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Reporting greenhouse gas emissions data: technical guidance

Guidance for reporting data to the Greenhouse Gas Reporting Program (GHGRP).

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Reporting requirements of greenhouse gas emissions

This technical guidance document is intended to help explain the most current greenhouse gas (GHG) reporting requirements issued under Environment and Climate Change Canada's Greenhouse Gas Reporting Program (GHGRP) until an updated version of this document is published. At the time of publication of this edition, the most current reporting requirements are those for the years 2024 and 2025, published in December 2023, in the *Canada Gazette* notice entitled *Notice with respect to reporting of greenhouse gases (GHGs) for 2024 and 2025 ("the GHGRP Notice")*. The GHGRP Notice supports the annual mandatory reporting of GHG emissions by facilities under the GHGRP.

All facilities that emit the equivalent of 10 000 tonnes (10 kilotonnes) or more of GHGs in carbon dioxide equivalent units (CO₂ eq) per year are required to submit a report. Expanded reporting requirements and the application of prescribed methodologies apply to facilities involved in the activities listed below, which were introduced in 2017 and 2018.

Sectors/activities subject to expanded reporting:

- Aluminium Production
- Ammonia Production
- Base Metal Production
- Cement Production
- Electricity and Heat Generation
- Ethanol Production
- Hydrogen Production
- Iron and Steel Production
- Lime Production
- Mining
- Nitric Acid Production
- Petroleum Refining
- Pulp and Paper Production
- CO₂ capture, transport, injection and/or geological storage

The [GHGRP Notice](#) is available online. You can also visit [Environment and Climate Change Canada's greenhouse gas website](#) for further details on the GHGRP.

This technical guidance document has been updated to include relevant changes that reflect the latest reporting requirements in the published notice. A small number of technical changes were incorporated into the reporting requirements, as well as a change to the reporting process (i.e. option to upload a provincial report discontinued) and a planned change to the level of emissions data expected to be made publicly available (for more details on the changes, see the published [ECCC response to stakeholder feedback](#)).

Glossary of terms

The following words and terms used in this guidance document shall have the indicated meaning:

2006 Intergovernmental Panel on Climate Change (IPCC)

Guidelines means the *2006 IPCC Guidelines for National Greenhouse Gas Inventories*, prepared by the Intergovernmental Panel on Climate Change National Greenhouse Gas Inventories Program.

Aluminium production means primary processes that are used to manufacture aluminium from alumina, including electrolysis in prebake and Söderberg cells, anode and cathode baking for prebake cells, and green coke calcination.

Base metal production means the primary and secondary production processes that are used to recover copper, nickel, zinc, lead, and cobalt. Primary production includes the smelting or refining of base metals from feedstock that comes primarily from ore. Secondary production processes includes the recovery of base metals from various feedstock materials, such as recycled metals. Process activities may include the removal of impurities using carbonate flux reagents, the use of reducing agents to extract metals or slag cleaning, and the consumption of carbon electrodes.

Biomass means plants or plant materials, animal waste or any product made of either of these, including wood and wood products, charcoal, and agricultural residues; biologically derived organic matter in municipal and industrial wastes, landfill gas, bio-alcohols, black liquor, sludge digestion gas and animal- or plant-derived oils.

Bone dry tonnes means biomass solids that contain zero percent (0%) moisture.

Canada's 2024 Greenhouse Gas Quantification Requirements means the document titled *Canada's Greenhouse Gas Quantification Requirements*, published by Environment and Climate Change Canada, 2023.

Carbon capture, transport, utilization and storage (CCTUS) means collectively CO₂ capture, CO₂ transport, CO₂ injection, CO₂ utilization and CO₂ storage.

Carbon dioxide equivalent (CO₂ eq) means a unit of measure for comparison between greenhouse gases that have different global warming potentials (GWPs). Since many greenhouse gases (GHGs) exist and their GWPs vary, the emissions are added in a common unit, CO₂ equivalent. To express GHG emissions in units of CO₂ equivalent, the quantity of a given GHG (expressed in units of mass) is multiplied by its GWP.

CAS Registry Number means the Chemical Abstracts Service Registry Number.

Cement production means all processes used to manufacture portland, ordinary portland, masonry, pozzolanic or other hydraulic cements.

CEMS means Continuous Emission Monitoring system.

CKD means cement kiln dust.

CO₂ capture means the capture of CO₂ at an integrated facility that would otherwise be directly released to the atmosphere.

CO₂ emissions from biomass decomposition means releases of CO₂ resulting from aerobic decomposition of biomass and from the fermentation of biomass.

CO₂ injection means an activity that places captured CO₂ into a long-term geological storage site or an enhanced fossil fuel recovery operation.

CO₂ storage means storage of CO₂ in a long-term geological formation.

CO₂ transport system means a system transporting captured CO₂ by any mode.

CO₂ utilization means the usage of captured CO₂ in products and processes with a goal of long-term removal from the atmosphere, including CO₂ injection at an enhanced fossil fuel recovery operation.

Cogeneration unit means a fuel combustion device which simultaneously generates electricity and either heat or steam.

Continuous Emission Monitoring system means the complete equipment for sampling, conditioning, and analyzing emissions or process parameters and for recording data.

CSM means cyclohexane-soluble matter.

Electricity generating unit means any device that combusts solid, liquid, or gaseous fuel for the purpose of producing electricity either for sale or for use on site. This includes cogeneration unit(s), but excludes portable or emergency generators that have less than 50 kW in nameplate generating capacity or that generate less than 2 MWh during the reporting year.

Emissions means direct releases to the atmosphere from sources that are located at the facility.

Enhanced fossil fuel recovery operation means enhanced oil recovery, enhanced natural gas recovery and enhanced coal bed methane recovery.

Ethanol production means processes that produce grain ethanol for the use in industrial applications or as a fuel.

Facility means an integrated facility, a pipeline transportation system, or an offshore installation.

Flaring emissions means controlled releases of gases from industrial activities, from the combustion of a gas or liquid stream produced at the facility, the purpose of which is not to produce useful heat or work. This

includes releases from waste petroleum incineration; hazardous emission prevention systems (in pilot or active mode); well testing; natural gas gathering systems; natural gas processing plant operations; crude oil production; pipeline operations; petroleum refining; chemical fertilizer production; steel production.

Fossil fuel production and processing means the exploration, extraction, processing including refining and upgrading, transmission, storage and use of solid, liquid or gaseous petroleum, coal or natural gas fuels, or any other fuels derived from these sources.

Fugitive emissions means releases from venting, flaring or leakage of gases from fossil fuel production and processing; iron and steel coke oven batteries; CO₂ capture, transport, injection and storage infrastructure.

GHGs means greenhouse gases.

GHGRP Notice means the Notice with respect to reporting of greenhouse gases (GHGs) for 2024 and 2025, *Canada Gazette*, Part I. This notice was published in the *Canada Gazette* on December 9, 2023.

GWP means global warming potential and allows the comparison of the global warming impacts of different gases. It is a measure of how much energy the emissions of 1 tonne of a certain gas will absorb over a given period of time, compared to the emissions of 1 tonne of carbon dioxide (CO₂). The time period for GWPs used for GHG reporting as per international reporting standards is 100 years. The larger the GWP, the more the given gas impacts global warming compared to CO₂. For example, the GWP for nitrous oxide (N₂O) is 265, which means that 1 tonne of N₂O emissions is equivalent to 265 tonnes of CO₂ emissions.

HFCs means hydrofluorocarbons.

Hydrogen production means processes that produce hydrogen gas by steam hydrocarbon reforming, partial oxidation of hydrocarbons, or other transformation of hydrocarbon feedstock. This activity may occur at bitumen upgraders; petroleum refineries; chemical plants; fertilizer plants; stand-alone industrial gas producers, and where needed for purification or synthesis of substances.

Industrial process emissions means releases from an industrial process that involves a chemical or physical reaction the primary purpose of which is to produce a product, as opposed to useful heat or work. This does not include venting from hydrogen production associated with fossil fuel production and processing.

Industrial product use emissions means releases from the use of a product, in an industrial process, that is not involved in a chemical or physical reaction and does not react in the process. This includes releases from the use of SF₆, HFCs and PFCs as cover gases, and the use of HFCs and PFCs in foam blowing. This does not include releases of PFCs and HFCs used in refrigeration, air conditioning, semiconductor production, fire extinguishing, solvents, aerosols and releases of SF₆ used in explosion protection, leak detection, electronic applications and fire extinguishing.

Integrated facility means all buildings, equipment, structures, on-site transportation machinery and stationary items that are located on a single site, on multiple sites or between multiple sites that are owned or operated by the same person or persons and that function as a single integrated site.

Integrated facility excludes public roads.

Iron and steel production means primary iron and steel production processes, secondary steelmaking processes, iron production processes, coke oven battery production processes, iron ore pellet firing processes, or iron and steel powder processes.

Leakage emissions means accidental releases and leaks of gases from fossil fuel production and processing, transmission and distribution; iron and steel coke oven batteries; CO₂ capture, transport, injection and storage infrastructure.

Lime production means all processes that are used to manufacture a lime product by calcination of limestone or other calcareous materials.

