



## Topic

The new F-Gas Regulation phase down (draft proposal April 2022)

## Author

Dr Rob Lamb, Group Sales and Marketing Director



# What does the proposed new F-Gas Regulations revision mean for the users and operators of cooling equipment?

## What does the proposed new F-gas Regulations revision mean for the users and operators of cooling equipment?

We are almost at the halfway point of the planned F-gas phase-down and on 5th April 2022, the European Commission proposed new revisions to the current F-gas Regulation to support meeting 2050 climate change goals. The proposals, expected to come into force in Europe and the UK in 2024, follow the 2016 Kigali Amendment to the Montreal Protocol, which stressed the need for tougher action to combat global warming, including reducing hydrofluorocarbon greenhouse gases (HFCs) by 85% between 2019 and 2036 and preventing up to 0.5 degrees Celsius of warming this century.

The existing F-gas Regulation had already resulted in significant changes in the HVACR industry, including a rise in the manufacture and use of low global warming potential (GWP), mildly flammable (A2L) synthetic refrigerants. Often these "low" GWP refrigerants are hundreds of times more harmful to the environment than the baseline reference of CO<sub>2</sub>, and more work is required to bring the overall environmental impact of refrigeration and heating to a sustainable level.

The new draft proposal aims to achieve more stringent targets, including increasing the current hydrofluorocarbon (HFC) gases availability target from a 79% reduction to a 95% reduction by 2030, progressing to a 97.5% reduction by 2050. The draft also includes phase down steps beyond 2030, and a specific phase down schedule for production of gases that heavily contribute to the greenhouse effect by absorbing infrared radiation.

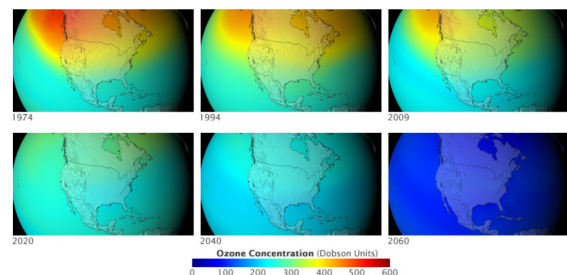
The phase down is the primary instrument for enacting technological change, but this is also supported by equipment restrictions, equipment bans, and a tighter plan for traceability with regards to refrigerant entering the marketplace through customs in the UK.

In a recent development (17th Oct 2022) the European Parliament's environmental committee's rapporteur, Bas Eickhout, called for an outright ban on HFC and HFO refrigerants and an even steeper phase down than the April 2022 proposal. So, what can be expected and how can end-users address the potential business challenges the imminent requirements will bring?

## Why does the F-gas regulation exist and what has it achieved?

The hole in the ozone layer has been significantly decreased since the late 1980's, when 197 countries united to ratify the Montreal protocol. The protocol acknowledged that man-made ozone-depleting substances were causing harm to the ozone layer, a small part of the atmosphere that protects Earth from too much ultraviolet (UV) radiation from the sun.

The treaty regulates the production and consumption of nearly 100 man-made chemicals linked to ozone destruction and depletion such as chlorofluorocarbons (CFCs) and hydrofluorocarbons (HFCs). One major ozone-depleting substance (ODP) is R22, an HCFC refrigerant which was banned in the UK in 2015, and experienced a major phase down in the years leading up to the ban. The overall usage of ozone-depleting substances has been successfully minimised as a result of the Montreal Protocol, and is continuing to trend downwards for the remaining few technologies with a reliance on ODP substances. Models created for 2065 projected that the hole is on the path to recovery – but had the world not banned these gases through the Montreal Protocol, the ozone hole would have increased in size to have global coverage by 2040. This could be considered a worldwide "near miss" event, which could only have happened (and also been prevented) by the actions of humanity – a notable case study for why the F-gas Regulations are now of utmost importance to the human race.



