Environment and Climate Change Canada
Environnement et Changement climatique Canada

TECHNICAL GUIDANCE ON REPORTING GREENHOUSE GAS EMISSIONS – 2017 DATA

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Facility Greenhouse Gas Reporting

Canada

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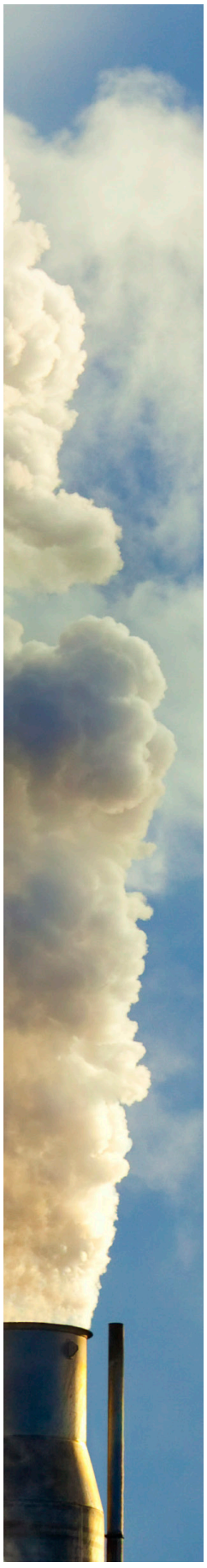


Reporting requirements for 2017 greenhouse gas emissions

In the *Canada Gazette* notice entitled *Notice with respect to reporting of greenhouse gases (GHGs) for 2017 (the 2017 GHGRP Notice)*, published in December 2017, Environment and Climate Change Canada released the GHG reporting requirements for the calendar year 2017. This notice supports the annual mandatory reporting of GHG emissions by facilities under Environment and Climate Change Canada's GHG Reporting Program (GHGRP) and presents a number of changes made to the reporting requirements as part of the first phase of the expansion to the program.

Starting with reports for the year 2017, the GHGRP applies to more GHG emitting operations in Canada. All facilities that emit the equivalent of 10 000 tonnes (10 kilotonnes) or more of GHGs in carbon dioxide equivalent units (CO_2 eq) per year are required to submit a report.

Additionally, for 2017 reports, facilities engaged in the following activities are required to provide additional data and to apply a prescribed methodological framework in determining their GHG emissions:

- carbon capture, transport and storage (CCTS)
- lime manufacturing (NAICS 327410)
- cement manufacturing (NAICS 327310)
- aluminium manufacturing (NAICS 331313)
- iron and steel manufacturing (NAICS 331110)

The 2017 GHGRP Notice is available online[1]. Please note that every reference to schedules in this document refers to the schedules in the 2017 GHGRP Notice. You can also visit Environment and Climate Change Canada's greenhouse gas website[2] for further details on the GHGRP.

This technical guidance document has been updated to include relevant changes that reflect enhanced requirements as part of the expansion to reporting under the GHGRP. This guidance document introduces:

- updated definitions
- clarifications on changes to some emission source categories
- information to explain who is subject to basic emissions reporting and who is subject to expanded requirements

[1] http://www.gazette.gc.ca/rp-pr/p1/2017/2017-12-30/html/notice-avis-eng.html#na2

[2] https://www.canada.ca/en/environment-climate-change/services/climate-change/greenhouse-gas-emissions.html

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.

2017 GHGRP Notice means the Notice with respect to reporting of greenhouse gases (GHGs) for 2017, *Canada Gazette*, Part I. This notice was published in the *Canada Gazette* on December 30, 2017.

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

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, bioalcohols, black liquor, sludge digestion gas and animal- or plant-derived oils.

Canada's Greenhouse Gas Quantification Requirements means Canada's Greenhouse Gas Quantification Requirements, Greenhouse Gas Reporting Program, Environment and Climate Change Canada, 2017.

Carbon capture, transport and storage (CCTS) means collectively CO_2 capture, CO_2 transport, CO_2 injection and CO_2 storage.

Carbon dioxide equivalent (CO_2 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, CO_2 eq. To express GHG emissions in units of CO_2 eq, 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 manufacturing means all processes used to manufacture portland, ordinary portland, masonry, pozzolanic or other hydraulic cements.

CO_2 capture means the capture of CO_2 at an integrated facility that would otherwise be released to atmosphere.

CO_2 emissions from biomass decomposition means releases of CO_2 resulting from aerobic decomposition of biomass and from the fermentation of biomass.

CO_2 injection means an activity that places captured CO_2 into a long-term geological storage site or an enhanced fossil fuel recovery operation.

CO_2 storage means a long-term geological formation where CO_2 is stored.

CO_2 transport system means transport of captured CO_2 by any mode.

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

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 and 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 (whether 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; CO_2 capture, transport, injection and storage infrastructure.

GHGs means greenhouse gases.

