zulhasni said.

Yahya Atan was representing Malaysia's Department of the Environment. He talked about the first installation of Panasonic's CO₂ condensing unit in Malaysia.

The installation was done at local Malaysian supermarket chain Jaya Grocer, and it was funded in part by the Multilateral Fund for the Implementation of the Montreal Protocol via Malaysia's Department of the Environment.

The project was commissioned in May 2017. Atan stated what the end user was expecting in terms of return on investment from the project.

"We expect to reduce CO₂ emissions by 54.3% and cut power consumption by 12.7% a year compared to an R404A freezer," he said.

Funding and assistance from UN agencies

Shaofeng Hu was representing the UN Environment Programme (UNEP) and Anshu Kumar attended from the United Nations Development Programme (UNDP).

Hu argued that the UN is taking a comprehensive approach not only by providing the direction needed for the industry to move forward but also by supporting developing countries with financing and by removing barriers.

"We are working to remove all the barriers for adoption of the new generation of refrigerants," said Hu. He strongly encouraged all those interested in financing to contact their local government agencies to find out what is available.

Kumar, meanwhile, argued that increased awareness among end users was required.

"The end user does not know about this change from synthetic to naturals and multilateral funding, so we need to work harder to increase this awareness among end users," he said.

Kumar also revealed a project currently underway in the Maldives.

"We will replace all air-conditioners at one resort in the Maldives (about 300) to [propane] R290 air-conditioning, completed by the end of this year," he said.



LATIN AMERICA AND CARIBBEAN

7. Grenada's First Two Hydrocarbons-based Air-conditioning Systems were Installed

Grenada's pilot training centre for low-GWP, flammable refrigerants is located in the capital, Saint-Georges

On 25 August, the small Caribbean island country of Grenada installed its first two air-conditioning (AC) units to use hydrocarbons. The installation of the R290-based (propane) units is part of a regional demonstration project implemented by the United Nations Industrial Development Organization (UNIDO).



Funding was provided by the Multilateral Fund for the Implementation of the Montreal Protocol on Substances that Deplete the Ozone Layer.

Grenada received two 18,000 British Thermal Unit (BTU) R290 inverter air-conditioning units under a regional demonstration project for the introduction of low global warming potential (GWP) flammable refrigerants in the region. The two hydrocarbon-based AC units were installed in Grenada's pilot training centre for low-GWP flammable refrigerants and were inaugurated on 25 August by the country's National Ozone Unit and UNIDO.

"The training centre has been equipped with state-of-the-art tools and equipment specifically designed to handle flammable refrigerants," says the National Ozone Unit of Grenada on its official website.

This includes recovery machines, vacuum pumps, refrigerant identifiers, electronic scales and leak detectors, charging stations, welding machines, multi-meters, among other useful HVAC&R tools.

The training centre is open to local technicians, technical colleges and residential air-conditioning (RAC) technicians in the region.

This new air-conditioning systems will be used to train students and technicians in using hydrocarbon technology in the air-conditioning sector.

The allocation of additional funding to the Multilateral Fund for the Implementation of the Montreal Protocol for demonstration and viability projects with HFC-free technology will be on the agenda of the next Montreal Protocol meeting, which takes place on 20-24 November 2017 in Montreal, Canada.

▶ [Hydrocarbons21](#), 31 August 2017, By Marie Battesti



NORTH AMERICA

8. Federal Court Overturns EPA Ban on Hydrofluorocarbons

The District of Columbia Court of Appeals ruled the Environmental Protection Agency exceeded its authority under the Clean Air Act by requiring companies to replace hydrofluorocarbons with other substances to fight climate change.

A three-judge panel of the U.S. Court of Appeals for the District of Columbia ruled the U.S. Environmental Protection Agency (EPA) exceeded its authority under the Clean Air Act by requiring companies to replace hydrofluorocarbons (HFCs) with other substances in an effort to fight climate change.



EPA's 2015 rule effectively banned 38 different HFCs and HFC blends from use in aerosol spray cans, new automobile air conditioning systems, foam blowing machines, vending machines, and retail refrigerators, beginning in 2020. President Barack Obama's administration enacted the HFC ban as an integral part of its plan to combat climate change.

The suit, brought by HFC manufacturers from France (Arkema SA) and Mexico (Mexichem Fluor), argued EPA was not authorized to institute the ban. Arkema and Mexichem manufacture HFC-134a, a refrigerant used in automotive air conditioners. Two U.S. companies, Honeywell International and Chemours, which manufacture the refrigerant HFO-1234yf, a hydrofluoroolefin (HFO) that would replace HFC-134a, intervened in the suit in support of EPA.

