

Greenhouse Gas (GHG) Emissions Measurement and Reporting Guidelines

**PART 1A: INTRODUCTION TO THE GHG MEASUREMENT AND
REPORTING REQUIREMENTS FOR THE REPORTABLE FACILITY**

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Revision History

Version no.	Revision date	Summary of changes
1	29 December 2017	Initial release on Measurement and Reporting (M&R) requirements supporting the Energy Conservation (Greenhouse Gas Measurement and Reporting) Regulations 2017.
2	15 January 2020	<p>Amendments to update the Measurement and Reporting (M&R) requirements supporting the Carbon Pricing Act 2018.</p> <p>This document has 2 parts – part 1A for reportable facilities and 1B for taxable facilities. The content from section 1 until section 2.2 is the same for both 1A and 1B.</p>
3	29 March 2021	Amendments to align with Carbon Pricing Act 2018 (Amendment of Second Schedule) Order 2021.
4	15 Dec 2023	Amendments to align with Carbon Pricing (Amendment) Act, which will come into operation on 1 Jan 2024.

1. Introduction to the Guidelines

1.1 Purpose

This document is aligned with and supports the Carbon Pricing (Measurement, Reporting and Verification) Regulations 2018 under the Carbon Pricing Act (CPA).

This document is part of a series of Measurement and Reporting (M&R) guidelines and templates developed by the National Environment Agency (NEA):

- i) **Part I: Introduction to the GHG Measurement and Reporting Requirements**
- ii) Part II: Monitoring Plan
- iii) Part III: Emissions Report

This series of guidelines aim to provide guidance on:

- i) the implementation of the Measurement and Reporting (M&R) requirements;
- ii) compliance requirements relating to the measurement and reporting of greenhouse gas (GHG) emissions; and
- iii) the preparation of the Monitoring Plan and the Emissions Report.

This series of guidelines should be read in conjunction with the Greenhouse Gas (GHG) Verification and Accreditation (V&A) guidelines and templates, the Carbon Pricing (Measurement, Reporting and Verification) Regulations 2018 (i.e. “MRV Regulations”) and the Carbon Pricing (Registration and General Matters) Regulations 2018.

2. Overview of the Carbon Pricing Act and the GHG Measurement and Reporting (M&R) Requirements

2.1 Introduction

The Carbon Pricing Act (CPA) came into force on 1 Jan 2019. The Act gives effect to the carbon tax and also incorporates the greenhouse gas (GHG) measurement and reporting (M&R) requirements for industrial facilities which were previously¹ under the Energy Conservation Act.

Firstly, the Act applies to business facilities² in the industry sectors of:

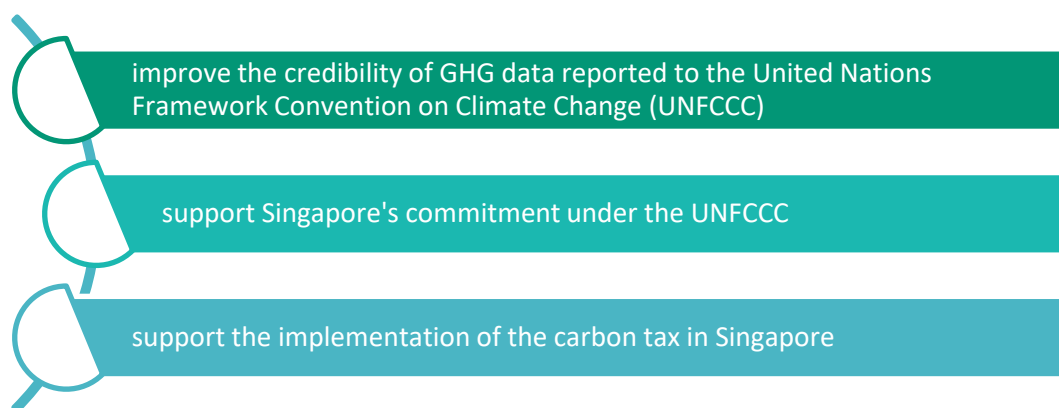
- i) manufacturing and manufacturing-related services;
- ii) supply of electricity, gas, steam, compressed air and chilled water for air-conditioning; and
- iii) water supply and sewage and waste management.