GWP means global warming potential and allows the comparison of the global warming impacts of different gases. It is a measure of how much radiative 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 (CO_2). 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 CO_2. For example, the GWP for nitrous oxide (N_2O) is 298, which means that 1 tonne of N_2O emissions is equivalent to 298 tonnes of CO_2 emissions.

HFCs means hydrofluorocarbons.

Industrial process emissions means releases from an industrial process that involves a chemical or physical reaction other than combustion, and the primary purpose of which is not to produce 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 for an industrial process that does not involve a chemical or physical reaction and does not react in the process. This includes releases from the use of SF_6, HFCs and PFCs as cover gases, and the use of HFCs and PFCs in foam blowing. This does not include releases from PFCs and HFCs in refrigeration, air conditioning, semiconductor manufacturing, fire extinguishing, solvents, aerosols and SF_6 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 manufacturing 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; CO_2 capture, transport, injection and storage infrastructure for long-term geological storage.

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

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 vehicules without public road licences.

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 CO_2 or processed natural gas and their associated installations, including meter sets and storage installations but excluding straddle plants or other processing installations.

Reporting company means a person who operates one or more facilities that meet the reporting criteria as set out in Schedule 3 of the *Canada Gazette* 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 CO_2 emitted from geological formations used for long term storage of CO_2.

Venting emissions means controlled releases of a process or waste gas, including releases of CO_2 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 realeases from the combustion of waste fuels to produce useful heat or work.

Wastewater emissions means releases resulting from wastewater and wastewater treatment at a facility.

Preface

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). National GHG emissions and removals are reported to the UNFCCC according to the manner, format and frequency dictated by the UNFCCC Reporting Guidelines[3]. To fulfill its obligations, Canada must estimate its national GHG emissions according to the comprehensive requirements for reporting to the UNFCCC, which include consistency with the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (IPCC, 2006)[4], a key technical document developed by the Intergovernmental Panel on Climate Change (IPCC).[5]

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 inform and validate 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. A *Canada Gazette* notice is published every year requiring the reporting of GHG emissions for the calendar year specified in the notice and the facility data collected is published annually.

This program is part of Canada's effort to develop, 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. The publication of the 2017 GHGRP Notice implements the first phase of expanded reporting under the GHGRP.

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 The *2006 IPCC Guidelines for National Greenhouse Gas Inventories* consists of five volumes and includes new sources and gases as well as updates to previously published methods.

5 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.

Purpose

The purpose of this document is to provide guidance to potential reporting facilities to help determine if they are required to submit a report by June 1st and to present technical information related to 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 2017 GHGRP Notice, the notice will prevail.

This technical guide supports the first year of the phased expansion to the GHG reporting requirements for facilities in Canada and applies the key changes presented in the 2017 GHGRP Notice:

- the reporting threshold of carbon dioxide equivalent units has been lowered from 50 kilotonnes to 10 kilotonnes
- requirements to provide additional data related to GHG emissions determined through prescribed quantification methods are specific to: manufacturers of cement, lime, iron & steel and aluminum, as well as facilities engaged in carbon capture, transport and storage activities

Separate guidance is available regarding the online Single Window System that should be used to submit a report. This guidance includes instructions on how to use the reporting system, how to complete and submit the report, and other relevant information.