Limited by Law

A provision of the 1990 amendments to the 1973 Clean Air Act required manufacturers to replace substances that deplete stratospheric ozone with substances that are not ozone-depleting. The court ruled on August 8 “the fundamental problem for EPA is that HFCs are not ozone-depleting substances.”

“EPA’s well-intentioned policy objectives with respect to climate change do not on their own authorize the agency to regulate,” the court ruled. “Under the Constitution, congressional inaction does not license an agency to take matters into its own hands, even to solve a pressing policy issue such as climate change.... However much we might sympathize or agree with EPA’s policy objectives, EPA may act only within the boundaries of its statutory authority. Here, EPA exceeded that authority.”

Costs Without Benefits

Arthur Viterito, a professor of geography at the College of Southern Maryland, says the HFC ban would impose large costs on consumers and is based on questionable climate science.

“In light of the many questions that remain concerning the nature and sensitivity of the global climate to greenhouse gases, this sort of regulatory overreach should not be allowed,” Viterito said. “Some of the newly developed substitutes for HFCs are prohibitively expensive.

“Honeywell’s HFO products are roughly ten times as costly as HFCs,” said Viterito. “As with so many other regulatory initiatives, replacing HFCs with HFOs would slow economic growth, eroding the buying power of American consumers in the process.”

Myron Ebell, director of the Center for Energy and Environment at the Competitive Enterprise Institute (CEI), applauded the court’s ruling, saying it promotes consumer safety and energy efficiency.

“We welcome the court’s ruling overturning the EPA’s rule to ban HFCs,” said Ebell. “Banning HFCs will force the use of alternatives that are much less safe because they are inflammable and are also less energy-efficient.

“Government mandates that limit consumer choice are bad enough, but conflicting, dangerous mandates are even worse,” Ebell said.

Montreal Protocol Complication

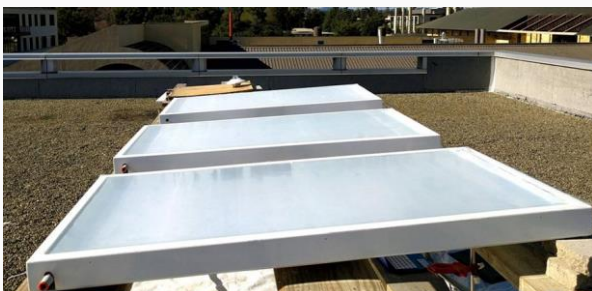
The court’s ruling complicates fulfillment of U.S. obligations under the 1987 Montreal Protocol on Substances that Deplete the Ozone Layer. A 2016 amendment to that treaty, signed in Kigali, Rwanda, pledges signatory countries to eliminate HFCs in an effort to fight climate change. Under the amendment, agreed to by the Obama administration, the United States would begin cutting HFCs in 2019, phasing down to 15 percent of baseline use in 2036.

Ebell says the Kigali Amendment has not been presented to the U.S. Senate for ratification and thus is not legally binding in the United States.

“CEI opposed the ratification of the amendment, which would change the purpose of the Montreal Protocol from protecting the ozone layer into a global warming treaty,” Ebell said.

▶ [Heartland](#), 7 September 2017, By: Tim Benson

9. Cooling Without Electricity



A fluid-cooling panel designed being tested on the roof of Stanford University’s Packard Electrical Engineering building

USA: Scientists at Stanford University claim to have developed radiative cooling panels that can reduce the temperature of flowing water to 5°C below ambient.

The development builds on radiative cooling research, initiated in 2013, a roof as a testbed for a high-tech mirror-like optical surface that could reduce the energy requirement of air conditioning and refrigeration. The research team is now said to have shown that a system involving these surfaces can cool flowing water to a temperature below that of the surrounding air. The entire cooling process is done without electricity.

“This research builds on our previous work with radiative sky cooling but takes it to the next level. It provides for the first time a high-fidelity technology demonstration of how you can use radiative sky cooling to passively cool a fluid and, in doing so, connect it with cooling systems to save electricity,” said Raman, who is co-lead author of a paper detailing this research, published in [Nature Energy](#).

Professor of electrical engineering Shanhui Fan and former research associates Aaswath Raman and Eli Goldstein have founded the company SkyCool Systems, which is working on further testing and commercialising this technology.

While on a hot sunny day sunlight will warm more than radiative sky cooling will cool, the SkyCool system uses a multilayer optical film that reflects about 97% of the sunlight while simultaneously being able to emit the surface’s thermal energy through the atmosphere. Without heat from sunlight, the team maintains that the radiative sky cooling effect can enable cooling below the air temperature even on a sunny day.