Mining means the mining, beneficiating or otherwise preparing metallic and non-metallic minerals, including coal.

NAICS means the North American Industry Classification System.

Nitric acid production means the use of one or more trains to produce weak nitric acid that is 30 to 70 percent in strength. A nitric acid train produces weak nitric acid through the catalytic oxidation of ammonia followed by the absorption of nitrogen oxides by water. The absorber tail gas contains unabsorbed nitrogen oxides, including nitrous oxide emissions of which may be reduced by abatement technologies.

Offshore installation means an offshore drilling unit, production platform or ship, or sub-sea installation that is attached or anchored to the continental shelf of Canada in connection with the exploitation of oil or natural gas.

On-site transportation emissions means releases from machinery used for the transport or movement of substances, materials, equipment or products that are used in the production process at an integrated facility. This includes releases from vehicles without public road licences.

Petroleum refining means processes used to produce gasoline, aromatics, kerosene, distillate fuel oils, residual fuel oils, lubricants, asphalt, or other products through the refining of crude oil or through redistillation, cracking, rearrangement or reforming of unfinished petroleum derivatives. This includes catalytic cracking units; fluid coking units; delayed coking

units; catalytic reforming units; coke calcining units; asphalt blowing operations; blowdown systems; storage tanks; process equipment components (i.e., compressors, pumps, valves, pressure relief devices, flanges, and connectors) in gas service; marine vessel, barge, tanker truck, and similar loading operations; flares; sulphur recovery plants; and non-merchant hydrogen plants that are owned or under the direct control of the refinery owner and operator. This does not include facilities that distill only pipeline transmix or produce lubricants, asphalt paving, roofing, and other saturated materials using already refined petroleum products.

PFCs means perfluorocarbons.

Pipeline transportation system means all pipelines that are owned or operated by the same person within a province or territory that transport/distribute CO₂ or processed natural gas and their associated installations, including meter sets and storage installations but excluding straddle plants or other processing installations.

Pulp and paper production means separating cellulose fibres from other materials in fibre sources to produce pulp, paper and paper products. This includes converting paper into paperboard products, or operating coating and laminating processes.

Reporting company means a person who operates one or more facilities that meet the reporting criteria as set out in Schedule 3 of the GHGRP Notice.

Stationary fuel combustion emissions means releases from stationary fuel combustion sources, in which fuel is burned for the purpose of producing useful heat or work. This includes releases from the combustion of waste fuels to produce useful heat or work.

Stationary fuel combustion sources means devices that combust solid, liquid, gaseous, or waste fuel for the purpose of producing useful heat or work. This includes boilers, electricity generating units, cogeneration units, combustion turbines, engines, incinerators, process heaters, and other stationary combustion devices, but does not include emergency flares.

Surface leakage means CO₂ emitted from geological formations used for long term storage of CO₂.

Venting emissions means controlled releases of a process or waste gas, including releases of CO₂ associated with carbon capture, transport, injection and storage; from hydrogen production associated with fossil fuel production and processing; of casing gas; of gases associated with a liquid or a solution gas; of treater, stabilizer or dehydrator off-gas; of blanket gases; from pneumatic devices which use natural gas as a driver; from compressor start-ups, pipelines and other blowdowns; from metering and regulation station control loops.

Waste emissions means releases that result from waste disposal activities at a facility including landfilling of solid waste, flaring of landfill gas, and waste incineration. This does not include releases from the combustion of waste fuels to produce useful heat or work, or releases of CO₂ from biomass combustion.

Wastewater emissions mean releases resulting from wastewater and wastewater treatment at a facility. This includes, but is not limited to, releases from flaring of captured gas from wastewater treatment. It does not include releases of CO₂ from biomass combustion.

Background

Canada is working towards fulfilling its climate change policy objectives, in part by ensuring that it has the capacity to quantify, track and report progress on the reduction of greenhouse gas (GHG) emissions in a way that meets a required level of accuracy, thoroughness, transparency and public credibility.

The federal government, specifically Environment and Climate Change Canada (ECCC), is responsible for developing and reporting a reliable, accurate and timely Greenhouse Gas Inventory for Canada as part of its obligations under the United Nations Framework Convention on Climate Change (UNFCCC). To fulfill its obligations, Canada must estimate its national GHG emissions according to the comprehensive guidance provided by the UNFCCC, which includes reference to the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (IPCC, 2006),¹ a key technical document developed by the Intergovernmental Panel on Climate Change (IPCC)².

National GHG emissions and removals are reported to the United Nations Framework Convention on Climate Change (UNFCCC) according to the manner, format and frequency dictated by the UNFCCC Reporting Guidelines³. Canada's GHG Inventory is a comprehensive inventory of GHG data and information covering all sources and sinks of GHGs caused by human activity in Canada. The inventory is largely based on emission estimates developed from national and provincial statistics. The facility data collected under the GHGRP is used to compare, validate and in some cases, develop the national inventory estimates from industrial sources.

The Government of Canada established the GHGRP in March 2004 under the authority of section 46 of the *Canadian Environment Protection Act*, 1999 (CEPA) to collect GHG emissions information annually from the largest

emitting Canadian facilities. The GHGRP was launched through the publication of the first *Canada Gazette* notice in March 2004, which set out basic emissions reporting requirements. A *Canada Gazette* notice has been published every one or two years requiring the reporting of GHG emissions for the calendar year(s) specified in the notice and the facility data collected is published annually.

This program is part of Canada's ongoing efforts to develop and maintain, in collaboration with Canadian provinces and territories, a harmonized and efficient mandatory GHG reporting system that minimizes duplication and reporting burden for industry and governments. Key objectives of the program are to provide Canadians with consistent information on GHG emissions, support the development of emission estimates presented in the Canada's GHG Inventory and support regulatory initiatives.

In December 2016, ECCC issued a notice of intent in the *Canada Gazette* indicating its intent to pursue an expansion to the GHGRP in order to enable direct use of the reported data in Canada's GHG Inventory, to increase the consistency and comparability of GHG data across jurisdictions and to obtain a more comprehensive picture of emissions by Canadian facilities. Notices that were published to require reporting of 2017 and 2018 data represented phases 1 and 2 of the expansion, respectively. ECCC has also introduced some incremental changes to reporting since that time.

1 Introduction

1.1 Purpose

The purpose of this document is to provide guidance to potential reporting companies to help determine if they are required to submit a report by June 1st and to present technical information related to greenhouse gas

(GHG) emissions reporting. This technical information includes the GHGs and emission sources subject to reporting, along with information on methods for calculating emissions and the required reporting format. An overview of the reporting process is also described herein. Should any inconsistencies be found between this guide and the GHGRP Notice, the notice will prevail.

Separate guidance is available at the [GHGRP website](#) regarding the online Single Window System that is used to submit a report. Video tutorials are also available via YouTube. This guidance includes instructions on how to use the reporting system, how to complete and submit the report, and other relevant information.

1.2 Reporting process overview

The legal basis for the GHGRP is the *Notice with respect to reporting of greenhouse gases (GHGs)* for [a specified year(s)], which is published periodically (i.e., every two years) in the *Canada Gazette*, Part I under the authority of subsection 46(1) of the *Canadian Environmental Protection Act, 1999* (CEPA).

The current GHG reporting requirements stipulate that all persons who **operate** a facility that emits 10 000 tonnes (or 10 kt) or more of GHGs (expressed in carbon dioxide equivalent [CO₂ eq] units) in the calendar year (the reporting threshold), or a facility engaged in carbon capture, transport, utilization and storage (CCTUS) activities are subject to the reporting requirements and must report their emissions and other identified information to Environment and Climate Change Canada (ECCC) (see [Figure 1](#) for an overview of the reporting process). Facilities need to calculate their total emissions (in CO₂ eq units) of the GHGs covered by this reporting requirement to determine if they are required to report. If the

facility's emissions fall below the reporting threshold and if the facility is not engaged in CCTUS activities, the facility is not required to submit a report but is encouraged to submit a voluntary report nonetheless.

A reporting company with a facility or facilities subject to the reporting requirements must include with the GHG emissions report a statement of certification, signed by an authorized signing officer, indicating that the information submitted is true, accurate and complete. This statement should be submitted electronically with the GHG report through the online reporting system.

The reporting company may also submit, with the GHG report, a written request that the reported information be treated as confidential. If applicable, the reporting company must complete the confidentiality request process, which includes preparing the written request and submitting it online with the report to Environment and Climate Change Canada. Please note that a request for confidentiality must be submitted each year, since it applies only to the reporting year in which the request was made.