The above image published on earthobservatory.nasa.gov from a snapshot on May 21, 2009, shows computer predictions of what would have happened to the ozone layer over the mid-latitudes of the Western Hemisphere if CFCs had not been banned by the Montreal Protocol. Low Ozone Concentration corresponds to lower UV protection.

The birth of the latest F-gas Regulation began with the Kyoto protocol. In addition to reducing ozone-depleting

warming substances such as HFCs – which are currently used as replacements for hydrochlorofluorocarbons (HCFCs) and chlorofluorocarbons (CFCs) – given they are also powerful greenhouse gases in addition to their ozone-depleting effect.

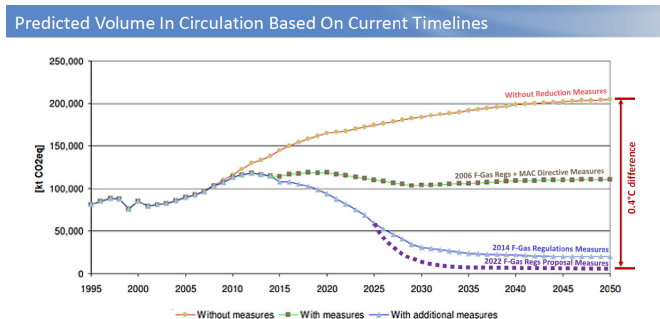
### F-gas refrigerants and F-gases

F-gases are man-made fluorinated gases, such as HFCs and HFOs, and are often hundreds or even thousands of times more potent in terms of global warming effect than CO2. These gases come in toxic and non-toxic forms, and varying in flammability (non-flammable, mildly-flammable and highly-flammable). It is worth noting that these descriptors for toxicity and flammability are defined under a fixed set of conditions, and that the Dangerous Substances and Explosive Atmospheres Regulations (DSEAR, 2002) does not distinguish between “mildly” and “highly” flammable substances – they are both flammable. Furthermore, so-called “non-toxic” refrigerants still carry their own oxygen deprivation level (ODL) and Acute Toxicity Exposure Level (ATEL) under ISO 817:2014 and are harmful to human health if concentrations surpass specific levels in an occupied space.

HFCs represent around 90% of F-gas emissions and they are mainly used as refrigerants in refrigerators, freezers, air conditioners, and heat pumps. However, they are also used as propellants in medical inhalers, aerosol spray cans, fire extinguishers, high-voltage switchgear, and as blowing agents for foams.

The F-gas phase down also includes other F-gases commonly used in industrial manufacturing processes such as perfluorocarbons (PFCs), sulphur hexafluoride (SF6) and nitrogen trifluoride (NF3) and aims to reduce overall emissions across all manufactured gases.

The graph below shows what would have happened without the introduction of the measures installed by the F-gas Regulation over time, highlighting the volume of fluorinated gases in the atmosphere.



The F-gas Regulation is not specific to HFCs but covers all Fluorinated gases. This will have an impact on F-gas manufacturing quotas – the total volume of F-gases in the marketplace – as all industries will be in competition. At present, the 2016 F-gas Regulations quota reduction timeline stops at 2030. The new 2022 proposal plans a near 50% cut by 2024, followed by an even larger percentage step down in 2027 to just 10% of the 2015 baseline. To put this in perspective, the current 2027 reduction target is 25% of the 2015 baseline.

Manufacturers will have to commit to these mandatory declining quotas based on refrigerant GWP values which will make the availability of higher GWP HFC refrigerants more scarce and as a result prices will rise.