“With this technology, we’re no longer limited by what the air temperature is, we’re limited by something much colder – the sky and space,” said Eli Goldstein, co-lead author of the paper.

The experiments published in 2014 were performed using small wafers of a multilayer optical surface, about 8in in diameter, and only showed how the surface itself cooled. The next step was to scale up the technology and see how it works as part of a larger cooling system.

For their latest paper, the researchers created a system where panels covered in the specialised optical surfaces sat atop pipes of running water and tested it on the roof of the Stanford University’s Packard Building in September 2015. These panels were slightly more than 2ft in length on each side and the researchers ran as many as four at a time. With the water moving at a relatively fast rate, they found the panels were able to consistently reduce the temperature of the water 3-5°C below ambient air temperature over a period of three days.

The researchers also applied data from this experiment to a simulation where their panels covered the roof of a two-storey commercial office building in Las Vegas – a hot, dry location where their panels would work best. They calculated how much electricity they could save if, in place of a conventional air-cooled chiller, they used vapour-compression system with a condenser cooled by their panels. They found that, in the summer months, the panel-cooled system would save 14.3 MWh of electricity, a 21% reduction in the electricity used to cool the building. Over the entire period, the daily electricity savings fluctuated from 18-50%.

SkyCool Systems is now measuring the energy saved when panels are integrated with traditional air conditioning and refrigeration systems at a test facility. The researchers are focused on making their panels integrate easily with standard air conditioning and refrigeration systems and are said to be particularly excited at the prospect of applying their technology to the serious task of cooling data centres.

Fan has also carried out research on various other aspects of radiative cooling technology. He and Raman have applied the concept of radiative sky cooling to the creation of an efficiency-boosting coating for solar cells. With Yi Cui, a professor of materials science and engineering at Stanford and of photon science at SLAC National Accelerator Laboratory, Fan developed a cooling fabric.

“It’s very intriguing to think about the universe as such an immense resource for cooling and all the many interesting, creative ideas that one could come up with to take advantage of this,” he said.

▶ [CoolingPost](#), 5 September 2017



EUROPE & CENTRAL ASIA

10. EU Companies Cut Further the Use of Chemicals Harmful to Ozone Layer

Imports, exports and the overall consumption of chemicals harming the ozone layer decreased in the European Union in 2016, according to latest annual report on ozone-depleting substances, published today by the European Environment Agency (EEA). It shows a continuous trend in the phasing out of such chemicals over the last decade.



Image © Andy Parker, iStockphoto.com

The EEA report '[Ozone-depleting substances 2016](#)' presents aggregated data reported by companies on the import, export, production, destruction, and use of ozone-depleting substances (ODS) in the European Union (EU).

Phasing out the ozone-depleting substances is key to protecting the ozone layer in the Earth's atmosphere. The ozone layer serves an important function in protecting life on Earth as it absorbs sun's ultraviolet radiation. This radiation is harmful for the environment and humans, causing for example skin cancer.

Key findings in 2016 data, as compared to 2015 are as follows:

- EU **imports** of ozone-depleting substances decreased by **15 %**.
- EU **exports** of ozone-depleting substances decreased by **17 %**.
- EU **production** of ozone-depleting substances decreased by **1 %**.
- EU **destruction** of ozone-depleting substances decreased by **26 %**.
- EU overall **consumption** (= production + import – export – destruction) of ozone-depleting substances decreased by **13 %**.

The EEA report is published in advance of the [International Day for the Preservation of the Ozone Layer](#), which is marked every year on 16 September.

Background

In 1989, the Montreal Protocol on Substances that Deplete the Ozone Layer entered into force. Its objective is to protect the stratospheric ozone layer by phasing out the production of ozone-depleting substances. The protocol covers over 200 individual substances with a high ozone-depleting potential, including chlorofluorocarbons (CFCs), halons, carbon tetrachloride (CTC), 1,1,1-Trichloroethane (TCA), hydrochlorofluorocarbons (HCFCs), hydrobromofluorocarbons (HBFCs), bromochloromethane (BCM) and methyl bromide (MB), all of which are referred to as 'controlled substances'.

The Montreal Protocol was amended to regulate hydrofluorocarbons (HFCs) in October 2016, in Kigali, Rwanda. Both developed and developing countries have taken on mandatory commitments to reduce production and consumption of HFCs in the next three decades.

