

Hydrofluorocarbon Phasedown

PURPOSE

This Operating Experience Level 3 (OE-3) document provides information about recently issued regulations that will restrict supplies of hydrofluorocarbons (HFCs). HFCs are a class of chemicals used as refrigerants, in fire suppression systems, and in certain scientific equipment. HFCs are greenhouse gases (GHGs) with global warming potentials (GWPs) hundreds to thousands of times higher than carbon dioxide.

The United States (U.S.) Environmental Protection Agency (EPA) is implementing the HFC phasedown requirements of the American Innovation and Manufacturing (AIM) Act of 2020. EPA regulations will likely increase the cost and decrease the availability of certain HFCs. Therefore, Department of Energy programs and sites should begin planning for the HFC phasedown now to preclude potential impacts on operations and/or mission.

BACKGROUND

HFCs were developed and manufactured to replace chlorofluorocarbons (CFCs), which damage the stratospheric ozone layer. The Montreal Protocol, a 1987 international agreement, phased out the production of CFCs. HFCs were the primary substitutes for CFCs as refrigerants, solvents, fire suppressants, foam blowing agents, and aerosols. Although HFCs do not damage the stratospheric ozone layer, they are potent GHGs that accelerate climate change. The Kigali Amendment to the Montreal Protocol, negotiated in 2016, addresses the growing climate impact of HFCs by establishing a gradual international phase-down of their production and consumption.

EPA has previously regulated CFCs by restricting use (consumption) and production. EPA has indicated that it will follow a similar methodology for HFCs, including a gradual phasedown of HFCs through 2036 and HFC prohibitions for specific uses and equipment. EPA is also expected to propose regulations requiring collection and reclamation of HFCs from equipment and training for technicians servicing equipment containing HFCs.

A list of the regulated HFCs is provided in Table 1, from Title 42, U.S. Code, §7675.

Table 1: Regulated HFC

Common Name	Chemical Abstracts Service Registry Number
HFC-134	359-35-3
HFC-134a	811-97-2
HFC-143	430-66-0
HFC-245fa	460-73-1
HFC-365mfc	406-58-6
HFC-227ea	431-89-0
HFC-236cb	677-56-5
HFC-236ea	431-63-0
HFC-236fa	690-39-1
HFC-245ca	679-86-7
HFC-43-10mee	138495-42-8
HFC-32	75-10-5
HFC-125	354-33-6
HFC-143a	420-46-2
HFC-41	593-53-3
HFC-152	624-72-6
HFC-152a	75-37-6
HFC-23	75-46-7

The consumption and production phasedown schedule are provided in Table 2, from Title 40, Code of Federal Regulations (CFR), §84.7(a).

Table 2: HFC Phasedown Schedule

Years	Percent of Baseline	Percent Reduction
2011-2013 (Baseline)	100%	0%
2020-2023	90%	10%
2024-2028	60%	40%
2029-2033	30%	70%
2034-2035	20%	80%
2036 onwards	15%	85%

DISCUSSION

Manufacturing facilities will curtail HFC production and importers will reduce incoming HFCs to meet the phasedown schedule for each year. Reclaimed or recycled HFCs imported into the U.S. would be considered consumption and counted towards the phasedown schedule; however, HFCs reclaimed or recycled within the U.S. are not subject to the consumption or production phasedown schedule.

To meet the phasedown schedule, manufacturers are expected to first reduce production of HFCs with high GWP and low production quantities (i.e., specialty blends with few consumers). As new refrigeration equipment and alternative compounds are developed and become commercially available, EPA expects fewer HFCs will need to be manufactured each year.

The AIM Act also authorizes EPA to establish sector-specific or equipment-specific standards for HFCs. EPA will be proposing regulations prohibiting HFC use in new equipment and prohibit further transfers of existing equipment from CFC to HFC.

CONSIDERATIONS

Since EPA has issued a regulation reducing the manufacture and import of HFCs and will be issuing future regulations restricting the use of HFCs in new equipment, DOE programs and sites should plan for a decrease in availability and an increase in cost of HFCs. DOE sites are encouraged to identify the types of HFCs used, the equipment using HFCs, and the quantity of HFCs required to sustain operations. EPA expects commercial entities to deploy already developed alternatives to HFCs and continue research on new replacement materials; however, the unique needs of and specialized equipment used by DOE may not allow the ready use of HFC alternatives.

For DOE uses of HFCs where commercial alternatives are not available or currently viable, there are three primary options for ensuring an adequate supply of existing HFCs:

1. Obtain an essential use allocation allowance for an approved HFC use;
2. Create an onsite HFC repository; and,
3. Develop HFC capture and reclamation systems on existing equipment to collect and reuse HFCs.

The AIM Act and EPA authorizing regulations establish essential use allocation allowances that give priority to certain manufactured HFCs within the phasedown schedule cap. Essential use allocation allowances are available for medical inhalers, defense sprays, onboard aerospace fire suppression, semiconductor manufacturing, and mission-critical military end uses.

With the exception of mission-critical military end use, EPA reviews and assigns allowances to manufacturers and importers. For mission-critical military end use, EPA has designated the U.S. Department of Defense (DoD) as the agency responsible for managing and assigning allowances.

Although allocation allowances assign priority to produced HFCs, they do not compel the manufacture or import of specific HFCs. DOE and National Nuclear Security Administration sites pursuing an essential use allocation allowance must provide EPA or DoD with sufficient justification as to why the process qualifies for an allocation. Essential use allocations must be renewed annually, and EPA will review the essential use allocation allowance program every five years.

An onsite HFC repository is a stockpile for the long-term storage of HFCs. Repositories are not prohibited under the AIM Act or EPA regulations. In response to the Montreal Protocol, DOE, DoD, and several private entities created repositories for mission-critical CFC; an HFC repository would fulfill a similar need. The DOE Clean Air Working Group (CAWG) is currently working with several DOE sites to compile best management practices for developing and managing an HFC repository.

Finally, there is no prohibition in the AIM Act or EPA authorizing regulations for the reuse of HFCs from existing processes. EPA is expected to issue additional regulations for the capture and reclamation of HFCs, similar to existing regulations for the capture and reclamation of CFCs. EPA expects a secondary market for reclaimed HFCs, much like the secondary market for reclaimed CFCs. However, DOE sites with stringent purity requirements for specific applications may find that the secondary HFC market may be unable to meet their needs.

The CAWG will continue to work with DOE sites to develop best practices for identifying site HFC use, requesting essential use allowance allocations, planning for HFC curtailment, and implementing HFC capture and reclamation strategies. The CAWG will also continue to publish advisories on proposed EPA HFC regulations.

To participate in the CAWG, contact Ashley L. Ruocco, CAWG Chair, Office of Sustainable Environmental Stewardship (AU-21) at 301-903-7010 or ashley.ruocco@hq.doe.gov.

REFERENCES & ADDITIONAL INFORMATION

42 U.S. Code §7675 – [American Innovation and Manufacturing Act](#)

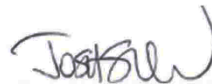
40 CFR, Part 84 – [Phasedown of HFC](#)

86 FR 55116, October 5, 2021 – [2022 HFC Allocations](#)

86 FR 57141, October 14, 2021 – [Notice to Grant Petitions for Sector-Specific HFC Regulations](#)

EPA – [Protecting Our Climate by Reducing Use of HFC](#)

Questions regarding this OE-3 document can be directed to Ashley L. Ruocco at 301-903-7010 or ashley.ruocco@hq.doe.gov. This OE-3 document requires no follow-up report or written response.



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