

2025 Refrigerant Changes - A Summary

Modine Manufacturing Company



Hydrofluorocarbons (HFCs) are factory-made chemicals primarily used in air conditioning and refrigeration. They can be up to 10,000 times more potent than carbon dioxide in contributing to climate change. GWP is a measure of how much infrared thermal radiation a greenhouse gas added to the atmosphere would absorb over a given time, as a multiple of that which would be absorbed by the same mass of added carbon dioxide (CO₂). GWP is 1 for CO₂. R-410A has a GWP of 2088, meaning it would absorb 2088 times the thermal radiation of CO₂. It is easy to see how much of an impact these refrigerants can have on global warming. Without action to limit their use, emissions of HFCs are expected to nearly triple in the U.S. by 2030. Since development and environmental considerations must go hand in hand with strong international action to phase down HFCs, we can avoid up to 0.5°C (0.9°F) of warming by 2100 and limit global warming.

The U.S. Department of Energy (DOE) is supporting the efforts to phase down the use and emissions of highly potent greenhouse gases known as hydrofluorocarbons (HFCs). DOE has created a long-term strategy, to develop and deploy low- to zero-global warming potential (GWP) technologies, for an 85% reduction of HFCs by 2035, in HVAC applications.

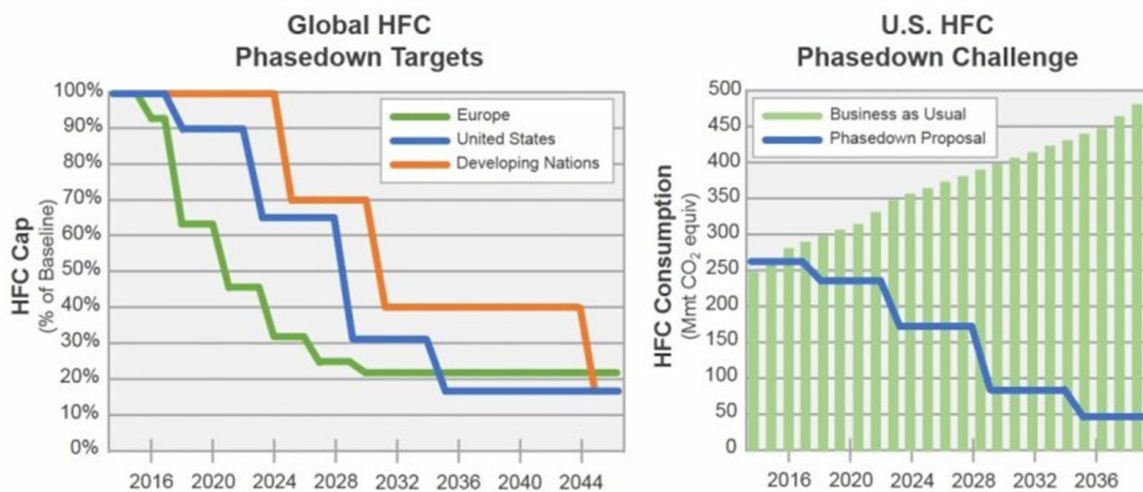


Figure 1: Phasedown timeline proposal. From “The Road to Zero: DOE’s Next-Generation Heating and Cooling R&D Strategy, energy.gov. Accessed March 19, 2023, <https://www.energy.gov/eere/buildings/road-zero-does-next-generation-heating-and-cooling-rd-strategy>

How does it affect the School (Light Commercial) HVAC industry?

The American Innovation and Manufacturing Act (AIM) directs the Environmental Protection Agency (EPA) to determine the quantity of HFC production and consumption allowances. This act gives the EPA the authority to regulate HFCs by 1) restricting the production/supply of HFCs, 2) restricting the demand with the regulation of GWP limits and consumption allowances, and 3) approving new refrigerants to replace HFCs through the EPA’s SNAP program.



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The phasedown of the HFC will challenge the availability of replacement refrigerants to service the industry. Appropriate measures are needed to restrict the demand for new products that are yet to be designed with new refrigerants. Reclamation of HFCs is crucial to support the installed base during the transition to the next generation of refrigerants. The State of California leads other states in establishing regulations for the control of emissions. In September 2022, California enacted Senate Bill (SB) 1206, which directs CARB to prohibit the sale or distribution of bulk HFCs that exceed a specified GWP: “Under SB 1206, a person shall not offer for sale or distribution, or otherwise enter into commerce in the state, bulk HFCs or bulk blends containing HFCs that exceed the following GWP limits:

- Beginning January 1, 2025, the GWP shall not exceed 2,200.
- Beginning January 1, 2030, the GWP shall not exceed 1,500.
- Beginning January 1, 2033, the GWP shall not exceed 750.

