An outlook from Daikin on refrigerant alternatives in Europe – addressing Applications, Affordability, Safety and Future-Readiness

**Brussels, 08 October 2024 - The revised F-gas regulation (EU) 2024/573, which came into force across Europe in March 2024, aims to further reduce the consumption of hydrofluorocarbons (HFCs) in Europe. At the international trade fair Chillventa 2024, Daikin Europe N.V., a leading manufacturer of Heating, Ventilation, Air Conditioning and Refrigeration (HVAC-R) equipment, shared its vision for implementing the HFC phase-down while continuing to support the much-needed decarbonisation of the building sector.**

Ein Bild, das draußen, Himmel, Wolke, Gelände enthält.

Automatisch generierte Beschreibung

*At Chillventa 2024, Daikin Europe N.V. shared its vision for implementing the HFC phase-down, while continuing the much-needed roll-out of affordable, energy-efficient and safe heat pumps. © Daikin*

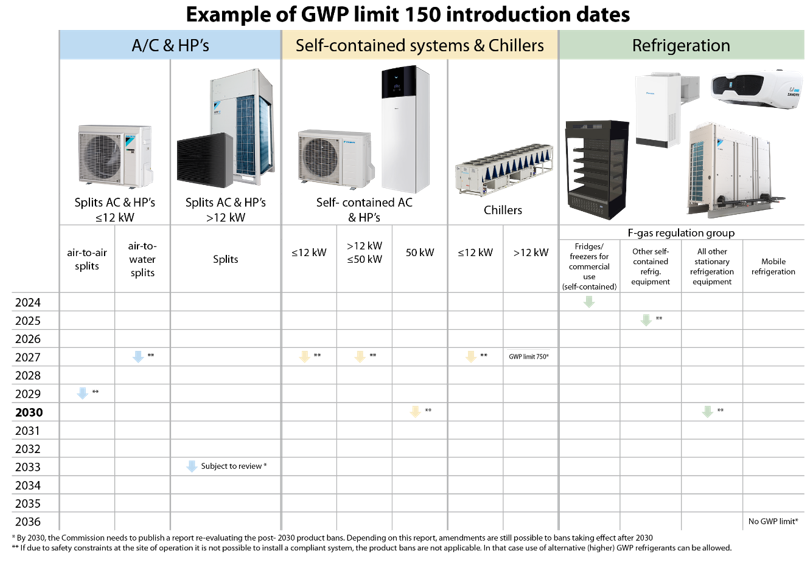
**The revised F-gas regulation**

The revised 2024 F-gas regulation accelerates the reduction in the consumption of virgin HFCs through a stricter phase-down plan than the Kigali Amendment, expressed in CO2 equivalents (= total kg of HFCs imported or produced in the EU x the Global Warming Potential (GWP) value). The aim is to promote the use of refrigerants with a lower GWP, reduce refrigerant charge and increase the reuse of recycled or reclaimed refrigerants.

A graph of gas prices

Description automatically generated*Comparison of the permitted consumption of newly produced HFCs expressed in CO2 equivalents, between the 2014 F-gas regulation EU 517/2014 and updated F-gas regulation EU 2024/573. © Daikin*

In addition, GWP limits are introduced for refrigerants used in HVAC-R products. Systems using a refrigerant with a GWP value equal to or above the defined limit may no longer be placed on the market after a certain cut-off date, which varies depending on the type of system. Products already placed on the EU market before the cut-off date may continue to be sold, installed, operated and serviced throughout their entire lifetime. This approach aims to gradually introduce new refrigerants.

*Example of cut-off dates for systems with a refrigerant with a GWP limit of 150 defined in the F-gas regulation EU 2024/573. © Daikin*

**A balanced refrigerant choice per application**

Contrary to popular perception, the new F-gas regulation does not mandate an immediate ban on fluorinated refrigerants. In building applications, certain fluorinated refrigerants continue to meet a wide range of safety and performance requirements. Bernard Dehertogh, Deputy General Manager DX at Daikin Europe N.V., emphasises: *“To drive the much-needed decarbonisation in the building sector, we need flexibility in refrigerant choices. There is no one-size-fits-all solution, as different applications present different challenges.”*

Daikin's strategy is to select the appropriate refrigerant for each application, balancing four key factors: safety, energy efficiency, environmental impact and cost over the entire life cycle of a product.

**Possible refrigerant alternatives per application**

**1) Refrigerant alternatives for air-to-water heat pumps in residential buildings**

For residential air-to-water systems, Daikin transitioned to lower GWP refrigerants in 2017, when it began replacing R410A with R32, significantly reducing the refrigerant’s GWP to 675. Today, R32 is the market standard, and while it remains the most cost-effective solution for air-to-water heat pumps, a shift to alternatives with a GWP below 150 will be required from 2027 onwards (for air-to-water monobloc systems and air-to-water split systems – see illustration above).

A primary alternative to R32 is R290, commonly known as propane, an A3 highly flammable refrigerant with an ultra-low GWP of 0.02. However, due to its high flammability, propane has restrictions in handling, application and installation location. Typically, a minimum distance from windows and doors, pavements or neighbouring properties must be maintained. For these applications, Daikin is launching a hydrosplit heat pump, ensuring that only trained installers handle this equipment through its ‘Stand By Me Certified Programme’.

However, it is clear that in many applications, such as apartment buildings or terraced houses with limited outdoor space, maintaining the minimum distance is not always feasible, and alternative solutions are indispensable.