Within the EU, ozone-depleting substances are covered by [Regulation \(EC\) No 1005/2009](#) (known as the ODS Regulation). The EU ODS Regulation is more stringent than the rules of the Montreal Protocol and also encompasses additional substances.

▶ [The European Environment Agency \(EEA\)](#), 14 September 2017

11. ODS Consumption in Belarus Down Almost 60 Times Over 30 Years



Belarus has achieved an almost 60-time reduction in the consumption of ozone depleting substances (ODS) over the past 30 years, BelTA [Belarusian Telegraph Agency] learned from the website of the Natural Resources and Environment Ministry of Belarus.

The consumption of ODS in the country totaled 51.5 tonnes in 2016. According to the National Research Center for Ozone Layer Monitoring of the Belarusian State University, the total ozone content in the atmosphere over Belarus has been recently close to the normal showings, except for the period of season anomalies.

The Montreal Protocol on Substances that Deplete the Ozone Layer was signed in 1987. It is an international treaty designed to protect the ozone layer by phasing out the production of numerous substances that are responsible for ozone depletion. All of the ozone depleting substances controlled by the Montreal Protocol contain either chlorine or bromine used as cooling agents in the air-cooling and conditioning sector, propellants in household and medical aerosol products,

clean agents in the fire-extinguishing systems, solvents in electronic and precision engineering, foam-blowing agents in the construction of building materials.

The stratospheric ozone layer protects life on Earth from harmful effects of the ultraviolet radiation from the sun. According to global scientific estimates, by the year 2030 the Montreal Protocol will have prevented two million cases of skin cancer annually, averted damage to human eyes and immune systems. The protocol has also made a significant contribution to the climate change mitigation by preventing more than 135 billion tonnes of emissions of carbon dioxide equivalent as a result of phasing out chlorofluorocarbons and halons, which are powerful greenhouse gases.

At a time of fulfilling the commitments under the Montreal Protocol and phasing out the use of ozone-depleting substances, the use of hydrofluorocarbons, which have no ozone-depleting potential but which contribute to global warming, has greatly increased around the world. The levels of hydrofluorocarbons in the atmosphere indicate a significant increase in their concentrations over the past decades. Projections also point to their further growth (at least 7% per year) in the case of inertial scenarios. If no action is taken, hydrofluorocarbons, which are used for refrigerating and air-conditioning, can generate up to 20% of greenhouse gas emissions by 2050.

The participants of the 28th meeting of the parties to the Montreal Protocol held in Kigali (Rwanda) adopted an amendment to regulate the consumption of hydrofluorocarbons. According to scientific estimates, the reduction of the use of these substances can reduce the global warming by 0.4 degrees by the end of the century.

Belarus fulfills all commitments under the international agreements in the field of the protection of the ozone layer. In 2013 the country launched a strategy for phasing out hydrochlorofluorocarbons by 2020. Under the GEF international technical assistance project "Phasing out hydrochlorofluorocarbons and replacing them with non-ODS alternatives in Belarus," the country is planning to assess the extent of the use of these substances, to determine the cost of using the alternate substitutes. Based on the results of these studies, Belarus will elaborate its position regarding the ratification of the Kigali amendment to the Montreal Protocol.

► [BelTA Belarusian Telegraph Agency](#), 18 September 2017

12. UK Begins Ratification of Kigali Deal on HFCs

The UK has committed to nearly wipe out hydrofluorocarbons (HFCs) as part of a landmark UN agreement which aims to prevent 0.5C of global warming by the end of the century.

The Kigali amendment to the UN Montreal Protocol, agreed by almost 200 nations in October 2016, forces countries to reduce HFC refrigerant gases from appliances such as air conditioning units and refrigerators. As part of the UK's commitment to the deal, the country will reduce HFCs by 85% between 2019 and 2036.

Announcing the UK's start of the ratification process yesterday (5 September), Defra Secretary Michael Gove said: "Adopting this ambitious target will mark the UK as a world leader in tackling climate change.

"Not only will this deal reduce global carbon emissions by the equivalent of around 70 billion tonnes of carbon dioxide by 2050 - the same as 600 coal fired power stations would produce during that time – it will also help to protect our health, our agriculture and the wider environment."

Ozone protection

The Montreal Protocol, originally agreed back in 1987, is regarded as one of the world's most successful treaties, having successfully phased out 98% of ozone depleting substances such as chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs). The ozone layer has since shown encouraging signs of recovery.

HFCs were subsequently introduced to limit damage to the ozone layer and replace phased out refrigerants. However, they have much greater levels of global warming potential. Under the Kigali amendment, developed countries are required to cap and phase down HFCs starting in 2019.