### How has the F-gas phase-down already impacted the refrigeration industry?

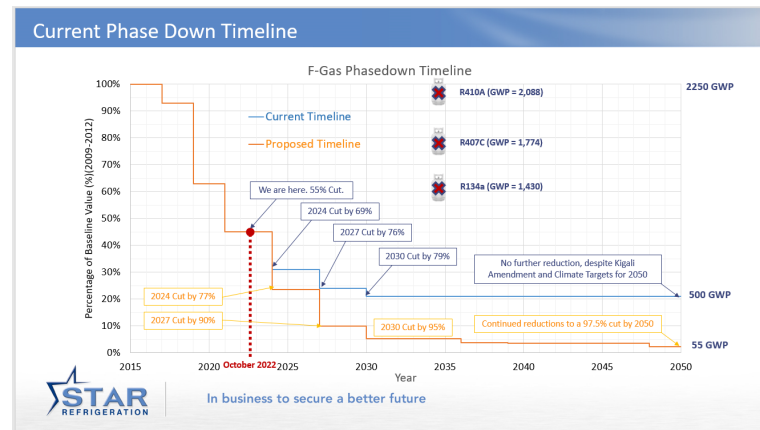
The current legislation introduced equipment bans based on the intensity of the refrigerant’s global warming potential. Back in 2020, refrigerants above 2,500 GWP were banned on both a service and stationary equipment basis. This affected many businesses across a variety of industries, impacting multipack centralised refrigeration systems for commercial use, standalone hermetically sealed self-

-contained systems, domestic fridges, and stationary refrigeration equipment.

Common refrigerants like R404A, R422D and R507 could no longer be used in virgin form as it became mandatory to purchase either recycled or reclaimed gas to charge a system. The proposed revision to the regulations will also remove permission for users to continue to source recycled or reclaimed refrigerant in a further effort to abolish systems that continue to use these environmentally damaging substances.

### What does the quota phase down look like?

The graph below shows the current (blue) and proposed (amber) phase down timeline under the F-gas Regulations. The current iteration of the Regulation concludes in 2030, but the plan is to extend targets beyond this date – until 2050 – to align with the agreements made in the Kigali amendment.

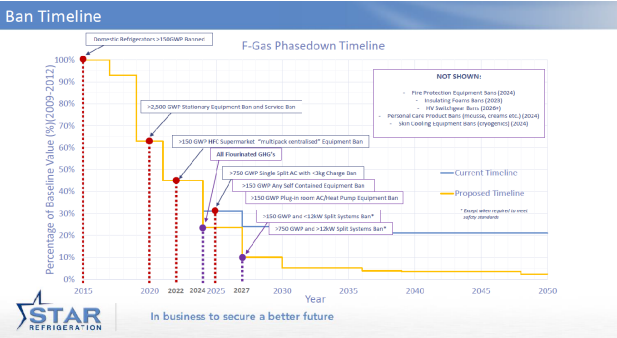


One important area to highlight is that the target of a 79% cut (i.e. ~500GWP market average) by 2030 is now being brought forward. The UK would be within 2% of the current 2030 target figure as early as 2024, and will be at a 95% reduction by 2030 under the new regulation.

The 95% cut corresponds to a market average GWP of <115. Most “low GWP” refrigerants currently on the market are classified with respect to the 2030 target. The proposed 95% cut by 2030 would mean that many existing “low GWP” solutions would have GWPs two or three times higher than the new market average. Therefore, there will be an unbalanced exposure for owners of cooling equipment using high GWP gases as prices increase and availability reduces.

### What bans will the new F-gas regulations introduce?

The graph below illustrates the current (red) and proposed (purple) dates affecting HVACR equipment and refrigerants. One important date was 1st Jan 2015 – when domestic refrigerators using refrigerants with GWP > 150 were banned (almost all domestic fridges now use very low GWP hydrocarbon-based refrigerants). Another important date is 1st Jan 2020, when the ban of refrigerants >2500 GWP ban was introduced, limiting both the sale of stationary equipment (e.g. industrial refrigeration plant) and use of high GWP refrigerants for service and maintenance. To date, this remains the only combined ban of this nature and there are no plans in the revision to introduce any tighter restrictions lower than the 2500GWP limit. This decision not to introduce a stricter ban has been criticised by a number of environmental committees and NGO’s as it puts an over-reliance on the secondary effects of the phase down (e.g. lower availability and higher cost of high GWP gases) to enact change, rather than implementing a more strict industry standard.