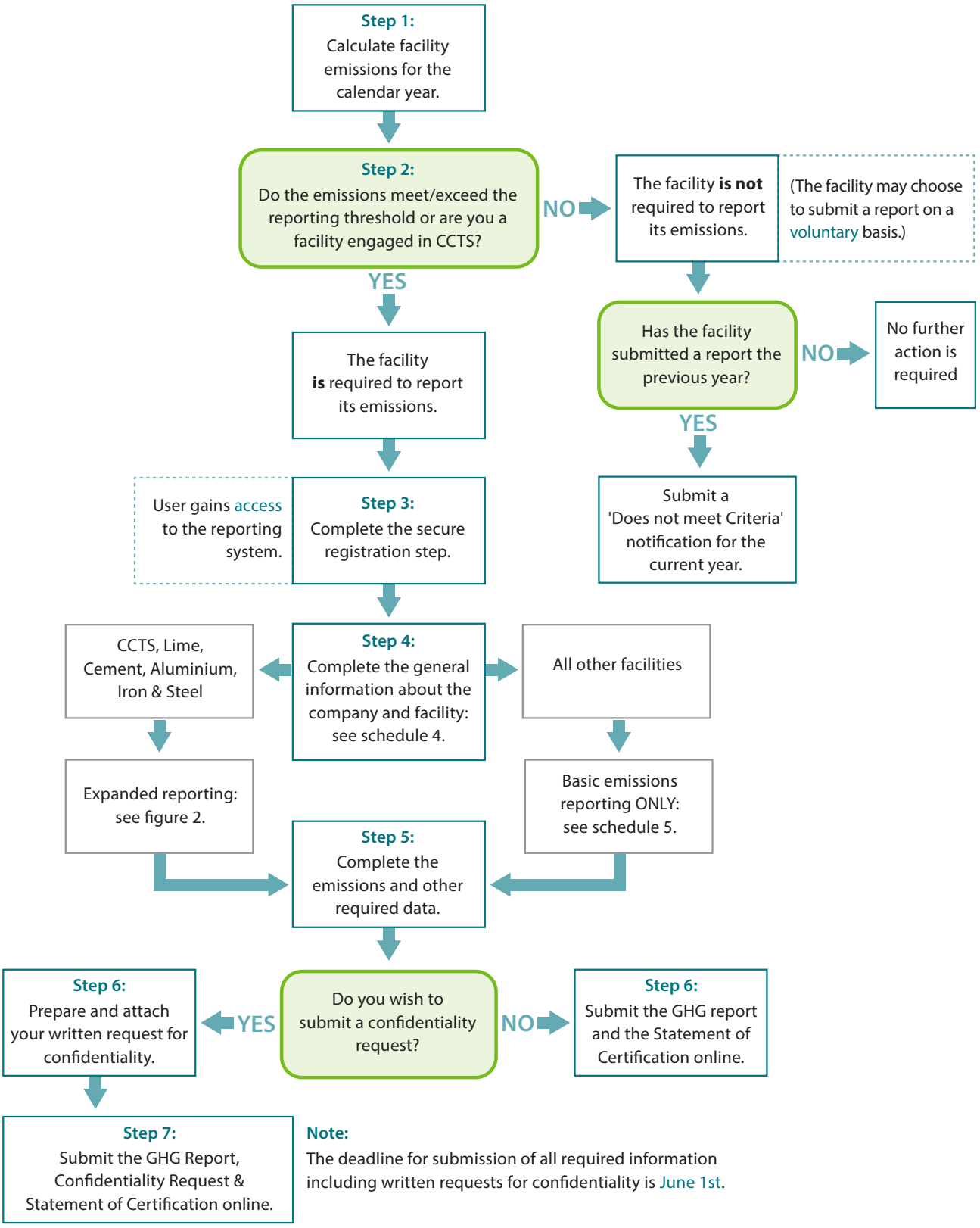
1 Reporting process overview

The legal basis for the GHGRP is the *Notice with respect to reporting of greenhouse gases (GHGs)* for [a specified year], which is published annually 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 (CO_2 eq) units) in the calendar year (the reporting threshold), or a facility that is engaged in carbon capture, transport and storage (CCTS) activities, are subject to the reporting requirements and must report their emissions and other identified information to Environment and Climate Change Canada. Facilities need to calculate their total emissions (in CO_2 eq units) of the GHGs covered by this reporting requirement and are to submit reports if they meet or exceed the reporting threshold and requirements (see Figure 1 for an overview of the reporting process). If the facility's emissions fall below the reporting threshold, when applicable, the facility is not required to submit a report but is encouraged to submit a voluntary report nonetheless.

The information that must be submitted includes general information about the reporting company and facility (examples, name, address/location, contacts, parent companies, various identifiers) and the GHG emissions information for the facility in question. Each facility is required to report total GHG emissions as per the reporting format described in Section 4 of this document. Facilities subject to expanded reporting must provide the information described in the identified schedules of the 2017 GHGRP notice (see Figure 2 for an overview of the reporting process).

Figure 1: **reporting process overview**



A 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.

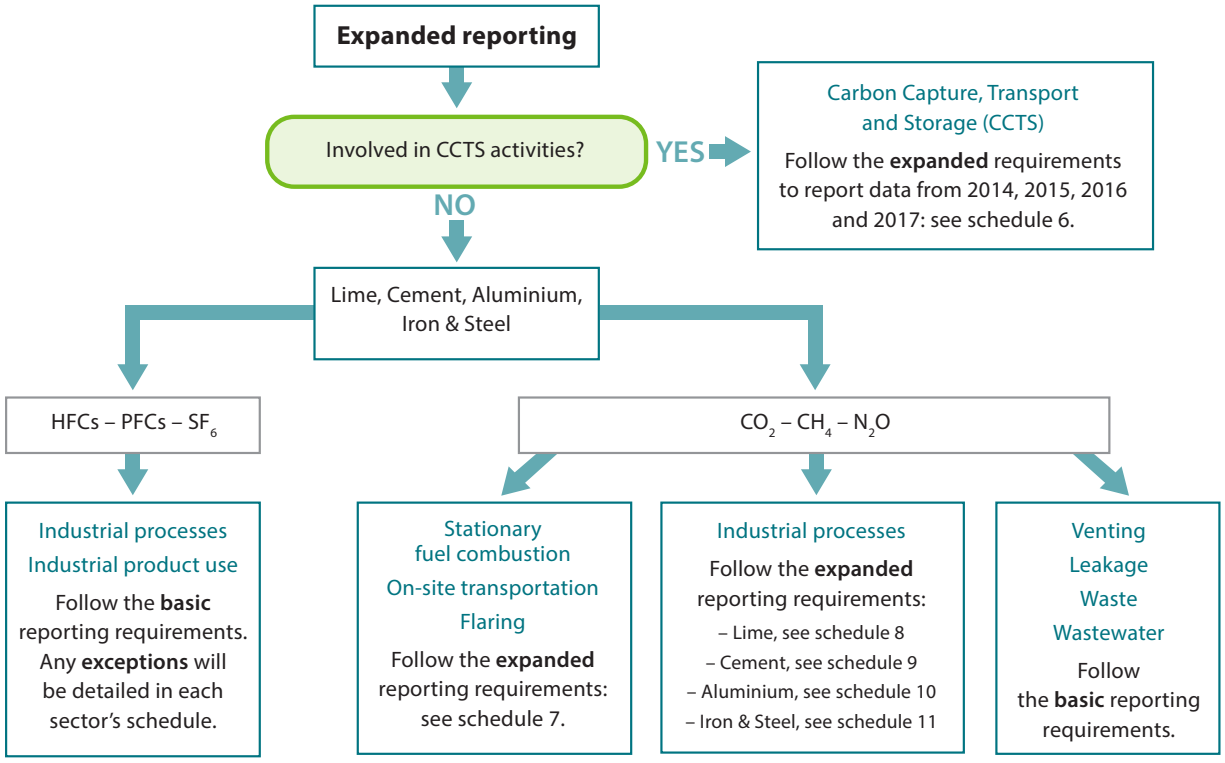
If the facility is owned by a non Canadian parent company, and exceeds the reporting threshold, then the operator is required to submit a report for the facility. The operator would not, however, be required to provide parent company information if there is no Canadian parent company.