This international agreement is legally binding and strengthens existing commitments. The UK, for example, had already committed to phase down HFC use by 79% by 2030, starting in 2015. Timetables for developing countries are different. The UK Government claims that carbon savings represent a net benefit of £1.17bn to the British economy.

Many global food and drink companies – Coca Cola, Pepsico and Unilever among them – have already started to replace fluorinated gases with climate-friendly and natural refrigerants, which are more energy-efficient and can save money.

Last month, German discount supermarket group Aldi invested £20m in natural refrigerants which will be installed across all of its UK stores. And earlier in 2016, fellow supermarket group Sainsbury's became the first company in the world to incorporate "closed-loop" natural refrigerant trailer units for its delivery vehicles.

▶ [Edie net](#), 6 August 2017, By: George Ogleby

13. German Agency Seeks Ban on R1233zd

The German Federal Environment Agency (UBA) is pushing for a ban on the new low GWP refrigerant R1233zd under a review of the European ODS Regulation.

Last month, the European Commission initiated an evaluation of the European ODS regulation (1005/2009) to establish whether it is still fit for purpose. The regulation was introduced in 2010 to implement the Montreal Protocol, which has been in force since 1989.

In its feedback submission, the German Environment Agency calls for a consistent strict ban of ozone depleting substances and points out that R1233zd, which is being used in new low pressure centrifugal chillers as an alternative to R123, has an ozone depletion potential of 0.00034.

“We recommend a consistent strict ban of ozone depleting substances,” the German Environment Agency says in its feedback. Referring to R1233zd, it says “Despite the ODP >0 the substance will be produced and promoted for several new applications in the field of refrigeration”.

An A1, non-toxic, non-flammable refrigerant with a GWP of 4.5 (under AR4), R1233zd has already been adopted by many leading chiller manufacturers as an energy efficient alternative for applications currently using R123. R1233zd is also being used as a foam blowing agent.

R123 was first introduced in the early 1990s as an alternative to the CFC R11. Although highly efficient with a low GWP (77), R123 is an HCFC and currently being phased out worldwide under the Montreal Protocol.

Its new alternative, R1233zd, is normally described as zero-ODP due to its very low ODP, and, measured at 0.00034, its ODP is nearly 200 times less than R123.

▶ [CoolingPost](#), 15 August 2017, By: Neil Everitt



FEATURED

OZONE SECRETARIAT

- ▶ Vienna Convention and Montreal Protocol Meetings: A Primer - [Read/Download](#)
- ▶ [29th Meeting of the Parties to the Montreal Protocol](#)
- ▶ [COP11-MOP29 : Issues for discussion by and information for the attention of the Conference of the Parties to the Vienna Convention at its eleventh meeting and the Twenty Ninth Meeting of the Parties to the Montreal Protocol - UNEP/OzL.Conv.11/2–UNEP/OzL.Pro.29/2 - Advance copy \(E \)](#)
- ▶ [28th Meeting of the Parties to the Montreal Protocol](#)
- ▶ Final text of the Kigali Amendment to the Montreal Protocol available in all the six official UN languages ([A](#) [C](#) [E](#) [F](#) [R](#) [S](#))
- ▶ OEWG 39: The 39th Session of the Open-ended Working Group of the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer, preceded by the 58th meeting of the Implementation Committee under the Non-Compliance Procedure for the Montreal Protocol, held on 9 July and a workshop on safety standards relevant to the use of low-GWP alternatives to HFCs, held on 10 July 2017.
 - [Draft report of the thirty-ninth meeting of the Open-ended Working Group of the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer - Addendum](#)
 - [Draft report of the thirty-ninth meeting of the Open-ended Working Group of the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer](#)
- ▶ Click [here](#) for further information.

– Browse through the Ozone Secretariat “[In Focus](#)” to learn about latest updates.

– Click [here](#) for Montreal Protocol Meetings Dates and Venues

The UN Environment Assessment Panels have been the pillars of the ozone protection regime since the very beginning of the implementation of the Montreal Protocol. Through provision of independent technical and scientific assessments and information, the Panels have helped the Parties reach informed decisions that have made the Montreal Protocol a world-recognized success.

UNEP initiated the process of setting up the assessment panels in 1988, pursuant to Article 6 of the Montreal Protocol, to assess the scientific issues of ozone depletion, environmental effects of ozone depletion, and the status of alternative substances and technologies and their economic implications.