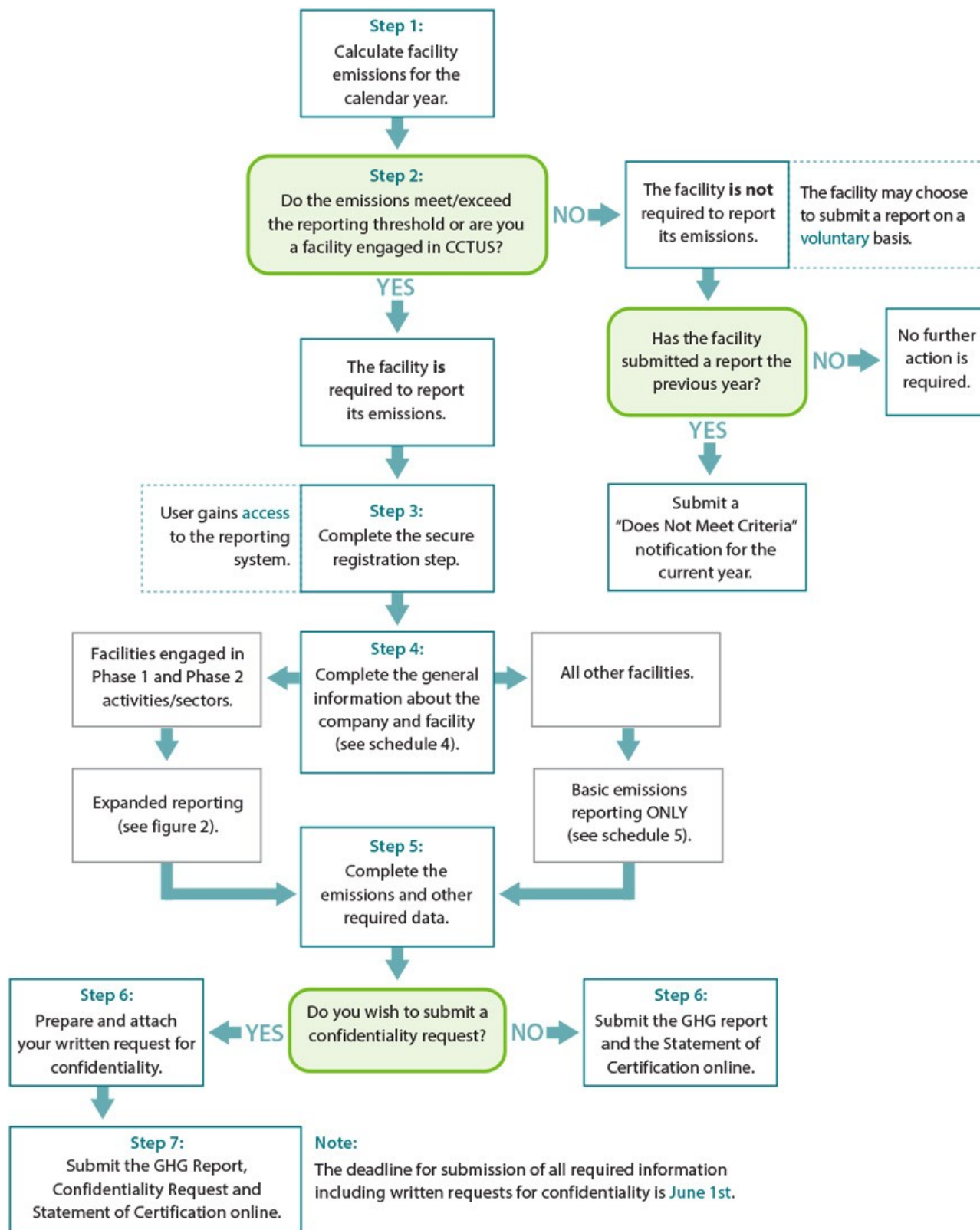
The information that must be submitted includes general information about the reporting company and facility (e.g., name, address/location, contacts, parent companies, various identifiers), the GHG emissions information for the facility in question, and additional activity-specific information as identified in the relevant schedules of the notice. Each facility is required to report total GHG emissions as per the reporting format described in section 4 of this document.

If the facility is owned by a non-Canadian parent company, and exceeds the reporting threshold, then the operator is required to submit a report for the facility. The operator would not, however, be required to provide parent company information if there is no Canadian parent company.

All information (i.e., the GHG report, statement of certification and confidentiality request, if applicable) must be submitted by the June 1st reporting deadline.

If a facility reported emissions in a previous year but does not meet the current year's reporting threshold, it is required to notify Environment and Climate Change Canada by submitting a Does Not Meet Criteria notification online through the Single Window System.

Figure 1: Reporting process overview



► Long description for Figure 1

1.3 Options for reporting

The online Single Window System is used to submit reports to the GHGRP. Some options are available to facilities when preparing the GHG report to be submitted:

- Facilities in British Columbia who provide GHG reports to their provincial government through ECCC's Single Window system and are **not** subject to the GHGRP expanded reporting requirements, can choose to use the existing function to pre-populate the federal report with basic emissions data, based on relevant provincially reported data.
- Facilities that are subject to the *Output Based Pricing System (OBPS) Regulations* can access an "OBPS to GHGRP printout" from the OBPS reporting dashboard (in the Single Window system). This is intended to aid reporters that are **not** subject to GHGRP expanded reporting requirements in understanding how the information reported in the OBPS Annual Report is applicable to GHGRP reporting, and how to map similar data between the OBPS and GHGRP reports.
- Facilities that are subject to expanded reporting requirements must fully complete the GHGRP activity screens relevant to their specific activities. Then, the **Load Activity Emissions into sections A, B & C** functionality, located in section A of the report, should be used to automatically populate the relevant sections. These facilities do not need to review the OBPS to GHGRP printout since they will not need to map data between the two programs.

2 Reporting Criteria

2.1 Reporting threshold

The reporting threshold under the greenhouse gas (GHG) reporting requirements is 10 kilotonnes (kt) of carbon dioxide equivalent (CO_2 eq). A facility is subject to the reporting requirements if its total annual emissions of GHGs meet or exceed the reporting threshold.

To complete this assessment, it is necessary for a facility to calculate its total emissions (in CO_2 eq.) for the relevant calendar year for the GHGs and emission sources covered. Total emissions are calculated as the sum total mass of each of the gases multiplied by their respective global warming potential (GWP) (see [Equation 1](#)).

Emissions of individual species of hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs) must be quantified separately and then multiplied by their GWPs. Only the emissions of HFCs, PFCs and sulphur hexafluoride (SF_6) that fall within the definitions of industrial processes and industrial product use must be included in the calculations (see [section 4.3](#)).

CO_2 emissions from biomass materials must **not** be included in the threshold calculation. However, if a report is required, CO_2 emissions from biomass combustion must be quantified and reported separately as part of the reportable GHG information (see [section 4](#)). Methane (CH_4) and nitrous oxide (N_2O) emissions from biomass-related sources must be included in the reporting threshold calculation and reported as part of the GHG emission totals, if a report is required.

Equation 1

$$\begin{aligned} \text{Total Emissions (in CO}_2 \text{ eq)} = & \sum_1^i (E_{\text{CO}_2} \times \text{GWP}_{\text{CO}_2})_i + \sum_1^i (E_{\text{CH}_4} \times \text{GWP}_{\text{CH}_4})_i + \sum_1^i (E_{\text{N}_2\text{O}} \times \text{GWP}_{\text{N}_2\text{O}})_i + \\ & \sum_1^i (E_{\text{HFC}} \times \text{GWP}_{\text{HFC}})_i + \sum_1^i (E_{\text{PFC}} \times \text{GWP}_{\text{PFC}})_i + \sum_1^i (E_{\text{SF}_6} \times \text{GWP}_{\text{SF}_6})_i \end{aligned}$$

► Long Description for equation 1

where:

E = total emissions, from all activities occurring at the facility, of a particular gas from the facility (tonnes)

GWP = global warming potential of the particular gas (see [section 2.4](#))

i = each emission source

If the person who operates a facility changes during the calendar year, the facility operator on December 31st shall report for the entire calendar year. If facility operations terminate during the calendar year, the last operator shall report for the portion of the calendar year where operations occurred.

2.2 Facilities subject to expanded reporting requirements

In addition to the 10-kt reporting threshold, facilities classified under the North American Industry Classification System (NAICS) codes **and** involved in the sectors/activities listed below (see List 1 and List 2), are also required to provide additional data and apply specific quantification methods when determining their emissions.

List 1: Sectors/activities subject to expanded reporting

- Mining
- Ethanol Production
- Lime Production

- Cement Production
- Aluminium Production
- Iron and Steel Production
- Electricity and Heat Generation
- Ammonia Production
- Nitric Acid Production
- Hydrogen Production
- Petroleum Refining
- Pulp and Paper Production
- Base Metal Production

List 2: Facilities classified under NAICS codes subject to expanded reporting

- 212
- 221112
- 221119
- 221330
- 322
- 324110
- 324121
- 325120
- 325190
- 325313
- 327310
- 327410
- 331110
- 331313
- 331410
- 331490

Facilities must determine their emissions by gas for each emission source or activity that occurs at the facility, following the respective requirements for each emission source or activity, and then calculate if the total of emissions meets or exceeds the 10-kt threshold:

- Stationary fuel combustion: refer to the expanded requirements (schedules 7 and 12)
- Industrial processes: refer to the expanded requirements applicable for each sector (schedules 8-18)
- Fugitive (venting, leakage): refer to the basic and expanded requirements
- Fugitive (flaring): refer to the expanded requirements (schedule 7)
- On-site transportation: refer to the expanded requirements (schedule 7)
- Waste: refer to the basic requirements (schedule 5)
- Wastewater: refer to the basic requirements (schedule 5), unless covered by expanded requirements in schedules 16 or 17

Any facility engaged in more than one activity listed above shall report emissions for each activity separately, unless otherwise stated within the applicable schedule(s).

