

EPA Administrator Gina McCarthy signed the following document on July 24, 2014, and EPA is submitting it for publication in the Federal Register (FR). While we have taken steps to ensure the accuracy of this Internet version of the document, it is not the official version. Please refer to the official version in a forthcoming FR publication, which will appear on the Government Printing Office's FDSys website (<http://fdsys.gpo.gov/fdsys/search/home.action>). {It will also appear on Regulations.gov (<http://www.regulations.gov>) in Docket No. EPA-HQ-OAR-2009-0927}.

6560-50

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 98

[EPA-HQ-OAR-2009-0927; FRL- 9913-03-OAR]

RIN 2060-AS28

Greenhouse Gas Reporting Program: Addition of Global Warming Potentials

AGENCY: Environmental Protection Agency.

ACTION: Proposed rule.

SUMMARY: The Environmental Protection Agency (EPA) is proposing to add chemical-specific and default global warming potentials (GWPs) for a number of fluorinated greenhouse gases (GHGs) and fluorinated heat transfer fluids (HTFs) to the general provisions of the Greenhouse Gas Reporting Rule. Currently, these fluorinated GHGs and HTFs are not assigned GWPs under the rule. The proposed changes would increase the completeness and accuracy of the carbon dioxide (CO₂)-equivalent emissions calculated and reported by suppliers and emitters of fluorinated GHGs and HTFs. In addition, the EPA is proposing conforming changes to the provisions for the Electronics Manufacturing and Fluorinated Gas Production source categories.

DATES: Comments must be received on or before [INSERT DATE 30 DAYS AFTER PUBLICATION IN THE FEDERAL REGISTER], unless a hearing is requested. If a hearing is

requested, comments must be received on or before [INSERT DATE 45 DAYS AFTER PUBLICATION IN THE FEDERAL REGISTER].

Public Hearing. The EPA does not plan to conduct a public hearing unless requested. To request a hearing, please contact the person listed in the following **FOR FURTHER INFORMATION CONTACT** section by [INSERT DATE 7 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]. Upon such request, the EPA will hold the hearing on [INSERT DATE 15 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER], in the Washington, DC area. The EPA will provide further information about the hearing on the Greenhouse Gas Reporting Program website, <http://www.epa.gov/climatechange/emissions/ghgrulemaking.html> if a hearing is requested.

ADDRESSES: You may submit your comments, identified by Docket ID No. EPA-HQ-OAR-2009-0927, by any of the following methods:

- Federal eRulemaking Portal: <http://www.regulations.gov>. Follow the online instructions for submitting comments.
- Email: A-and-R-Docket@epa.gov. Include Docket ID No. EPA-HQ-OAR-2009-0927 in the subject line of the message.
- Fax: (202) 566-9744.
- Mail: Environmental Protection Agency, EPA Docket Center (EPA/DC), Mailcode 28221T, Attention Docket ID No. EPA-HQ-OAR-2009-0927, 1200 Pennsylvania Avenue, NW, Washington, DC 20460.
- Hand/Courier Delivery: EPA Docket Center, Room 3334, EPA WJC West Building, 1301 Constitution Avenue, NW, Washington, DC 20004. Such deliveries are accepted only during the Docket's normal hours of operation, and special arrangements should be made for deliveries of boxed information.

Instructions: Direct your comments to Docket ID No. EPA-HQ-OAR-2009-0927,

Addition of Global Warming Potentials. The EPA's policy is that all comments received will be included in the public docket without change and may be made available online at

<http://www.regulations.gov>, including any personal information provided, unless the comment

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includes information claimed to be confidential business information (CBI) or other information whose disclosure is restricted by statute. Should you choose to submit information that you claim to be CBI in response to this notice, clearly mark the part or all of the comments that you claim to be CBI. For information that you claim to be CBI in a disk or CD-ROM that you mail to the EPA, mark the outside of the disk or CD-ROM as CBI and then identify electronically within the disk or CD-ROM the specific information that is claimed as CBI. In addition to one complete version of the comment that includes information claimed as CBI, a copy of the comment that does not contain the information claimed as CBI must be submitted for inclusion in the public docket. Information marked as CBI will not be disclosed except in accordance with procedures set forth in 40 CFR part 2. Send or deliver information claimed as CBI to only the mail or hand/courier delivery address listed above, attention: Docket ID No. EPA-HQ-OAR-2009-0927.

If you have any questions about CBI or the procedures for claiming CBI, please consult the person identified in the **FOR FURTHER INFORMATION CONTACT** section. Do not submit information that you consider to be CBI or otherwise protected through <http://www.regulations.gov> or email. The <http://www.regulations.gov> website is an “anonymous access” system, which means the EPA will not know your identity or contact information unless you provide it in the body of your comment. If you send an email comment directly to the EPA without going through <http://www.regulations.gov>, your email address will be automatically captured and included as part of the comment that is placed in the public docket and made available on the Internet. If you submit an electronic comment, the EPA recommends that you include your name and other contact information in the body of your comment and with any disk or CD-ROM you submit. If the EPA cannot read your comment due to technical difficulties and cannot contact you for clarification, the EPA may not be able to consider your comment.

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Electronic files should be free of special characters, any form of encryption, and any defects or viruses.

Docket: All documents in the docket are listed in the <http://www.regulations.gov> index. Although listed in the index, some information is not publicly available (e.g., CBI or other information whose disclosure is restricted by statute). Certain other material, such as copyrighted material, will be publicly available only in hard copy. Publicly available docket materials are available either electronically in <http://www.regulations.gov> or in hard copy at the Air Docket, EPA/DC, WJC West Building, Room 3334, 1301 Constitution Ave. NW, Washington, DC. This Docket Facility is open from 8:30 a.m. to 4:30 p.m., Monday through Friday, excluding legal holidays. The telephone number for the Public Reading Room is (202) 566-1744, and the telephone number for the Air Docket is (202) 566-1742.

FOR FURTHER INFORMATION CONTACT: Carole Cook, Climate Change Division, Office of Atmospheric Programs (MC-6207J), Environmental Protection Agency, 1200 Pennsylvania Ave. NW, Washington, DC 20460; telephone number: (202) 343-9263; fax number: (202) 343-2342; email address: GHGReporting@epa.gov. For technical information, please go to the Greenhouse Gas Reporting Rule Program website at <http://www.epa.gov/climatechange/emissions/ghgrulemaking.html>. To submit a question, select Rule Help Center, followed by Contact Us. To obtain information about the public hearing or to register to speak at the hearing, please go to <http://www.epa.gov/climatechange/emissions/ghgrulemaking.html>. Alternatively, contact Carole Cook at (202) 343-9263.

Worldwide Web (WWW). In addition to being available in the docket, an electronic copy of this proposal will also be available through the WWW. Following the Administrator's

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signature, a copy of this action will be posted on the EPA's Greenhouse Gas Reporting Program website at <http://www.epa.gov/climatechange/emissions/ghgrulemaking.html>.

SUPPLEMENTARY INFORMATION:

Regulated Entities. The Administrator determined that this action is subject to the provisions of Clean Air Act (CAA) section 307(d). See CAA section 307(d)(1)(V) (the provisions of section 307(d) apply to “such other actions as the Administrator may determine”). These are proposed amendments to existing regulations. If finalized, these amended regulations would affect emitters and suppliers of fluorinated greenhouse gases (GHGs). Regulated categories and examples of affected entities include those listed in Table 1 of this preamble:

Table 1. Examples of Affected Entities by Category

Category	NAICS	Examples of affected facilities
Electrical Equipment Use	221121	Electric bulk power transmission and control facilities.
Electrical Equipment Manufacture or Refurbishment	33531	Power transmission and distribution switchgear and specialty transformers manufacturing facilities.
Electronics Manufacturing	334111	Microcomputers manufacturing facilities.
	334413	Semiconductor, photovoltaic (solid-state) device manufacturing facilities.
	334419	Liquid Crystal Display (LCD) unit screens manufacturing facilities.
	334419	Micro-electro-mechanical systems (MEMS) manufacturing facilities.
Fluorinated Gas Production	325120	Industrial gases manufacturing facilities.
Importers and Exporters of Pre-charged Equipment and Closed-Cell Foams	423730	Air-conditioning equipment (except room units) merchant wholesalers.
	333415	Air-conditioning equipment (except motor vehicle) manufacturing.
	336391	Motor vehicle air-conditioning manufacturing.
	423620	Air-conditioners, room, merchant wholesalers.
	443111	Household appliance stores.
	423730	Automotive air-conditioners merchant wholesalers.
	326150	Polyurethane foam products manufacturing.

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Category	NAICS	Examples of affected facilities
	335313	Circuit breakers, power, manufacturing.
	423610	Circuit breakers merchant wholesalers.
Magnesium Production	331419	Primary refiners of nonferrous metals by electrolytic methods.

Table 1 of this preamble is not intended to be exhaustive, but rather lists the types of facilities that the EPA is now aware could be potentially affected by the reporting requirements. Other types of facilities not listed in the table could also be subject to reporting requirements. To determine whether you are affected by this action, you should carefully examine the applicability criteria found in 40 CFR part 98, subpart A or the relevant criteria in subparts I, L, T, DD, SS, OO, and QQ. If you have questions regarding the applicability of this action to a particular facility, consult the person listed in the preceding **FOR FURTHER INFORMATION CONTACT** section.

Acronyms and Abbreviations. The following acronyms and abbreviations are used in this document.

AR4	Fourth Assessment Report
AR5	Fifth Assessment Report
BAMM	Best available monitoring methods
CAA	Clean Air Act
CBI	Confidential business information
CFC	Chlorofluorocarbon
CFR	Code of Federal Regulations
CO ₂	Carbon dioxide
CO ₂ e	CO ₂ -equivalent
e-GGRT	Electronic Greenhouse Gas Reporting Tool
EPA	U.S. Environmental Protection Agency
FLIGHT	Facility Level Information on Greenhouse Gases Tool
FR	Federal Register
GHG	Greenhouse gas

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GHGRP	Greenhouse Gas Reporting Program
GWP	Global warming potential
HCFC	Hydrochlorofluorocarbon
HCFE	Hydrochlorofluoroether
HFC	Hydrofluorocarbon
HFE	Hydrofluoroether
HTF	heat transfer fluid
IPCC	Intergovernmental Panel on Climate Change
LCD	Liquid crystal display
MEMS	Micro-electro-mechanical systems
MtCO ₂ e	Metric tons carbon dioxide equivalent
N ₂ O	Nitrous oxide
NAICS	North American Industry Classification System
NF ₃	Nitrogen trifluoride
NODA	Notice of data availability
NTTAA	National Technology Transfer and Advancement Act
OMB	Office of Management and Budget
PFC	Perfluorocarbon
RFA	Regulatory Flexibility Act
RY	Reporting year
SAR	Second Assessment Report
SF ₆	Sulfur hexafluoride
SIP	State implementation plan
PSD	Prevention of significant deterioration
UMRA	Unfunded Mandates Reform Act of 1995
UNFCCC	United Nations Framework Convention on Climate Change
WWW	Worldwide Web

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I. Background

A. How is this Preamble Organized?

The first section of this preamble contains background information regarding the Greenhouse Gas Reporting Program (GHGRP) and information on when the amendments would become effective if finalized. This section also discusses the EPA's use of our legal authority under the Clean Air Act (CAA) to collect data under the Greenhouse Gas Reporting Rule at 40 CFR part 98, hereinafter referred to as the "GHG Reporting Rule" or "Part 98."

The second section of this preamble describes in detail the changes that we are proposing, presents the EPA's rationale for the proposed changes, and identifies issues on which the EPA is particularly interested in receiving public comments.

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Finally, the third section of the preamble discusses the various statutory and executive order requirements applicable to this proposed rulemaking.

B. Background on the GHG Reporting Rule

The GHG Reporting Rule was published in the Federal Register on October 30, 2009 (74 FR 56260). Part 98 became effective on December 29, 2009, and requires reporting of GHGs from certain facilities and suppliers. The October 30, 2009 final rule established reporting requirements for 28 categories of GHG emitters and suppliers, including Suppliers of Industrial Greenhouse Gases (including producers, importers, and exporters of fluorinated GHGs), subpart OO. A notice finalizing reporting requirements for Magnesium Production, subpart T, was published on July 12, 2010 (75 FR 39736). A notice finalizing reporting requirements for the following categories was published on December 1, 2010 (75 FR 74774): Electronics Manufacturing, subpart I; Fluorinated Gas Production, subpart L; Electrical Transmission and Distribution Equipment Use, subpart DD; Importers and Exporters of Fluorinated Greenhouse Gases Contained in Pre-Charged Equipment or Closed-Cell Foams, subpart QQ; and Electrical Equipment Manufacture or Refurbishment, subpart SS.

C. Legal Authority

The EPA is proposing these rule amendments under its existing CAA authority provided in CAA section 114. As stated in the preamble to the 2009 final rule (74 FR 56260), CAA section 114 provides the EPA broad authority to require the information addressed in this proposed rule because such data would inform and are relevant to the EPA's carrying out a wide variety of CAA provisions.

D. When would these amendments apply?

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The EPA anticipates publishing a final rule based on this proposal in time for the final rule to be effective for the reporting of data gathered in 2014 (i.e., Reporting Year 2014), which must be reported to the EPA by March 31, 2015.

II. Proposed Amendments

A. Summary of Proposed Amendments

The EPA is proposing to amend Table A-1 to subpart A of 40 CFR part 98 (Table A-1), the compendium of GWPs used to calculate carbon-dioxide equivalents (CO₂e) under the GHGRP, to add chemical-specific GWPs for 103 fluorinated GHGs. The proposed chemical-specific GWPs are primarily drawn from the Fifth Assessment Report (AR5) published by the Intergovernmental Panel on Climate Change (IPCC) in 2013, which is discussed further in Section II.B. of this preamble.¹

The EPA is also proposing to amend Table A-1 to add default GWPs for fluorinated GHGs and fluorinated HTFs for which peer-reviewed GWPs are not available. These default GWPs would be calculated and assigned based on fluorinated GHG group and would be based on the chemical-specific GWPs for the compounds in Table A-1 as it would be amended under today's proposal.

In addition, as discussed further in sections II.D. and II.E. of this preamble, we are proposing conforming changes to subparts I and L, which include their own default GWPs for purposes of certain CO₂e calculations.

¹ IPCC, 2013: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F., D. Qin, G.K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 1535 pp.

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This amendment would generally not affect the GWPs of the GHGs currently included in Table A-1.² As discussed further in Section III.B of this preamble, we do not anticipate that finalizing the GWPs proposed in this action would expand the set of facilities required to report under the Greenhouse Gas Reporting Rule. However, to allow for the possibility that some facilities or suppliers could become newly subject to one or more subparts of part 98 due to the addition of the GWPs, we are proposing special provisions for these facilities regarding the timing of reporting and the use of best available monitoring methods (BAMM).

Except in the case of subpart L, which is discussed in Section II.D. of this preamble, reporters would not be required to resubmit their CO₂e emissions for prior years. Instead, for facilities affected by this rulemaking, we would recalculate CO₂e emissions for Reporting Years (RY) 2010-2013 and publish them in our Facility Level Information on Greenhouse Gases Tool (FLIGHT) using the most recent and comprehensive GWPs in Table A-1. This is the same approach that we finalized in the final rule entitled “2013 Revisions to the Greenhouse Gas Reporting Rule and Final Confidentiality Determinations for New or Substantially Revised Data Elements” (78 FR 71904, November 29, 2013; hereinafter referred to as “final 2013 Revisions Rule”), except that this recalculation would occur in 2015 rather than 2014.

B. Background on GHGRP GWPs

Table A-1 is a compendium of GWP values of certain GHGs that are required to be reported under one or more subparts of the Greenhouse Gas Reporting Rule. These GWPs are used to convert tons of chemical into tons of CO₂-equivalent (CO₂e) for purposes of various calculations and reporting under the rule. As indicated in the Federal Register notice for the final Part 98 (74 FR 56348), it is the EPA’s intent to periodically update Table A-1 as GWPs are

² The sole exception is the GWP for sevoflurane, which is proposed to be amended here because a GWP for this chemical is available in AR5 but was not included in previous IPCC Assessment Reports.

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evaluated or reevaluated by the scientific community. This will provide a more accurate and complete account of the atmospheric impacts of GHG emissions and supplies.