Four panels, namely the panels for Scientific, Environmental Effects, Technology, and Economic Assessments were formally established and approved at the First Meeting of the Parties to the Montreal Protocol in 1989 where their first set of Terms of Reference were adopted. Shortly after the Second Meeting of the Parties in 1990, the Panels for Technical Assessment and the Panel for Economic Assessment were merged into one Panel called the Technology and Economic Assessment Panel (TEAP), which together with the Scientific Assessment Panel (SAP) and the Environmental Effects Assessment Panel (EEAP) make up the three assessment panels active today.

In accordance with Article 6 of the Montreal Protocol and subsequent decisions of the Parties, the three panels carry out a periodic assessment at least every 4 years. The first assessment reports were published in 1989 and since then major periodic assessments have been published by all three panels in 1991, 1994, 1998, 2002, 2006 and 2010. For each periodic assessment, the key findings of the panels are synthesized into a short report. The full SAP assessment report for 2014 was published in December 2014, while the EEAP assessment report for 2014 was published in January 2015.

PROGRESS & QUADRENNIAL ASSESSMENT REPORTS

- [EEAP](#)
- [SAP](#)
- [TEAP](#)

[Assessment Panels List of Meetings](#)

SYNTHESIS REPORTS

- [2014 assessments](#)
- [2010 assessments](#)
- [2006 assessments](#)

THE MULTILATERAL FUND FOR THE IMPLEMENTATION OF THE MONTREAL PROTOCOL



[79th meeting of the Executive Committee, Bangkok, 3-7 July 2017](#)

[Report of the 78th meeting of the Executive Committee](#)

[Adjusted business plan of the Multilateral Fund for 2017-2019 after the 77th meeting of the Executive Committee](#)

[▶ Learn more](#)



Please visit the [OzonAction Ozone Day website](#) for other interesting products. Also, in the right-hand column of this webpage you will find links to last year's Ozone Day webpage and other previous years; please feel free to browse through them for useful information and ideas.

We would also appreciate receiving your Ozone Day planned activities/reports for posting on the OzonAction website. You may send this information through your respective regional OzonAction CAP office or to Ms [Jo Chona](#).

[OzonAction Ozone Day 2017 website](#)



OzonAction Smartphone Application

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- Toxicity and flammability class
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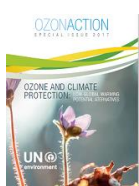
[The Kigali Amendment to the Montreal Protocol - Opportunities and Next Steps - OzonAction Video](#)

The Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer reached agreement at their 28th Meeting of the Parties on 15 October 2016 in Kigali, Rwanda to phase down hydrofluorocarbons (HFCs). The UN Environment, OzonAction developed a video to find out from renowned international scientific, health, technical, financial and national experts about background and significance of this Kigali amendment.



The amendment presents many opportunities: improving the environment, refrigeration and air-conditioning systems and especially energy efficiency. It also presents new challenges. It is absolutely critical now for industry, governmental bodies and civil society to work together to adopt greener technologies in each country of the world and fight global warming.

 [OzonAction YouTube](#) | See also: [United Nations Treaty Collection](#)



Ozone and Climate Protection: Low-Global Warming Potential Alternatives - [OzonAction Special Issue 2017](#)

OzonAction Factsheets:



[HS codes for HCFCs and certain other Ozone Depleting Substances ODS](#) (post Kigali update)



[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).



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](#)



OzonAction Multimedia Video Application: Refrigeration and Air-conditioning Technician Video Series - OzonAction has launched an exciting new application which hosts series of short instructional videos on techniques, safety and best practice for refrigeration and air-conditioning technicians. This application, consisting of short instructional videos on techniques, safety and best practice, serves as a complementary training tool for refrigeration and air-conditioning (RAC) sector servicing technicians to help them revise and retain the skills they have acquired during hands-on training. Additional videos will be added regularly.

Please share with your RAC associations, technicians and other interested stakeholders... **Over 11, 200 installations to date!**

Now available in the [Android Play Store](#) and Apple Store/iTunes.



(Just search for 'OzonAction' or scan this QR Code)



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 "OzonAction", or scan this 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

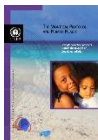
OzonAction Recent Publications:



Lower-GWP Alternatives in Commercial and Transport Refrigeration: An expanded compilation of propane, CO₂, 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, CO₂ 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.



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.



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. [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.



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.



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.



EVENTS

2017



Le salon SIFA (salon interprofessionnel du froid et ses applications), organisé par La Rpf et le groupe LSA / Usine Nouvelle, aura lieu du 3 au 5 octobre 2017 au Dock Pullman de Paris, France. Le SIFA est un salon-congrès portant sur les enjeux réglementaires, économiques, techniques et environnementaux relatifs au FROID dans les domaines du tertiaire, de la grande distribution, l'agroalimentaire et de l'industrie.