2.3 Reporting carbon capture, transport, utilization and storage activities

As of 2017, Environment and Climate Change Canada began collecting information on the quantities of CO₂ captured and fugitive CO₂ losses from capture systems, transportation infrastructure, injection equipment, utilization and long-term geologic storage sites, including oil and gas operations using CO₂ for enhanced recovery of oil, natural gas and coal bed methane.

The GHG reporting requirements apply to facilities that are engaged in CO₂ capture, CO₂ transport, CO₂ injection, CO₂ utilization or CO₂ storage. No reporting threshold applies to the requirements related to these carbon capture, transport, utilization and storage (CCTUS) activities. A facility is thus subject to the reporting requirements identified for CCTUS activities (schedule 6) when involved in any part of these CCTUS activities.

Any other emission sources of this same facility involved in CCTUS activities are subject to the 10-kt threshold and to the basic emissions reporting requirements (or expanded requirements, if applicable). Therefore, a facility, even if involved in CCTUS activities, is subject to the reporting requirements if its total direct emissions of GHGs (not related to its CCTUS activities) meet or exceed the reporting threshold.

2.4 Greenhouse gases subject to reporting

The GHGs that are subject to mandatory reporting are listed in [Table 1](#). The GWP and Chemical Abstracts Service Registry Number (CAS Number) for each of these GHGs are also listed in the table. The GWPs listed in [Table 1](#) are updated values taken from the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report, stemming from improvements in climate change science. These updated GWP values were applied starting with the reporting of 2022 data under the GHGRP and will continue into future years. For years prior to 2022, facilities should refer to the *Canada Gazette* notices previously published for the list of GWP values to use (available on the [Greenhouse Gas Reporting Program \(GHGRP\) website](#)) in determining if they meet the reporting requirements, if applicable. When analyzing or publishing the emissions data, ECCC will apply the latest GWP values currently in use to the full time series of data (2004 to the latest year collected).

Reporting companies are required to report the emissions of each individual GHG type, expressed in units of tonnes for each. For example, a reporter would report 100 tonnes of nitrous oxide (N₂O) rather than 26 500 tonnes of CO₂ eq units for N₂O.

However, when a potential reporter is assessing whether he or she needs to submit a report, he or she will need to convert the emissions to CO₂ eq units to compare them with the reporting threshold. The CO₂ eq value is how much CO₂ would be required to produce a similar warming effect, and it is calculated by multiplying the amount of the gas by an associated GWP.

Table 1: Greenhouse gases and gas species subject to mandatory reporting

Greenhouse Gas	Formula	CAS Registry Number^a	100-year Global Warming Potential (GWP)^b
1. Carbon dioxide	CO ₂	124-38-9	1
2. Methane	CH ₄	74-82-8	28
3. Nitrous oxide	N ₂ O	10024-97-2	265
4. Sulphur hexafluoride	SF ₆	2551-62-4	23 500
5. HFC-23	CHF ₃	75-46-7	12 400
6. HFC-32	CH ₂ F ₂	75-10-5	677
7. HFC-41	CH ₃ F	593-53-3	116
8. HFC-43-10mee	C ₅ H ₂ F ₁₀	138495-42-8	1 650
9. HFC-125	C ₂ HF ₅	354-33-6	3 170
10. HFC-134	C ₂ H ₂ F ₄ (Structure: CHF ₂ CHF ₂)	359-35-3	1 120

11. HFC-134a	C ₂ H ₂ F ₄ (Structure: CH ₂ FCF ₃)	811-97-2	1 300
12. HFC-143	C ₂ H ₃ F ₃ (Structure: CHF ₂ CH ₂ F)	430-66-0	328
13. HFC-143a	C ₂ H ₃ F ₃ (Structure: CF ₃ CH ₃)	420-46-2	4 800
14. HFC-152a	C ₂ H ₄ F ₂ (Structure: CH ₃ CHF ₂)	75-37-6	138
15. HFC-227ea	C ₃ HF ₇	431-89-0	3 350
16. HFC-236fa	C ₃ H ₂ F ₆	690-39-1	8 060
17. HFC-245ca	C ₃ H ₃ F ₅	679-86-7	716
18. Perfluoromethane	CF ₄	75-73-0	6 630
19. Perfluoroethane	C ₂ F ₆	76-16-4	11 100
20. Perfluoropropane	C ₃ F ₈	76-19-7	8 900
21. Perfluorobutane	C ₄ F ₁₀	355-25-9	9 200
22. Perfluorocyclobutane	c-C ₄ F ₈	115-25-3	9 540
23. Perfluoropentane	C ₅ F ₁₂	678-26-2	8 550
24. Perfluorohexane	C ₆ F ₁₄	355-42-0	7 910

^a The Chemical Abstracts Service (CAS) Registry Number is the property of the American Chemical Society, and any use or redistribution, except as required in supporting regulatory requirements and/or for reports to the Government of Canada when the information and the reports are required

by law or administrative policy, is not permitted without the prior, written permission of the American Chemical Society.

^b 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.

3 General description of reporting requirements

3.1 Basic and expanded reporting requirements

All facilities with emissions above the 10-kilotonne (kt) threshold will be required to report their emissions of greenhouse gases (GHGs). Facilities with activities outside the industrial sectors/activities listed in [section 2.2](#), will report their GHG emissions by gas for each of the identified emission source categories (listed in [section 4.1](#)). These basic emissions reporting requirements are provided in Schedule 5 of the GHGRP Notice.

Facilities engaged in the industrial activities/sectors listed in [section 2.2](#) are also subject to requirements for additional information and the use of prescribed quantification methods. These facilities must provide expanded details of their emissions resulting from specific sources, including fuel combustion (both stationary and on-site transportation), flaring and certain industrial processes (see [Figure 2](#)).

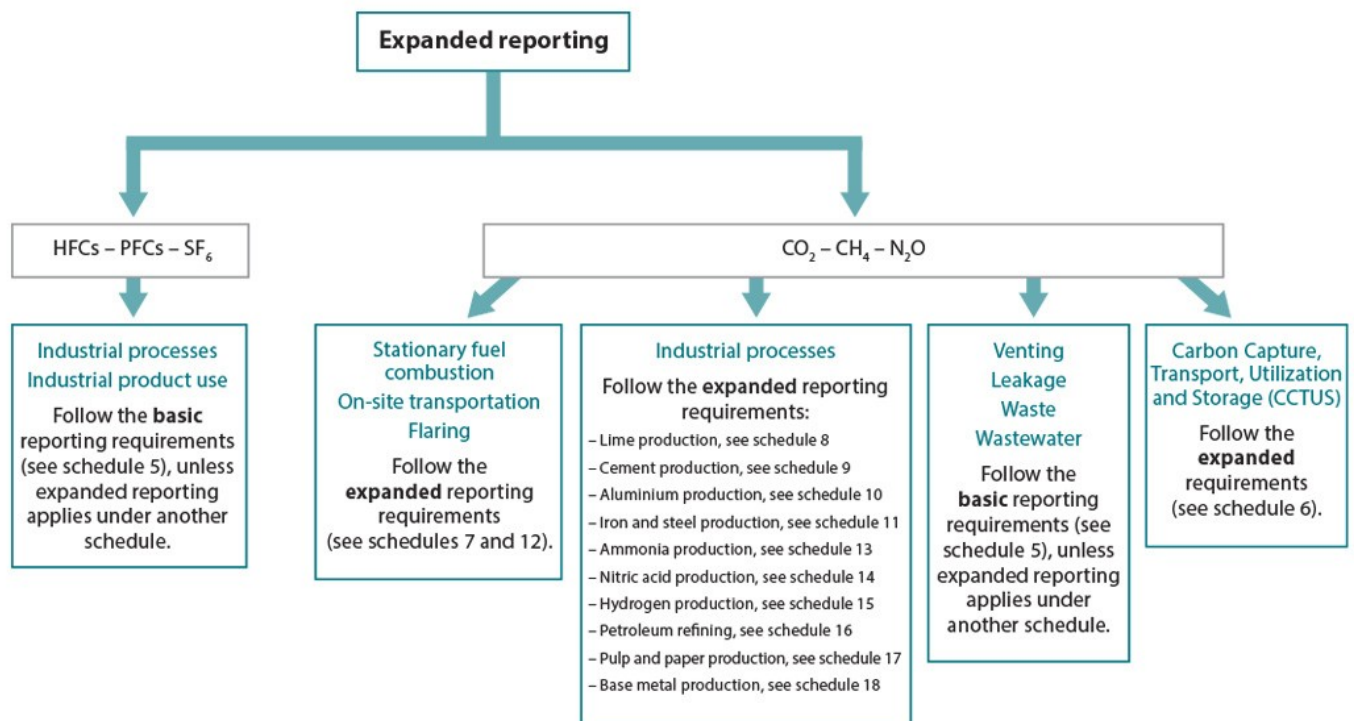
For example, a facility involved in waste treatment activities would be subject to the basic emissions reporting requirements. Another facility involved in lime production would be subject to the expanded reporting

requirements. However, a facility producing lime and engaged in waste treatment will report its GHG emissions from lime production using the expanded requirements, but would use the basic requirements to report its emissions from the waste treatment activities.