Secondly, the Act defines a business facility as a single site at which any business activity is carried out, including series of activities carried out at more than one parcel of land, where:

- i) parcels of land that are contiguous, adjacent, adjoining or separately by any road or pathway, or drain or waterway; or
- ii) there is dependency between the activities carried on the parcels of land.

Lastly, a person (i.e. corporation) is said to have operational control over a business facility if the person has the authority to introduce or implement operating policies, health and safety policies or environmental policies. If more than one corporation satisfies the former at any one time, the corporation that has the greatest authority to introduce or implement the policies is taken for the purposes of the Act, to have operational control over the business facility.

The M&R requirements aim to improve the accuracy and rigour of GHG emissions data, in order to:



¹ GHG reporting under the ambit of the ECA ceased after the submission of the Energy Use Report by 30 Jun 2019. From the 2020 reports (for year 2019), all GHG reporting for ECA-registered industrial facilities (that emits $\geq 2,000\text{tCO}_2\text{e}$) will come under the CPA. Please refer to Section 80(3) of the CPA.

² Refer to Section 3 of the Carbon Pricing (Registration and General Matters) Regulations 2018 for the full elaboration of the prescribed industry sectors.

Prior to the introduction of the MRV Regulations, GHG data was gathered through the Energy Use Reports mandated under the Energy Conservation (Energy Management Practices) Regulations of the Energy Conservation Act. Additional M&R Requirements were later introduced under the Energy Conservation (Greenhouse Gas Measurement and Reporting) Regulations 2017, which now all reside in the MRV Regulations under the CPA.

The level of granularity of data to be measured and reported by each facility remains unchanged under the MRV Regulations. Table 1 highlights the key changes in the M&R requirements under the MRV Regulations vis-à-vis the Energy Conservation (Energy Management Practices) Regulations³.

Table 1: Key changes in M&R requirements under the Carbon Pricing Act and the Energy Conservation Act

Requirements	Energy Conservation (Energy Management Practices) Regulations	Carbon Pricing (Measurement, Reporting and Verification) Regulations
Report data at system / process level for fuel combustion activities	Yes (requirements unchanged)	
Report data at system / process level for non-fuel combustion activities (i.e. industrial processes and product use (IPPU))	Yes (requirements unchanged)	
Compute GHG emissions for both fuel combustion and IPPU activities	Partial (for IPPU)	Yes (for both fuel combustion and IPPU)
Implement quality management procedures, i.e. Quality Control / Quality Assurance (QC/QA) procedures	No	Yes
Submit documentation / justification on quantification of GHG emissions and QC/QA procedures	No	Yes

³ Prior to the implementation of the MRV Regulations, registered corporations under the ECA have been reporting (i) energy, and (ii) non-energy data related to GHG emissions under the Energy Conservation (Energy Management Practices) Regulations.

2.2 Eligibility, emissions thresholds and coverage



A facility will be subject to the M&R requirements when its total direct GHG emissions (Scope 1⁴) attains the first emissions threshold of **2,000 tonnes of carbon dioxide equivalent (CO₂e) in any calendar year** ('trigger year')⁵.

There are two emissions threshold under the CPA, bearing different compliance obligations. This is summarised in Figure 1 below.

- i) Any facility that attains the first emissions threshold, but not the second threshold (i.e. emits between $\geq 2,000$ tCO₂e and $< 25,000$ tCO₂e in any calendar year (tCO₂e/year) is to be registered as a reportable facility.
- ii) Any facility that attains the second emissions threshold (i.e. emits $\geq 25,000$ tCO₂e in any calendar year (tCO₂e/year) is to be registered as a taxable facility.

Any facility that attains the first or second emissions threshold is to register under the CPA by **30 June** of the year immediately following the trigger year through the Emissions Data Monitoring and Analysis (EDMA) System available at <https://www.edma.gov.sg/>. For example, if the facility attains the first (but not the second) emissions threshold in 2020, the facility will have to register for the CPA as a reportable facility by 30 June 2021.