The bill also prohibits California from using non-reclaimed HFCs with GWP greater than 750 to fix leaks on service stationary equipment owned or operated by the state, starting January 1, 2025. Because California is one of the larger states, it appears that other states would follow suit regardless of the Federal requirements. Many states are already voluntarily following California’s emission standards with more currently considering aligning with California’s air standards.

In November 2022, it was announced that the EPA will enforce a GWP limit of 700 on new production by January 1, 2025, for residential and light commercial air conditioning and heat pump systems. This limit will be enforced on VRF (Variable Refrigerant Flow) systems a year later, on 1/1/2026. By imposing such limits, the goal is to reserve the limited supply of HFCs for existing installations.

Much of the light commercial HVAC industry, including Modine IAQ (Indoor Air Quality), currently utilizes R-410A refrigerant, an HFC with a GWP of 2,088 which will have to be fully transitioned to a new, low-GWP refrigerant before the end of 2024.

The EPA has approved the use of specific “A2L” refrigerants through the Significant New Alternatives Policy (SNAP) program.

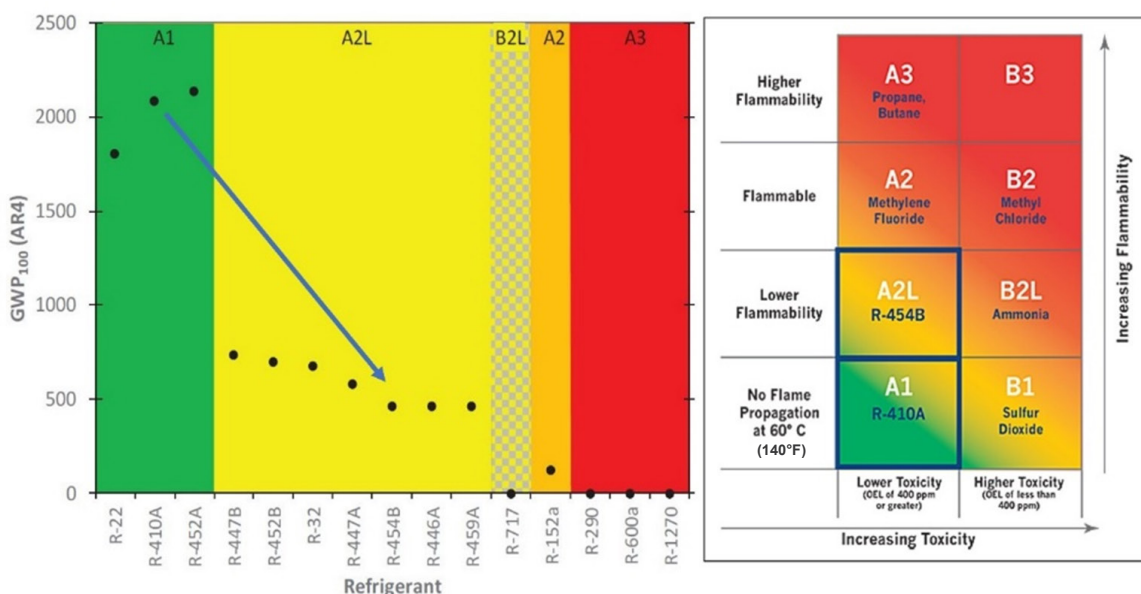


Figure 2: Refrigerant GWPs and ASHRAE 34 Refrigerant classification of Toxicity and Flammability. From “Easing Concerns About Refrigerant Flammability”, neep.org. Accessed May 19, 2023, <https://neep.org/blog/easing-concerns-about-refrigerant-flammability>

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What is the impact of A2L Refrigerants?

The GWP values of multiple refrigerants are shown in Figure 2. The figure shows a reduction of GWP by switching refrigerants to A2L. With the transition to A2L refrigerants, the GWP goals set by the regulations for the next decade will be met by the light commercial HVAC industry.

These refrigerants have also been added to ASHRAE 34 - “Designation and Safety Classification of Refrigerants”, and is also highlighted in Figure 2. The first letter represents the toxicity class of the refrigerant. The two classes of toxicity are A and B, with B being more toxic than A. The current refrigerants and the ones proposed for the near future are all of class A.

The second number/letter identifies flammability. Flammability has four classes with flammability increasing in the order 1, 2L, 2, and 3.

An A2L refrigerant is mildly flammable, compared to R-410A, and is of low toxicity, like R-410A. AHRI teamed up with the UL Firefighter Safety Research Institute and members of the fire service to test the differences between refrigerants in real fire scenarios. Researchers wanted to test the worst-case scenario for a commercial building fire. One test aimed to quantify the amount of heat when a refrigerant was added to a fire. This test is called the “heat release rate,” and it was found that the added heat was only slightly higher for an A2L refrigerant compared to R-410A. This resulting added heat was about the same as a small plastic trashcan fire.