*Due to its high flammability (A3), propane systems need to maintain minimum distances from doors, windows, neighbours etc., whereas alternatives can be more flexible. © Daikin*

Therefore, Daikin continues its research into energy-efficient alternative refrigerants, such as R454C, an A2L mildly flammable refrigerant with a GWP of 145.5, which is below the 150 GWP limit. This presents a strong alternative to ensure that all types of residential buildings can access heat pump heating in the near future.

**2) Refrigerant alternatives for residential and small commercial air-to-air systems**

With its split and multi-split systems, Daikin offers cost-effective air-to-air heat pumps, ideal for replacing electric heating, oil boilers etc. or for use in regions where cooling is also required. As these systems are commonly installed on balconies and the refrigerant circuit extends into the building, they face even greater installation challenges compared to self-contained air-to-water systems when using propane.

To overcome these hurdles, refrigerants such as R454C (GWP 145.5) and CO2 (R744, GWP 1) will become increasingly important for large residential, and small office and retail applications. In the short term, however, due to the cost-effective properties of R32, we expect it to remain the dominant solution.

**3) Looking beyond 2032 for commercial air-to-air heat pumps**

For large commercial applications, such as Daikin's VRV systems, the legislation allows for more transition time. In this segment as well, Daikin has led the transition from R410A, the current market standard, to R32. Increasingly, HVAC manufacturers are launching R32 ranges, providing customers with a solution for new installations at least until 2033.

However, it is also time to think ahead. With the phase-down and quota restrictions on the horizon, lower GWP solutions need to be developed. CO2 is the next logical step for VRV systems, as it is an ultra-low GWP, non-flammable type A1 refrigerant. To ensure a smooth transition over the next decade, manufacturers must address energy efficiency and affordability concerns. Additionally, the necessary training programmes should be implemented to prepare the market for handling this higher pressure refrigerant.

**Defining the refrigerant portfolio for the road ahead**

The path forward will involve many small steps, balancing the different properties of refrigerants with the timeline of the phase-down scheme.

R32 (GWP 675 – A2L) remains the balanced refrigerant for many applications in the years to come, allowing for continued heat pump adoption in a cost-effective way.

R290 propane (GWP 0.02 – A3) provides an energy-efficient, ultra-low GWP solution for specific applications where safety requirements and installation space allow. It comes at a higher cost compared to R32, due to increased safety requirements and refrigerant properties that result in larger units.

R454C (GWP 145.5 – A2L) is a strong alternative with a lower GWP than R32, suitable for applications where propane is not an option. This refrigerant can bring affordable, efficient and safe heat pumps to a broader market.

Finally, R744 CO2 (GWP 1 – A1), an ultra-low GWP refrigerant already used in many refrigeration systems, offers a promising long-term option for medium and large commercial systems. It is a solution that deserves the full attention of all stakeholders in the HVAC market: component and HVAC manufacturers, as well as their engineering and installer partners, with the aim of launching the next generation of direct expansion systems.

**Ready for the future**

*“Daikin is continuing its research and development into alternative refrigerants to accelerate the adoption of heat pumps across all systems and applications. We encourage the entire industry to follow this path. In the future, there may even be solutions that are not yet in the public eye”,* says Bernard Dehertogh. *“As a manufacturer, we will take responsibility and provide the education and training needed to adopt these new technologies.”*

*“At the same time, we should not forget that today's heat pump solutions, such as those based on R32, have already significantly reduced CO2 emissions compared to fossil fuel heating. Therefore, we should continue to use these solutions to transition to clean heating based on renewable energy in the short term”*, adds Dehertogh.

All appliances placed on the market before their respective cut-off dates specified in the revised F-gas regulation can be sold, operated, maintained and repaired throughout their entire life cycle.

**Did you know?**

With the new F-gas regulation (EU 2024/573), some labelling values for refrigerants have been updated. This applies to two refrigerants mentioned in this text. The GWP value for R454C has been reduced from 148.3 (in accordance with F-Gas Regulation EU 517/2014) to 145.5. The GWP value for R290 (propane) was also updated, from 3 (according to assessment report 4) to 0.02.

All GWP values indicated in this text are based on the revised F-gas regulation EU 2024/573.

**About Daikin Europe N.V.**

The Daikin Europe group is the leading provider of heating, cooling, ventilation, air purification and refrigeration (HVAC-R) technology in Europe, the Middle East, and Africa. Daikin designs, manufactures, and offers customers a broad portfolio of products, maintenance services as well as turnkey solutions for residential, commercial, and industrial purposes. To date, Daikin Europe has over 13,800 employees across more than 59 subsidiaries. It has 14 manufacturing sites in Belgium, the Czech Republic, Germany, Italy, Spain, Austria, the United Kingdom, Turkey, the United Arab Emirates, and the Kingdom of Saudi Arabia. Headquartered in Ostend (Belgium) for over 50 years, the Daikin Europe group is a subsidiary of the global group Daikin Industries.

**About Daikin Industries Ltd.**

Daikin Industries (DIL) is a worldwide leader in heat pump, air conditioning, and air filtration technology with more than 98,000 employees. Founded in Osaka in 1924, it is the only manufacturer in the world that develops and manufactures heating, ventilation, air conditioning, and refrigeration equipment, as well as compressors and refrigerants in-house. Daikin was named one of the world’s top 100 most innovative companies by Clarivate (UK) and LexisNexis (USA), recognized for its leadership in technology research and intellectual property patents. For its fiscal year 2023 Daikin reported a record sales result of € 28 billion (1 April 2023 – 31 March 2024).

Read more on [www.daikin.eu](http://www.daikin.eu) and [www.daikin.com](http://www.daikin.com).

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