Figure 1: Emissions threshold under the Carbon Pricing Act

First emissions threshold - Facility emits between $\geq 2,000$ and $< 25,000$ tCO ₂ e in any calendar year (tCO ₂ e/year)	Second emissions threshold - Facility emits $\geq 25,000$ tCO ₂ e in any calendar year (tCO ₂ e/year)
	
<input type="checkbox"/> Register as a reportable facility	<input type="checkbox"/> Register as a taxable facility
<input type="checkbox"/> Submit an annual Emissions Report	<input type="checkbox"/> Submit a Monitoring Plan
<input type="checkbox"/> No carbon tax liability	<input type="checkbox"/> Submit an annual third-party verified Emissions Report
	<input type="checkbox"/> Liable for the carbon tax for the verified reckonable emissions in the Emissions Report

The types of processes or activities resulting in GHG emissions are broadly categorised into (i) fuel combustion (i.e. energy use) and (ii) industrial processes and product use (IPPU)⁶ (i.e. non-energy use). GHG emissions directly released into the atmosphere from both fuel combustion and IPPU activities

⁴ Three scopes of reporting are defined by the GHG Protocol (<http://www.ghgprotocol.org/corporate-standard>), direct emissions as Scope 1, indirect emissions related to production of energy commodities used (e.g. electricity) as Scope 2 and other indirect emissions as Scope 3.

⁵ The calendar year during which direct GHG emissions first attain the first or second emissions threshold is defined as the 'trigger year' in the MRV Regulations.

⁶ 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 3 Industrial Processes and Product Use: <http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol3.html>

within the facility boundary and under operational control of the Corporation, are to be measured and reported in accordance with the M&R requirements.

The GHGs⁷ covered by the CPA are:

- i) Carbon dioxide (CO₂);
- ii) Methane (CH₄);
- iii) Nitrous oxide (N₂O);
- iv) Sulphur hexafluoride (SF₆);
- v) Nitrogen trifluoride (NF₃);
- vi) Hydrofluorocarbons (HFCs); and
- vii) Perfluorocarbons (PFCs).

The GHG emissions are further classified as reckonable and non-reckonable under the CPA. The emissions coverage for the CPA, and details on the types of GHGs that are reckonable and non-reckonable, are summarised in Table 2⁸.

⁷ Refer to the First Schedule of the CPA for the Global Warming Potential (GWP) values and the full list of HFCs and PFCs.

⁸ Refer to Part 2 of the Second Schedule of the CPA.

Table 2: Emissions covered under the Carbon Pricing Act

Covered under the Carbon Pricing Act		Emissions excluded from the Carbon Pricing Act
Reckonable emissions	Non-reckonable emissions	
<p>All direct emissions of CO₂, CH₄, N₂O, SF₆, NF₃, HFCs and PFCs, from:</p> <ul style="list-style-type: none"> Fuel combustion Industrial processes and product use (IPPU), <p>excluding emissions defined as non-reckonable.</p> <p><i>Note:</i> Reckonable emissions also include:</p> <ul style="list-style-type: none"> CH₄ and N₂O emissions from combustion of biofuels or biomass. CO₂, CH₄ and N₂O emissions from combustion of diesel with sulphur content of more than 10ppm 	<ul style="list-style-type: none"> SF₆ emitted in the course of manufacturing, installing, using or disposing of any electrical equipment CO₂ emissions used and emitted in the course of <ul style="list-style-type: none"> purging, blasting, using any lubricant or paraffin wax, combustion of any of the following: <ul style="list-style-type: none"> biodiesels biogasoline charcoal landfill gas sludge gas sulphite lyes (black liquor) wood or wood waste other biogas other liquid biofuel other primary solid biomass HFCs and PFCs emitted in the course of using any refrigeration and air-conditioning equipment for non-manufacturing purposes HFCs and PFCs listed in Table 3.1 Any GHG emitted in the course of <ul style="list-style-type: none"> using any fire protection equipment, using any fuel on which excise duty is payable, or which is exempt from the payment of excise duty, under the Customs Act (Cap. 70), and emitted as a fugitive emission (excluding flaring and venting). 	<ul style="list-style-type: none"> Indirect emissions (Scope 2 and Scope 3) e.g. from electricity consumption Emissions from land-based activities (as defined by the UNFCCC) Transport emissions