The reporting requirements for carbon capture, transport, utilization and storage (CCTUS) apply to any facility involved in these activities. The 10-kt threshold does not apply in this case; any facility engaged in this activity must report its related emissions and other required information. However, the 10-kt threshold will apply to the non-CCTUS related activities of those same facilities.

Reporters are reminded of the legal requirement to keep copies of the information submitted, together with any calculations, measurements and other data on which the information is based, for a minimum period of three years from the date the information must be submitted.

Figure 2: Expanded reporting process overview



3.2 Key elements in calculating emissions

3.2.1 Basic emissions quantification requirements

For facilities that are not involved in any of the industries/activities described in [section 2.2](#) (i.e. not subject to expanded reporting), there are no specific protocols to define how reporting companies must calculate their GHG emissions. However, reporters must use methods that are consistent with the methodologies approved by the United Nations Framework Convention on Climate Change (UNFCCC) and developed by the 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines ⁴. Reporters not subject to expanded reporting, although not required, may also use [Canada's Greenhouse Gas Quantification Requirements](#), where appropriate.

The reporting facility must identify and report the type of estimation method or methods used to determine the quantities of emissions reported. Such methods include monitoring or direct measurement, mass balance, emission factors, engineering estimates and methods described in [Canada's Greenhouse Gas Quantification Requirements](#). These are defined below.

Monitoring or direct measurement:

This type of method may involve continuous emission monitoring systems (i.e., emissions recorded over an extended and uninterrupted period), predictive emission monitoring (correlations developed between measured emission rates and process parameters) or source testing (e.g., stack sampling).

Mass balance:

This type of method involves the application of the law of conservation of mass to a facility, process or piece of equipment. Emissions are determined from the difference in the input and output of a unit operation where the accumulation and depletion of a substance are included in the calculations.

Emission factors:

This method uses emission factors (EF) to estimate the rate at which a pollutant is released into the atmosphere (or captured) as a result of some process activity or unit throughput. The EFs used may be average or general EFs, or technology-specific EFs.

Engineering estimates:

This type of method may involve estimating emissions based on engineering principles and judgment, using knowledge of the chemical and physical processes involved, the design features of the source, and an understanding of the applicable physical and chemical laws.

The following key characteristics of the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (IPCC, 2006) are useful for reporters when calculating their facility's GHG emissions:

1. The availability of a number of differing "tiers" of calculation methods
For various categories of emission sources, there are several ways of calculating the emissions, described as tiers (e.g., Tier 1, Tier 2, Tier 3), and each tier has an associated increasing level of detail and accuracy (e.g., a Tier 2 method is considered more accurate than a Tier 1 method).

2. The use of specific emission factors or data

An emission factor is a value that quantifies emissions associated with an activity (e.g., fuel combustion). To evaluate GHG emissions, "default

emission factors” are provided for many different fuels and activities. These default emission factors are considered to be less accurate than country-specific factors and even less accurate than process-specific factors. Reporters should use Canada-specific emission factors ⁵ or, better yet, industry-specific or technology-specific ones, where available. For example, the combustion of natural gas in a boiler results in emissions of GHGs such as CO₂, CH₄ and N₂O. Each has published emission factors that relate its emission rates to quantities of natural gas burned. To determine emissions, a facility would need to determine the total quantity of natural gas consumed during the calendar year (using billing records or meter reading) and multiply this quantity by the emission factor for each GHG. Canada’s latest inventory report provides up-to-date Canada-specific emission factors and information to assist in quantifying emissions.

3. A focus on the prioritization of effort

The IPCC suggests that the most effort on quantifying emissions should be spent on those sources that are the most critical: those that make up the largest quantity, are responsible for the greatest increase or decrease, or have the highest level of uncertainty associated with them.

Although comprehensive and rigorous, the IPCC Guidelines provide a flexible approach to GHG calculation procedures. The prioritization of emission sources of greatest importance is also emphasized. In prioritizing the work, these guidelines recognize that the more specific the emission factor or methodology (in terms of geography, facility or process), the better the emission estimate should be.

In the spirit of the IPCC Guidelines, reporters should prioritize their efforts when calculating their GHG emissions. This concept can be applied by identifying the emission sources of greatest significance at the facility and

using a higher level of effort when calculating emissions from these sources. Since these emission sources have a greater impact on the totals, the use of more detailed methods would be appropriate. For example, for significant sources, efforts could be focused on using available facility- or process-specific emission factors or estimation methods, as opposed to general or default emission factors or estimation methods. Applying a lower level of effort (i.e., less detailed methods) to calculate emissions for less significant sources would minimize the impact on the level of accuracy.

For further details on the IPCC methodologies, reporters should refer to Table 2, which presents specific references to the relevant sections of the 2006 IPCC Guidelines for the emission sources subject to reporting. Facilities can also refer to Annexes 3 (Methodologies) and 6 (Emission Factors) of Part 2 of Canada’s GHG Inventory Report to obtain detailed explanations of estimation methodologies and emission factors used by Environment and Climate Change Canada in the development of the estimates in the national inventory.

Table 2: Reference to methodological guidance in the 2006 Intergovernmental Panel on Climate Change guidelines, by emission source

Emission Source Category	2006 IPCC Guidelines
Stationary Fuel Combustion (CO ₂ , CH ₄ , N ₂ O)	Volume 2 (Energy), Chapter 2 (Stationary Combustion), pages 2.1–2.47
Industrial Process (CO ₂ , CH ₄ , N ₂ O)	Volume 3 (Industrial Process and Product Use), Chapters 1–8

Fugitive (flaring, venting, leakage) (CO ₂ , CH ₄ , N ₂ O)	Volume 2 (Energy), Chapter 4 (Fugitive Emissions), pages 2.1–2.47
Waste (CO ₂ , CH ₄ , N ₂ O)	Volume 5 (Waste), Chapters 1–5
Wastewater (CO ₂ , CH ₄ , N ₂ O)	Volume 5 (Waste), Chapter 6 (Wastewater Treatment and Discharge), pages 6.1–6.28 IPCC 2019 Refinement to the 2006 Guidelines, Volume 5 (Waste) Chapter 6 (Wastewater Treatment and Discharge), pages 6.30-6.50
On-site Transportation (CO ₂ , CH ₄ , N ₂ O)	Volume 2 (Energy), Chapter 3 (Mobile Combustion), pages 3.1–3.78
HFCs	Various chapters, including: • Volume 3 (Industrial Process and Product Use), Chapter 3 (Chemical Industry Emissions), pages 3.92–3.106 • Volume 3 (Industrial Process and Product Use), Chapter 7 (Emissions of Fluorinated Substitutes for Ozone Depleting Substances), pages 7.1–7.71

PFCs	Various chapters, including: • Volume 3 (Industrial Process and Product Use), Chapter 4 (Metal Industry Emissions), pages 4.1–4.85 • Volume 3 (Industrial Process and Product Use), Chapter 7 (Emissions of Fluorinated Substitutes for Ozone Depleting Substances), pages 7.1–7.71 • Volume 3 (Industrial Process and Product Use), Chapter 8 (Other Product Manufacture and Use), pages 8.1–8.43
SF ₆	Various chapters, including: • Volume 3 (Industrial Process and Product Use), Chapter 4 (Metal Industry Emissions), pages 4.1–4.85 • Volume 3 (Industrial Process and Product Use), Chapter 8 (Other Product Manufacture and Use), pages 8.1–8.43

3.2.2 Expanded emissions quantification requirements

All facilities engaged in the activities or sectors listed in [section 2.2](#) are required to monitor and report additional data used to determine the identified emissions and, to follow specific quantification requirements described in [Canada's Greenhouse Gas Quantification Requirements](#). In most cases, more than one quantification method is available for each sector or activity (i.e.: described below) depending on the information available to the reporter. This approach to GHG calculation procedures continues to allow flexibility, while building consistency in the methods used and the resulting data.

(i) Carbon capture, transport, utilization and storage (section 1 of the quantification requirements)

Any facility engaged in CO₂ capture, CO₂ transport, CO₂ injection, CO₂ utilization and/or CO₂ storage is required to apply the prescribed quantification requirements in section 1. Since enhanced oil recovery (EOR) is integrated in these activities, this will include companies engaged in EOR using CO₂. The CO₂ activities covered would include CO₂ injected directly into long-term geological storage as well as CO₂ used for EOR planned for long term geological storage.

(ii) Fuel combustion and Flaring (section 2 of the quantification requirements)

Fuel combustion and flaring quantification requirements have been issued for all facilities involved in the industrial activities/sectors (listed in section 2.2). The fuel combustion quantification requirements include stationary fuel combustion and on-site transportation emissions source categories, as well as their related flaring emissions. Facilities are not required to report fuels and associated emissions when the sum of CO₂ equivalent emissions (excluding CO₂ from biomass) from the combustion of one or more fuels do not exceed 0.5% of the total facility CO₂ equivalent emissions from all fuels combusted (excluding CO₂ from biomass combustion). Facilities are also not required to report flaring emissions if the sum of CO₂ equivalent emissions from any flare(s) do not exceed 0.5% of the total facility CO₂ equivalent flaring emissions, or 0.05% of the total facility CO₂ equivalent combustion emissions, whichever is larger.