## Equipment

All self-contained equipment using refrigerants above 150 GWP will be banned from 2025. Refrigeration systems manufactured in the last few years have already been designed to use refrigerants with very low global warming potential such as natural refrigerants (ammonia, CO2 and hydrocarbons) and HFOs (the fourth generation of fluorine-based gases following HCFCs, CFCs and HFCs).

Technological innovations such as the advent of low-charge ammonia cooling equipment, industrial CO2 refrigeration systems and more strict health and safety requirements have made the shift to natural solutions possible in sectors where HFCs were traditionally used.

## Leak Detection

F-gas leak detection requirements are also going to change. The current requirement is for systems with a charge equivalent to more than five tonnes of CO2 to have a manual leak check every 12 months, or every 24 months, if automatic gas detection systems are installed. The new proposal removes this five-tonne baseline and leak tests would be required for all F-gas containing systems – regardless of charge – every 12 or 24 months respectively.

The latest proposal also specifically mentions HFO gases and outlines minimum quantities before full fixed leak detection systems are legally required. The HFO gas detection requirements are more onerous than HFCs on account of their flammability and toxicity to the local environment when released – along with the fact HFOs have been shown to contribute “forever chemicals” which do not break down in the environment.

## Illegal trading

The new measures highlight the need to tackle traceability, rogue trading, and the illegal trade of refrigerants, though it does not specify exactly how this will be enforced (likely because the legal implementation will be different for individual EU Member states and those following the EU standards like the UK). One possible solution already introduced in the US is adding QR codes to cylinders to identify the chain of purchase, from manufacturer

to the point of sale, through to import and use. If introduced, a QR code system would offer live data for customs and quota officers to monitor in order to ensure volume of F-gas in the market does not exceed the legal limits. At the moment, quota applications are done on a manual basis and tracking total volume can prove difficult for those involved at a national scale.

## Blanket bans

The current F-gas regulations contains an exemption which allows the use of virgin refrigerants above 2500 GWP for systems with a charge less than 10 Tonnes of CO2 equivalent. When the new regulation comes into force, this will no longer be available to operators of small refrigeration systems, who will then be required to use recycled F-gas which will only be available as an option until 2030.

The 2022 amendments also redefine the substances affected as ‘fluorinated greenhouse gases’ (GHGs) -previously referred as ‘HFCs’-. The change prevents chemical suppliers from altering gas name conventions and definitions to circumvent any HFC-specific regulation. It is worth noting that HFC and HFO manufacturers are currently under substantial legal pressure due to continued environmental non-compliance relating to PFAs (a by-product of synthetic gases that never breaks down in the environment and is harmful to human health). Consequently, a more catch-all description in the F-gas Regulation is in the environmental interest of everyone going forward.

The proposals also mention reserving the right to ban individual refrigerants on a case-by-case basis if it can be demonstrated that a lower GWP technologically equivalent alternative exists.

## Quota Tax

The current allocation of F-gas quota is free to wholesalers, but since the introduction of the F-gas Regulation, the number of quota holders has increased by a factor of 30 to take advantage of the free allocation system. In an effort to combat the number of quota holders, the proposed regulation plans to introduce a nominal fee per tonne of CO2 equivalent allocated under the quota. This effectively places a ‘carbon tax’ on selling refrigerants in the market. The proposed fee is currently set at €3 / ton of CO2 equivalent which would equate to a 10% price increase for common refrigerants such as R134a. This tax, coupled with the quota reduction itself, will mean that over time, availability will reduce while competition increases, giving rise to exacerbated price increases

## Recycling and Reclaiming

The new proposal bans users from charging refrigerant which has been decanted from their system unless it has been processed through a reclamation rig (i.e. a recovery system which contains basic oil separation, moisture removal, NCG purging, and filtration)