Table 3.1: HFCs and PFCs newly added under the Carbon Pricing (Amendment) Act

HFCs	PFCs
(a) HFC-227ca (CF ₃ CF ₂ CHF ₂)	(a) PFC-c216 (c-C ₃ F ₆)
(b) HFC-245cb (CF ₃ CF ₂ CH ₃)	(b) Perfluorocyclopentene (c-C ₅ F ₈)
(c) HFC-245ea (CHF ₂ CHFCHF ₂)	(c) PFC-61-16 (n-C ₇ F ₁₆)
(d) HFC-245eb (CH ₂ FCHF ₂ CF ₃)	(d) PFC-71-18 (C ₈ F ₁₈)
(e) HFC-263fb (CH ₃ CH ₂ CF ₃)	(e) PFC-91-18 (C ₁₀ F ₁₈)
(f) HFC-272ca (CH ₃ CF ₂ CH ₃)	(f) Perfluorodecalin (cis) (Z-C ₁₀ F ₁₈)
(g) HFC-329p (CHF ₂ CF ₂ CF ₂ CF ₃)	(g) Perfluorodecalin (trans) (E-C ₁₀ F ₁₈)
(h) HFC-1132a (CH ₂ =CF ₂)	(h) PFC-1114 (CF ₂ =CF ₂)
(i) HFC-1141 (CH ₂ =CHF)	(i) PFC-1216 (CF ₃ CF=CF ₂)
(j) (Z)-HFC-1225ye (CF ₃ CF=CHF(Z))	(j) Perfluorobuta-1,3-diene (CF ₂ =CF ₂ CF=CF ₂)
(k) (E)-HFC-1225ye (CF ₃ CF=CHF(E))	(k) Perfluorobut-1-ene (CF ₃ CF ₂ CF=CF ₂)
(l) (Z)-HFC-1234ze (CF ₃ CH=CHF(Z))	(l) Perfluorobut-2-ene (CF ₃ CF=CF ₂ CF ₃)
(m) HFC-1234yf (CF ₃ CF=CH ₂)	
(n) (E)-HFC-1234ze (trans-CF ₃ CH=CHF)	
(o) (Z)-HFC-1336 (CF ₃ CH=CHCF ₃ (Z))	
(p) HFC-1243zf (CF ₃ CH=CH ₂)	
(q) HFC-1345zfc (C ₂ F ₅ CH=CH ₂)	
(r) 3,3,4,4,5,5,6,6,6-Nonafluorohex-1-ene (C ₄ F ₉ CH=CH ₂)	
(s) 3,3,4,4,5,5,6,6,7,7,8,8,8-Tridecafluorooct-1-ene (C ₆ F ₁₃ CH=CH ₂)	
(t) 3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-Heptafluorodec-1-ene (C ₈ F ₁₇ CH=CH ₂)	

In ascertaining whether a facility attains the first and second emissions threshold, the Corporation shall only consider the reckonable emissions i.e. only reckonable emissions contribute towards meeting the emissions threshold for the purpose of registration under the CPA. The other key differences between the implications of the reckonable and non-reckonable emissions are summarised in Table 3.

Table 3: Difference between reckonable and non-reckonable emissions

Implications	Reckonable emissions	Non-reckonable emissions
Contribute towards meeting the first or second emissions threshold?	Yes	No
Documented in the Monitoring Plan?	Yes	Yes
Reported in Emissions Report?	Yes	Yes
Subject to third-party verification?	Yes	No
Liable ⁹ for the carbon tax?	Yes	No

2.3 Obligations when there is a transfer of operational control of a registered/registrable reportable facility

A corporation that takes over the operational control of a registered/registrable reportable facility shall register the facility under CPA no later than **30 June** of the year immediately after the year of the transfer.