(iii) Mining (section 2 and 6 of the quantification requirements)

Expanded requirements continue to apply for facilities engaged in mining, beneficiating or otherwise preparing metallic and non-metallic minerals, including coal. Facilities are required to apply fuel combustion and flaring

quantification requirements. Facilities that are involved in iron ore pelletizing are also subject to methods prescribed for iron and steel production in section 6 of the quantification requirements.

(iv) Ethanol Production (section 2 of the quantification requirements)

Expanded requirements continue to apply for facilities engaged in ethanol production processes that produce grain ethanol for use in industrial applications or as a fuel. Facilities in this sector must use the prescribed fuel combustion and flaring quantification requirements to determine their emissions.

(v) Lime production (section 3 of the quantification requirements)

Expanded requirements continue to apply for facilities engaged in lime production. Lime production involves three main processes: stone preparation, calcination, and hydration. During the calcination process, lime is heated which generates process-related CO₂ emissions. Facilities are required to apply site-specific methodologies to quantify process-related CO₂ emissions.

(vi) Cement production (section 4 of the quantification requirements)

Expanded requirements continue to apply for facilities engaged in cement production. The cement production process is comprised of two steps: (i) clinker production and (ii) finish grinding. Process-related GHG emissions from cement production arise from process-related CO₂ emissions generated during clinker production. Facilities are required to apply site-specific methodologies to quantify process-related CO₂ emissions.

(vii) Aluminium production (section 5 of the quantification requirements)

Expanded requirements continue to apply for facilities engaged in aluminium production. The production of primary aluminium results in process-related emissions of CO₂, two perfluorocarbons (PFCs), namely,

perfluoromethane, (C_4F_{10}) and perfluoroethane (C_2F_6), as well as sulphur hexafluoride (SF_6). Process related CO_2 , C_4F_{10} and C_2F_6 emissions from aluminium production will be categorized under industrial process emissions, while SF_6 emissions will be categorized under industrial product use emissions.

(viii) Iron and steel production (section 6 of the quantification requirements)

Expanded requirements continue to apply for facilities engaged in iron and steel production. Quantification and reporting of CO_2 emissions are required from major process units and processes where raw materials, usually in combination with fuel combustion, contribute to GHG emissions. CO_2 emissions from identified process units are to be quantified (and CH_4 for emissions from the coke oven battery).

For facilities that manufacture iron and steel, carbon process inputs and outputs that contribute less than 1% of the total mass of carbon into or out of the process are exempt from requirements. For facilities that manufacture iron and steel powder, carbon process inputs and outputs that contribute less than 0.5% of the total mass of carbon into or out of the process are exempt from requirements. All process related CO_2 emissions from iron and steel and iron and steel power production will be categorized under industrial process emissions with the exception of emissions arising from coke oven batteries which are to be categorized as stationary fuel combustion and/or flaring emissions.

(ix) Electricity and Heat Generation (section 7 of the quantification requirements)

Expanded requirements continue to apply for facilities that generate electricity and/or heat. In addition to reporting fuel combustion emissions, facilities are required to apply prescribed quantification requirements to

report annual emissions from acid gas scrubbers and reagents.

(x) Ammonia Production (section 8 of the quantification requirements)

Expanded requirements continue to apply for facilities engaged in ammonia production. Ammonia is manufactured from fossil-based feedstock which is produced by steam reforming of a hydrocarbon. This also includes processes where ammonia is manufactured through the gasification of solid and liquid raw material. Facilities are required to apply prescribed methods (e.g. feedstock-use methods) to quantify and report their annual emissions data.

(xi) Nitric Acid Production (section 9 of the quantification requirements)

Expanded requirements continue to apply for facilities that produce nitric acid. Nitric acid production requires one or more trains to produce weak nitric acid that is 30 to 70 percent in strength. Facilities are required to apply prescribed methods (e.g. use site-specific emission factors and production data) to quantify and report total annual N_2O , CO_2 and CH_4 emissions.

(xii) Hydrogen Production (section 10 of the quantification requirements)

Hydrogen production facilities produce hydrogen gas by steam hydrocarbon reforming, partial oxidation of hydrocarbons, or other transformation of hydrocarbon feedstock. This activity includes hydrogen that is produced at any of the facilities falling within the sectors subject to the expanded requirements (typically petroleum refineries or stand-alone hydrogen producers). Note that hydrogen production emissions in association with ammonia production are quantified using methods prescribed under ammonia production.

Facilities are required to apply prescribed facility-specific quantification methodologies (or make use of CEMS data, if available) to quantify and report their annual emissions data. Under the facility-specific

methodologies, process related CO₂ emissions are calculated using an approach based on the type, composition and quantity of feedstock that is consumed and CO₂ that is recovered.

(xiii) Petroleum Refining (section 11 of the quantification requirements)

Expanded requirements continue to apply for facilities engaged in petroleum refining processes. This includes the production of gasoline, aromatics, kerosene, distillate fuel oils, residual fuel oils, lubricants, asphalt, or other products through the refining of crude oil or through redistillation, cracking, rearrangement or reforming of unfinished petroleum derivatives. All process-related CO₂, CH₄, and N₂O emissions from petroleum refineries will be categorized under venting, flaring or leakage emissions. The total annual CO₂, CH₄ and N₂O emission from on-site wastewater treatment must also be reported.

(xiv) Pulp and Paper Production (section 12 of the quantification requirements)

Expanded requirements continue to apply for facilities engaged in pulp and paper production. Covered processes include the separation of cellulose fibres from other impurities in fibre sources to produce pulp and paper products. Processes that convert paper into paperboard products and the operation of coating and laminating are also included. Facilities are required to quantify and report the total annual CO₂ emissions from the chemical recovery process and the total annual CO₂, CH₄ and N₂O emissions from on-site wastewater treatment plants.

(xv) Base Metal Production (section 13 of the quantification requirements)

Expanded requirements continue to apply for facilities engaged in base metal production. Covered processes include primary and secondary production processes that are used to recover copper, nickel, zinc, lead, and

cobalt. Carbon process inputs that contribute less than 0.5% of the total mass of carbon into the process are exempt from the requirements.

(xvi) Facilities subject to federal *Output Based Pricing System (OBPS) Regulations* or Alberta's *Specified Gas Reporting Regulation*

For facilities engaged in any of the activities listed above (i.e., subject to GHGRP expanded reporting requirements) and that are also subject to the federal *OBPS Regulations*, an option is provided to allow these facilities to use OBPS-specific emission quantification methodologies to quantify emissions for GHGRP reporting purposes. Also, while an "OBPS to GHGRP printout" is available to reporters in the OBPS reporting application to assist them in preparing their OBPS and GHGRP reports, it should not be used by reporters who must meet GHGRP expanded reporting requirements (see [section 1.3](#)).

For facilities in Alberta that are also subject to the provincial *Specified Gas Reporting Regulation*, federal reporting identifies Alberta-specific methodologies that may be used by these facilities for reporting to the GHGRP.

3.3 Review and verification

Environment and Climate Change Canada (ECCC) reviews the information submitted by facilities and conducts a number of data quality checks of the submitted data for compliance purposes and for completeness. ECCC also follows up with individual facilities if there are any clarifications needed regarding their data. Reporting companies are required to keep copies of the requested information, together with any calculations, measurements and other data on which the information is based, at the facility to which it

relates or at that facility's parent company, located in Canada. All information must be kept for a period of three years from the date the report must be submitted.

Reporting companies are also required to submit a Statement of Certification, signed by an authorized signing officer, stating that the information submitted is true, accurate and complete.

Companies that meet reporting requirements but fail to report, fail to report on time, or knowingly submit false or misleading information, face penalties as listed under sections 272 and 273 of CEPA. Facilities that did not meet the reporting criteria in previous years should review their status to determine whether they are required to report for the current reporting year.

Currently, there are no specific requirements for a facility to have its emissions verified by a third party. The information reported by a facility should nevertheless be verifiable, which means that any information that would allow a facility's emissions to be verified by the government or a third party certified by the government to carry out such verifications should be retained. Facilities can choose to have their emissions verified by a third party if they wish.

Note: While ECCC does not require third-party verification as part of the mandatory reporting obligations issued under the GHGRP, facilities subject to the *Output Based Pricing System Regulations* are required to have OBPS annual reports verified.

4 Emissions reporting format

4.1 Reporting emissions data

Environment and Climate Change Canada (ECCC)'s online Single Window reporting tool is available for reporting facilities to submit their greenhouse gas (GHG) reports to ECCC. To enter GHG emissions data, the reporter will input numerical values (in units of tonnes) for the emission sources occurring at the facility. The quantity of emissions in carbon dioxide equivalent (CO₂ eq) units will be automatically calculated by the online reporting system.