GWPs that have been newly evaluated or reevaluated in the peer-reviewed scientific literature are periodically consolidated and published by the IPCC. The initial Table A-1 finalized in the 2009 Greenhouse Gas Reporting Rule included GWP values from the Second Assessment Report (SAR) and, for gases that were not included in SAR, from the Fourth Assessment Report³ (hereinafter referred to as “IPCC AR4” or “AR4”). (In addition, Table A-1 included a GWP for one fluorinated GHG that had been published in the peer-reviewed literature but not an IPCC report, the GWP for sevoflurane.)⁴ The IPCC recently published AR5, which contains GWPs for a number of fluorinated GHGs that were not included in either SAR or AR4.

The scope of the fluorinated compounds reported under the GHGRP is established by the definition of “fluorinated GHG” at 40 CFR 98.6 (and, for subpart I, “fluorinated HTF” at 40 CFR 98.98), rather than by inclusion in Table A-1. The EPA therefore receives reports of emissions and supplies for a number of fluorinated compounds that have not had GWPs included in Table A-1.⁵ At present, these supplies, and a large fraction of these emissions, are assigned a GWP of zero for purposes of GHGRP calculations and reporting, including threshold determinations.⁶

³ IPCC Fourth Assessment Report (AR4), 2007. *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [Core Writing Team, Pachauri, R.K and Reisinger, A. (eds.)]. IPCC, Geneva, Switzerland, 104 pp.

⁴ Langbein, T., H. Sonntag, D. Trapp, A. Hoffmann, W. Malms, E.-P. Röth, V. Mörs and R. Zellner (1999). “Volatile anaesthetics and the atmosphere: atmospheric lifetimes and atmospheric effects of halothane, enflurane, isoflurane, desflurane and sevoflurane.” *British Journal of Anaesthetics* 82 (1): 66-73, discussed in the Technical Support Document for Industrial Gas Supply: Production, Transformation, and Destruction of Fluorinated GHGs and N₂O, Office of Air and Radiation, USEPA, February 6, 2009.

⁵ Such reports have been received under subparts I, L, OO, and QQ.

⁶ For most subparts, including subparts I, OO, and QQ, reporters are required to report CO₂e only for fluorinated GHGs listed in Table A-1. Subpart I includes a default GWP of 2,000 for purposes of various calculations (but not reporting) as discussed in section II.E. of this preamble. Subpart L includes default GWPs of 2,000 and 10,000 for This document is a prepublication version, signed by EPA Administrator Gina McCarthy on July 24, 2014. We have taken steps to ensure the accuracy of this version, but it is not the official version.

1. Recent Actions Related to GHGRP GWPs

The EPA has recently undertaken several efforts to improve the quality and completeness of the GWPs used to calculate and report emissions under the GHGRP. On November 29, 2013, we published the final 2013 Revisions Rule. That rule amended Table A-1 to update the GWPs for GHGs included in AR4 to the AR4 values. The revisions improved the quality of reported CO₂e emissions and supply by reflecting improved scientific understanding (since the publication of SAR) of the radiative forcing and atmospheric lifetimes of the GHGs that have GWPs in AR4. In addition, for those GHGs, the revisions ensured comparability of data collected in the GHGRP to the Inventory of U.S. Greenhouse Gas Emissions and Sinks that the EPA compiles annually to meet international commitments under the United Nations Framework Convention on Climate Change (UNFCCC). Countries that submit GHG inventories under the UNFCCC have decided to use AR4 GWPs for the GHGs that have AR4 GWPs, beginning with the inventories submitted in 2015.⁷

In the proposed 2013 Revisions Rule, we proposed to adopt GWPs for 26 additional fluorinated GHGs not included in Table A-1 or AR4. The EPA received comments on the proposed 2013 Revisions Rule stating that we should not include GWPs in Table A-1 for compounds that are not included in an IPCC report or peer reviewed. We did not include these GWPs in the final 2013 Revisions Rule because we agreed with commenters that we needed additional time to evaluate our approach to assigning GWPs for compounds not included in AR4.

purposes of both calculations and reporting. Under the amendments to subpart L discussed below, these two default GWPs would be replaced by five default GWPs.

⁷ As discussed in the notices for the proposed and final 2013 Revisions Rule, the IPCC publishes Scientific Assessment Reports, including updated and expanded sets of GWPs, approximately every six years. The countries that submit annual GHG inventories under the UNFCCC update the GWPs that they use for those inventories less frequently. For example, the GWPs from the IPCC SAR have been used for UNFCCC reporting for over a decade. This document is a prepublication version, signed by EPA Administrator Gina McCarthy on July 24, 2014. We have taken steps to ensure the accuracy of this version, but it is not the official version.

In the preamble to the final rule, we noted that we might address these compounds in a separate future action.

On April 5, 2013, we published a Notice of Data Availability (NODA) (78 FR 20632) regarding another 43 fluorinated GHGs and HTFs whose GWPs were not included in Table A-1.⁸ The NODA announced to the public the following: (1) the availability of estimated GWPs for eight of these compounds, as well as data and analysis submitted in support of these values, and (2) the availability of approximate GWPs and/or chemical structure information for another 35 compounds, for whose GWPs we did not possess supporting data and analysis. We requested and received comment on this information.

On November 18, 2013, we proposed amendments to subpart L, Fluorinated Gas Production, that included an amendment to establish within subpart L a new set of default GWPs by fluorinated GHG group for the emissions calculated and reported under that subpart (78 FR 69337; hereinafter referred to as “proposed amendments to subpart L”). The proposed set of five default GWPs would replace the current set of two default GWPs in subpart L that are applied to fluorinated GHGs that are not included in Table A-1, which would increase the precision and accuracy of calculated CO₂e emissions. We requested and received comments on the proposed fluorinated GHG groups and associated default GWPs included in the proposed amendments to subpart L.

2. Summary of Comments Related to Addition of GWPs

The EPA received five comments on the NODA and five comments on the proposed 2013 Revisions Rule that were related to the proposed addition of the GWPs for 26 fluorinated

⁸ We had not included these compounds in the proposed 2013 Revisions Rule because documentation for GWPs for these compounds was limited at the time that the proposal was being prepared. We subsequently received more documentation from the compounds’ manufacturers.

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GHGs. A detailed summary of and response to all comments received on the proposed 2013 Revisions Rule is provided in the docket for that final rule (EPA-HQ-OAR-2012-0934). We are presenting an overview here because some of those comments have also informed the approach we are proposing under this rule for establishing chemical-specific and default GWPs for additional fluorinated GHGs in Table A-1. We also received three comments on the proposed amendments to subpart L that were related to the proposed addition of GWPs to Table A-1. We discuss those comments in this notice to the extent relevant to the approach we are proposing in this action.

Several commenters on the actions noted above supported adding GWPs to Table A-1 for the compounds included in the proposed 2013 Revisions Rule and NODA. Commenters stated that to characterize emissions and trends effectively, it is important for the EPA to use the most recent and accurate GWP values available. Other commenters stated that the EPA should add new GWPs to Table A-1 only after these GWPs have been included in an IPCC Scientific Assessment Report. They argued that GWPs that have been published in IPCC reports are less likely to change over time, and are likely to change less significantly, than GWPs that have been derived through “a less rigorous scientific process.”

C. Today's Proposed Rule

1. General Approach to Addition of GWPs to Table A-1

As noted in the final 2013 Revisions Rule, the EPA intends to weigh multiple considerations in updating the set of GWPs used under the GHGRP. These include the accuracy of the GWPs, the consistency of those GWPs with the GWPs used in other national and international programs, the predictability and stability of the GWPs, the source of the GWPs, and the impacts of those GWPs on other regulatory programs. We are weighing these considerations

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for this proposed rule as we did in developing the final 2013 Revisions Rule. However, there is an important difference between the two rules. In the final 2013 Revisions Rule, we weighed these considerations primarily in the context of updating the GWPs for GHGs that were already listed in Table A-1. In this proposed rule, we are weighing these considerations in the context of proposing to add GWPs for GHGs that are not presently included in Table A-1. For such GHGs, the improvement in accuracy associated with listing a GWP in Table A-1 is likely to be large, because the alternative is generally to continue to assign these GHGs a GWP of zero for purposes of the calculations and reporting under the GHGRP. Moreover, such GHGs are not included in AR4; thus, using GWPs from other sources does not introduce inconsistencies for purposes of UNFCCC reporting.

The EPA is proposing to add chemical-specific and default GWPs to Table A-1 to balance and carry out the goals listed above as efficiently and effectively as possible. For the chemical-specific GWPs that would be added to Table A-1, we are proposing to rely on AR5 and, in one case, on AR4. For the default GWPs, we are proposing to rely on GWPs from AR5 and AR4, supplemented by consideration of atmospheric lifetimes and radiative efficiencies from the peer-reviewed literature.

a. General Approach to Chemical-Specific GWPs

For the fluorinated GHGs that do not have GWPs listed in AR4, but that do have GWPs listed in AR5, we are proposing through this action to adopt the chemical-specific GWPs in AR5. This approach would ensure that, for this set of GHGs, the GWPs used by the GHGRP would be consistent with the most recent international scientific consensus. As discussed above, in the final 2013 Revisions Rule, we adopted AR4 GWPs for the GHGs that were included in AR4. We noted that where reporting under the UNFCCC is linked to an older report (e.g., AR4

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for the GHGs with GWPs listed in AR4), use of the GWPs from a newer report would introduce inconsistencies between the GWPs used in the GHGRP and those used in the U.S. Inventory of Greenhouse Gas Emissions and Sinks. However, where UNFCCC reporting is not linked to an older report, such inconsistencies are not a concern. In fact, adopting the AR5 GWPs would facilitate U.S. reporting under the UNFCCC Reporting Guidelines, which state: “Annex I Parties are strongly encouraged to also report emissions and removals of additional GHGs, such as hydrofluoroethers (HFEs), perfluoropolyethers (PFPEs), and other gases for which 100-year global warming potential values are available from the IPCC but have not yet been adopted by the [Conference of the Parties to the UNFCCC].”⁹

To list chemical-specific GWPs on Table A-1, the EPA believes that it is appropriate to require that these GWPs have been published in a peer-reviewed scientific journal. This helps to ensure that the data and methods used to evaluate the GWPs are consistent with current scientific good practice and thereby helps to ensure that the resulting GWPs are accurate. The EPA acknowledges that, in some cases, this will prevent the listing of GWPs that have not been published in the peer-reviewed literature but that may nevertheless be reasonably accurate. For example, eight of the GWPs discussed in the NODA and 11 of the GWPs that we proposed in the proposed 2013 Revisions Rule were supported by some data and analysis; however, we are not proposing these GWPs in this action because they have not been published in the peer-reviewed literature. We consider it important to adopt a clear, widely accepted criterion of scientific acceptance for including chemical-specific GWPs on Table A-1, which is intended to serve as the compendium of chemical-specific GWPs for the GHGRP. We believe that publication in a peer-reviewed scientific journal meets this standard.

⁹ Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I:UNFCCC reporting guidelines on annual greenhouse gas inventories, FCCC/CP/2013/10/Add.3.

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The chief concern raised by requiring that chemical-specific GWPs on Table A-1 be peer-reviewed is that omission of a GWP that may be somewhat inaccurate could lead to the use of an effective GWP (zero) that is known to be very inaccurate. We believe that concern is addressed by the proposed establishment of default GWPs, discussed below.

Our proposal to adopt GWPs from a newer IPCC Assessment Report (AR5) for compounds not listed in the older IPCC Assessment Report required for UNFCCC reporting (AR4) is consistent with the approach we took in the original Table A-1. At the time we created the original Table A-1, the IPCC had already issued AR4, but the UNFCCC reporting guidelines required use of the GWPs in the IPCC SAR for compounds listed in that report. As discussed above, the original Table A-1 included GWPs from the SAR for the GHGs that had GWPs in the SAR and GWPs from AR4 for the GHGs that did not have GWPs in the SAR but did in AR4 (e.g., NF₃). This ensured that the chemical-specific GWPs were both consistent with those used for UNFCCC reporting and as accurate and complete as practicable. Table A-1 also included a peer-reviewed GWP for a GHG that did not have a GWP in either the SAR or AR4 (sevoflurane). While we are not proposing in this action to add chemical-specific GWPs for GHGs that do not have a GWP in either of the most recent assessment reports, we may propose such additions in a future action.

b. General Approach to Default GWPs

Even with the addition of the AR5 GWPs, a significant share of the fluorinated GHG and HTF emissions and supplies reported under the GHGRP would not have chemical-specific GWPs included in Table A-1. We are proposing default GWPs to ensure that the atmospheric impacts of these fluorinated GHGs and HTFs are reflected in facility calculations and CO₂e emissions totals. Otherwise, an effective GWP of zero would continue to underestimate the

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atmospheric impacts of the fluorinated GHGs or HTFs emitted or supplied, which could lead to a significant underestimate of facility CO₂e emissions as a whole.

Such underestimates lead to inconsistencies between facilities and industries in terms of the completeness of the CO₂e emissions calculated and reported. It is important for the EPA to assign GWPs to all GHGs in order to understand the potential impact of certain sectors and facilities, compare emissions, and provide consistency and transparency with respect to emissions across the program.

In addition to these benefits, establishing default GWPs would increase the long-term stability and predictability of the GWPs used under the GHGRP. As chemical-specific GWPs for GHGs were developed, peer reviewed, and added to Table A-1, the change from each default GWP to the chemical-specific GWP would likely be considerably smaller than the change from zero to the chemical-specific GWP. This would greatly reduce the magnitude of any future revisions to or inconsistencies in the time series of CO₂e emissions. At the same time, having a default GWP for each GHG may allow the EPA to update Table A-1 less frequently because the default would reduce the error in CO₂e estimates that presently arises from not having a chemical-specific GWP for that GHG on Table A-1.

2. Addition of Chemical-Specific GWPs for 103 Compounds and Update of GWP for

Sevoflurane

We are proposing to amend Table A-1 to Subpart A of Part 98 to add peer-reviewed GWPs for the 103 compounds listed in Table 2 of this preamble. To reflect the latest scientific

consensus regarding fluorinated GHGs that do not have GWPs in AR4, we are proposing to adopt the GWPs provided for 102 of these 103 compounds in Table 8.A.1 of AR5.¹⁰

Table 2. Chemical-Specific GWPs Proposed for Addition to Table A-1

Common or Trade Name	Chemical Name(s)	CAS No.	Chemical Formula	AR5 GWP (100 year)
Saturated HFCs				
HFC-227ca	1,1,1,2,2,3,3-Heptafluoropropane	2252-84-8	CF ₃ CF ₂ CHF ₂	2640
HFC-245cb	1,1,1,2,2-Pentafluoropropane	1814-88-6	CF ₃ CF ₂ CH ₃	4620
HFC-245ea	1,1,2,3,3-Pentafluoropropane	24270-66-4	CHF ₂ CHFCHF ₂	235
HFC-245eb	1,1,1,2,3-Pentafluoropropane	431-31-2	CH ₂ FCHF ₂ CF ₃	290
HFC-263fb	1,1,1-Trifluoropropane	421-07-8	CH ₃ CH ₂ CF ₃	76
HFC-272ca	2,2-Difluoropropane	420-45-1	CH ₃ CF ₂ CH ₃	144
HFC-329p	1,1,1,2,2,3,3,4,4-Nonafluorobutane	375-17-7	CHF ₂ CF ₂ CF ₂ CF ₃	2360
Saturated PFCs				
PFC-6-1-12	Hexadecafluoroheptane	335-57-9	C ₇ F ₁₆ ; CF ₃ (CF ₂) ₅ CF ₃	7820
PFC-7-1-18	Octadecafluorooctane	307-34-6	C ₈ F ₁₈ ; CF ₃ (CF ₂) ₆ CF ₃	7620
	Perfluorodecalin (cis)	60433-11-6	Z-C ₁₀ F ₁₈	7240
	Perfluorodecalin (trans)	60433-12-7	E-C ₁₀ F ₁₈	6290
Saturated HFEs				
Partially Segregated HFEs				
HFE-263m1; R-E-143a	1,1,2,2-Tetrafluoro-1-(trifluoromethoxy)ethane	690-22-2	CF ₃ OCH ₂ CH ₃	29
HFE-365mcf2	1-Ethoxy-1,1,2,2,2-pentafluoroethane	22052-81-9	CF ₃ CF ₂ OCH ₂ CH ₃	58
HG'-01	1,1,2,2-Tetrafluoro-1,2-dimethoxyethane	73287-23-7	CH ₃ OCF ₂ CF ₂ OCH ₃	222
HG'-02	1,1,2,2-Tetrafluoro-1-methoxy-2-(1,1,2,2-tetrafluoro-2-methoxyethoxy)ethane	485399-46-0	CH ₃ O(CF ₂ CF ₂ O) ₂ CH ₃	236
HG'-03	3,3,4,4,6,6,7,7,9,9,10,10-Dodecafluoro-2,5,8,11-tetraoxadodecane	485399-48-2	CH ₃ O(CF ₂ CF ₂ O) ₃ CH ₃	221
	Difluoro(methoxy)methane	359-15-9	CH ₃ OCHF ₂	144
	2-Chloro-1,1,2-trifluoro-1-methoxyethane	425-87-6	CH ₃ OCF ₂ CHFC1	122
	1-Ethoxy-1,1,2,2,3,3,3-heptafluoropropane	22052-86-4	CF ₃ CF ₂ CF ₂ OCH ₂ CH ₃	61
	2-Ethoxy-3,3,4,4,5-pentafluorotetrahydro-2,5-bis[1,2,2,2-tetrafluoro-1-(trifluoromethyl)ethyl]-furan	920979-28-8	C ₁₂ H ₅ F ₁₉ O ₂	56
	1-Ethoxy-1,1,2,3,3,3-hexafluoropropane	380-34-7	CF ₃ CHF ₂ CF ₂ OCH ₂ CH ₃	23
	Fluoro(methoxy)methane	460-22-0	CH ₃ OCH ₂ F	13
	1,1,2,2-Tetrafluoro-3-methoxy-propane; Methyl 2,2,3,3-tetrafluoropropyl ether	60598-17-6	CHF ₂ CF ₂ CH ₂ OCH ₃	0.49

¹⁰ The EPA had previously proposed GWPs for 15 of these compounds in the proposed 2013 Revisions Rule, but since that rule was proposed, updated GWPs for these 15 compounds have been published in AR5. The other 11 compounds for which we proposed GWPs in the proposed 2013 Revisions Rule have not had GWPs published in the peer-reviewed literature; under this proposed rule, these compounds would be assigned default GWPs. A table specifying these chemicals and showing the default GWPs that would be assigned to them (as well as the chemicals whose cited GWPs were listed in the NODA) is available in the docket for this rulemaking.