The reportable facility shall then comply with measurement and reporting requirements under section 2.5.

2.4 Deregistration from the Carbon Pricing Act

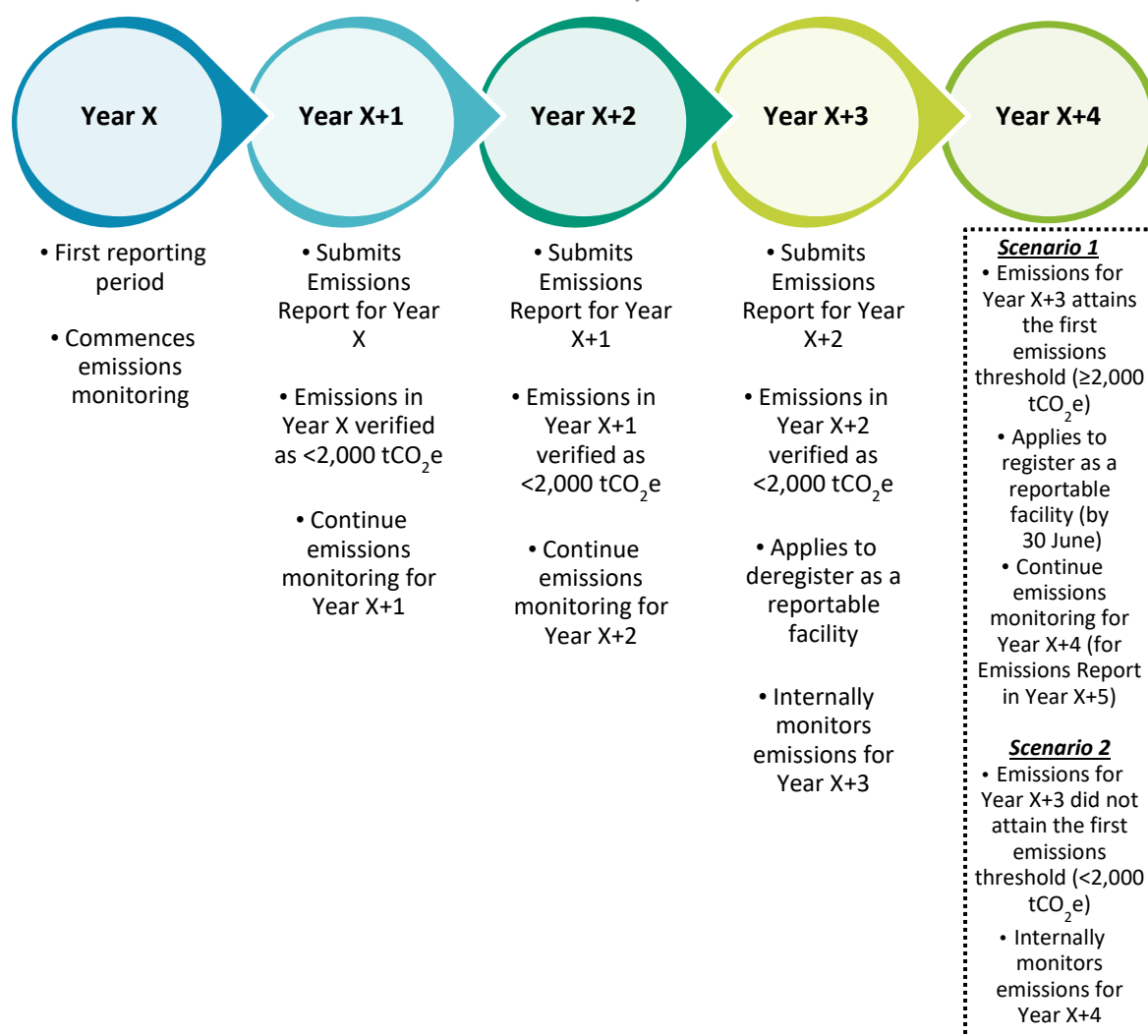
A reportable facility subject to the MRV Regulations will cease to be a reportable facility under the following circumstances and can apply to deregister from the CPA:

- i) The Corporation ceases to have operational control over the facility; or
- ii) The Corporation has operational control over the business facility but has ceased to operate the business facility and has no intention of resuming its business activity within the next 36 months after such cessation; or
- iii) Reckonable GHG emissions did not attain the first emissions threshold for 3 consecutive years¹⁰ (see Figure 2); or
- iv) Subject to NEA's approval, the facility has carried out modifications (including by way of additions and removals to any work process such that the facility did not attain the first emissions threshold for 1 year, and has demonstrated that it is unlikely to attain the first emissions threshold for the subsequent 2 consecutive years.

⁹ If verified reckonable emissions for the taxable facility falls below the second threshold for that reporting period, they will not be required to pay the carbon tax.

¹⁰ If emissions did not fall below 2,000 tCO₂e, the facility is still registered as a reportable facility.

Figure 2: Scenario where a reportable facility's emissions did not attain the first emissions threshold for three consecutive years



2.5 Submission of the Emissions Report

Under the MRV Regulations, the Corporation will be required to compile and submit an Emissions Report for every reportable facility and each reporting period¹¹, for NEA's approval:

- i) The Emissions Report shall contain information on the facility's activity data, computation for each direct GHG emissions, and the total GHG emissions.
- ii) The Emissions Report shall be submitted by **30 June** of the year following immediately the end of each reporting period.
- iii) The facility is required to use the Emissions Report User-Interface (UI) provided by NEA in the Emissions Data Monitoring and Analysis (EDMA) system. This Emissions Report UI builds on the forms and templates used for energy use reporting and IPPU emissions reporting under the ECA prior to the implementation of the MRV Regulations.
- iv) The Emissions Report shall be substantiated with supporting documents.

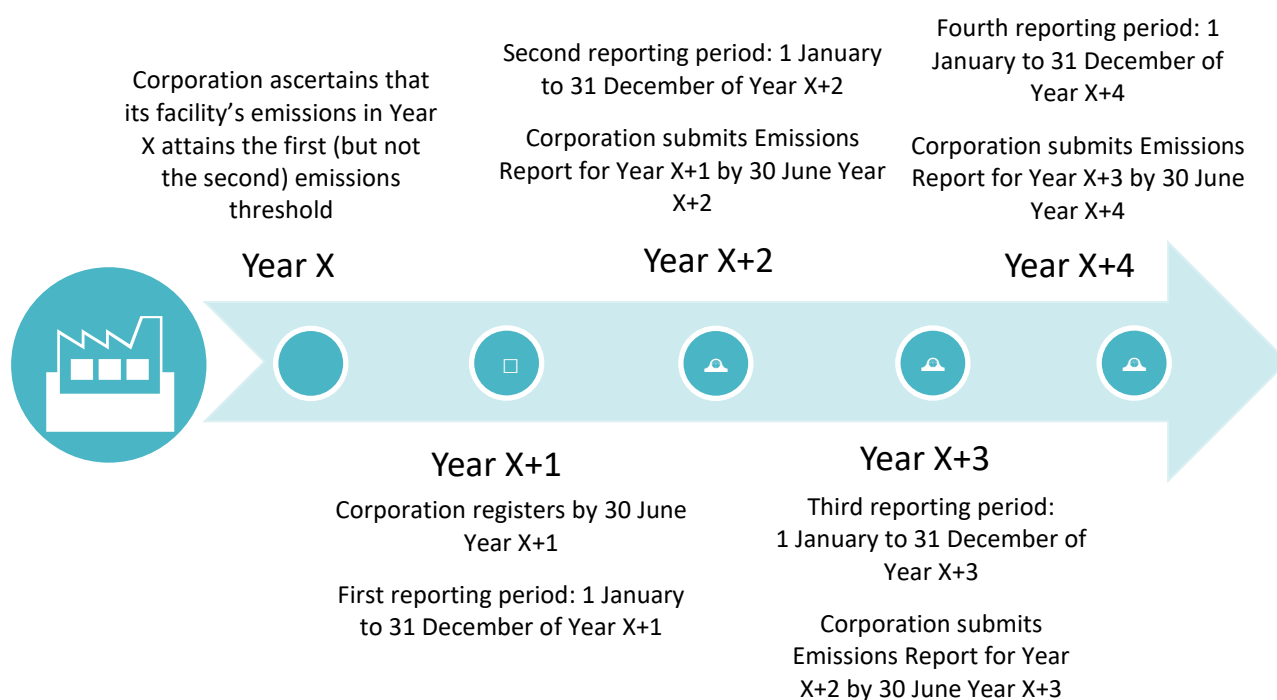
In summary, the timelines for facility registration and the Emissions Report submission are illustrated below in Figure 3.