Many of the A2L refrigerants, including R-454B, contain components classified as “HFO” refrigerants. It should be noted that the industry in Europe has recently focused on “HFO” refrigerants as a contributor to PFAS in the environment and may be facing future regulations.

Building codes must also be updated and the State adoption of these updated codes must be in place in time to allow for A2L refrigerants.

How are Modine and other industry peers addressing the change?

For Modine and other peers to start manufacturing products to go to market, the refrigerant sub-system needs to be A2L capable. The compressor and valve suppliers are currently updating their product offerings to be A2L capable. Modine and most of the light commercial industry have selected to use the A2L classified R-454B refrigerant due to it being the lowest GWP option with performance similar to R-410A.

Modine is taking a two-step approach to become A2L compliant. Step one is working on the transition from UL 1995 to UL 60335 compliance to ensure that flammability-related safety is in place by Jan 2024 for Electrical Heat Pumps, Air-Conditioners, and Dehumidifiers. These requirements will be discussed further on the next page. The second step is a conversion from R-410A to R-454B refrigerant which will be in place by January 2025.

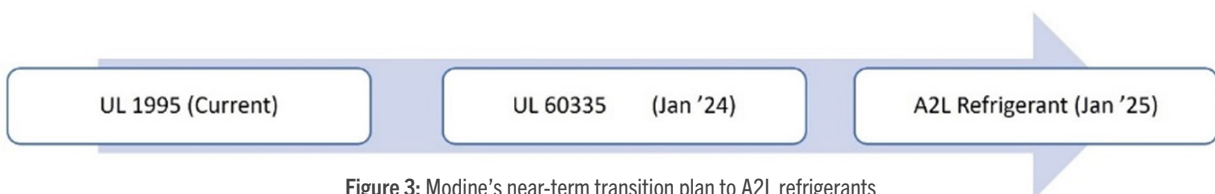


Figure 3: Modine's near-term transition plan to A2L refrigerants

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Requirements for Refrigerant Leak Detection Systems per UL 60335

1. The new design with the R-454B refrigerant, will have Indicating type detectors factory installed with sensors optimally located to detect any leaks.
2. The refrigerant leak detector sensor set point will be factory set and sealed and will not allow any field adjustment. This is a requirement per UL60335 certification.
3. The leak detection system will be designed to activate at a maximum concentration of < 25% of the Lower Flammability Limit of the refrigerant being used in the equipment. This 4-times safety factor helps ensure flammable concentrations are not reached. This will be tested as a part of the product development testing.
4. In case of leaks, the control system will be programmed such that the detectors will turn on devices such as circulation fans. This will dilute the refrigerant concentration of the air inside the ventilated space to limits lower than the flammable limit.
5. Controls will have self-test protocols run at the cadence of every hour to ensure proper operation and function. This fail-safe mode is maintained until the detector is replaced.
6. The sensor in the unit shall not be subject to poisoning due to common household and workplace contaminants that would damage the sensor or produce false alarms or nuisance trips per UL 60335-2-40. This testing requirement will be met as a part of the product development testing.

What do Modine reps need to know?

The use of these new A2L refrigerants will require that the building codes of states, cities, and municipalities be updated before widespread adoption. Most of these requirements will be written into UL 60335-2-40, ASHRAE 34, and ASHRAE 15 - "Safety Standard for Refrigeration Systems". The building codes should allow for enough ventilation to dilute the concentration of the ventilated air.

While equipment safety protocols will fall on manufacturers, the site-related safety protocols will fall on the technicians and the contractors. Safety training and site analysis of space constraints (too small to handle catastrophic leaks) will be part of the contractors' responsibilities, including refrigerant safety training, such as to EPA 608 - "Technician Certification Program". There is a training available for flammable refrigerants that you can find provided by the Air Conditioning Contractors of America (ACCA) and by the North American Technician Excellence (NATE) in addition to other trainers.

References

1. [The Road to Zero: DOE's Next-Generation Heating and Cooling R&D Strategy | Department of Energy \(energy.gov\)](#)
2. [EPA Moves Forward with Phase Down of Climate-Damaging Hydrofluorocarbons | US EPA \(epa.gov\)](#)
3. [Restrictions on Certain Uses of Hydrofluorocarbons Under Subsection \(i\) of the American Innovation and Manufacturing Act \(reginfo.gov\)](#)
4. [Easing Concerns about Refrigerant Flammability | Northeast Energy Efficiency Partnerships \(neep.org\)](#)
5. [New Refrigerant Codes and Standards - MEP Academy \(mepacademy.com\)](#)
6. [California Bans Sale of Bulk R-410A and Other HFCs | ACHR News \(achrnews.com\)](#)