A “not applicable” (NA) box will be available for each emission source category and gas listed, and the reporter may select this box only in those cases where:

- the emission source or emission type does not occur at the facility
- the emissions from a given source are not estimated due to the unavailability of data

If a reporter has calculated the emissions for a given category or gas type and the emissions are zero, the reporter should enter the digit “0” in the relevant numeric field.

The reporting facility needs to calculate and report its direct emissions of the three gases, carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O) individually. When reporting these emissions, the reporter is required to disaggregate the emissions by the following source categories:

- Stationary Fuel Combustion
- Industrial Process
- Fugitive, including:
 - Venting

- Flaring
- Leakage
- On-Site Transportation
- Waste
- Wastewater

The reporting facility also needs to calculate and report its direct emissions of hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF₆) by individual gas species. These will be categorized as Industrial Process and Industrial Product Use emissions.

A graphical representation of the GHGs to be reported under the Greenhouse Gas Reporting Program (GHGRP) is presented in [Table 3](#).

Table 3: Greenhouse gases to be reported by facilities and source categories

Greenhouse Gas	Emission Source (				
	Stationary Fuel Combustion Emissions	Industrial Process Emissions	Industrial Product Use Emissions	Fugitive – Venting Emissions	F F E
Carbon Dioxide (excluding CO ₂ emissions from biomass combustion, which is to be reported separately)	Report	Report	N/A	Report	R
Methane	Report	Report	N/A	Report	R

Greenhouse Gas	Stationary Fuel Combustion Emissions	Industrial Process Emissions	Industrial Product Use Emissions	Fugitive – Venting Emissions	F F E
Nitrous Oxide	Report	Report	N/A	Report	R
Sulphur hexafluoride	N/A	Report	Report	N/A	N
Hydrofluorocarbons	N/A	Report by gas	Report by gas	N/A	N
Perfluorocarbons	N/A	Report by gas	Report by gas	N/A	N
Total	Report	Report	Report	Report	R

4.2 Carbon dioxide, methane and nitrous oxide emissions

CO₂, CH₄ and N₂O are reported individually, by source category. Additional information on each of these categories is provided in the following subsections.

4.2.1 Stationary fuel combustion emissions

Most facilities will have some form of stationary fuel combustion. This category includes releases from stationary fuel combustion sources occurring at the facility, where the fuel is burned to produce useful heat or work (e.g., to generate electricity, heat or steam). It includes external (e.g., boilers) and internal (e.g., cogeneration turbines) combustion sources. On-site waste incineration is also included if the waste is combusted to

produce energy. Emissions from waste incineration used as a disposal method are included under the Waste Emissions category (see [section 4.2.5](#)).

Note: If biomass is being combusted for the purposes of creating energy, CH₄ and N₂O emissions should be reported under Stationary Fuel Combustion Emissions. The CO₂ emissions should be reported under Biomass Combustion Emissions (see [section 4.2.7](#)). Also, emissions from coke oven batteries in iron and steel manufacturing are to be reported under stationary fuel combustion when fuel is used for the production of coke.

4.2.2 Industrial process emissions

This category refers to emissions from an industrial process involving chemical or physical reactions, the primary purpose of which is to produce a non-fuel product, as opposed to useful heat or work. Examples of industrial process emissions include mineral production (e.g., cement, lime), metal production (e.g., iron and steel, aluminium) and chemical production (e.g., adipic acid, nitric acid).

This category of emissions is expected to be unique to specific sectors and to specific facilities in a given sector, depending on the operations performed at the facility.

Note: In instances where industrial process emissions are produced in combination with emissions from fuel combusted to supply energy, the emissions are to be separated and categorized accordingly. Emissions produced for energy purposes (i.e. fuel combusted for useful heat or work) are included under Stationary Fuel Combustion Emissions, whereas industrial process emissions are included under Industrial Process Emissions. The reduction of iron in a blast furnace through the oxidation of coke is an example where, in the same process, coke serves a dual purpose

of fuel (to generate heat required for the reaction) and of reductant (to reduce the iron). In this case, since the primary purpose of coke oxidation is to produce pig iron, the emissions are categorized as Industrial Process Emissions ⁶.

4.2.3 Fugitive emissions

Fugitive emissions are defined as the sum of venting, flaring and leakage emissions.

In general, fugitive emissions result from the production, processing and handling of fossil fuels, from iron and steel coke oven batteries and from carbon capture, transport, injection and storage activities.

(i) Venting emissions

Venting emissions are defined as the controlled release of a process or waste gas to the atmosphere. These include, but are not limited to, releases of CO₂ associated with carbon capture, transport, injection and storage, casing gas, gas associated with a liquid (or solution gas), treater, stabilizer or dehydrator off-gas, blanket gas and releases from pneumatic devices that use natural gas as a driver, and from compressor start-ups, pipelines and other blowdowns, and metering and regulation station control loops.

In general, venting emissions are a result of the handling or processing of fuel in the fossil fuel industries.

CO₂ emissions from hydrogen production in fossil fuel production and processing are to be reported under venting emissions from facilities that are involved in the production, upgrading and refining of fossil fuels. CO₂ released as a result of processing, such as the sweetening of natural gas, should also be reported as venting emissions.

(ii) Flaring emissions

Flaring emissions are defined as controlled releases of gases from industrial activities from the combustion of a gas and/or liquid stream produced at a facility not for the purpose of producing useful heat or work. They may arise from waste petroleum incineration, hazardous emission prevention systems (whether in pilot or active mode), well testing, natural gas gathering systems, natural gas processing plant operations, crude oil production, pipeline operations, petroleum refining as well as chemical fertilizer and steel production.

In general, flaring emissions are a result of the handling or processing of fuel in fossil fuel industries.

Note: Flaring of landfill gas should be accounted for under the Waste Emissions category (see [section 4.2.5](#)). Also, emissions from coke oven batteries in iron and steel manufacturing are to be reported under flaring emissions when applicable.

(iii) Leakage emissions

Leakage emissions are defined as accidental releases and leaks of gases from fossil fuel production and processing, transmission and distribution; iron and steel coke oven batteries; CO₂ capture, transport, injection and storage infrastructure for long-term geological storage.

Note: The release of landfill gases are to be reported under the Waste Emissions category (see [section 4.2.5](#)). Also, emissions from coke oven batteries in iron and steel manufacturing can be reported under leakage emissions when applicable.

4.2.4 On-site transportation emissions

This category refers to releases of CO₂, CH₄ and N₂O resulting from fuels combusted in machinery used at an integrated facility for the transport or movement of substances, materials, equipment or products that are used

in the production process. The following are some examples of such machinery or equipment:

- vehicles that are not licensed for use on public roads
- transport of feed materials (examples, by truck, rail, forklift, conveyors) from their on-site storage location to a specific process unit or between process units, such as:
 - moving molten metal to different stages in the steel production process
 - moving waste material at a landfill facility
 - mining and/or moving mined materials at above or below-ground mining operations

The list below includes examples of transportation activities or machinery that would not be reported:

- a manager who uses a company vehicle (examples, pickup truck or car) to conduct inspections of activities on the grounds of the facility
- lawn maintenance and snow clearing vehicles
- emissions from transportation to and from a facility

4.2.5 Waste emissions

This category of emissions refers to releases that result from waste disposal sources at a facility. This includes landfilling of solid waste and sludges, flaring of landfill gas, fugitive and flaring emissions from anaerobic digestion of waste, composting and waste incineration. GHG emissions from waste-to-energy conversion, where waste material is used directly as fuel or converted into fuel, must be calculated and reported under Stationary Fuel Combustion Emissions. There are emissions of CO₂, CH₄ and N₂O from waste disposal, and special consideration is necessary for CO₂ emissions originating from biomass materials in waste (see section 4.2.7).

Recommended approaches to estimate methane emissions at landfills receiving municipal solid waste are described in the Technical Guidance Document on Estimating, Measuring and Monitoring Landfill Methane, generated by the Department. A Landfill Methane Modelling Tool is available that enables users to calculate estimated methane generation in accordance with the recommendations in the guidance document. The guidance document and modelling tool are available upon request by sending an e-mail to: ges-dechets-ghg-waste@ec.gc.ca.

4.2.6 Wastewater emissions

This category of emissions refers to releases that result from wastewater and wastewater treatment at a facility. GHG emissions from wastewater treatment plants or processes will vary based on the type of influent (municipal vs. industrial wastewater), volume of influent and the specific treatment processes used. Wastewater treatment processes (aerobic and anaerobic) typically result in emissions of CH₄ and N₂O, and these emissions are reported under this category. CO₂ is also a product of aerobic and anaerobic wastewater treatment. However, as described in section 4.2.7, the portion of these emissions originating from biomass materials should not be reported.

Calculate only the fossil based (non-biogenic) CO₂ emissions from wastewater treatment. The fraction of non-biogenic organics should be determined by considering the source of organics and determining the non-biogenic portion using facility-specific data (e.g., company records) and engineering estimates. For example, organics introduced to wastewater such as pulp and paper or food processing may be considered to be of biogenic origin, whereas organics introduced to wastewater from sources such as petroleum refining, plastics manufacturing or methanol additions for denitrification may be considered non-biogenic.