## Star Refrigeration

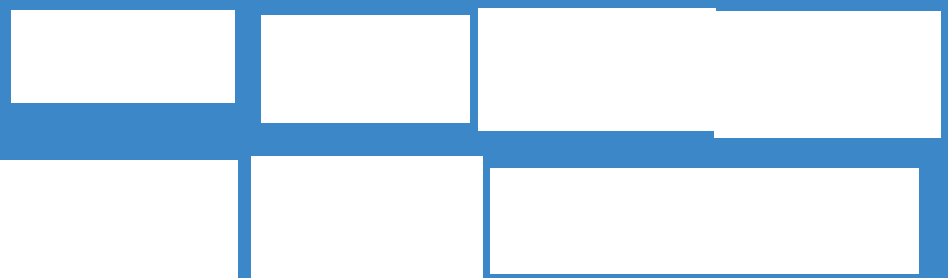
Thornliebank Industrial Estate, Nitshill Rd, Thornliebank, Glasgow G46 8JW

Tel: 0141 638 7916 star@star-ref.co.uk

@StarRefrig

www.star-ref.co.uk

## The Star Refrigeration Group



this means that traditional service work which requires the refrigerant charge to be decanted, will incur additional costs to clean the gas before it can be charged back into the system. It is unclear how this new rule will be enforced but the planned change will affect all users of F-gas, regardless of quantity or industry.

### What does the future look like?

Research shows that the reductions achieved by the F-gas Regulations alone will result in an approximately 0.5 degrees Celsius saving in global temperature increase which will make a significant contribution to overall climate goals by the end of this century.

Historically, the F-gas Regulation has been widely regarded as an environmental success. As of June 2022, a 55% reduction in the overall volume of fluorinated gas, compared to 2015 levels, has been achieved.

The proposed steeper phase-down will bring previous 2030 goals forward. The previous 2030 reduction was set at a 79% cut of the 2015 baseline. Under the new proposal, a 77% cut by 2025 will be implemented, compared to 79% by 2030 under the current phase-down. This then moves to a 90% cut in 2027. The ultimate goal of the new proposal is to continue making cuts to F-gas quotas to a final position of a 97.5% reduction by 2050. The timeline for these cuts means that the market will be squeezed in terms of technology and refrigerant capabilities, likely giving rise to premature plant replacement or refrigerant retrofit programs in order to keep older equipment operational and compliant.

Many are now turning to alternatives, such as HFOs (hydrofluoroolefins), the new generation of man-made fluorine-based gases, as they are technically low GWP gases with a low global warming potential. There are drawbacks however, as HFOs are mildly flammable and can be volatile, while the trifluoroacetic acid (TFA) they form as a byproduct contributes to acid rain and contaminates groundwater. TFA is also a long lasting chemical and experts are warning that as levels rise it is possible that future regulations could introduce limitations or a ban on chemicals that are responsible for their production.

Natural refrigerants are not subject to the F-gas phase-down and will therefore still be permitted in years to come.

In the short-to-medium term, the new proposals will see both F-gases quotas and overall volume reduce over time, as the market competitiveness becomes steeper. Some industries will be able to afford higher premiums for F-gas usage, but others will be more negatively affected.

As we go further along the timeline, the refrigeration sector will have to navigate some potential challenges, including competition for quota with other high value markets such as the pharmaceutical and high-voltage electrical industries. Despite these challenges, and given the urgency of the climate crisis, the new proposals are an obvious necessity and phasing out substances that contribute to the warming of the planet is an essential step in the journey to Net Zero.

This article has been CPD certified by the CPD certification service. To obtain your CPD diploma please email [cpdcertificate@star-ref.co.uk](mailto:cpdcertificate@star-ref.co.uk).

To find out more, watch Adam Strachan's webinar with the Cold Chain Federation discussing what the proposed regulations mean for operators and owners of cooling equipment in further detail <https://register.gotowebinar.com/recording/viewRecording/6090179941045231704/2943018122934326622/>

## Star Refrigeration

Thornliebank Industrial Estate, Nitshill Rd,  
Thornliebank,  
Glasgow G46 8JW

Tel: 0141 638 7916 [star@star-ref.co.uk](mailto:star@star-ref.co.uk)

@StarRefrig

[www.star-ref.co.uk](http://www.star-ref.co.uk)



## The Star Refrigeration Group