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Common or Trade Name	Chemical Name(s)	CAS No.	Chemical Formula	AR5 GWP (100 year)
Non-Segregated HFEs				
HCFE-235ca2; enflurane	2-Chloro-1-(difluoromethoxy)-1,1,2-trifluoroethane	13838-16-9	CHF ₂ OCF ₂ CHFCI	583
HFE-236ca	1-(Difluoromethoxy)-1,1,2,2-tetrafluoroethane	32778-11-3	CHF ₂ OCF ₂ CHF ₂	4240
HFE-329me3	1,1,1,2,3,3-Hexafluoro-3-(trifluoromethoxy)propane	428454-68-6	CF ₃ CFHCF ₂ OCF ₃	4550
HFE-347mmz1; Sevoflurane	2-(Difluoromethoxy)-1,1,1,3,3,3-hexafluoropropane	28523-86-6	(CF ₃) ₂ CHOCHF ₂	216
HFE-356mf2	bis(2,2,2-trifluoroethyl) ether	333-36-8	CF ₃ CH ₂ OCH ₂ CF ₃	17
HG-02	1-(Difluoromethoxy)-2-(2-(difluoromethoxy)-1,1,2,2-tetrafluoroethoxy)-1,1,2,2-tetrafluoroethane	205367-61-9	HF ₂ C-(OCF ₂ CF ₂) ₂ -OCF ₂ H	2730
HG-03	1,1,3,3,4,4,6,6,7,7,9,9,10,10,12,12-Hexadecafluoro-2,5,8,11-tetraoxadodecane	173350-37-3	HF ₂ C-(OCF ₂ CF ₂) ₃ -OCF ₂ H	2850
HG-20	(Difluoromethoxy)((difluoromethoxy)difluoromethoxy)difluoromethane	249932-25-0	HF ₂ C-(OCF ₂) ₂ -OCF ₂ H	5300
HG-21	1,1,3,3,5,5,7,7,8,8,10,10-Dodecafluoro-2,4,6,9-tetraoxadecane	249932-26-1	HF ₂ C-OCF ₂ CF ₂ OCF ₂ OCF ₂ O-CF ₂ H	3890
HG-30	1,1,3,3,5,5,7,7,9,9-Decafluoro-2,4,6,8-tetraoxanonane	188690-77-9	HF ₂ C-(OCF ₂) ₃ -OCF ₂ H	7330
	1,1,1,2,2,3,3-Heptafluoro-3-(1,2,2,2-tetrafluoroethoxy)-propane	3330-15-2	CF ₃ CF ₂ CF ₂ OCHF ₂ CF ₃	6490
	1,1'-Oxybis[2-(difluoromethoxy)-1,1,2,2-tetrafluoroethane]	205367-61-9	HCF ₂ O(CF ₂ CF ₂ O) ₂ CF ₂ H	4920
	1,1,3,3,4,4,6,6,7,7,9,9,10,10,12,12-hexadecafluoro-2,5,8,11-Tetraoxadodecane	173350-37-3	HCF ₂ O(CF ₂ CF ₂ O) ₃ CF ₂ H	4490
	1,1,3,3,4,4,6,6,7,7,9,9,10,10,12,12,13,13,15,15-eicosafluoro-2,5,8,11,14-Pentaoxapentadecane	173350-38-4	HCF ₂ O(CF ₂ CF ₂ O) ₄ CF ₂ H	3630
	1,1,2-Trifluoro-2-(trifluoromethoxy)-ethane	84011-06-3	CHF ₂ CHFOCF ₃	1240
	1,1,2,2-Tetrafluoro-1-(fluoromethoxy)ethane	37031-31-5	CH ₂ FOCF ₂ CF ₂ H	871
	Trifluoro(fluoromethoxy)methane	2261-01-0	CH ₂ FOCF ₃	751
	Difluoro(fluoromethoxy)methane	461-63-2	CH ₂ FOCHF ₂	617
	Fluoro(fluoromethoxy)methane	462-51-1	CH ₂ FOCH ₂ F	130
Unsaturated Compounds				
Unsaturated HFCs and Unsaturated HCFCs				
HFC-1132a; VF2	vinylidene fluoride	75-38-7	C ₂ H ₂ F ₂ , CF ₂ =CH ₂	0.04
HFC-1141; VF	vinyl fluoride	75-02-5	C ₂ H ₃ F, CH ₂ =CHF	0.02

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Common or Trade Name	Chemical Name(s)	CAS No.	Chemical Formula	AR5 GWP (100 year)
(E)-HFC-1225ye	(E)-1,2,3,3,3-Pentafluoroprop-1-ene	5595-10-8	CF ₃ CF=CHF(E)	0.06
(Z)-HFC-1225ye	(Z)-1,2,3,3,3-Pentafluoroprop-1-ene	5528-43-8	CF ₃ CF=CHF(Z)	0.22
Solstice 1233zd(E)	trans-1-chloro-3,3,3-trifluoroprop-1-ene	102687-65-0	C ₃ H ₂ ClF ₃ ; CHCl=CHCF ₃	1.34
HFC-1234yf; HFO-1234yf	2,3,3,3-Tetrafluoroprop-1-ene	754-12-1	C ₃ H ₂ F ₄ ; CF ₃ CF=CH ₂	0.31
HFC-1234ze(E)	(E)-1,3,3,3-Tetrafluoroprop-1-ene	1645-83-6	C ₃ H ₂ F ₄ ; cis- CF ₃ CH=CHF	0.97
HFC-1234ze(Z)	(Z)-1,3,3,3-Tetrafluoroprop-1-ene	29118-25-0	C ₃ H ₂ F ₄ ; trans-CF ₃ CH=CHF; CF ₃ CH=CHF(Z)	0.29
HFC-1243zf; TFP	trifluoro propene (TFP); 3,3,3-Trifluoroprop-1-ene	677-21-4	C ₃ H ₃ F ₃ , CF ₃ CH=CH ₂	0.12
(Z)-HFC-1336	(Z)-1,1,1,4,4,4-Hexafluorobut-2-ene	692-49-9	CF ₃ CH=CHCF ₃ (Z)	1.58
HFO-1345zfc	3,3,4,4,4-Pentafluorobut-1-ene	374-27-6	C ₂ F ₅ CH=CH ₂	0.09
Capstone 42-U	perfluorobutyl ethene (42-U); 3,3,4,4,5,5,6,6,6-Nonafluorohex-1-ene	19430-93-4	C ₆ H ₃ F ₉ , CF ₃ (CF ₂) ₃ CH=CH ₂	0.16
Capstone 62-U	perfluorohexyl ethene (62-U); 3,3,4,4,5,5,6,6,7,7,8,8,8-Tridecafluorooct-1-ene	25291-17-2	C ₈ H ₃ F ₁₃ , CF ₃ (CF ₂) ₅ CH=CH ₂	0.11
Capstone 82-U	perfluorooctyl ethene (82-U); 3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-Heptadecafluorodec-1-ene	21652-58-4	C ₁₀ H ₃ F ₁₇ , CF ₃ (CF ₂) ₇ CH=CH ₂	0.09
Unsaturated PFCs				
PFC-1114; TFE	tetrafluoroethylene (TFE); Perfluoroethene	116-14-3	CF ₂ =CF ₂ ; C ₂ F ₄	0.004
PFC-1216; Dyneon HFP	hexafluoropropylene (HFP); Perfluoropropene	116-15-4	C ₃ F ₆ ; CF ₃ CF=CF ₂	0.05
PFC C-1418	Perfluorocyclopentene; Octafluorocyclopentene	559-40-0	c-C ₅ F ₈	1.97
	Perfluorobut-2-ene	360-89-4	CF ₃ CF=CFCF ₃	1.82
	Perfluorobut-1-ene	357-26-6	CF ₃ CF ₂ CF=CF ₂	0.10
	Perfluorobuta-1,3-diene	685-63-2	CF ₂ =CFCF=CF ₂	0.003
Unsaturated Halogenated Ethers				
PMVE; HFE-216	perfluoromethyl vinyl ether (PMVE)	1187-93-5	CF ₃ OCF ₂ =CF	0.17
Fluoroxene	(2,2,2-Trifluoroethoxy)ethene	406-90-6	CF ₃ CH ₂ OCH=CH ₂	0.05
Other Short-Lived Compounds				
Ketones				
Novac 1230	FK-5-1-12 Perfluoroketone; FK-5-1-12myy2; perfluoro(2-methyl-3-pentanone)	756-13-8	CF ₃ CF ₂ C(O)CF (CF ₃) ₂	0.1
Fluorinated Aldehydes				
	3,3,3-Trifluoro-propanal	460-40-2	CF ₃ CH ₂ CHO	0.01
Fluorotelomer Alcohols				
	3,3,4,4,5,5,6,6,7,7,7-Undecafluoroheptan-1-ol	185689-57-0	CF ₃ (CF ₂) ₄ CH ₂ CH ₂ O H	0.43

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Common or Trade Name	Chemical Name(s)	CAS No.	Chemical Formula	AR5 GWP (100 year)
	3,3,3-Trifluoropropan-1-ol	2240-88-2	CF ₃ CH ₂ CH ₂ OH	0.35
	3,3,4,4,5,5,6,6,7,7,8,8,9,9,9-Pentadecafluorononan-1-ol	755-02-2	CF ₃ (CF ₂) ₆ CH ₂ CH ₂ OH	0.33
	3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,11-Nonadecafluoroundecan-1-ol	87017-97-8	CF ₃ (CF ₂) ₈ CH ₂ CH ₂ OH	0.19
Compounds including one or more carbon-iodine bonds				
	Trifluoroiodomethane	2314-97-8	CF ₃ I	0.4 ^a
Other Compounds				
	Trifluoromethyl formate	85358-65-2	HCOOCF ₃	588
	Perfluoroethyl formate	313064-40-3	HCOOCF ₂ CF ₃	580
	1,2,2,2-Tetrafluoroethyl formate	481631-19-0	HCOOCHF ₂ CF ₃	470
	Perfluorobutyl formate	197218-56-7	HCOOCF ₂ CF ₂ CF ₂ CF ₃	392
	Perfluoropropyl formate	271257-42-2	HCOOCF ₂ CF ₂ CF ₃	376
	1,1,1,3,3,3-Hexafluoropropan-2-yl formate	856766-70-6	HCOOCH(CF ₃) ₂	333
Halon 1202	Dibromodifluoromethane	75-61-6	CB ₂ F ₂	231
	1,1,1,3,3,3-Hexafluoropropan-2-ol	920-66-1	(CF ₃) ₂ CHOH	182
	Methyl carbonofluoridate	1538-06-3	FCOOCH ₃	95
	Methyl 2,2,2-trifluoroacetate	431-47-0	CF ₃ COOCH ₃	52
Halon-2311; Halothane	2-Bromo-2-chloro-1,1,1-trifluoroethane	151-67-7	CHBrClCF ₃	41
	2,2,3,3,4,4,4-Heptafluorobutan-1-ol	375-01-9	C ₃ F ₇ CH ₂ OH	34
	2,2,2-Trifluoroethyl formate	32042-38-9	HCOOCH ₂ CF ₃	33
	1,1-Difluoroethyl 2,2,2-trifluoroacetate	1344118-13-3	CF ₃ COOCF ₂ CH ₃	31
	Difluoromethyl 2,2,2-trifluoroacetate	2024-86-4	CF ₃ COOCHF ₂	27
	1,1-Difluoroethyl carbonofluoridate	1344118-11-1	FCOOCF ₂ CH ₃	27
	2,2,2-Trifluoroethanol	75-89-8	CF ₃ CH ₂ OH	20
	2,2,3,3,3-Pentafluoropropan-1-ol	422-05-9	CF ₃ CF ₂ CH ₂ OH	19
	2,2,3,4,4,4-Hexafluoro-1-butanol	382-31-0	CF ₃ CHF ₂ CF ₂ CH ₂ OH	17
	3,3,3-Trifluoropropyl formate	1344118-09-7	HCOOCH ₂ CH ₂ CF ₃	17
	2,2,3,3,4,4,4-Heptafluoro-1-butanol	375-01-9	CF ₃ CF ₂ CF ₂ CH ₂ OH	16
	2,2,3,3-Tetrafluoro-1-propanol	76-37-9	CHF ₂ CF ₂ CH ₂ OH	13
	2,2,2-Trifluoroethyl 2,2,2-trifluoroacetate	407-38-5	CF ₃ COOCH ₂ CF ₃	7
	Methyl 2,2-difluoroacetate	433-53-4	HCF ₂ COOCH ₃	3
	2,2-Difluoroethanol	359-13-7	CHF ₂ CH ₂ OH	3
	Perfluoroethyl acetate	343269-97-6	CH ₃ COOCF ₂ CF ₃	2.1
	Trifluoromethyl acetate	74123-20-9	CH ₃ COOCF ₃	2.0
	Perfluoropropyl acetate	1344118-10-0	CH ₃ COOCF ₂ CF ₂ CF ₃	1.8
	Perfluorobutyl acetate	209597-28-4	CH ₃ COOCF ₂ CF ₂ CF ₂ CF ₃	1.6
	Ethyl 2,2,2-trifluoroacetate	383-63-1	CF ₃ COOCH ₂ CH ₃	1.3
	2-Fluoroethanol	371-62-0	CH ₂ FCH ₂ OH	1.1
	4,4,4-Trifluorobutan-1-ol	461-18-7	CF ₃ (CH ₂) ₂ CH ₂ OH	0.05

^aAR4

In their compilation of the GWPs available in the scientific peer-reviewed literature for fluorinated GHGs, the authors of AR5 relied on the article “Global Warming Potentials and

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Radiative Efficiencies of Halocarbons and Related Compounds: A Comprehensive Review” (hereinafter referred to as the “Comprehensive Review”).¹¹ The Comprehensive Review refined and adjusted the GWPs that had been previously published for the fluorinated GHGs, for example updating them to reflect the most recent consensus absolute global warming potential of CO₂, to which all other GWPs are indexed. One set of adjustments is of particular interest for the 13 short-lived compounds for which the EPA previously proposed to add GWPs in the proposed 2013 Revisions Rule. These are adjustments to the radiative efficiencies of short-lived compounds to better account for the fact that such compounds are not well mixed in the atmosphere. As discussed in the proposed 2013 Revisions Rule, GWPs estimated for short-lived compounds are often based on the assumption that the compounds are well mixed in the atmosphere, and this assumption can lead to overestimated GWPs.¹² This expectation was confirmed by the adjustments made in the Comprehensive Review, which significantly lowered the estimated GWPs of the short-lived compounds compared to those that were proposed in the proposed 2013 Revisions Rule. The GWPs for short-lived compounds that we are proposing to adopt from AR5 reflect these adjustments.

