NEW YORK STATE | Department of Environmental Conservation

Existing Verifier Training

Training for Verifiers accredited by CARB and ANSI

Who is This Presentation For?

- Verifiers already accredited under
  - CARB's Mandatory Greenhouse Gas Reporting Program
  - ANAB ISO14065 accreditation for validation and verification bodies
- In addition to this training verifiers and verification bodies seeking an accreditation in New York must fill out an application which can be found on our website.

Mandatory Greenhouse Gas Reporting Verification - NYSDEC

Mandatory Greenhouse Gas Reporting Program and the CLCPA

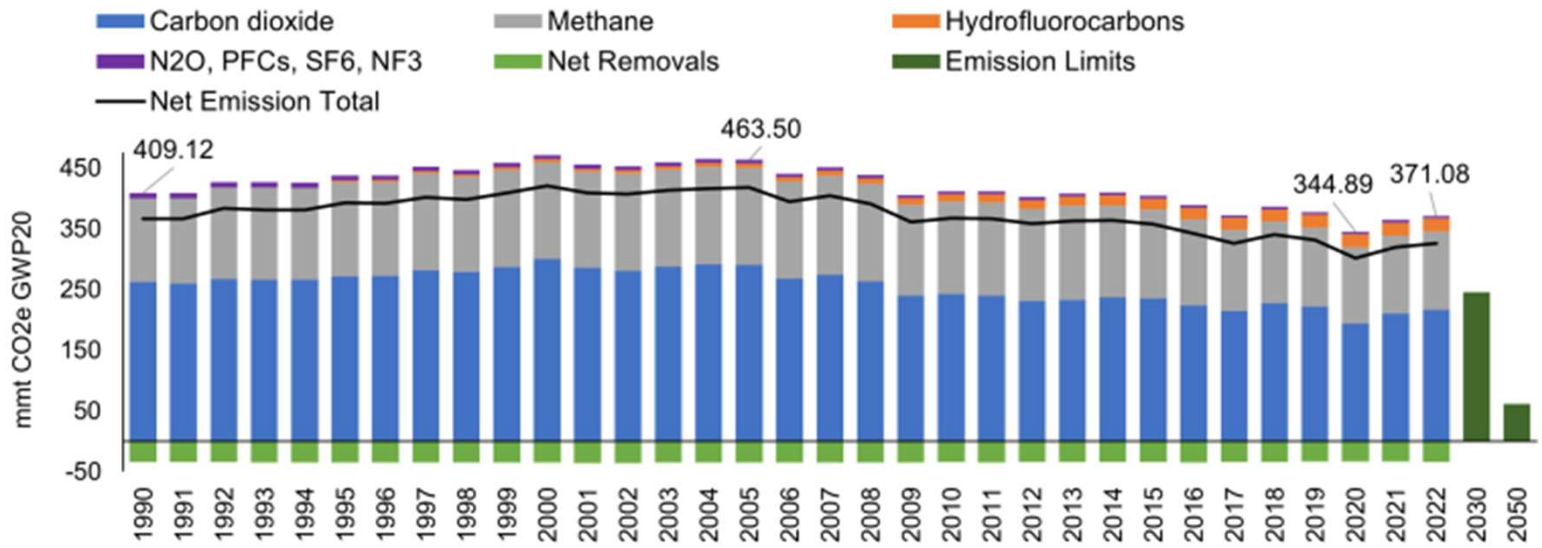
Background

- The **Climate Leadership and Community Protection Act (CLCPA)** requires a 40% reduction in GHG emissions by 2030 and an 85% reduction by 2050.
- The **Scoping Plan** recommended developing a mandatory greenhouse gas reporting program.

CLCPA Requirements

- Both in-state and **upstream out-of-state** emissions must be accounted for.
- New York currently uses **GWP20** for GHGs.

Figure ES.1: NYS Statewide Greenhouse Gas Emissions by Gas, 1990-2022 (mmt CO_2e GWP20)



NYSDEC. 2025 Statewide GHG Emissions Report.

Part 253 – Mandatory Greenhouse Gas Reporting Program

- Requires the reporting of emissions and product/activity data.
- Establishes that facilities with **≥ 10,000 metric tons of CO2e** are Reporting Entities.
- Establishes that fuel suppliers reporting any quantity of fuel supplied for use in the State are Reporting Entities.
- Requires verification for **large emissions sources** (≥ 25,000 mtons CO2e).