EUREKA 2017: Heating, Cooling & Ventilation: Sustainable technologies for a better life.
11-12 December 2017, Berlin, Germany

2018



1st IIR International Conference on the Application of HFO Refrigerants
2nd - 5th September 2018

1st IIR International Conference on the Application of HFO Refrigerants.
2-5 September 2018, Austin Court Conference Centre, Birmingham, United Kingdom



The HVAC & Refrigeration Show, 23 - 25 January 2018, London, United Kingdom

A/Ccess is the theme of the MACS 2018 Training Event and Trade Show to be held 14-18 February 2018, at the Caribe Royale Hotel and Convention Center, USA



AIRAH Refrigeration 2018, 26 – 27 March 2018, Sydney, Australia



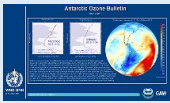
READING



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 CO₂-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 Grabiell. 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, United States.



Industrial Refrigeration Equipment Market (Refrigeration systems, Coil and Condensers, Thermal panels and Parts) - Latin America Industr Analysis, Size, Share, Growth, Trends and Forecast 2013 - 2019



[Geothermal Heating and Cooling: Design of Ground-Source Heat Pump Systems-ASHRAE](#)

A first edition, the IIR guide “[CO₂ 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...

[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 \(2014-2022\)](#)

[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

[The Importance of Ambition in the 2016 HFC Phase-Down Agreement.](#) Download the full report from EIA, [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.

[F-Gas Regulation shaking up the HVAC&R industry.](#) Commissioned by the Greens in the European Parliament, the study provides qualitative and quantitative analysis of the early impacts of the EU F-Gas Regulation on the European industry and evaluates its influences on other countries and regions in designing their own policies to curb HFCs.

"[The Road to Competence in Future Green Technologies](#)", the International Special Issue 2016-2017 of Centro Studi Galileo. Read/Download [pdf version](#) | [E-book](#)

The [2016 editions of ASHRAE’s major refrigerants-related standards](#) have been published as a package with 30 new refrigerants and refrigerant blends added.

[Quest for climate-friendly refrigerants finds complicated choices](#), National Institute of Standards and Technology (NIST), 17 February 2017, Summary: Researchers have just completed a multiyear study to identify the 'best' candidates for future use as air conditioning refrigerants that will have the lowest impact on the climate.



The second issue of [The Natural Voice magazine](#), entitled ‘Mainstreaming Natural Refrigerants’ showcases examples of installations using natural refrigerants around the world, including in the Gambia, Jordan, South Africa, China, Thailand, Tanzania and Saudi Arabia.



[Industria & Formazione, no. 2/17](#), Preview of the journal Industry & Training in refrigeration and air conditioning, technical refrigeration and air-conditioning, Centro Studi di Galileo # 406 Technological innovations in cooling and air conditioning with special focus on the F-Gas new regulations, new refrigerants, components and systems, food storage and cold sector. Vol. XLI - No. 2-2017.



Refrigeration: An increasingly strategic issue for data centres - [Cooling data centres: A major economic challenge](#) Today, data centres play a key role in many businesses as information technology is becoming an increasingly strategic factor. Cooling can present a major economic challenge for data centres. If cooling is implemented incorrectly or is inadequate, the amount of energy required to cool a data centre can equal or exceed that used to operate the equipment. Larger data centres can use a staggering amount of energy just to ensure the day-to-day running of electronic equipment. As a result, these data centres can produce a great deal of heat, which require large-scale cooling systems in order to maintain efficient and continual operation... Browse through a selection of [articles and papers](#), by [iifir](#)



[shecco](#) GUIDE to Natural Refrigerants Training in Europe shows that training is readily available. [Read on r744](#)



[40 Years of Global Environmental Assessments: A Retrospective Analysis](#), J. Jabbour and C. Flachsland. Environmental Science & Policy



FactSheet - [Hazards during the Repair and Maintenance of Refrigeration Systems on Vessels](#).



[High-performance insulation materials market](#), June 2017



[EIA Applauds Bipartisan Effort to Tackle Super Pollutants, Including HFCs](#). Environmental Investigation Agency, 8 June 2017



[The Environmental Investigation Agency \(EIA\)](#), recently launched report: [Chilling Facts VII](#), [Chilling Facts I-VI](#) reports available [here](#)



ASHRAE Releases New Edition of [Principles of Heating, Ventilating and Air Conditioning](#). - Eighth edition of textbook updated based on the 2017 ASHRAE Handbook - The textbook is ASHRAE’s recommended text for HVAC instruction and presents the fundamental concepts for HVAC systems and design.