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's Pollutant Inventories and Reporting Division. Facilities can submit a Does Not Meet Criteria notification online through the Single Window 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.

Figure 2: **expanded reporting process overview**



1.1 Options for reporting

The online Single Window System is used to submit reports to the GHGRP (see the GHGRP website[6]). Some options are available to facilities when preparing the GHG report to be submitted:

- facilities in British Columbia and Ontario, who provide GHG reports to their provincial government through ECCC's Single Window system, but 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

As a provisional approach, for the 2017 calendar year, ECCC is also providing options for facilities in order to meet the expanded reporting requirements under the GHGRP, as follows:

- facilities in British Columbia, Ontario and Quebec subject to expanded federal requirements in the four sectors (manufacturing of lime, cement, aluminium and iron and steel), and who already report the same information to these provinces, can complete the expanded GHGRP screens, or upload a copy of their submitted provincial GHG report as part of their 2017 GHG report submitted to ECCC
- similarly, facilities in Alberta and Saskatchewan subject to the expanded federal requirements regarding CCTS and already reporting similar data to provincial programs can complete the specific GHGRP screens for CCTS, or upload a copy of their submitted provincial report containing this information as part of their federal GHG report
- facilities in the remaining provinces are required to complete the expanded GHGRP screens to provide the information specified for the expanded requirements

6 https://www.canada.ca/en/environment-climate-change/services/climate-change/greenhouse-gas-emissions/facility-reporting.html

2 Reporting criteria

2.1 Reporting threshold

The reporting threshold under the new 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 emissions of GHGs meet or exceed the reporting threshold.

To complete this assessment, it is necessary for a facility to calculate its total emissions 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 or gas species multiplied by their respective global warming potential (GWP) (see Equation 1).

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.

Emissions of individual species of hydrofluorcarbons (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).

Equation 1:

$$Total\ Emissions = \sum_{1}^{i}(E_{CO_2} \times GWP_{CO_2})_i + \sum_{1}^{i}(E_{CH_4} \times GWP_{CH_4})_i + \sum_{1}^{i}(E_{N_2O} \times GWP_{N_2O})_i + \sum_{1}^{i}(E_{PFC} \times GWP_{PFC})_i + \sum_{1}^{i}(E_{HFC} \times GWP_{HFC})_i + \sum_{1}^{i}(E_{SF_6} \times GWP_{SF_6})_i$$

where:
E = total emissions of a particular gas or gas species from the facility (tonnes);
GWP = global warming potential of the same gas or gas species (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 Lime, cement, aluminium, iron and steel manufacturing

Facilities involved in the industrial activities listed below are subject to the 10-kt threshold reporting requirements, expanded reporting requirements, and are to apply specific quantification methods presented in Canada's Greenhouse Gas Quantification Requirements[7] document:

- lime manufacturing
- cement manufacturing
- aluminium manufacturing
- iron and steel manufacturing

Facilities must determine their emissions by gas and by emission source category, following each source category's respective requirements, and then calculate if the total of emissions meets or exceeds the 10-kt threshold:

- stationary fuel combustion: report using the expanded requirements (schedule 7)
- industrial processes: report using the expanded requirements applicable for each sector (schedule 8 to 11)
- fugitive (venting, leakage): report using the basic requirements (schedule 5)
- fugitive (flaring): report using the expanded requirements (schedule 7)
- on-site transportation: report using the expanded requirements (schedule 7)
- waste: report using the basic requirements (schedule 5)
- wastewater: report using the basic requirements (schedule 5)

Any facility engaged in more than one activity listed above shall report emissions for each activity separately.