Part 253 – Subpart 1: General Provisions

253-1.2 Applicability

- **1.2(f) Large Emissions Sources**
- **1.2(l) Exemptions**

253-1.3 Definitions

253-1.4 Greenhouse Gas Reporting Requirements

253-1.5 Greenhouse Gas Reporting Content

253-1.6 Reporting Mechanism

253-1.7 Record Keeping

- **1.7(e) GHG Monitoring Plan**

253-1.8 Confidentiality

253-1.9 Enforcement

253-1.10 Severability

253-1.11 Standardized Methods

Part 253 – Subpart 2

Covered

- 2.1 Aluminum Production (Subpart F)
- 2.3 Cement Production (Subpart H)
- 2.6 Electronics Manufacturing (Subpart I)
- 2.7 Facility Fuel Utilization and Combustion (Subpart C)
- 2.8 Glass Production (Subpart N)
- 2.9 Hydrogen Production (Subpart P)
- 2.10 Iron and Steel Production (Subpart Q)
- 2.11 Lead Production (Subpart R)
- 2.12 Oil and Gas Systems (Subpart W)
- 2.13 Solid Waste Management (Subpart HH and TT)
- 2.15 Suppliers of Coal
- 2.16 Suppliers of Liquid Fuels and Petroleum Products
- 2.17 Suppliers of Natural Gas (Subpart NN)
- 2.18 Upstream and Out-of-State emissions
- 2.19 Waste Haulers and Transporters
- 2.22 Industrial Product Data

Exempt

- 2.2 Anaerobic Digestion and Liquid Storage of Waste*
- 2.4 Electric Power Entities
- 2.5 Electricity Generation and Cogeneration
- 2.14 Suppliers of Agricultural Lime and Fertilizer
- 2.21 Fluorinated Gases*

Part 253 – Subparts 3&4

Subpart 3: Additional Requirements for Reported Data

3.1 Substitution for Missing Data Used to Calculate Emissions from Stationary Combustion and CEMS Sources

Subpart 4: Requirements for Verification of Greenhouse Gas Emissions Data Reports and Requirements Applicable to Emissions Data Verifiers; Requirements for Accreditation of Emissions Data

4.1 Requirements for Verification of Emissions Data Reports

4.2 Requirements for Verification Services

4.3 Accreditation Requirements for Verification Bodies, Lead Verifiers, and Verifiers of Emissions Data Reports

4.4 Conflict-of-Interest Requirements for Verification Bodies

Resources for Understanding Mandatory Reporting

[Part 253 Mandatory Greenhouse Gas Reporting Program]

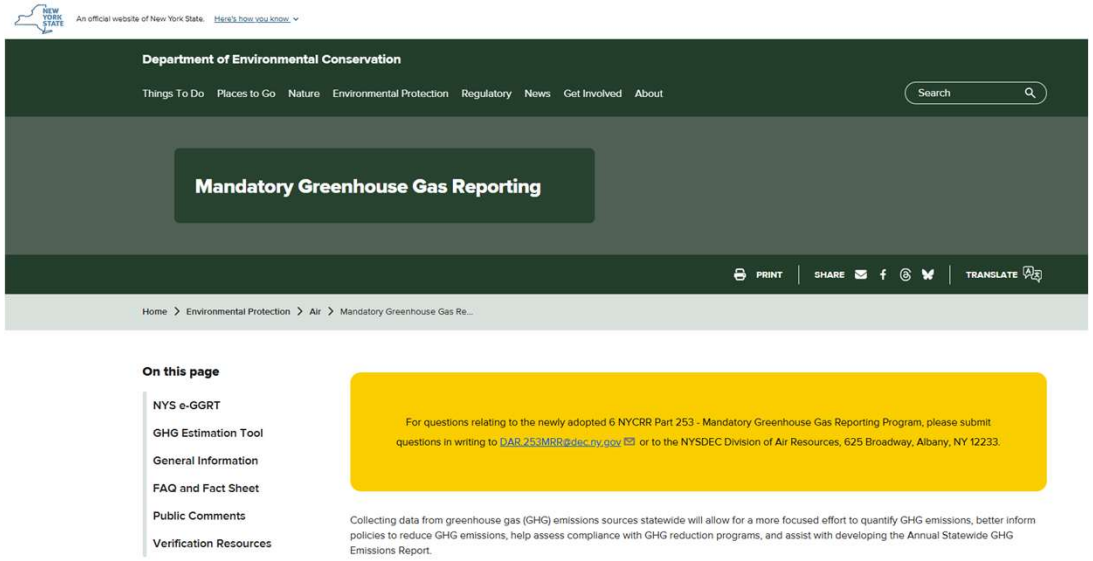
[Mandatory Greenhouse Gas Reporting – NYSDEC]

[Mandatory Greenhouse Gas Reporting Verification - NYSDEC]

[eCFR :: 40 CFR Part 98 (Nov. 18, 2024) -- Mandatory Greenhouse Gas Reporting]