AR5 expresses the GWPs of many short-lived compounds as “<1.” To allow calculations of CO₂e, which require a point estimate of each compound’s GWP, we have calculated more precise GWPs for these compounds based on the radiative efficiencies and atmospheric lifetimes provided for the compounds in AR5. Table 2 of this preamble lists the precise GWPs. We are also considering the option of assigning a GWP of “1” to these compounds. While using a GWP

¹¹ Hodnebrog, Ø., M. Etminan, J. S. Fuglestedt, G. Marston, G. Myhre, C. J. Nielsen, K. P. Shine, and T. J. Wallington. “Global Warming Potentials and Radiative Efficiencies of Halocarbons and Related Compounds: A Comprehensive Review,” *Reviews of Geophysics*, Accepted manuscript online: 24 April 2013.

¹² However, as noted in the proposed 2013 Revisions Rule, the absolute error (i.e., error in total CO₂e) associated with this overestimate is expected to be small when the GWP itself is small, which is generally the case for GHGs with atmospheric lifetimes of a few days or weeks (78 FR 19813).

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of 1 would lead to an overestimate of CO₂e emissions, this overestimate would be extremely small in most cases, and using a GWP of 1 would simplify calculations. We specifically request comment on whether we should assign the precise GWP (e.g., 0.12 for trifluoropropene) or “1” in these cases.

The Supplementary Material to Chapter 8 of AR5 (Table 8.SM.16) includes another set of GWPs for the GHGs included in Table 8.A.1. These GWPs have been adjusted to reflect feedback mechanisms that increase the GWPs by between 10 and 22 percent, depending on the atmospheric lifetime of the GHG. Because the GWPs included in AR4 (and earlier IPCC Scientific Assessment Reports) did not include this adjustment, we are not proposing to adopt the set of GWPs in AR5 that includes it. This will retain as much comparability as practicable among the GWPs used in the GHGRP, given our interest in remaining consistent with the GWPs used for UNFCCC reporting (i.e., the AR4 GWPs for the GHGs with GWPs in AR4).

For one fluorinated GHG, trifluoriodomethane (CF₃I), we are proposing to add a chemical-specific GWP from AR4. This GWP is 0.4. (There is no GWP for trifluoriodomethane in AR5.) The GWP for trifluoriodomethane was inadvertently omitted from earlier versions of Table A-1.

We are also proposing to update the GWP of sevoflurane, a hydrofluoroether that is used as an anesthetic. As noted above, the GWP for sevoflurane that is currently in Table A-1 (345) is based on a 1999 paper from the peer-reviewed literature because no IPCC report (including AR4) had included a GWP for sevoflurane when Part 98 was first promulgated. In today’s action, we are proposing to adopt the GWP provided for sevoflurane in AR5 (216), which is more accurate and reflects the current international scientific consensus.

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To make Table A-1 easier to use while accommodating the additional chemical-specific GWPs, we are proposing to reorganize the chemical-specific GWPs on Table A-1 by fluorinated GHG group and/or subgroup. These fluorinated GHG groups and subgroups are the same as those discussed as the basis for the proposed default GWPs in section II.C.3. of this preamble. The reorganized Table A-1 appears in the proposed regulatory text.

3. Addition of Default GWPs for Fluorinated GHGs that Do Not Have Chemical-Specific GWPs on Table A-1

The EPA is proposing eight default GWP values based on fluorinated GHG group. These default GWPs would be added to Table A-1 and would apply to fluorinated GHGs and HTFs not otherwise listed on Table A-1. The proposed fluorinated GHG groups are: (1) Fully fluorinated GHGs and HTFs, (2) saturated hydrofluorocarbons (HFCs), (3) partially segregated saturated HFEs and hydrochlorofluoroethers (HCFEs), (4) non-segregated saturated HFEs and HCFEs, (5) unsaturated perfluorocarbons (PFCs), unsaturated HFCs, unsaturated hydrochlorofluorocarbons (HCFCs), unsaturated ethers, unsaturated halogenated esters, and fluorinated ketones, (6) fluorotelomer alcohols, (7) fluorinated GHGs with carbon-iodine bonds, and (8) other GHGs and HTFs. For each fluorinated GHG group, we are basing the proposed default GWPs on the average of the chemical-specific GWPs of chemicals that belong to that group and that are either on Table A-1 or are proposed to be added to Table A-1 under this proposed rule. The proposed fluorinated GHG groups and associated GWPs are listed in Table 3 of this preamble.

Table 3. Default GWPs Proposed for Addition to Table A-1

Fluorinated GHG Group	Proposed GWP (100-year)
Fully fluorinated GHGs	10,000
Saturated hydrofluorocarbons (HFCs)	2,200
Partially segregated saturated HFEs and HCFEs	200

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Non-segregated saturated HFES and HCFES	2,400
Unsaturated PFCs, unsaturated HFCs, unsaturated HCFCs, unsaturated halogenated ethers, unsaturated halogenated esters, fluorinated aldehydes, and fluorinated ketones	1
Fluorotelomer alcohols	1
Fluorinated GHGs with carbon-iodine bond(s)	1
Other fluorinated GHGs	110

a. Fluorinated GHG Groups

The fluorinated GHG groups are based primarily on chemical structure, which is correlated with atmospheric lifetime and GWP. Thus, within each group, GWPs fall into a relatively limited range, and among the groups, GWPs vary significantly. This permits default GWPs to be established with more precision than is possible with larger or more diverse sets of fluorinated GHGs.

In proposing these groups, the EPA has taken into consideration the comments received on the default GWPs that were proposed for purposes of reporting emissions under subpart L. We proposed five fluorinated GHG groups and associated default GWPs in the proposed amendments to subpart L, including (1) fully fluorinated GHGs and HTFs, (2) saturated HFCs, (3) saturated HFES and saturated HCFES, (4) unsaturated PFCs, unsaturated HFCs, unsaturated HCFCs, unsaturated HFES, and fluorinated ketones, and (5) other GHGs and HTFs. Commenters requested that we split the third group, expand the fourth group, and add two additional groups, fluorotelomer alcohols and fluorinated GHGs with carbon-iodine bonds, to increase the precision and accuracy of the default GWPs applied to the chemicals in these groups. The commenters stated that five types of chemicals, including unsaturated fluorinated ethers, unsaturated halogenated esters, fluorinated aldehydes, fluorotelomer alcohols, and fluorinated GHGs with carbon-iodine bonds, would have been assigned GWPs that were too high if they had remained in the “Other” category. They further stated that two types of saturated HFES and HCFES would

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have been assigned GWPs that were, on average, either too high (for partially segregated saturated HFEs and HCFEs) or too low (for non-segregated saturated HFEs and HCFEs). We agree with these comments and are consequently including the suggested additional fluorinated GHG groups and associated default GWPs in this proposed rule.¹³ We are also revising the group of unsaturated compounds to include unsaturated fluorinated ethers, unsaturated halogenated esters, and fluorinated aldehydes.

The definitions and characteristics of each fluorinated GHG group are discussed below:

Fully fluorinated GHGs. Fully fluorinated GHGs are fluorinated GHGs that contain only single bonds and in which all available valence locations are filled by fluorine atoms. This group includes but is not limited to saturated perfluorocarbons; SF₅CF₃; fully fluorinated linear, branched and cyclic alkanes; fully fluorinated ethers; fully fluorinated tertiary amines; fully fluorinated aminoethers; and perfluoropolyethers. As discussed further below, for purposes of establishing a default GWP, we are proposing to exclude NF₃ and SF₆ from the group as we did in the proposed amendments to subpart L. The remaining fully fluorinated GHGs for which data are available have lifetimes of over 500 to several thousand years and GWPs of 6,290 to 17,700.

Saturated hydrofluorocarbons. This group would include HFCs that contain only single bonds (i.e., hydrofluoroalkanes such as HFC-134a). Saturated HFCs have lifetimes from 0.3 years to 270 years and GWPs from 12 to 14,800. The average GWP of saturated HFCs is approximately 2,200, the default GWP that we would assign to this group. Because the range of lifetimes and GWPs spanned by the saturated HFCs is quite large, we are also considering the option of establishing two default GWPs for HFCs: one for shorter-lived HFCs and one for longer-lived HFCs. This would provide more precise information regarding the atmospheric

¹³ The analysis supporting the proposed default GWPs, "Revised Analysis of Potential Default GWPs for Fluorinated GHGs Reported Under the GHGRP," is available in Docket EPA-HQ-OAR-2009-0927. This document is a prepublication version, signed by EPA Administrator Gina McCarthy on July 24, 2014. We have taken steps to ensure the accuracy of this version, but it is not the official version.

behavior of each group. For example, the average GWP of the saturated HFCs with atmospheric lifetimes above 20 years is approximately 5,700, while the average GWP of the saturated HFCs with atmospheric lifetimes below 20 years is approximately 600. However, the drawback of establishing default GWPs by atmospheric lifetime is that it requires reporters to know the atmospheric lifetimes of the HFCs to which the default GWPs would be applied. This information is not likely to be available for many HFCs that are not on Table A-1. The EPA specifically requests comment on the option of establishing different GWPs for short- and longer-lived HFCs. We also request comment on the option of establishing GWPs for HFCs based on the number of carbon-hydrogen bonds in the molecule, an option discussed in more detail for HFEs below and in “Analysis of Atmospheric Lifetimes, Radiative Efficiencies, and Global Warming Potentials of Saturated Hydrofluoroethers by Number of Carbon-Hydrogen and Carbon-Fluorine Bonds,” (available in Docket EPA-HQ-OAR-2009-0927), which includes an analysis of the relationship between the number of carbon-hydrogen bonds and GWPs in HFCs.

Non-segregated saturated HFEs and HCFEs. This group would include HFEs and HCFEs that contain only single bonds and include fluorine substitutes on all alkyl groups (e.g., HFE-134). This group and the partially segregated saturated HFEs and HCFEs, discussed below, are based on chemical structure and break the set of saturated HFEs and HCFEs into two smaller sets with relatively limited ranges of atmospheric lifetimes and GWPs. HFEs and HCFEs in this category have atmospheric lifetimes ranging from less than 1 year to 136 years and GWPs ranging from 11 to 14,900. Although there is a significant difference between the highest and lowest GWPs in this group, most compounds in the group have GWPs of more than 500. The average GWP of the group is 2,400, the default GWP that we would assign to this group.

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Partially segregated saturated HFEs and HCFEs. This group would include HFEs and HCFEs that contain only single bonds as well as at least one fully hydrogenated alkyl group with no fluorine or chlorine substitutes (e.g., HFE-356mm1). HFEs and HCFEs in this category have atmospheric lifetimes from a few weeks to 5.2 years and GWPs from 0.5 to 756. Most compounds in this category have GWPs below 500. The average GWP of the group is 200, the default GWP that we would assign to this group.

A 2008 study suggested that the number of carbon-hydrogen (C-H) bonds in saturated HFEs was a better predictor of their atmospheric lifetimes, and therefore GWPs, than whether the HFEs were non-segregated or partially segregated.¹⁴ Based on our analysis, dividing the set of HFEs and HCFEs into two or more groups based on the number of C-H bonds could increase the accuracy and precision of the associated default GWPs compared to dividing the HFEs and HCFEs into the non-segregated and partially segregated groups.¹⁵ We specifically request comment on the option of basing default GWPs for HFEs and HCFEs on the number of C-H bonds in the molecule.

Unsaturated PFCs, unsaturated HFCs, unsaturated HCFCs, unsaturated halogenated ethers, unsaturated halogenated esters, fluorinated aldehydes, and fluorinated ketones. This group would include very short-lived compounds including unsaturated PFCs (e.g., hexafluoropropylene and tetrafluoroethylene), unsaturated HFCs (e.g., HFC-1234yf and perfluorobutyl ethene), unsaturated HCFCs, unsaturated halogenated ethers (e.g., fluoroxene), unsaturated halogenated esters, fluorinated aldehydes, and fluorinated ketones. These GHGs have lifetimes of a few days to weeks. The average GWPs of the subgroups, where they have

¹⁴ Blowers, P., D.M. Moline, K.F. Tetrault, R.R. Wheeler, and S.L. Tuchawena. 2008. Global Warming Potentials of Hydrofluoroethers. *Environ. Sci. Technol.* 42, 1301–1307.

¹⁵ “Analysis of Atmospheric Lifetimes, Radiative Efficiencies, and Global Warming Potentials of Saturated Hydrofluoroethers by Number of Carbon-Hydrogen and Carbon-Fluorine Bonds,” available in Docket EPA-HQ-OAR-2009-0927.

been evaluated, range from 0.01 to 0.7. The average GWP for the group is 0.4, but we are proposing to assign a default GWP of one to simplify calculations. Using a default GWP of one would lead to an overestimate of CO₂e emissions, but this overestimate would be extremely small in most cases. We specifically request comment on this approach.

While multiple studies have indicated that unsaturated PFCs and unsaturated HFCs have low GWPs, fewer studies have evaluated GWPs for unsaturated HCFCs, unsaturated fluorinated ethers, fluorinated aldehydes, and fluorinated ketones.¹⁶ Thus, the GWPs of these subgroups are less certain. The EPA specifically requests comment on the likely variability of the lifetimes and GWPs of unsaturated HCFCs, unsaturated fluorinated ethers, fluorinated aldehydes, and fluorinated ketones and on whether or not these compounds should be included in the very-short-lived group or in the “Other fluorinated GHG” group, discussed below.

Although the EPA is not aware of any peer-reviewed studies that have evaluated GWPs for unsaturated fluorinated esters, the atmospheric behavior of saturated fluorinated esters and of other unsaturated compounds indicates that unsaturated fluorinated esters are likely to have low GWPs. The fluorinated esters with GWPs in AR5 (including the fluorinated acetates and formates) have GWPs ranging from 2 to 588, which is significantly lower than the ranges of GWPs for saturated HFCs and PFCs, respectively. This implies that the unsaturated esters are likely to have GWPs that are comparable to or lower than the GWPs of the unsaturated HFCs and PFCs. However, we are specifically requesting comment on whether this line of reasoning justifies the inclusion of unsaturated fluorinated esters in the same group as unsaturated HFCs and PFCs, to which we are proposing to assign a default GWP of one. The alternative group

¹⁶ However, at least one study found that a number of fluorinated ketones and fluorinated aldehydes had brief atmospheric lifetimes (several days) (Derwent, R.G. 1995. “Sources, Distributions, and Fates of VOCs in the Atmosphere.” *Issues in Environmental Science and Technology*, 4. pp 1-16.) All the fluorinated GHGs that have GWPs in AR5 and that have atmospheric lifetimes of less than two weeks have GWPs of less than one. This document is a prepublication version, signed by EPA Administrator Gina McCarthy on July 24, 2014. We have taken steps to ensure the accuracy of this version, but it is not the official version.

would be the “Other Fluorinated GHG” group, to which we are proposing to assign a default GWP of 110.

Fluorotelomer alcohols. This group includes saturated fluorinated compounds with the chemical formula $C_nF_{2n+1}CH_2CH_2OH$. Fluorotelomer alcohols have atmospheric lifetimes ranging from 2 to 3 weeks and GWPs ranging from 0.2 to 0.4. Their average GWP is 0.3. We are proposing a default GWP of one for this group; however, as for the unsaturated compounds discussed above, we particularly request comment on assigning a GWP equal to the average GWP of the group.