7 https://drive.google.com/drive/folders/0B7idO1RrwkW7L-WlxV1BrcU9ZeDA

2.3 Reporting carbon capture, transport and storage activities

Environment and Climate Change Canada is now collecting information on the quantities of CO_2 captured and fugitive CO_2 losses from capture systems, transportation infrastructure, injection equipment and geologic storage sites, including oil and gas operations using CO_2 for enhanced recovery of oil, natural gas and coal bed methane.

The GHG reporting requirements apply to facilities that were engaged in CO_2 capture, CO_2 transport, CO_2 injection or CO_2 storage in the 2014, 2015, 2016 or 2017 calendar years. No reporting threshold applies to the requirements related to these carbon capture, transport and storage (CCTS) activities. A facility is subject to the reporting requirements identified for CCTS activities (schedule 6) when involved in any part of these CCTS activities.

Any other emission source categories of this same CCTS facility that are not identified in schedule 6 are subject to the 10-kt threshold and to the basic emissions reporting requirements. Therefore, a facility, even if involved in CCTS activities, is subject to the reporting requirements if its total emissions of GHGs (not related to its CCTS activities) meet or exceed the reporting threshold.

If the person who operates a facility, where CCTS activities occurred, changed during the 2014, 2015, 2016 or 2017 calendar years, the facility operator on December 31st of any given year shall report for the entire calendar year. If facility operations terminated during the 2014, 2015, 2016 or 2017 calendar years, the last facility operator shall report for the portion of the year where operations occurred.

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 taken from the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report. These GWP values were applied starting with the reporting of 2013 data under the GHGRP and will continue into future years. For years prior to 2013, facilities should refer to the *Canada Gazette* notices previously published for the list of GWP values to use (available on the GHGRP website[8]) in determining if they meet the reporting requirements, if applicable.

Reporting facilities are required to report the emissions of each individual GHG, expressed in units of tonnes for each. For example, a reporter would report 100 tonnes of nitrous oxide (N_2O) rather than 29 800 tonnes of CO_2 eq units for N_2O.

However, when a potential reporter is assessing whether he or she needs to submit a report for a particular facility, he or she will need to convert the emissions to CO_2 eq units to compare them with the reporting threshold.

8 https://www.canada.ca/en/environment-climate-change/services/climate-change/greenhouse-gas-emissions/facility-reporting/reporting.html

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	25
3.	Nitrous oxide	N_2O	10024-97-2	298
4.	Sulphur hexafluoride	SF_6	2551-62-4	22 800
Hydrofluorocarbons (HFCs)				
5.	HFC-23	CHF_3	75-46-7	14 800
6.	HFC-32	CH_2F_2	75-10-5	675
7.	HFC-41	CH_3F	593-53-3	92
8.	HFC-43-10mee	$C_5H_2F_{10}$	138495-42-8	1 640
9.	HFC-125	C_2HF_5	354-33-6	3 500
10.	HFC-134	$C_2H_2F_4$ (Structure: CHF_2CHF_2)	359-35-3	1 100
11.	HFC-134a	$C_2H_2F_4$ (Structure: CH_2FCF_3)	811-97-2	1 430
12.	HFC-143	$C_2H_3F_3$ (Structure: CHF_2CH_2F)	430-66-0	353
13.	HFC-143a	$C_2H_3F_3$ (Structure: CF_3CH_3)	420-46-2	4 470
14.	HFC-152a	$C_2H_4F_2$ (Structure: CH_3CHF_2)	75-37-6	124
15.	HFC-227ea	C_3HF_7	431-89-0	3 220
16.	HFC-236fa	$C_3H_2F_6$	690-39-1	9 810
17.	HFC-245ca	$C_3H_3F_5$	679-86-7	693
Perfluorocarbons (PFCs)				
18.	Perfluoromethane	CF_4	75-73-0	7 390
19.	Perfluoroethane	C_2F_6	76-16-4	12 200
20.	Perfluoropropane	C_3F_8	76-19-7	8 830
21.	Perfluorobutane	C_4F_{10}	355-25-9	8 860
22.	Perfluorocyclobutane	c-C_4F_8	115-25-3	10 300
23.	Perfluoropentane	C_5F_{12}	678-26-2	9 160
24.	Perfluorohexane	C_6F_{14}	355-42-0	9 300

[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] United Nations Framework Convention on Climate Change (UNFCCC), 2014. FCCC/CP/2013/10/Add.3. Decision 24/CP.19. Revision of the UNFCCC Reporting on annual inventories for Parties included in Annex I to the Convention, November 2013.