If CH₄ from an anaerobic digestion process is collected and combusted for energy, it should be reported under Stationary Fuel Combustion Emissions. Advanced treatment plants with nutrient removal (i.e., nitrification and denitrification) represent a small but distinct source of N₂O. Much of the N₂O that leaves a wastewater treatment plant in the liquid effluent stream is eventually released to the atmosphere and does represent a significant source of GHGs, but wastewater treatment facilities are not required to report this type of delayed-flux emission from effluent.

Section 11.G of Canada's Greenhouse Gas Quantification Requirements provides methods for calculating CO₂, CH₄ and N₂O emissions from wastewater treatment. While only a requirement for certain facilities covered by expanded reporting requirements, other facilities not subject to these requirements may choose to use these methods.

In general, closed underground sewers are not considered a significant source of CH₄ or N₂O.

4.2.7 Emissions from biomass

The following materials are considered to be biomass materials:

- plants or plant materials, animal waste, or any product made of either of these
- wood and wood products, charcoal and agricultural residues
- biologically derived organic matter in municipal and industrial wastes
- landfill gas
- bioalcohols
- black liquor
- sludge digestion gas
- animal- or plant-derived oils

(i) CO₂ emissions from combustion of biomass

In accordance with United Nations Framework Convention on Climate Change (UNFCCC) Reporting Guidelines, special consideration is necessary when reporting CO₂ emissions from biomass in national inventories to ensure that there is no double counting. These guidelines require the reporting (although not the counting) of CO₂ emissions resulting from the combustion of biomass materials. This explicit reporting of CO₂ emissions from biomass-based combustion has the benefits of:

- reminding reporting companies that these emissions need to be reported internationally
- ensuring that CO₂ emissions from biomass are currently not counted in the totals
- demonstrating the quantity of atmospheric CO₂ loading that could be offset by biomass growth

The facility may use biomass materials as a fuel source in its on-site combustion processes. The reporting facility must report the CO₂ emissions from the combustion of biomass fuels under Biomass Combustion Emissions, and these should not be included in the emission totals for the facility. Any CH₄ and N₂O emissions should be reported under either Stationary Fuel Combustion Emissions if the biomass is being burned to create energy, or under Waste or Wastewater Emissions in the case of waste incineration and landfill/anaerobic digester gas flaring processes, and these emissions must be included in the facility totals. There is no reverse, biogenic mechanism by which replacement biomass removes these emissions from the atmosphere. Therefore, they must be included in the GHG totals in the same way as CH₄ and N₂O emissions from any other material combusted.

Similarly, for waste incineration processes that may occur at the facility, the waste stream may be composed of organic (or biomass) materials and fossil fuel-based carbon materials (e.g., plastics, rubber, liquid solvents,

waste oil). The CO₂ emissions from the biomass portion being incinerated should be reported separately in the GHG report (and not included in the CO₂ emission totals), whereas the CO₂ emissions resulting from incineration of the fossil fuel-based fraction must be included in the facility totals.

As a further example of combustion of biomass materials, in the case of flaring of landfill gas, the CO₂ emissions produced from this combustion process should be reported separately in the GHG report and not included in the emission totals, since landfill gas is considered a product stemming from the biodegradation of biomass material.

(ii) CO₂ emissions from non-combustion of biomass

Waste disposal and wastewater treatment processes can produce CO₂ emissions which can be, a result of aerobic decomposition of biomass material in the waste or wastewater stream. The reporting company is not required to report these CO₂ emissions; however, emissions of CH₄ and N₂O resulting from decomposition of biomass must be reported in the Waste or Wastewater Emissions categories.

Similarly, CO₂ emissions generated from the fermentation of biomass materials (e.g., corn or wheat) are not to be reported. The fermentation of sugar or converted starch contained in grains (e.g., corn or wheat) in the ethanol production process is an example of this type of fermentation process generating CO₂ emissions.

4.3 Hydrofluorocarbon, perfluorocarbon and sulphur hexafluoride emissions

The reporting facility also needs to calculate and report its direct emissions of the HFC and PFC gas species listed in [Table 1](#), and the gas SF₆, if the facility emits these GHGs from industrial processes and industrial product

use.

HFC, PFC and SF₆ emissions from **industrial processes** are described as emissions resulting from a chemical or physical transforming of material, such as PFC emissions from anode effects in primary aluminium smelting.

HFC, PFC and SF₆ emissions from **industrial product use** are described as the use of a product to deliberately exploit one or more physical or chemical properties of it. The use does not involve any chemical or physical reaction of the product in the process. Some examples include SF₆ and HFCs used in the magnesium industry as a cover gas. Use of SF₆ in electrical equipment (e.g., gas-insulated switchgears, circuit breakers) is also considered an industrial product use.

The following subsections provide additional detail on these GHGs and possible sources of such emissions.

4.3.1 Hydrofluorocarbons

(i) Overview

HFCs are a series of synthetic gases containing carbon, hydrogen and fluorine (see [Table 1](#) for a listing of individual HFC species). While HFCs are emitted in small quantities, they have disproportionate effects as a result of long atmospheric lifetimes, which in turn lead to large GWPs. The HFC species have 100-year GWPs ranging from 116 to as high as 12 400 (IPCC, 2013). The use of HFCs is expected to grow substantially as a result of the phasing out of various ozone-depleting substances (IPCC, 2006). HFCs are not included under the Montreal Protocol because they are not considered to be ozone-depleting substances.

(ii) Sources

The main sources of HFC emissions from industrial processes and industrial product use include emissions arising from foam blowing and the use of HFCs as a cover gas in metal production.

Emissions of HFCs from other applications, such as refrigeration, air conditioning, propellants in aerosols, fire extinguishers and solvents, are not considered industrial process or industrial product use emissions under the GHGRP and therefore should not be reported.

4.3.2 Perfluorocarbons

(i) Overview

PFCs are a family of industrial gases, and they should be reported by individual PFC gas species (see [Table 1](#)). Emissions of PFCs are relatively low by mass; however, they are potent GHGs, with 100-year GWPs ranging between 6 630 and 11 100 (IPCC, 2013). PFCs are not ozone-depleting substances, so they are not included under the Montreal Protocol.

(ii) Sources

The main sources of PFC emissions from industrial processes and industrial product use are attributed to two areas: aluminium production and foam blowing. PFC emissions are an undesirable by-product of aluminium production, while PFCs are purchased and used as foam-blowing agents.

Emissions of PFCs from other applications, such as refrigeration, air conditioning, semiconductor manufacturing, solvents, aerosols and fire extinguishing, are not considered industrial process or industrial product use emissions under the GHGRP and therefore should not be reported.

4.3.3 Sulphur hexafluoride

(i) Overview

SF₆ is a synthetic gas with chemical properties that render it relatively inert, which makes it a preferred choice in various industrial applications. It is a particularly potent GHG, with a 100-year GWP of 23 500 and an estimated lifetime of about 3 200 years (IPCC, 2013).

(ii) Sources

The main sources of SF₆ emissions from industrial processes and industrial product use include SF₆ used as a cover gas in magnesium smelting and casting as well as for special foundry products in the aluminium industry. Use of SF₆ as an insulating gas in electrical equipment (e.g., gas-insulated switchgear, circuit breakers) is also considered as an industrial product use.

Emissions of SF₆ from other applications, such as fire suppression and explosion protection, leak detection and various electronic applications, are not considered industrial process or industrial product use emissions under the GHGRP and therefore should not be reported.

Appendix A: references

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Contact us

If you have questions about this technical guidance document, please take a look at our

Questions and Answers web page. This provides additional information

that may help in answering your questions.

You may also contact the GHGRP directly for any other questions about the reporting requirements or for more information about the GHGRP:

Environment and Climate Change Canada
Greenhouse Gas Reporting Program
Place Vincent Massey, 7th Floor
351 St. Joseph Boulevard
Gatineau, Quebec K1A 0H3

GHG Helpline: 1-819-938-3258

Toll free: 1-877-877-8375

E-mail: ges-ghg@ec.gc.ca

Website: [Facility Greenhouse Gas Reporting](#)

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- 1 The *2006 Guidelines for National Greenhouse Gas Inventories* consists of five volumes and includes new sources and gases as well as updates to previously published methods.
 - 2 The IPCC, established in 1988 by the World Meteorological Organization and the United Nations Environment Programme, makes periodic assessments of the climate change issue and reports to governments as appropriate. It also provides scientific and technical advice to the Subsidiary Body for Scientific and Technological Advice to the UNFCCC.
 - 3 The Revised UNFCCC Reporting Guidelines are contained within the UNFCCC Secretariat's Report of the *Conference of the Parties on its nineteenth session*, held in Warsaw from 11 to 23 November 2013. A link to this report can be found in the References section of this document.

- 4 Detailed protocols can be obtained through the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (IPCC, 2006).
 - 5 Environment and Climate Change Canada uses various emission factors that are specific to Canada for estimating emissions from several emission sources. For more details, see the latest National Greenhouse Gas Inventory Report. Reference details are provided in Appendix A.
 - 6 This categorization of emissions is in accordance with that provided by the IPCC. Source: *2006 IPCC Guidelines for National Greenhouse Gas Inventories*, Volume 3, p. 1.12.
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