Fluorinated GHGs with carbon-iodine bonds. Fluorinated GHGs with carbon-iodine bonds have very short atmospheric lifetimes. AR4 included an atmospheric lifetime of 2 days and a GWP of 0.4 for one member of this group, CF₃I. Peer-reviewed studies on other members of this group have found similarly brief atmospheric lifetimes but have not assigned GWPs. We are proposing a default GWP of one for this group.

Other fluorinated GHGs. This group includes the fluorinated GHGs that do not fall into any of the seven sets defined above. To ensure that the gas groups are both distinct (i.e., do not overlap) and comprehensive (i.e., cover all fluorinated GHGs), this gas group is a catch-all for any remaining fluorinated GHGs. Based on the list of compounds and GWPs included in AR5, the EPA’s understanding is that this group would consist of saturated fluorinated acetates, saturated fluorinated formates, carbonofluoridates, and fluorinated alcohols (other than fluorotelomer alcohols) with lifetimes ranging from a few weeks to a few years and GWPs ranging from less than 5 to the hundreds. The EPA specifically requests comment on which chemicals would fall into this group and on their atmospheric lifetimes and GWPs. We are proposing a default GWP of 110 for this group.

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b. Calculation of Default GWPs

For each group, we have taken the average GWP of the group, rounding it to one or two significant figures.¹⁷ For example, to determine the default GWP for fully fluorinated GHGs, we determined the average GWP of all fully fluorinated fluorocarbons in either Table A-1 or, for compounds not included in Table A-1, in AR5. The average GWP for the fully fluorinated fluorocarbons is equal to 9,857. This provided the default GWP of 10,000 for fully fluorinated compounds.

This approach is expected to result in an unbiased estimate of the GWP of each fluorinated GHG group because, at the present time, the GWPs of the fluorinated GHGs on Table A-1 are not expected to be any lower or higher, on average, than the GWPs of the fluorinated GHGs that are not on Table A-1. However, for the “Other fluorinated GHGs” group, which is a “catch-all” category for fluorinated GHGs that do not fit into any other group, it is possible that newly synthesized types of compounds could have GWPs significantly different from the GWPs of the types of compounds that are currently in the group. Given this uncertainty, we are specifically requesting comment on an alternative option. This option would be to adopt a default GWP for this group based on the average of the GWPs of all fluorinated GHGs (i.e., 2000). This would recognize that the uncertainty associated with the GWPs of newly synthesized compound types may exceed that associated with the GWPs of the compound types currently identified as belonging to the “other fluorinated GHGs” group. However, while adopting a GWP

¹⁷ The number of significant figures to which the average GWPs were rounded depended on the relative and absolute errors associated with that number of significant figures. In general, GWPs were rounded to two significant figures when the average GWP was greater than 100, reflecting uncertainties in the average of a few percent. One exception was the rounded average GWP for fully fluorinated fluorocarbons, which was rounded to one significant figure (10,000) rather than two (9,900) because the uncertainty associated with the second figure (i.e., ± 100) is only about one percent of the average GWP for the group. Rounding the average for the fully fluorinated fluorocarbons to the nearest 100 (9,900) would understate the uncertainty associated with the default and result in a less robust default that would be more sensitive to small changes in the set of GWPs used to calculate the default. GWPs of less than one were rounded to one decimal place because, for the affected gases, the absolute error in CO₂e emissions that is associated with this rounding is expected to be small.

of 2000 would decrease the likelihood of underestimating the GWPs of new types of compounds, it would significantly overestimate the GWPs of the compound types that have been identified to date as belonging to this group.

The EPA also requests comment on the sets of chemicals selected as the bases for the default GWPs. First, we are specifically requesting comment on the fluorinated GHG groups proposed here. Do they capture most of the variability in GWPs exhibited by fluorinated GHGs? If not, please explain (1) what alternative fluorinated GHG groups would capture this variability, and (2) whether facilities could easily determine to which fluorinated GHG group a particular fluorinated compound belonged.

Second, we are requesting comment on the individual chemicals whose GWPs are used to establish GWPs for each fluorinated GHG group. We are specifically interested in comments on how to treat compounds with relatively high or low GWPs for their groups (i.e., outliers). Within the group of fully fluorinated GHGs, relatively high GWPs are generally a consequence of a compound's radiative efficiency (or, more precisely, the ratio of the compound's radiative efficiency to its molecular weight), which is in turn influenced by the compound's inclusion of bonds other than C-F bonds (e.g., S-F or N-F bonds in SF₆, SF₅CF₃, and NF₃) or by a cyclic structure (as for c-C₃F₆). Within the other fluorinated GHG groups, relatively high-GWP compounds are those that are relatively long-lived, such as HFC-23 among the saturated HFCs and HFE-125 and HFE-134 among the saturated HFEs, while relatively low-GWP compounds are those that are short-lived, such as HFC-152a among the saturated HFCs.

To develop the proposed defaults, we have included outliers where we could not rule out the possibility that such outliers may also occur among the fluorinated GHGs whose GWPs we wish to estimate through the use of defaults. Thus, to estimate the default GWP for fully

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fluorinated GHGs, the EPA did not include SF₆ or NF₃, because the definition of “fluorinated GHG” does not include any other compounds whose radiatively important bonds consist exclusively of S-F or N-F bonds. However, we did include SF₅CF₃, because the definition of “fluorinated GHG” does include fluorocarbons, which may include S-F and N-F bonds in addition to C-F bonds. We also included cyclic fluorinated GHGs for the same reason. An analysis of how the default GWPs change based on the inclusion or exclusion of outliers is included in the docket for this rulemaking. For fully fluorinated GHGs, the inclusion of SF₆ and NF₃ would increase the default from 10,000 to 11,000, while the exclusion of c-C₃F₆ and SF₅CF₃ (numerical outliers) would decrease the default to 9,000.

We are also specifically requesting comment on whether fluorinated GHGs that contain chlorine should be included in the “other fluorinated GHG” group or in the fluorinated GHG groups in which chemically similar fluorinated GHGs that do not contain chlorine are included. While most chlorine-containing GHGs are regulated under the EPA’s Stratospheric Ozone Protection Regulations at 40 CFR part 82, subpart A and are therefore excluded from the definition of “fluorinated GHG” under the GHG Reporting Rule (and the requirements of subpart L), some chlorine-containing GHGs are included in the definition of “fluorinated GHG.” These include, for example, a few HCFEs and unsaturated HCFCs. In the future, facilities may emit other chlorine-containing fluorinated GHGs (e.g., unsaturated chlorofluorocarbons (CFCs) and unsaturated hydrobromofluorocarbons). In developing the proposed default GWPs, we have included current chlorine-containing fluorinated GHGs in the same groups as similar fluorinated GHGs without chlorine (grouping HCFEs with HFES and unsaturated HCFCs with unsaturated HFCs), because the atmospheric lifetimes and GWPs of the chlorine-containing compounds are similar to those of the similar compounds without chlorine. The alternative would be to include

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the chlorine-containing compounds in the “Other fluorinated GHGs” group, but this approach would lead to the use of less accurate default GWPs for the chlorine-containing compounds.

In addition, we are specifically requesting comment on the option of calculating the default GWPs based on the AR5 GWPs for the chemicals in each group. As discussed above, our preferred approach is to calculate the default GWPs based on the chemical-specific GWPs that would appear in Table A-1 as amended by this rule, that is, on a combination of AR4 GWPs (for the fluorinated GHGs that have AR4 GWPs) and AR5 GWPs (for the fluorinated GHGs that do not have AR4 GWPs). This approach would provide consistency between the default GWPs and the chemical-specific GWPs on Table A-1. However, for some fluorinated GHGs (e.g., many HFEs), the AR5 GWPs are significantly different from the AR4 GWPs. While it would be inconsistent with UNFCCC reporting guidelines to use AR5 GWPs as the chemical-specific GWPs for fluorinated GHGs that have AR4 GWPs, it would not be inconsistent with UNFCCC guidelines to use those chemical-specific AR5 GWPs to set defaults. This is because the UNFCCC does not provide guidance regarding which GWPs to use for GHGs that have not had GWPs published in IPCC reports (i.e., the GHGs to which default GWPs would be applied). AR5 reflects the most current scientific understanding of the atmospheric lifetimes and/or radiative behavior of GHGs. Basing defaults on these newly assigned GWPs would increase the accuracy and the long-term robustness of the defaults, particularly for the non-segregated and partially segregated saturated HFE groups.

4. Revised Definition of “Global Warming Potential”

We are also proposing to revise the definition of “global warming potential” in subpart A to clarify how chemical-specific and default GWPs would be selected and applied for purposes of the calculations in Part 98. This clarification states that the chemical-specific GWPs in Table

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A-1 would be required to be applied to GHGs that had chemical-specific GWPs listed in Table A-1, while the default GWPs in Table A-1 would be required to be applied to fluorinated GHGs that did not have chemical-specific GWPs listed in Table A-1. This would help to ensure that chemical-specific and default GWPs were applied correctly and consistently in CO₂e calculations across Part 98.

5. Special Provisions for Facilities and Suppliers that Become Newly Subject to One or More Subparts of Part 98 Due to the Addition of GWPs

As discussed further in Section III.B of this preamble, we do not anticipate that finalizing the GWPs proposed in this action would expand the set of facilities required to report under the Greenhouse Gas Reporting rule. However, to allow for the possibility that some facilities or suppliers could become newly subject to one or more subparts of Part 98 due to the addition of the GWPs, we are proposing special provisions for these facilities regarding the timing of reporting and the use of best available monitoring methods (BAMM). These provisions would be identical to the equivalent provisions for facilities and suppliers that became newly subject to one or more subparts due to the update of GWPs in the 2013 Revisions Rule, 40 CFR 98.3(k) and (l). To implement this approach, we are proposing to revise 40 CFR 98.3(k) and (l) to delete most references to particular years and replace these with references based on the year during which the changes to the GWPs are promulgated.

D. Relationship Between this Proposed Rule and Proposed Amendments to Subpart L

As discussed above, the EPA proposed a set of amendments to subpart L last November that would replace the two existing default GWPs in subpart L with five default GWPs (in a new Table L-1) for the calculations and reporting under that subpart. The EPA intends to finalize the proposed amendments to subpart L in time for reporting in calendar year 2015, which for subpart

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L reporters will include previously deferred detailed reporting of 2011 through 2013 emissions as well as of 2014 emissions. We also intend to finalize this proposed rule in time for reporting in calendar year 2015, probably after finalizing the amendments to subpart L. This would ensure that the chemical-specific GWPs that would be added under this action, which we did not propose to add under the amendments to subpart L, would apply to subpart L emissions for the entire time series. In addition, while we anticipate that the default GWPs finalized in Table L-1 under the amendments to subpart L would be the same as the default GWPs finalized in Table A-1 under this action, we intend to remove Table L-1 and the references to it when this rule is finalized. After these removals, subpart L would not include any subpart-specific default GWPs. This would simplify subpart L and ensure future as well as current consistency among the default GWPs applied across Part 98.

E. Relationship Between this Proposed Rule and Default GWP in Subpart I

For purposes of certain calculations under subpart I, electronics facilities are required to use a default GWP of 2,000 for fluorinated GHGs for which Table A-1 does not “define” or “list” a GWP value. These calculations include the preliminary calculation of stack system emissions at 40 CFR 98.93(i)(1) and (i)(2), the calculation of the relative standard deviation of stack emission factors at 40 CFR 98.94 (j)(5)(ii)(C), the calculation of the change in annual consumption of fluorinated GHGs at 40 CFR 98.94(j)(8)(i), the calculations of the effective destruction or removal efficiency at 40 CFR 98.96 (Equations I-26, I-27, and I-28), and the calculation of the approximate percentage of total GHG emissions consisting of emissions from research and development activities at 40 CFR 98.96(x). To clarify that the default GWPs that we are proposing to add to Table A-1 should be used for these calculations rather than the default GWP of 2,000, we are proposing to remove all references to the default GWP of 2,000 from

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subpart I. This would ensure that the GWPs used for the calculations in subpart I are consistent with those used for all other calculations and reporting under Part 98.

F. Calculation of Differences and Changes in CO₂e Quantities under Subpart I and Subpart L

Both subpart I and subpart L include calculations that compare CO₂e parameters that are measured and/or calculated at different times. For example, under subpart I, facilities using the stack testing method must evaluate whether annual consumption of a fluorinated GHG has changed by more than 10 percent of the total annual fluorinated GHG consumption in CO₂e since the most recent emissions test. If it has, then the facility must re-test (40 CFR 98.94(j)(8)(i)). Under subpart L, facilities that plan a change to an operating scenario whose emission factor was measured must estimate and compare the emission calculation factors for the measured and changed scenarios. If the difference exceeds 15 percent, then the facility must re-test (40 CFR 98.124(c)(7)(ii)).

For purposes of these and similar calculations, facilities would use, for both the original and the updated parameters, the GWPs that are in the version of Table A-1 in effect at the time of the calculation. This would avoid the introduction of differences that are caused by differences in GWPs rather than by changes to production processes.

G. Relationship Between this Proposed Rule and GHG Permitting Requirements

EPA's stationary source permitting regulations incorporate Table A-1 to subpart A of 40 CFR part 98 to provide a method for calculating emissions of GHGs (in terms of CO₂e) in order to determine whether Prevention of Significant Deterioration (PSD) permitting requirements are applicable to an individual source. See 75 FR 31522, 40 CFR 51.166(b)(48)(ii)(a), 40 CFR 52.21(b)(49)(ii)(a). In the 2013 Revisions Rule, we explained how a change to a GWP relates to PSD permitting (78 FR 71914-71917). For example, we explained that in the case of a final PSD

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permit that is issued prior to the effective date of a GWP revision, the permit should continue to rely upon the GWPs that were in place at the time of permit issuance for purposes of demonstrating compliance with the conditions of the permit.

On June 23, 2014, the U.S. Supreme Court issued its decision in *Utility Air Regulatory Group v. EPA* (No. 12-1146). The Court said that EPA may not treat greenhouse gases as an air pollutant for purposes of determining whether a source is a major source required to obtain a PSD or title V permit. The Court also said that PSD permits that are otherwise required (based on emissions of conventional pollutants) may continue to require limitations on greenhouse gas emissions based on the application of Best Available Control Technology (BACT). EPA is continuing to examine the implications of the Court's decision, including how EPA may need to revise its permitting regulations based on the Supreme Court decision. Nevertheless, because the Court decision upheld the PSD BACT requirement for GHGs under specific circumstances, EPA believes it is likely that its revised PSD permitting regulations would continue to incorporate Table A-1 GWPs to calculate CO₂e.

In the current version of Part 98, Table A-1 assigns chemical-specific GWPs for individual GHG compounds. It contains chemical-specific GWPs for carbon dioxide, methane, nitrous oxide, sulfur hexafluoride, and several HFC and PFC compounds. However, not all HFC and PFC compounds are included in the current version of Table A-1. This proposed rule would add chemical-specific and default GWPs to Table A-1 for the remaining HFCs and PFCs that the current version of Table A-1 does not cover.

To the extent that Table A-1 GWPs continue to be used in permitting, as with the 2013 Revisions Rule, adoption of these chemical-specific and default GWPs may automatically apply in some state and local PSD programs, while some state and local agencies may have to engage

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in an adoption process to incorporate the revised Table A-1 into their program regulations.¹⁸ In the 2013 Revisions Rule, EPA noted that some states would need to modify their PSD SIPs programs in order to make the revisions to Table A-1 effective in their permitting programs (78 FR 71916). As a result of the Supreme Court decision issued June 23, 2014, additional revisions to state PSD SIPs and title V programs may be necessary, but EPA has yet to determine the nature of any appropriate revisions to EPA's federal regulations that establish the minimum requirements for state PSD and title V programs.¹⁹ EPA will provide more information on this subject in forthcoming actions by the Agency. To the extent necessary, we will address the procedures for states to adopt the revisions to Table A-1 in any subsequent action addressing that decision, which should allow states to make any necessary regulatory amendments at one time.

III. Statutory and Executive Order Reviews

A. Executive Order 12866: Regulatory Planning and Review and Executive Order 13563: Improving Regulation and Regulatory Review

This action is not a "significant regulatory action" under the terms of Executive Order 12866 (58 FR 51735, October 4, 1993) and is therefore not subject to review under Executive Orders 12866 and 13563 (76 FR 3821, January 21, 2011).