3 Basic concepts for reporting emissions

3.1 General reporting requirements

All facilities with emissions above the new 10-kilotonne (kt) threshold in 2017 are required to report their emissions of greenhouse gases (GHGs):

- facilities with activities outside the sectors outlined below will report their GHG emissions by gas for each of the identified emission source categories (listed in section 4.1). Reporters will be subject to these basic emissions reporting requirements as in prior years
- facilities involved in cement, lime, iron and steel and aluminium manufacturing must report additional information and use prescribed quantification methods. Reporters need to select a method from the prescribed list of quantification requirements for determining emissions contained in Canada's Greenhouse Gas Quantification Requirements

For example, a facility involved in waste treatment activities would be subject to the basic emissions reporting requirements. Another facility involved in lime manufacturing would be subject to the expanded reporting requirements. However, a facility manufacturing lime and doing waste treatment will report its GHG emissions from lime manufacturing using the expanded requirements, but would use the basic requirements to report its emissions from the waste treatment activities. All activities generating emissions, in this instance waste treatment and lime manufacturing, must be considered for the purpose of determining if a facility meets or exceeds the reporting threshold.

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

3.2 Key elements in calculating emissions

3.2.1 Basic emissions quantification requirements

Currently, there are no specific protocols to define how reporting facilities must calculate their GHG emissions for facilities that are not involved in any of the industries described in section 3.2.2. However, reporters must use methods that are consistent with the methodologies described in the 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines.

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 and engineering estimates. 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 or calculated 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 established 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 each category of emission sources, there are several ways of calculating the emissions, described as tiers (e.g., Tier 1, Tier 2, Tier 3); 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 emission rates 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 from the 2018 National Inventory Report[9] or, better yet, industry-specific or technology-specific ones, when available. For example, the combustion of natural gas in a boiler results in emissions of GHGs such as CO_2, CH_4 and N_2O. Each gas 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.

9 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* (a link to this report is accessible at https://www.canada.ca/en/environment-climate-change/services/climate-change/greenhouse-gas-emissions.html). Reference details are provided in Appendix B.

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 the 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.

Table 2: **reference to methodological guidance in the 2006 Intergovernmental Panel on Climate Change guidelines, by emission source[a]**

Emission Source Category	2006 IPCC Guidelines
CO_2, CH_4, N_2O	
Stationary Fuel Combustion	Volume 2 (Energy), Chapter 2 (Stationary Combustion), pages 2.1–2.47
Industrial Process	Volume 3 (Industrial Process and Product Use), Chapters 1–8
Fugitive (flaring, venting, leakage)	Volume 2 (Energy), Chapter 4 (Fugitive Emissions), pages 4.1–4.78
Waste	Volume 5 (Waste), Chapters 1–5
Wastewater	Volume 5 (Waste), Chapter 6 (Wastewater Treatment and Discharge), pages 6.1–6.28
On-site Transportation	Volume 2 (Energy), Chapter 3 (Mobile Combustion), pages 3.1–3.78
HFCs, PFCs, SF_6	
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

[a] Documents available at www.ipcc-nggip.iges.or.jp/public/2006gl/index.html

3.2.2 Expanded emissions quantification requirements

Facilities engaged in the lime, cement, aluminium and iron and steel manufacturing are subject to expanded details of their 2017 emissions resulting from specific sources, including fuel combustion (both stationary and on-site transportation), and certain industrial processes. They are also required to monitor and report additional data used to determine the identified emissions and to use specific requirements regarding their quantification methods. New requirements for reporting on CCTS activities are also in place as part of the GHGRP expansion.

(i) Carbon capture, transport and storage (schedule 6, section 1 of Canada's Greenhouse Gas Quantification Requirements)

Any facility engaged in CO_2 capture, CO_2 transport, CO_2 injection and/or CO_2 storage is required to report the identified information in schedule 6 for their 2014, 2015, 2016 and 2017 data. Since enhanced fossil fuel recovery is integrated in these activities, this will include facilities engaged in enhanced fossil fuel recovery using CO_2. The CO_2 activities covered would include CO_2 injected directly into long-term geological storage as well as CO_2 used for enhanced fossil fuel recovery with a goal of long term geological storage of CO_2.

(ii) Fuel combustion (schedule 7, section 2 of Canada's Greenhouse Gas Quantification Requirements)

A common set of reporting requirements and quantification methods for combustion emissions have been issued for the four industries listed below. The fuel combustion requirements include emissions from stationary fuel combustion, on-site transportation, and flaring. Facilities are not required to report fuels and associated emissions when the sum of CO_2 emissions from the combustion of one or more fuels do not exceed 0.5 % of the total facility CO_2 emissions from all fuel combustion.

(iii) Lime manufacturing (schedule 8, section 3 of Canada's Greenhouse Gas Quantification Requirements)

Lime production involves three main processes: stone preparation, calcination, and hydration. During the calcination process, lime is heated which generates process-related CO_2 emissions. These CO_2 emissions will be categorized under industrial process emissions.