In the event where the total reckonable emissions in the Emissions Report for Year X attain the second emissions threshold ($\geq 25,000$ tCO₂e), on top of submitting the Emissions Report for Year X by 30 June of Year X+1, the Corporation is required to register the facility as a taxable facility by 30 June of Year X+1 as well. The Corporation is required to prepare and submit a Monitoring Plan for the taxable facility by 31 December of Year X+1. Please refer to Part 1B of the M&R guidelines for more information.

It is an offence under the MRV Regulations if the Corporation (i) fails to submit the Emissions Report, (ii) fails to resubmit the Emissions Report when directed, or (iii) submits false or misleading information in the Emissions Report.

¹¹ The reporting period is the whole of the year (or part of) in which the facility is registered as a taxable or reportable facility under the CPA.

Figure 3: Submission and registration timeline for reportable facility



2.6 Responsibilities and required qualifications/experience of GHG Manager

The Corporation shall appoint at least one GHG Manager for each reportable facility to be responsible for preparing and submitting the Emissions Report. In the event where the Corporation has multiple reportable facilities, the same GHG Manager could be appointed to be in charge of multiple facilities.

The appointment of external service providers to assist the GHG Manager(s) in the preparation of the Emissions Report is allowed, but service providers shall not be appointed as the GHG Manager.

The duties and responsibilities of a GHG Manager include, but are not limited to, the list below:

- i) Be responsible for data collation, preparation and analysis of the Emissions Report;
- ii) Assess data collection for the requisite parameters that contribute to GHG emissions;
- iii) Document measurement approaches;
- iv) Monitor GHG emission sources and their operating parameters on a regular basis;
- v) Measure and report GHG emissions;
- vi) Submit the Emissions Report in accordance with the MRV Regulations; and
- vii) Ensure the Emissions Report are, to the best of the knowledge of the GHG manager, complete and accurate.

Each GHG Manager must have at least one of the following qualifications or experience:

- i) Singapore Certified Energy Manager (certified by the Institution of Engineers, Singapore); or
- ii) Qualifications or at least three years' experience in any of the following fields; or
 - a. Energy management;
 - b. Energy auditing;
 - c. GHG emissions computation;
 - d. GHG accounting;
 - e. Any standard of ISO 14064; or
 - f. Any standard of ISO 50001.
- iii) At least three years' experience in the operational processes and activities of the facility.

The Corporation is to justify and provide evidence to NEA, within 30 days after appointing the GHG Manager, that the GHG Manager has the required qualifications or experience to properly carry out the duties of a GHG Manager.

In the event where the only GHG Manager is no longer appointed as a GHG Manager, the Corporation is required to appoint a replacement GHG manager within 3 months.

Some recommended training are available from the GHG Management Institute¹², including:

- i) 201 Basics of Organisational GHG Accounting; and
- ii) Document measurement approaches.

2.7 Appointment of Designated Representative

The Corporation shall appoint at least one Designated Representative as part of the regulatory requirements. The Designated Representative cannot be the same person appointed as the GHG Manager mentioned above.

There are no specified qualifications required for the appointment of Designated Representative.

¹² Please refer to the GHG Management Institute's website <http://ghginstitute.org/courses/> for more information on training courses.