B. Paperwork Reduction Act

¹⁸ For PSD, state and local permitting agencies handle the majority of GHG PSD permitting through either EPA-approved state rules, which generally incorporate the requirements from the Tailoring Rule provisions at 40 CFR 51.166 or 52.21, or through a delegation from the EPA in which the state issues PSD permits on behalf of the EPA using 40 CFR 52.21. Through its Regional Offices, the EPA issues PSD permits for areas not covered by an EPA-approved or delegated state permit program using 40 CFR 52.21.

¹⁹ Similar to the PSD rules, EPA's title V permitting regulations have also incorporated Table A-1 to subpart A of 40 CFR part 98 to provide a method for calculating emissions of GHG (in terms of CO₂e). See 75 FR 31522, 40 CFR 70.2 (definition of "subject to regulation"), 40 CFR 71.2 (same). As for PSD, the 2013 Revisions Rule also explained how a change to a GWP would relate to title V permitting, including in EPA-approved title V permitting programs implemented by state and local permitting authorities. 78 FR 71914-71917. EPA is still evaluating how, if at all, the Table A-1 GWPs will continue to be used in the title V permitting regulations in light of the Supreme Court's decision in *Utility Air Regulatory Group v. EPA*. EPA will provide further information in future actions as appropriate.

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This action does not increase information collection burden. The proposed addition of GWPs to subpart A is not expected to affect the applicability of the rule. The seven subparts that could potentially be affected include subpart I, subpart L, subpart T, subparts DD and SS, and subparts OO and QQ. Subpart I applicability is determined by a simplified emissions calculation that includes a specific, limited set of fluorinated GHGs, none of whose GWPs would be affected by finalization of this proposed rule. Under subpart L, all fluorinated gas production facilities that emit GHGs whose GWPs are increasing are already believed to be reporting. Similarly, all fluorinated GHG production facilities are already required to report under subpart OO, and all fluorinated GHG importers and exporters of the fluorinated GHGs and HTFs that would be assigned GWPs are already believed to report under subparts OO and QQ. The applicability of subparts DD and SS would not be affected because the thresholds for both subparts are expressed in terms of GHG masses rather than CO₂e masses. Any impact on the applicability of subpart T is expected to be negligible, because the fluorinated GHGs that would be assigned default GWPs and that would be reported under that subpart are believed to make up a very small fraction of the CO₂-e emissions from covered facilities. The OMB has previously approved the information collection requirements for subparts A, I, L, T, DD, OO, QQ, and SS under 40 CFR part 98 under the provisions of the Paperwork Reduction Act, 44 U.S.C. 3501 et seq., and has assigned Office of Management and Budget (OMB) control numbers 2060-0629 and 2060-0650.

Further information on the EPA's assessment on the impact on burden can be found in the memorandum, "Economic Analysis of Adding Chemical-Specific and Default GWPs to Table A-1" in docket number EPA-HQ-OAR-2009-0927.

C. Regulatory Flexibility Act (RFA)

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The RFA generally requires an agency to prepare a regulatory flexibility analysis of any rule subject to notice and comment rulemaking requirements under the Administrative Procedure Act or any other statute unless the agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. Small entities include small businesses, small organizations, and small governmental jurisdictions.

For purposes of assessing the impacts of this proposed rule on small entities, small entity is defined as: (1) a small business as defined by the Small Business Administration's regulations at 13 CFR 121.201; (2) a small governmental jurisdiction that is a government of a city, county, town, school district or special district with a population of less than 50,000; and (3) a small organization that is any not-for-profit enterprise which is independently owned and operated and is not dominant in its field.

After considering the economic impacts of these proposed rule amendments on small entities, I certify that this action will not have a significant economic impact on a substantial number of small entities. The proposed addition of default GWPs to subpart A is not expected to affect the applicability of the rule to small entities.

Further, the EPA took several steps to reduce the impact of 40 CFR part 98 on small entities when developing the final GHG Reporting Rules in 2009 and 2010. For example, the EPA determined appropriate thresholds that reduced the number of small businesses reporting. In addition, the EPA conducted several meetings with industry associations to discuss regulatory options and the corresponding burden on industry, such as recordkeeping and reporting. Finally, the EPA continues to conduct significant outreach on the GHGRP and maintains an "open door" policy for stakeholders to help inform the EPA's understanding of key issues for the industries.

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We continue to be interested in the potential impacts of the proposed rule on small entities and welcome comments on issues related to such impacts.

D. Unfunded Mandates Reform Act (UMRA)

The proposed rule amendments do not contain a federal mandate that may result in expenditures of \$100 million or more for state, local, and tribal governments, in the aggregate, or the private sector in any one year. Thus, the proposed rule amendments are not subject to the requirements of sections 202 and 205 of the UMRA. This proposed rule is also not subject to the requirements of section 203 of UMRA because it contains no regulatory requirements that might significantly or uniquely affect small governments. Facilities and suppliers subject to the proposed rule include electronics manufacturers, fluorinated gas producers, magnesium producers and processors, manufacturers and users of electrical equipment, importers and exporters of fluorinated GHGs in bulk, and importers and exporters of pre-charged equipment and closed-cell foams. None of the facilities currently known to undertake these activities is owned by a small government. Therefore, this action is not subject to the requirements of section 203 of the UMRA.

E. Executive Order 13132: Federalism

This action does not have federalism implications. It would not have substantial direct effects on the states, on the relationship between the national government and the states, or on the distribution of power and responsibilities among the various levels of government, as specified in Executive Order 13132. For a more detailed discussion about how Part 98 relates to existing state programs, please see Section II of the preamble to the final Greenhouse Gas Reporting Rule (74 FR 56266).

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The proposed amendments apply to facilities that directly emit fluorinated GHGs or that are suppliers of fluorinated GHGs. They would not apply to governmental entities unless the governmental entity owns a facility that directly emits fluorinated GHGs above threshold levels (such as a semiconductor manufacturing facility). We are not aware of any governmental entities that would be affected. This regulation also would not limit the power of states or localities to collect GHG data and/or regulate GHG emissions. Thus, Executive Order 13132 does not apply to this action.

Although section 6 of Executive Order 13132 does not apply to this action, the EPA did consult with state and local officials or representatives of state and local governments in developing the original GHG Reporting Rule published on October 30, 2009 and the rule finalizing subparts I, L, DD, QQ, and SS published on December 1, 2010. A summary of the EPA's consultations with state and local governments is provided in Section VIII.E of the preamble to the 2009 final rule.

In the spirit of Executive Order 13132, and consistent with EPA policy to promote communications between the EPA and state and local governments, the EPA specifically solicits comment on this proposed action from state and local officials.

F. Executive Order 13175: Consultation and Coordination with Indian Tribal Governments

This action would not have tribal implications, as specified in Executive Order 13175 (65 FR 67249, November 9, 2000). The proposed amendments apply to facilities that directly emit fluorinated GHGs or that are suppliers of fluorinated GHGs. They would not have tribal implications unless the tribal entity owns a facility that directly emits fluorinated GHGs above threshold levels (such as a semiconductor manufacturing facility). We are not aware of any tribal

facilities that would be affected. Thus, Executive Order 13175 does not apply to this action. EPA specifically solicits additional comment on this proposed action from tribal officials.

G. Executive Order 13045: Protection of Children from Environmental Health Risks and Safety Risks

The EPA interprets Executive Order 13045 (62 FR 19885, April 23, 1997) as applying only to those regulatory actions that concern health or safety risks, such that the analysis required under section 5-501 of the Executive Order has the potential to influence the regulation. This action is not subject to Executive Order 13045 because it would not establish an environmental standard intended to mitigate health or safety risks.

H. Executive Order 13211: Actions that Significantly Affect Energy Supply, Distribution, or Use

This action is not subject to Executive Order 13211 (66 FR 28355, May 22, 2001), because it is not a significant regulatory action under Executive Order 12866.

I. National Technology Transfer and Advancement Act

Section 12(d) of the National Technology Transfer and Advancement Act of 1995 (NTTAA), Public Law No. 104-113 (15 U.S.C. 272 note), directs the EPA to use voluntary consensus standards in its regulatory activities unless to do so would be inconsistent with applicable law or otherwise impractical. Voluntary consensus standards are technical standards (e.g., materials specifications, test methods, sampling procedures, and business practices) that are developed or adopted by voluntary consensus standards bodies. NTTAA directs the EPA to provide Congress, through OMB, explanations when the EPA decides not to use available and applicable voluntary consensus standards.

This proposed rulemaking does not involve technical standards. Therefore, the EPA is not considering the use of any voluntary consensus standards.

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J. Executive Order 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations

Executive Order 12898 (59 FR 7629, February 16, 1994) establishes federal executive policy on environmental justice. Its main provision directs federal agencies, to the greatest extent practicable and permitted by law, to make environmental justice part of their mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations in the United States.

The EPA has determined that this proposed rule would not have disproportionately high and adverse human health or environmental effects on minority or low-income populations because it would not affect the level of protection provided to human health or the environment; it is a rule addressing information collection and reporting procedures.

List of Subjects in 40 CFR Part 98

Environmental protection, Administrative practice and procedure, Greenhouse gases,
Reporting and recordkeeping requirements.

Dated:

Gina McCarthy,
Administrator.

For the reasons stated in the preamble, the Environmental Protection Agency proposes to amend CFR title 40 chapter I as set forth below:

PART 98--[MANDATORY GREENHOUSE GAS REPORTING]

1. The authority citation for part 98 continues to read as follows:

Authority: 42 U.S.C. 7401, et seq.

Subpart A--[GENERAL PROVISIONS]

2. Section 98.2 is amended by:

- a. Revising paragraph (b)(1);
- b. Revising paragraph (b)(4); and
- c. Revising paragraph (f)(1).

The revisions read as follows:

§ 98.2 Who must report?

* * * * *

(b) * * *

(1) Calculate the annual emissions of CO₂, CH₄, N₂O, and each fluorinated GHG in metric tons from all applicable source categories listed in paragraph (a)(2) of this section. The GHG emissions shall be calculated using the calculation methodologies specified in each applicable subpart and available company records.

* * * * *

(4) Sum the emissions estimates from paragraphs (b)(1), (b)(2), and (b)(3) of this section for each GHG and calculate metric tons of CO₂e using Equation A-1 of this section.

$$CO_2e = \sum_{i=1}^n GHG_i \times GWP_i \quad \text{(Eq. A-1)}$$

Where:

- CO₂e = Carbon dioxide equivalent, metric tons/year.
- GHG_i = Mass emissions of each greenhouse gas, metric tons/year.
- GWP_i = Global warming potential for each greenhouse gas from Table A-1 of this subpart.
- n = The number of greenhouse gases emitted.
- * * * * *
- (f) * * *

(1) Calculate the mass in metric tons per year of CO₂, N₂O, and each fluorinated GHG that is imported and the mass in metric tons per year of CO₂, N₂O, and each fluorinated GHG that is exported during the year.

* * * * *

- 3. Section 98.3 is amended by:
 - a. Revising paragraph (c)(4)(iii)(E);
 - b. Removing and reserving paragraph (c)(4)(vi);
 - c. Revising paragraph (c)(5)(i);
 - d. Revising paragraph (c)(5)(ii);
 - e. Revising paragraph (c)(12)(iii)(E);
 - f. Revising paragraph (k); and
 - g. Revising paragraph (l) introductory text;
 - h. Revising paragraph (l)(1) introductory text;
 - i. Revising paragraph (l)(2) introductory text;
 - j. Revising paragraph (l)(2)(i);
 - k. Revising paragraph (l)(2)(ii)(C) through (E); and
 - l. Revising paragraph (l)(2)(iii).

The revisions read as follows:

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§ 98.3 What are the general monitoring, reporting, recordkeeping, and verification requirements of this part?

* * * * *

(c) * * *

(4) * * *

(iii) * * *

(E) Each fluorinated GHG (as defined in § 98.6).

* * * * *

(vi) [Reserved]

* * * * *

(5) * * *

(i) Total quantity of GHG aggregated for all GHG from all applicable supply categories in Table A-5 of this subpart and expressed in metric tons of CO₂e calculated using Equation A-1 of this subpart.

(ii) Quantity of each GHG from each applicable supply category in Table A-5 to this subpart, expressed in metric tons of each GHG.

* * * * *

(12) * * *

(iii) * * *

(E) Each fluorinated GHG.

* * * * *

(k) Revised global warming potentials and special provisions for reporting year 2013 and subsequent reporting years. This paragraph (k) applies to owners or operators of facilities or

suppliers that first become subject to any subpart of part 98 solely due to an amendment to Table A-1 of this subpart.

(1) A facility or supplier that first becomes subject to part 98 due to a change in the GWP for one or more compounds in Table A-1 of this subpart, Global Warming Potentials, is not required to submit an annual GHG report for the reporting year during which the change in GWPs is promulgated.

(2) A facility or supplier that was already subject to one or more subparts of part 98 but becomes subject to one or more additional subparts due to a change in the GWP for one or more compounds in Table A-1 of this subpart, is not required to include those subparts to which the facility is subject only due to the change in the GWP in the annual GHG report submitted for the reporting year during which the change in GWPs is promulgated .

(3) Starting on January 1 of the year after the year during which the change in GWPs is promulgated, facilities or suppliers identified in paragraphs (k)(1) or (2) of this section must start monitoring and collecting GHG data in compliance with the applicable subparts of part 98 to which the facility is subject due to the change in the GWP for the annual greenhouse gas report for that reporting year, which is due by March 31 of the following calendar year.

(4) A change in the GWP for one or more compounds includes the addition to Table A-1 of this subpart of either a chemical-specific or a default GWP that applies to a compound to which no chemical-specific GWP in Table A-1 of this subpart previously applied.

(l) Special provision for best available monitoring methods in 2014 and subsequent years.

This paragraph (l) applies to owners or operators of facilities or suppliers that first become subject to any subpart of part 98 due to an amendment to Table A-1 of this subpart, Global Warming Potentials.

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(1) Best available monitoring methods. From January 1 to March 31 of the year after the year during which the change in GWPs is promulgated, owners or operators subject to this paragraph (1) may use best available monitoring methods for any parameter (e.g., fuel use, feedstock rates) that cannot reasonably be measured according to the monitoring and QA/QC requirements of a relevant subpart. The owner or operator must use the calculation methodologies and equations in the “Calculating GHG Emissions” sections of each relevant subpart, but may use the best available monitoring method for any parameter for which it is not reasonably feasible to acquire, install, and operate a required piece of monitoring equipment by January 1 of the year after the year during which the change in GWPs is promulgated. Starting no later than April 1, of the year after the year during which the change in GWPs is promulgated, the owner or operator must discontinue using best available methods and begin following all applicable monitoring and QA/QC requirements of this part, except as provided in paragraph (1)(2) of this section. Best available monitoring methods means any of the following methods:

* * * * *

(2) Requests for extension of the use of best available monitoring methods. The owner or operator may submit a request to the Administrator to use one or more best available monitoring methods beyond March 31 of the year after the year during which the change in GWPs is promulgated.

(i) Timing of request. The extension request must be submitted to EPA no later than January 31 of the year after the year during which the change in GWPs is promulgated.

(ii) * * *

(C) A description of the reasons that the needed equipment could not be obtained and installed before April 1 of the year after the year during which the change in GWPs is promulgated.

(D) If the reason for the extension is that the equipment cannot be purchased and delivered by April 1 of the year after the year during which the change in GWPs is promulgated, supporting documentation such as the date the monitoring equipment was ordered, investigation of alternative suppliers and the dates by which alternative vendors promised delivery, backorder notices or unexpected delays, descriptions of actions taken to expedite delivery, and the current expected date of delivery.

(E) If the reason for the extension is that the equipment cannot be installed without a process unit shutdown, include supporting documentation demonstrating that it is not practicable to isolate the equipment and install the monitoring instrument without a full process unit shutdown. Include the date of the most recent process unit shutdown, the frequency of shutdowns for this process unit, and the date of the next planned shutdown during which the monitoring equipment can be installed. If there has been a shutdown or if there is a planned process unit shutdown between November 29 of the year during which the change in GWPs is promulgated and April 1 of the year after the year during which the change in GWPs is promulgated, include a justification of why the equipment could not be obtained and installed during that shutdown.

* * * * *

(iii) Approval criteria. To obtain approval, the owner or operator must demonstrate to the Administrator's satisfaction that it is not reasonably feasible to acquire, install, and operate a required piece of monitoring equipment by April 1 of the year after the year during which the change in GWPs is promulgated. The use of best available methods under this paragraph (l) will

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not be approved beyond December 31 of the year after the year during which the change in GWPs is promulgated.