(iv) Cement manufacturing (schedule 9, section 4 of Canada's Greenhouse Gas Quantification Requirements)

The cement manufacturing process comprises two steps: (i) clinker production and (ii) finish grinding. Process-related GHG emissions from cement manufacturing arise from process-related CO_2 emissions generated during clinker production. Clinker typically contains a large fraction of calcium oxide (CaO) and may contain a very small fraction of magnesium oxide (MgO), which is formed during the calcination process from magnesite in raw materials. During clinker production, some of the clinker precursor materials form partially or fully calcined cement kiln dust instead of forming clinker, which must also be included in the calculation of emissions to be reported. All process related CO_2 emissions from clinker production will be categorized under industrial process emissions.

(v) Aluminium manufacturing (schedule 10, section 5 of Canada's Greenhouse Gas Quantification Requirements)

The manufacturing of primary aluminium results in process-related emissions of CO_2, two perfluorocarbons (PFCs), namely, perfluoromethane, (CF_4) and perfluoroethane (C_2F_6), as well as sulphur hexafluoride (SF_6). All data used to quantify the emission sources specified above must be reported; process-related CO_2, CF_4 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.

(vi) Iron and steel manufacturing (schedule 11, section 6 of Canada's Greenhouse Gas Quantification Requirements)

Quantification and reporting of CO_2 emissions are required from major process units and processes where the consumption of raw materials, usually in combination with fuel combustion, contribute to GHGs emissions. Emissions from CO_2 are to be quantified and reported for the following major process units and processes: taconite indurating furnace, basic oxygen furnace, coke oven battery, sinter production, electric arc furnace, argon-oxygen decarburization, direct reduction furnace, blast furnace, ladle furnace, the atomization of molten cast iron, the decarburization of iron powder, molten steel grading and the annealing of steal powder.

For facilities that manufacture iron and steel, specific 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 those facilities manufacturing iron and steel powder, carbon process inputs and ouputs 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, 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 will be categorized under fugitive emissions.

Canada's Greenhouse Gas Quantification Requirements document describes the required methods to be used by each manufacturing industry mentioned above and by those involved in CCTS activities. In most cases, more than one quantification method is available for each sector or activity. The selection of a method depends on the information available to the reporter, thus allowing a flexible approach to GHG calculation procedures while building consistency in the methods used and the resulting data.

3.3 Review and verification

Environment and Climate Change Canada (ECCC) reviews the information submitted by facilities and conducts a number of quality checks of the submitted data for compliance purposes and for completeness. ECCC will follow up with individual facilities if there are any clarifications needed regarding their data. Reporting facilities are required to keep copies of the reported 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 in Canada. All information must be kept for a period of three years from the mandated submission date.

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

Facilities that meet reporting threshold but fail to report, fail to report on time, or knowingly submit false or misleading information, face the penalties 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.

4 Emissions reporting format

4.1 Reporting emissions data

Environment and Climate Change Canada's online Single Window reporting tool is available to 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 of each GHG emitted) for each emission source occurring at the facility. The quantity of emissions in carbon dioxide equivalent (CO_2 eq) units will be automatically calculated by the online reporting system.

A "not applicable" (N/A) 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; or
- the source or type of emission occurs but the emissions 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 emissions of the three gases, carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) 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 emissions of hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6) by individual gas species from the following source categories:

- industrial processes
- industrial product use

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

4.2 Carbon dioxide, methane and nitrous oxide emissions

CO_2, CH_4 and N_2O 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

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

	Emission Source Categories (in tonnes)								
				Fugitive					
Greenhouse Gas	**Stationary Fuel Combustion**	**Industrial Process**	**Industrial Product Use**	**Venting**	**Flaring**	**Leakage**	**On-site Transportation**	**Waste**	**Waste-water**
Carbon Dioxide (excluding CO_2 emissions from biomass combustion, which is to be reported separately)	Applicable	Applicable	N/A[a]	Applicable	Applicable	Applicable	Applicable	Applicable	Applicable
Methane	Applicable	Applicable	N/A	Applicable	Applicable	Applicable	Applicable	Applicable	Applicable
Nitrous Oxide	Applicable	Applicable	N/A	Applicable	Applicable	Applicable	Applicable	Applicable	Applicable
Sulphur hexafluoride	N/A	Applicable	Applicable	N/A	N/A	N/A	N/A	N/A	N/A
Hydrofluorocarbons	N/A	by species	by species	N/A	N/A	N/A	N/A	N/A	N/A
Perfluorocarbons	N/A	by species	by species	N/A	N/A	N/A	N/A	N/A	N/A
Total	…	…	…	…	…	…	…	…	…

[a] N/A = non applicable.

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, CH_4 and N_2O emissions should be reported under Stationary Fuel Combustion Emissions. The CO_2 emissions should be reported under Biomass Combustion Emissions (see Section 4.2.7).