[The Australian Institute of Refrigeration, Air Conditioning and Heating outlines the Future of HVAC in a Net-Zero World](#)



[The Dirtiest Contraband in Gibraltar](#), El Pais, 8 August 2017



“[Absorption Chillers Market: Global Industry Analysis and Forecast, 2017-2025](#),”... The demand for thermally-driven chillers in multiple industrial verticals is poised to grow in the immediate future. Considering the rising demand for electrical chillers in commercial, residential as well as industrial settings, the adoption of absorption chillers will gain traction at considerable rate. By consuming lesser energy than conventional electrical chillers, absorption chillers will also garner surplus demand for not using ozone-depleting chlorofluorocarbons (CFC) for chilling purposes. Persistence Market Research’s latest report delivers key insights for the future of global [absorption chillers market](#), excerpts from which highlight that by the end of 2025, more than US\$ 2 Bn worth of absorption chillers will be sold throughout the globe...



MISCELLANEOUS

Announcement!

The UN Environment, OzonAction, in collaboration with Marco Gonzalez and Stephen O. Andersen are updating and expanding the Montreal Protocol Who’s Who” as part of the celebration of the 30th Anniversary of the Montreal Protocol - which was agreed as 16 September 1987.

The new website will be launched during the upcoming Meeting of the Parties to the Montreal Protocol, Montreal, Canada, 20-24 November 2017.

We are pleased to invite you to submit your nomination*, and/or nominate an Ozone Layer Champion(s). The short profile should reflect the nominee’s valuable work related to the Montreal Protocol and ozone layer protection.

Please notify and nominate worthy candidates through the [on-line form](#)

Looking forward to receiving the nomination(s), and please feel free to contact our team for any further assistance concerning your nomination.

Take this opportunity to raise the profile of men and women who made important contribution to the Montreal Protocol success and ozone layer protection.

▶ Contact : [Samira Korban-de Gobert](#), UN Environnement, OzonAction

* If you are already nominated, no need to resubmit your profile



How will the heat pump market move towards natural refrigerants? Eric Delforge talks about the energy-efficient properties of natural refrigerants when used in heat pump applications.

[Watch on r774's YouTube channel](#)



[UN knowledge platform launches live-tracking tools to review progress towards SDGs](#), UN Environment’s dynamic online platform designed for sharing contextualized data...



New **International Journal of Refrigeration** service for IIR members - As of January 2017, not only will IIR members continue to receive the hard copy of the journal but IIR membership will now also give members access to the complete archives of the *International Journal of Refrigeration (IJR)* online. Designed with IIR members in mind, this new and practical electronic subscription gives members substantial advantages:

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International Observers - New AREA membership category - Due to the significant worldwide interest in European legislative developments and the increase in competence of personnel who handle new refrigerants, AREA is pleased to introduce its brand new "International Observer" membership category. This provides a fantastic opportunity for non-European RACHP installer bodies the world, to benefit from the expertise and discussions within Europe through access to AREA. Contact: info@area-eur.be



The Mobile Air Conditioning Society (MACS) Worldwide has released the **MACS Mobile A/C Diagnostics app** powered by Shiftmobility® for use on all mobile devices. The MACS app includes comprehensive mobile A/C and engine cooling system specifications for cars and light duty trucks from 1960-present; A library of heavy duty vehicle specifications donated by MACS member companies; access to MACS training calendar and website, archived MACS **ACTION™** magazines and **Service Reports**, MACS mobile A/C diagnostic checklists and a MACS member supplier directory. The MACS app is available only to MACS members in good standing. Each membership will receive one free download; and additional member downloads are \$60 each annually. The MACS app can be downloaded from the Google play or iTunes store



MONTREAL PROTOCOL
WHO'S WHO

The Montreal Protocol Who's who

See the latest nominations /

Nominate Ozone Layer Protection Champion

From Your Country /Region >>

<http://www.unep.fr/ozonaction/montrealprotocolwhoswho>

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Since its inception in January 2000, the goal of OzoNews is to provide current news relating to ozone depletion and the implementation of the Montreal Protocol, to stimulate discussion and promote cooperation in support of compliance with the Montreal Protocol. With the exception of items written by UNEP and occasional contributions solicited from other organizations, the news is sourced from on-line newspapers, journals and websites.

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<http://www.youtube.com/ozonaction>

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