4. Section 98.6 is amended by:
 - a. Adding, in alphabetical order, the definition for Fluorinated GHG group;
 - b. Adding, in alphabetical order, the definition for Fluorotelomer alcohols;
 - c. Adding, in alphabetical order, the definition for Fully fluorinated GHGs;
 - d. Revising the definition for Global warming potential;
 - e. Adding, in alphabetical order, the definition for Non-segregated saturated hydrochlorofluoroethers (HCFEs);
 - f. Adding, in alphabetical order, the definition for Non-segregated saturated hydrofluoroethers (HFEs);
 - g. Adding, in alphabetical order, the definition for Other fluorinated GHGs;
 - h. Adding, in alphabetical order, the definition for Partially segregated saturated hydrochlorofluoroethers (HCFEs);
 - i. Adding, in alphabetical order, the definition for Partially segregated saturated hydrofluoroethers (HFEs);
 - j. Adding, in alphabetical order, the definition for Saturated hydrochlorofluoroethers (HCFEs);
 - k. Adding, in alphabetical order, the definition for Saturated hydrofluorocarbons (HFCs);
 - l. Adding, in alphabetical order, the definition for Saturated hydrofluoroethers (HFEs);
 - m. Adding, in alphabetical order, the definition for Unsaturated ethers.
 - n. Adding, in alphabetical order, the definition for Unsaturated hydrochlorofluorocarbons (HCFCs);

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o. Adding, in alphabetical order, the definition for Unsaturated hydrofluorocarbons (HFCs); and

p. Adding, in alphabetical order, the definition for Unsaturated perfluorocarbons (PFCs).

The revisions and additions read as follows:

§ 98.6 Definitions.

* * * * *

Fluorinated GHG group means one of the following sets of fluorinated GHGs: fully fluorinated GHGs; saturated hydrofluorocarbons; partially segregated saturated hydrofluoroethers and saturated hydrochlorofluoroethers; non-segregated saturated hydrofluoroethers and saturated hydrochlorofluoroethers; unsaturated PFCs, unsaturated HFCs, unsaturated HCFCs, unsaturated ethers, unsaturated halogenated esters, fluorinated aldehydes, and fluorinated ketones; fluorotelomer alcohols; fluorinated GHGs with carbon-iodine bonds; or Other fluorinated GHGs.

* * * * *

Fluorotelomer alcohols means fluorinated GHGs with the chemical formula $C_nF_{2n+1}CH_2CH_2OH$.

* * * * *

Fully fluorinated GHGs means fluorinated GHGs that contain only single bonds and in which all available valence locations are filled by fluorine atoms. This includes but is not limited to: saturated perfluorocarbons; SF_6 ; NF_3 ; SF_5CF_3 ; fully fluorinated linear, branched, and cyclic alkanes; fully fluorinated ethers; fully fluorinated tertiary amines; fully fluorinated aminoethers; and perfluoropolyethers.

* * * * *

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Global warming potential or GWP means the ratio of the time-integrated radiative forcing from the instantaneous release of one kilogram of a trace substance relative to that of one kilogram of a reference gas, i.e., CO₂. GWPs for each greenhouse gas are provided in Table A-1 of this subpart. For purposes of the calculations in this part, if the GHG has a chemical-specific GWP listed in Table A-1, use that GWP. Otherwise, use the default GWP provided in Table A-1 for the fluorinated GHG group of which the GHG is a member.

* * * * *

Non-segregated saturated hydrochlorofluoroethers (HCFEs) means saturated hydrochlorofluoroethers that include fluorine substitutes on all alkyl groups.

Non-segregated saturated hydrofluoroethers (HFEs) means saturated hydrofluoroethers that include fluorine substitutes on all alkyl groups.

* * * * *

Other fluorinated GHGs means fluorinated GHGs that are none of the following: fully fluorinated GHGs, saturated hydrofluorocarbons, saturated hydrofluoroethers, saturated hydrochlorofluoroethers, unsaturated perfluorocarbons, unsaturated hydrofluorocarbons, unsaturated hydrochlorofluorocarbons, unsaturated ethers, unsaturated halogenated esters, fluorinated aldehydes, fluorinated ketones, fluorotelomer alcohols, or fluorinated GHGs with carbon-iodine bonds.

* * * * *

Partially segregated saturated hydrochlorofluoroethers (HCFEs) means saturated hydrochlorofluoroethers that contain at least one fully hydrogenated alkyl group with no fluorine or chlorine substitutes.

Partially segregated saturated hydrofluoroethers (HFES) means saturated hydrofluoroethers that contain at least one fully hydrogenated alkyl group with no fluorine substitutes.

* * * * *

Saturated hydrochlorofluoroethers (HCFES) means fluorinated GHGs in which two hydrocarbon groups are linked by an oxygen atom; in which two or more, but not all, of the hydrogen atoms in the hydrocarbon groups have been replaced by fluorine atoms and chlorine atoms; and which contain only single bonds.

Saturated hydrofluorocarbons (HFCs) means fluorinated GHGs that are hydrofluorocarbons and that contain only single bonds.

Saturated hydrofluoroethers (HFES) means fluorinated GHGs in which two hydrocarbon groups are linked by an oxygen atom; in which one or more, but not all, of the hydrogen atoms in the hydrocarbon groups have been replaced by fluorine atoms; and which contain only single bonds.

* * * * *

Unsaturated ethers means fluorinated GHGs in which two hydrocarbon groups are linked by an oxygen atom; in which one or more of the hydrogen atoms in the hydrocarbon groups have been replaced by fluorine atoms; and which contain one or more bonds that are not single bonds. Unsaturated ethers include unsaturated HFES.

Unsaturated hydrochlorofluorocarbons (HCFCs) means fluorinated GHGs that contain only carbon, chlorine, fluorine, and hydrogen and that contain one or more bonds that are not single bonds.

Unsaturated hydrofluorocarbons (HFCs) means fluorinated GHGs that are hydrofluorocarbons and that contain one or more bonds that are not single bonds.

Unsaturated perfluorocarbons (PFCs) means fluorinated GHGs that are perfluorocarbons and that contain one or more bonds that are not single bonds.

* * * * *

5. Table A-1 to Subpart A is revised to read as follows:

Table A-1 to Subpart A of Part 98—Global Warming Potentials [100-Year Time Horizon]

Chemical-Specific GWPs			
Name	CAS No.	Chemical formula	Global warming potential (100 yr.)
Carbon dioxide	124-38-9	CO ₂	1
Methane	74-82-8	CH ₄	25 ^a
Nitrous oxide	10024-97-2	N ₂ O	298 ^a
Fully Fluorinated GHGs			
Sulfur hexafluoride	2551-62-4	SF ₆	22,800 ^a
Trifluoromethyl sulphur pentafluoride	373-80-8	SF ₅ CF ₃	17,700
Nitrogen trifluoride	7783-54-2	NF ₃	17,200
PFC-14 (Perfluoromethane)	75-73-0	CF ₄	7,390 ^a
PFC-116 (Perfluoroethane)	76-16-4	C ₂ F ₆	12,200 ^a
PFC-218 (Perfluoropropane)	76-19-7	C ₃ F ₈	8,830 ^a
Perfluorocyclopropane	931-91-9	C-C ₃ F ₆	17,340
PFC-3-1-10 (Perfluorobutane)	355-25-9	C ₄ F ₁₀	8,860 ^a
PFC-318 (Perfluorocyclobutane)	115-25-3	C-C ₄ F ₈	10,300 ^a
PFC-4-1-12 (Perfluoropentane)	678-26-2	C ₅ F ₁₂	9,160 ^a
PFC-5-1-14 (Perfluorohexane, FC-72)	355-42-0	C ₆ F ₁₄	9,300 ^a

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PFC-9-1-18	306-94-5	C ₁₀ F ₁₈	7,500
PFC-6-1-12	335-57-9	C ₇ F ₁₆ ; CF ₃ (CF ₂) ₅ CF ₃	7,820 ^b
PFC-7-1-18	307-34-6	C ₈ F ₁₈ ; CF ₃ (CF ₂) ₆ CF ₃	7,620 ^b
PFPME (HT-70)	NA	CF ₃ OCF(CF ₃)CF ₂ O CF ₂ OCF ₃	10,300
Perfluorodecalin (cis)	60433-11-6	Z-C ₁₀ F ₁₈	7,236 ^b
Perfluorodecalin (trans)	60433-12-7	E-C ₁₀ F ₁₈	6,288 ^b
Saturated hydrofluorocarbons (HFCs)			
HFC-23	75-46-7	CHF ₃	14,800 ^a
HFC-32	75-10-5	CH ₂ F ₂	675 ^a
HFC-41	593-53-3	CH ₃ F	92 ^a
HFC-125	354-33-6	C ₂ HF ₅	3,500 ^a
HFC-134	359-35-3	C ₂ H ₂ F ₄	1,100 ^a
HFC-134a	811-97-2	CH ₂ FCF ₃	1,430 ^a
HFC-143	430-66-0	C ₂ H ₃ F ₃	353 ^a
HFC-143a	420-46-2	C ₂ H ₃ F ₃	4,470 ^a
HFC-152	624-72-6	CH ₂ FCH ₂ F	53
HFC-152a	75-37-6	CH ₃ CHF ₂	124 ^a
HFC-161	353-36-6	CH ₃ CH ₂ F	12
HFC-227ca	2252-84-8	CF ₃ CF ₂ CHF ₂	2640 ^b
HFC-227ea	431-89-0	C ₃ HF ₇	3,220 ^a
HFC-236cb	677-56-5	CH ₂ FCF ₂ CF ₃	1,340
HFC-236ea	431-63-0	CHF ₂ CHFCF ₃	1,370
HFC-236fa	690-39-1	C ₃ H ₂ F ₆	9,810 ^a
HFC-245ca	679-86-7	C ₃ H ₃ F ₅	693 ^a
HFC-245cb	1814-88-6	CF ₃ CF ₂ CH ₃	4620 ^b
HFC-245ea	24270-66-4	CHF ₂ CHFCHF ₂	235 ^b
HFC-245eb	431-31-2	CH ₂ FCHFCF ₃	290 ^b
HFC-245fa	460-73-1	CHF ₂ CH ₂ CF ₃	1,030

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HFC-263fb	421-07-8	CH ₃ CH ₂ CF ₃	76 ^b
HFC-272ca	420-45-1	CH ₃ CF ₂ CH ₃	144 ^b
HFC-329p	375-17-7	CHF ₂ CF ₂ CF ₂ CF ₃	2360 ^b
HFC-365mfc	406-58-6	CH ₃ CF ₂ CH ₂ CF ₃	794
HFC-43-10mee	138495-42-8	CF ₃ CFHCFHCF ₂ CF ₃	1,640 ^a
Partially segregated saturated hydrofluoroethers (HFEs) and hydrochlorofluoroethers (HCFEs)			
HFE-143a	421-14-7	CH ₃ OCF ₃	756
HFE-245cb2	22410-44-2	CH ₃ OCF ₂ CF ₃	708
HFE-254cb2	425-88-7	CH ₃ OCF ₂ CHF ₂	359
HFE-263fb2	460-43-5	CF ₃ CH ₂ OCH ₃	11
HFE-263m1; R-E-143a	690-22-2	CF ₃ OCH ₂ CH ₃	29 ^b
HFE-347mcc3 (HFE-7000)	375-03-1	CH ₃ OCF ₂ CF ₂ CF ₃	575
HFE-347mmy1	22052-84-2	CH ₃ OCF(CF ₃) ₂	343
HFE-356mec3	382-34-3	CH ₃ OCF ₂ CHFCF ₃	101
HFE-356mm1	13171-18-1	(CF ₃) ₂ CHOCH ₃	27
HFE-356pcc3	160620-20-2	CH ₃ OCF ₂ CF ₂ CHF ₂	110
HFE-365mcf2	22052-81-9	CF ₃ CF ₂ OCH ₂ CH ₃	58 ^b
HFE-365mcf3	378-16-5	CF ₃ CF ₂ CH ₂ OCH ₃	11
HFE-374pc2	512-51-6	CH ₃ CH ₂ OCF ₂ CHF ₂	557
HFE-449s1 (HFE-7100) Chemical blend	163702-07-6 163702-08-7	C ₄ F ₉ OCH ₃ (CF ₃) ₂ CFCF ₂ OCH ₃	297
HFE-569sf2 (HFE-7200) Chemical blend	163702-05-4 163702-06-5	C ₄ F ₉ OC ₂ H ₅ (CF ₃) ₂ CFCF ₂ OC ₂ H ₅	59
HG'-01	73287-23-7	CH ₃ OCF ₂ CF ₂ OCH ₃	222 ^b
HG'-02	485399-46-0	CH ₃ O(CF ₂ CF ₂ O) ₂ CH ₃	236 ^b
HG'-03	485399-48-2	CH ₃ O(CF ₂ CF ₂ O) ₃ CH ₃	221 ^b
Difluoro(methoxy)methane	359-15-9	CH ₃ OCHF ₂	144 ^b
2-Chloro-1,1,2-trifluoro-1-	425-87-6	CH ₃ OCF ₂ CHFCI	122 ^b

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methoxyethane			
1-Ethoxy-1,1,2,2,3,3,3-heptafluoropropane	22052-86-4	CF ₃ CF ₂ CF ₂ OCH ₂ CH ₃	61 ^b
2-Ethoxy-3,3,4,4,5-pentafluorotetrahydro-2,5-bis[1,2,2,2-tetrafluoro-1-(trifluoromethyl)ethyl]-furan	920979-28-8	C ₁₂ H ₅ F ₁₉ O ₂	56 ^b
1-Ethoxy-1,1,2,3,3,3-hexafluoropropane	380-34-7	CF ₃ CHF ₂ CF ₂ OCH ₂ CH ₃	23 ^b
Fluoro(methoxy)methane	460-22-0	CH ₃ OCH ₂ F	13 ^b
1,1,2,2-Tetrafluoro-3-methoxypropane; Methyl 2,2,3,3-tetrafluoropropyl ether	60598-17-6	CHF ₂ CF ₂ CH ₂ OCH ₃	0.5 ^b
Non-segregated saturated hydrofluoroethers (HFEs) and hydrochlorofluoroethers (HCFEs)			
HFE-125	3822-68-2	CHF ₂ OCF ₃	14,900
HFE-134 (HG-00)	1691-17-4	CHF ₂ OCHF ₂	6,320
HFE-227ea	2356-62-9	CF ₃ CHFOCF ₃	1,540
HFE-236ca	32778-11-3	CHF ₂ OCF ₂ CHF ₂	4,240 ^b
HFE-236ca12 (HG-10)	78522-47-1	CHF ₂ OCF ₂ OCHF ₂	2,800
HFE-236ea2 (Desflurane)	57041-67-5	CHF ₂ OCHF ₂ CF ₃	989
HFE-236fa	20193-67-3	CF ₃ CH ₂ OCF ₃	487
HFE-245fa1	84011-15-4	CHF ₂ CH ₂ OCF ₃	286
HFE-245fa2	1885-48-9	CHF ₂ OCH ₂ CF ₃	659
HFE-329mcc2	134769-21-4	CF ₃ CF ₂ OCF ₂ CHF ₂	919
HFE-329me3	428454-68-6	CF ₃ CFHCF ₂ OCF ₃	4,550 ^b
HFE-338mcf2	156053-88-2	CF ₃ CF ₂ OCH ₂ CF ₃	552
HFE-338mmz1	26103-08-2	CHF ₂ OCH(CF ₃) ₂	380
HFE-338pcc13 (HG-01)	188690-78-0	CHF ₂ OCF ₂ CF ₂ OCHF ₂	1,500
HFE-347mcf2	171182-95-9	CF ₃ CF ₂ OCH ₂ CHF ₂	374
HFE-347mmz1 (Sevoflurane)	28523-86-6	(CF ₃) ₂ CHOCHF ₂	216 ^c
HFE-347pcf2	406-78-0	CHF ₂ CF ₂ OCH ₂ CF ₃	580