Facilities subject to the expanded requirements must report their stationary fuel combustion emissions under either electricity generation, steam generation or all other combustion. Emissions from coke oven batteries in iron and steel manufacturing are therefore to be reported under all other combustion category 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 other than combustion and where the primary purpose of the industrial process is not energy production. Examples of industrial process emissions include mineral production (e.g., cement, lime), metal production (e.g., iron and steel, aluminum) 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 reported as Stationary Fuel Combustion Emissions, whereas industrial process emissions are reported as 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.[10]

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 CO_2 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.

CO_2 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. CO_2 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 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 the fossil fuel industries.

Note: Flaring of landfill gas should be accounted for under the Waste Emissions category (see Section 4.2.5).

(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; CO_2 capture, transport, injection and storage infrastructure for geological storage.

Note: The release of landfill gases are to be reported under the Waste Emissions category (see Section 4.2.5). Also, fugitive 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 CO_2, CH_4 and N_2O 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

10 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.

process. Examples of such machinery or equipment may include:

- 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

Examples of transportation activities or machinery that would not be reported include:

- 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, such as delivery of materials

4.2.5 Waste emissions

This category of emissions refers to releases that result from waste disposal or management sources at a facility. This includes landfilling of solid waste, flaring of landfill gas 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 CO_2, CH_4 and N_2O from waste disposal, and special consideration is necessary for CO_2 emissions originating from biomass materials in waste (see Section 4.2.7).

4.2.6 Wastewater emissions

This category of emissions refers to releases that result from wastewater and wastewater treatment at a facility. Wastewater treatment processes (aerobic and anaerobic) typically result in emissions of CH_4 and N_2O, and these emissions are reported under this category. CO_2 is also a product of aerobic and anaerobic wastewater treatment. However, as described in Section 4.2.7, these emissions should not be reported.

In general, closed underground sewers are not considered a significant source of CH_4 or N_2O.

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. If CH_4 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 N_2O.

Much of the N_2O 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.

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; and
- animal- or plant-derived oils

(i) CO_2 emissions from combustion of biomass

The United Nations Framework Convention on Climate Change (UNFCCC) Reporting Guidelines require that CO_2 emissions from biomass materials be reported separately. This explicit reporting of CO_2 emissions from biomass-based combustion has the benefits of:

- reminding reporting facilities that these emissions need to be reported internationally;
- ensuring that CO_2 emissions from biomass are currently separated from the totals; and
- demonstrating the quantity of atmospheric CO_2 loading that could be offset by biomass growth.

A facility may use biomass materials as a fuel source in its on-site combustion processes. The reporting facility must report the CO_2 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 CH_4 and N_2O emissions should be reported under either Stationary Fuel Combustion Emissions or On-site Transportation if the biomass is being burned to create energy, or under Waste Emissions in the case of waste incineration and landfill gas flaring processes, and these emissions must be included in the facility totals. There is no reverse, biogenic mechanism by which replacement biomass removes emissions of CH_4 or N_2O from the atmosphere. Therefore, they must be included in the GHG totals in the same way as CH_4 and N_2O 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 CO_2 emissions from the biomass portion being incinerated should be reported separately in the GHG report (and not included in the CO_2 emission totals), whereas the CO_2 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 CO_2 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) Other CO_2 emissions from biomass (non-combustion)

Waste disposal and wastewater treatment processes can produce CO_2 emissions, a result of aerobic decomposition of biomass material in the waste or wastewater stream. The reporting company is not required to report these CO_2 emissions; however, emissions of CH_4 and N_2O resulting from decomposition of biomass must be reported in the Waste or Wastewater Emissions categories.

Similarly, CO_2 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 CO_2 emissions.

4.3 Hydrofluorocarbon, perfluorocarbon and sulphur hexafluoride emissions

A reporting facility also needs to calculate and report its emissions of the HFC and PFC gas species listed in Table 1, and the gas SF_6, if the facility emits these GHGs from industrial processes or industrial product use.

HFC, PFC and SF_6 emissions from **industrial processes** are described as emissions resulting from a chemical or physical transformation of material, such as HFCs and PFCs used as foam-blowing agents and PFC emissions from anode effects in primary aluminum smelting.

HFC, PFC and SF_6 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 SF_6 and HFCs used in the magnesium industry as a cover gas. Use of SF_6 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 92 to as high as 14 800 (IPCC, 2012). The use of HFCs is growing 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 that 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 7 390 and 12 200 (IPCC, 2012). 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: aluminum production and foam blowing. PFC emissions are a by-product of aluminum 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

SF_6 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 22 800 and an estimated lifetime of about 3 200 years (IPCC, 2012).

(ii) Sources

The main sources of SF_6 emissions from industrial processes and industrial product use include SF_6 used as a cover gas in magnesium smelting and casting as well as for special foundry products in the aluminum industry. Use of SF_6 as an insulating gas in electrical equipment (e.g., gas-insulated switchgear, circuit breakers) is also considered as an industrial product use.

Emissions of SF_6 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 Frequently Asked Questions (FAQ) 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 2017 requirements or for more information about the GHGRP:

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