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HFE-356mff2	333-36-8	CF ₃ CH ₂ OCH ₂ CF ₃	17 ^b
HFE-356pcf2	50807-77-7	CHF ₂ CH ₂ OCF ₂ CHF ₂	265
HFE-356pcf3	35042-99-0	CHF ₂ OCH ₂ CF ₂ CHF ₂	502
HFE-43-10pccc (H-Galden 1040x, HG-11)	E1730133	CHF ₂ OCF ₂ OC ₂ F ₄ O CHF ₂	1,870
HCFE-235ca2 (Enflurane)	13838-16-9	CHF ₂ OCF ₂ CHFCI	583 ^b
HCFE-235da2 (Isoflurane)	26675-46-7	CHF ₂ OCHClCF ₃	350
HG-02	205367-61-9	HF ₂ C-(OCF ₂ CF ₂) ₂ - OCF ₂ H	2,730 ^b
HG-03	173350-37-3	HF ₂ C-(OCF ₂ CF ₂) ₃ - OCF ₂ H	2,850 ^b
HG-20	249932-25-0	HF ₂ C-(OCF ₂) ₂ - OCF ₂ H	5,300 ^b
HG-21	249932-26-1	HF ₂ C- OCF ₂ CF ₂ OCF ₂ OCF ₂ O-CF ₂ H	3,890 ^b
HG-30	188690-77-9	HF ₂ C-(OCF ₂) ₃ - OCF ₂ H	7,330 ^b
1,1,1,2,2,3,3-Heptafluoro-3-(1,2,2,2-tetrafluoroethoxy)-propane	3330-15-2	CF ₃ CF ₂ CF ₂ OCHFC F ₃	6,490 ^b
1,1'-Oxybis[2-(difluoromethoxy)-1,1,2,2-tetrafluoroethane	205367-61-9	HCF ₂ O(CF ₂ CF ₂ O) ₂ CF ₂ H	4,920 ^b
1,1,3,3,4,4,6,6,7,7,9,9,10,10,12,12-hexadecafluoro-2,5,8,11-Tetraoxadodecane	173350-37-3	HCF ₂ O(CF ₂ CF ₂ O) ₃ CF ₂ H	4,490 ^b
1,1,3,3,4,4,6,6,7,7,9,9,10,10,12,12,13,13,15,15-eicosafluoro-2,5,8,11,14-Pentaoxapentadecane	173350-38-4	HCF ₂ O(CF ₂ CF ₂ O) ₄ CF ₂ H	3,630 ^b
1,1,2-Trifluoro-2-(trifluoromethoxy)-ethane	84011-06-3	CHF ₂ CHFOCF ₃	1,240 ^b
1,1,2,2-Tetrafluoro-1-(fluoromethoxy)ethane	37031-31-5	CH ₂ FOCF ₂ CF ₂ H	871 ^b
Trifluoro(fluoromethoxy)methane	2261-01-0	CH ₂ FOCF ₃	751 ^b
Difluoro(fluoromethoxy)methane	461-63-2	CH ₂ FOCHF ₂	617 ^b

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Fluoro(fluoromethoxy)methane	462-51-1	CH ₂ FOCH ₂ F	130 ^b
Unsaturated perfluorocarbons (PFCs)			
PFC-1114; TFE	116-14-3	CF ₂ =CF ₂ ; C ₂ F ₄	0.004 ^b
PFC-1216; Dyneon HFP	116-15-4	C ₃ F ₆ ; CF ₃ CF=CF ₂	0.05 ^b
PFC C-1418	559-40-0	c-C ₅ F ₈	1.97 ^b
Perfluorobut-2-ene	360-89-4	CF ₃ CF=CF ₂	1.82 ^b
Perfluorobut-1-ene	357-26-6	CF ₃ CF ₂ CF=CF ₂	0.10 ^b
Perfluorobuta-1,3-diene	685-63-2	CF ₂ =CF ₂ CF=CF ₂	0.003 ^b
Unsaturated hydrofluorocarbons (HFCs) and hydrochlorofluorocarbons (HCFCs)			
HFC-1132a; VF2	75-38-7	C ₂ H ₂ F ₂ , CF ₂ =CH ₂	0.04 ^b
HFC-1141; VF	75-02-5	C ₂ H ₃ F, CH ₂ =CHF	0.02 ^b
(E)-HFC-1225ye	5595-10-8	CF ₃ CF=CHF(E)	0.06 ^b
(Z)-HFC-1225ye	5528-43-8	CF ₃ CF=CHF(Z)	0.22 ^b
Solstice 1233zd(E)	102687-65-0	C ₃ H ₂ ClF ₃ ; CHCl=CHCF ₃	1.34 ^b
HFC-1234yf; HFO-1234yf	754-12-1	C ₃ H ₂ F ₄ ; CF ₃ CF=CH ₂	0.31 ^b
HFC-1234ze(E)	1645-83-6	C ₃ H ₂ F ₄ ; cis- CF ₃ CH=CHF	0.97 ^b
HFC-1234ze(Z)	29118-25-0	C ₃ H ₂ F ₄ ; trans-CF ₃ CH=CHF; CF ₃ CH=CHF(Z)	0.29 ^b
HFC-1243zf; TFP	677-21-4	C ₃ H ₃ F ₃ , CF ₃ CH=CH ₂	0.12 ^b
(Z)-HFC-1336	692-49-9	CF ₃ CH=CHCF ₃ (Z)	1.58 ^b
HFO-1345zfc	374-27-6	C ₂ F ₅ CH=CH ₂	0.09 ^b
Capstone 42-U	19430-93-4	C ₆ H ₃ F ₉ , CF ₃ (CF ₂) ₃ CH=CH ₂	0.16 ^b
Capstone 62-U	25291-17-2	C ₈ H ₃ F ₁₃ , CF ₃ (CF ₂) ₅ CH=CH ₂	0.11 ^b
Capstone 82-U	21652-58-4	C ₁₀ H ₃ F ₁₇ , CF ₃ (CF ₂) ₇ CH=CH ₂	0.09 ^b
Unsaturated halogenated ethers			

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PMVE; HFE-216	1187-93-5	CF ₃ OCF ₂ =C	0.17 ^b
Fluoroxene	406-90-6	CF ₃ CH ₂ OCH=CH ₂	0.05 ^b
Fluorinated aldehydes			
3,3,3-Trifluoro-propanal	460-40-2	CF ₃ CH ₂ CHO	0.01 ^b
Fluorinated ketones			
Novec 1230 (perfluoro (2-methyl-3-pentanone))	756-13-8	CF ₃ CF ₂ C(O)CF ₂ (CF ₃) ₂	0.1 ^b
Fluorotelomer alcohols			
3,3,4,4,5,5,6,6,7,7,7-Undecafluoroheptan-1-ol	185689-57-0	CF ₃ (CF ₂) ₄ CH ₂ CH ₂ OH	0.43 ^b
3,3,3-Trifluoropropan-1-ol	2240-88-2	CF ₃ CH ₂ CH ₂ OH	0.35 ^b
3,3,4,4,5,5,6,6,7,7,8,8,9,9,9-Pentadecafluorononan-1-ol	755-02-2	CF ₃ (CF ₂) ₆ CH ₂ CH ₂ OH	0.33 ^b
3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,11-Nonadecafluoroundecan-1-ol	87017-97-8	CF ₃ (CF ₂) ₈ CH ₂ CH ₂ OH	0.19 ^b
Fluorinated GHGs with carbon-iodine bond(s)			
Trifluoroiodomethane	2314-97-8	CF ₃ I	0.4 ^b
Other fluorinated compounds			
Trifluoromethyl formate	85358-65-2	HCOOCF ₃	588 ^b
Perfluoroethyl formate	313064-40-3	HCOOCF ₂ CF ₃	580 ^b
1,2,2,2-Tetrafluoroethyl formate	481631-19-0	HCOOCHF ₂ CF ₃	470 ^b
Perfluorobutyl formate	197218-56-7	HCOOCF ₂ CF ₂ CF ₂ CF ₃	392 ^b
Perfluoropropyl formate	271257-42-2	HCOOCF ₂ CF ₂ CF ₃	376 ^b
1,1,1,3,3,3-Hexafluoropropan-2-yl formate	856766-70-6	HCOOCH(CF ₃) ₂	333 ^b
Dibromodifluoromethane (Halon 1202)	75-61-6	CF ₂ Br ₂	231 ^b
Bis(trifluoromethyl)-methanol	920-66-1	(CF ₃) ₂ CHOH	195
1,1,1,3,3,3-Hexafluoropropan-2-ol	920-66-1	(CF ₃) ₂ CHOH	182 ^b
Methyl carbonofluoridate	1538-06-3	FCOOCH ₃	95 ^b
(Octafluorotetramethy-lene)	NA	X-(CF ₂) ₄ CH(OH)-	73

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hydroxymethyl group		X	
Methyl 2,2,2-trifluoroacetate	431-47-0	CF ₃ COOCH ₃	52 ^b
2,2,3,3,3-pentafluoropropanol	422-05-9	CF ₃ CF ₂ CH ₂ OH	42
2-Bromo-2-chloro-1,1,1-trifluoroethane (Halon-2311 / Halothane)	151-67-7	CHBrClCF ₃	41 ^b
2,2,3,3,4,4,4-Heptafluorobutan-1-ol	375-01-9	C ₃ F ₇ CH ₂ OH	34 ^b
2,2,2-Trifluoroethyl formate	32042-38-9	HCOOCH ₂ CF ₃	33 ^b
1,1-Difluoroethyl 2,2,2-trifluoroacetate	1344118-13-3	CF ₃ COOCF ₂ CH ₃	31 ^b
Difluoromethyl 2,2,2-trifluoroacetate	2024-86-4	CF ₃ COOCHF ₂	27 ^b
1,1-Difluoroethyl carbonofluoridate	1344118-11-1	FCOOCF ₂ CH ₃	27 ^b
2,2,2-Trifluoroethanol	75-89-8	CF ₃ CH ₂ OH	20 ^b
2,2,3,3,3-Pentafluoropropan-1-ol	422-05-9	CF ₃ CF ₂ CH ₂ OH	19 ^b
2,2,3,4,4,4-Hexafluoro-1-butanol	382-31-0	CF ₃ CHFCF ₂ CH ₂ OH	17 ^b
3,3,3-Trifluoropropyl formate	1344118-09-7	HCOOCH ₂ CH ₂ CF ₃	17 ^b
2,2,3,3,4,4,4-Heptafluoro-1-butanol	375-01-9	CF ₃ CF ₂ CF ₂ CH ₂ OH	16 ^b
2,2,3,3-Tetrafluoro-1-propanol	76-37-9	CHF ₂ CF ₂ CH ₂ OH	13 ^b
2,2,2-Trifluoroethyl 2,2,2-trifluoroacetate	407-38-5	CF ₃ COOCH ₂ CF ₃	7 ^b
Methyl 2,2-difluoroacetate	433-53-4	HCF ₂ COOCH ₃	3 ^b
2,2-Difluoroethanol	359-13-7	CHF ₂ CH ₂ OH	3 ^b
Perfluoroethyl acetate	343269-97-6	CH ₃ COOCF ₂ CF ₃	2.1 ^b
Trifluoromethyl acetate	74123-20-9	CH ₃ COOCF ₃	2.0 ^b
Perfluoropropyl acetate	1344118-10-0	CH ₃ COOCF ₂ CF ₂ CF ₃	1.8 ^b
Perfluorobutyl acetate	209597-28-4	CH ₃ COOCF ₂ CF ₂ CF ₂ CF ₃	1.6 ^b
Ethyl 2,2,2-trifluoroacetate	383-63-1	CF ₃ COOCH ₂ CH ₃	1.3 ^b
2-Fluoroethanol	371-62-0	CH ₂ FCH ₂ OH	1.1 ^b
4,4,4-Trifluorobutan-1-ol	461-18-7	CF ₃ (CH ₂) ₂ CH ₂ OH	0.05 ^b

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Default GWPs for Compounds for which Chemical-Specific GWPs Are Not Listed Above	
Fluorinated GHG Group^d	Global warming potential (100 yr.)
Fully fluorinated GHGs	10,000
Saturated hydrofluorocarbons (HFCs)	2,200
Partially segregated saturated hydrofluoroethers (HFEs) and hydrochlorofluoroethers (HCFEs)	200
Non-segregated saturated HFEs and HCFEs	2,400
Unsaturated perfluorocarbons (PFCs), unsaturated HFCs, unsaturated hydrochlorofluorocarbons (HCFCs), unsaturated halogenated ethers, unsaturated halogenated esters, fluorinated aldehydes, and fluorinated ketones	1
Fluorotelomer alcohols	1
Fluorinated GHGs with carbon-iodine bond(s)	1
Other fluorinated GHGs	110

^a The GWP for this compound is different than the GWP in the version of Table A-1 to subpart A of Part 98 published on October 30, 2009.

^b This compound was added to Table A-1 for reporting year 2014 and subsequent reporting years.

^c The GWP for this compound was updated for reporting year 2014 and subsequent reporting years.

^d For electronics manufacturing (as defined in § 98.90), the term “fluorinated GHGs” in the definition of each fluorinated GHG group in § 98.6 shall include fluorinated heat transfer fluids (as defined in § 98.98), whether or not they are also fluorinated GHGs.

Subpart I—[ELECTRONICS MANUFACTURING]

6. Section 98.93 is amended by revising introductory paragraph (i)(2) to read as follows:

§98.93 Calculating GHG emissions.

* * * * *

(i) * * *

(2) Method selection for stack systems in the fab. If the calculations under paragraph

(i)(1) of this section, as well as any subsequent annual measurements and calculations under this

subpart, indicate that the stack system meets the criteria in paragraph (i)(2)(i) through (iii) of this

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section, then you may comply with either paragraph (i)(3) of this section (stack test method) or paragraph (i)(4) of this section (method to estimate emissions from the stack systems that are not tested). If the stack system does not meet all three criteria in paragraphs (i)(2)(i) through (iii) of this section, then you must comply with the stack test method specified in paragraph (i)(3) of this section.

* * * * *

7. Section 98.94 is amended by:

- a. Removing paragraph (j)(5)(ii)(C); and
- b. Revising paragraph (j)(8)(i).

The revision reads as follows:

§98.94 Monitoring and QA/QC requirements.

* * * * *

(j) * * *

(8) * * *

(i) Annual consumption of a fluorinated GHG used during the most recent emissions test (expressed in CO₂e) changes by more than 10 percent of the total annual fluorinated GHG consumption, relative to gas consumption in CO₂e for that gas during the year of the most recent emissions test (for example, if the use of a single gas goes from 25 percent of CO₂e to greater than 35 percent of CO₂e, this change would trigger a re-test).

* * * * *

8. Section 98.96 is amended by:

- a. Revising the parameter “GWP_i” of Equation I-26 in introductory paragraph (r);
- b. Revising the parameters “GWP_i” and “GWP_k” of Equation I-27 in paragraph (r)(1);

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c. Revising the parameters “GWP_i” and “GWP_k” of Equation I-28 in paragraph (r)(2);

and

d. Revising paragraph (x).

The revisions read as follows:

§98.96 Data reporting requirements.

* * * * *

(r) * * *

* * * * *

GWP_i = GWP of emitted fluorinated GHG i from Table A-1 of this part.

* * * * *

(1) * * *

* * * * *

GWP_i = GWP of emitted fluorinated GHG i from Table A-1 of this part.

GWP_k = GWP of emitted fluorinated GHG by-product k, from Table A-1 of this part.

* * * * *

(2) * * *

* * * * *

GWP_i = GWP of emitted fluorinated GHG i from Table A-1 of this part.

GWP_k = GWP of emitted fluorinated GHG by-product k, from Table A-1 of this part.

* * * * *

(x) If the emissions you report under paragraph (c) of this section include emissions from research and development activities, as defined in § 98.6, report the approximate percentage of total GHG emissions, on a metric ton CO₂e basis, that are attributable to research and

development activities, using the following ranges: less than 5 percent, 5 percent to less than 10 percent, 10 percent to less than 25 percent, 25 percent to less than 50 percent, 50 percent to less than 75 percent, 75 percent to less than 90 percent, 90 percent to less than 95 percent, 95 percent to less than 99 percent, and 99 percent to less than 100 percent. This document is a prepublication version, signed by EPA Administrator Gina McCarthy on July 24, 2014. We have taken steps to ensure the accuracy of this version, but it is not the official version.

percent, 10 percent to less than 25 percent, 25 percent to less than 50 percent, 50 percent and higher.

* * * * *