[eCFR :: 40 CFR Part 98 (May 14, 2024) -- Mandatory Greenhouse Gas Reporting]

[eCFR :: 40 CFR Part 98 (Apr. 25, 2024) -- Mandatory Greenhouse Gas Reporting]



Verification Process Overview

1.2(f) Large Emissions Sources

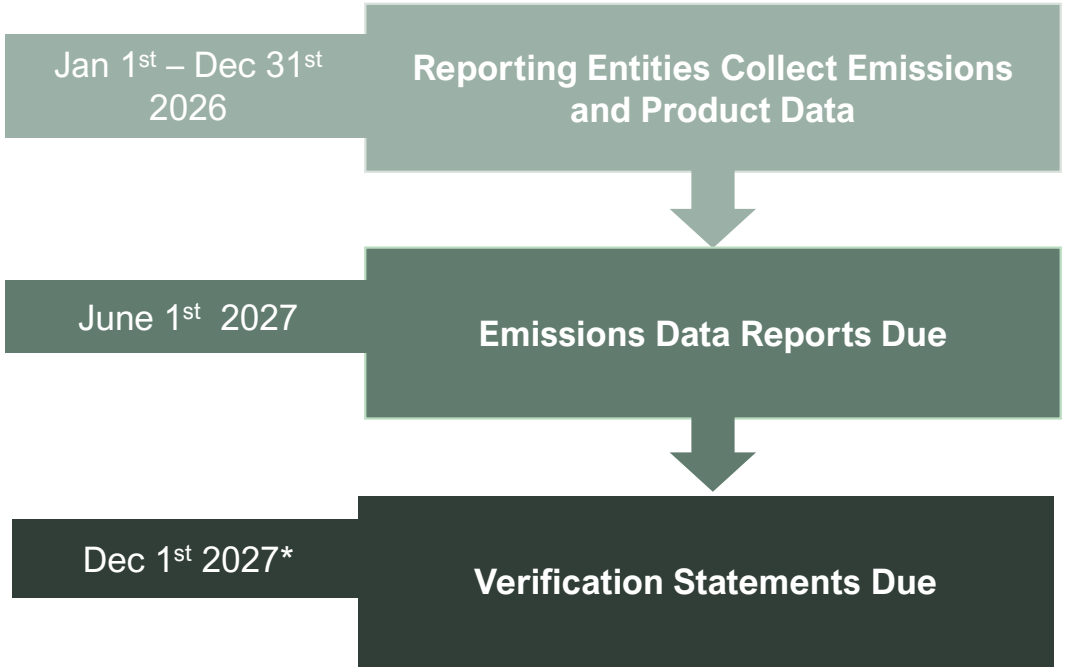
Verification is only required for large emissions sources.

- Owners and operators of facilities with emissions ≥ 25,000 metric tons CO_2e.
- Fuel Suppliers with:
  - 15,000,000 cubic feet of NG / year;
  - 100,000 gallons of affected liquid fuels / year;
  - 15,000,000 cubic feet or more of liquefied natural gas or compressed NG / year; or
  - 500 Short tons of coal / year.
- Waste Haulers and Transporters 25,000 metric tons CO2e/yr for all waste exported out of NY to landfills or combustion facilities.
- Electric Power Entities are exempt from verification.

Verification Sectors

Sector Specialist	Source Type
Transactions	Suppliers of petroleum products or biofuels, suppliers of coal, transporters of solid waste, suppliers of natural gas, natural gas liquids, or liquified petroleum gas
Oil and gas systems	Petroleum refineries, hydrogen production unit or facility, or petroleum and natural as systems listed in 1.2(k)
Process emissions	Cement production, glass production, electronics manufacturing, iron and steel production, solid waste management or lead production

Timeline



*The verification statement deadline is Dec 1st for the first two years of the program in 2029 and all subsequent years the deadline will be August 10th.

Conducting Verification

- First, submit a Notice of Verification Services and Conflict of interest to the Department. Verifiers cannot begin verification without first obtaining Department approval.
- [4.1(a)(1)] Full verification must be conducted the first year of contracting with an emissions source.
    - If a reporting entity receives a positive verification statement in the first year, a less intensive verification can be conducted for the following two years.

Positive	no non conformance or material misstatement in the final emissions data report
Qualified Positive	no material misstatement but other non-conformances
Negative	there is material misstatement, correctable errors that are not fixed, could be other non-conformances as well

- Note, separate verification statements are submitted for emissions and product data.

Reasonable Assurance

1.3(b)(354) ‘Reasonable Assurance’. A high degree of confidence that submitted data and statements are valid.

A verification team must **make its own determination** of emissions and product data reported to determine if there is **reasonable assurance** that the emissions or product data report does not contain a **material misstatement**. [4.2(b)(9)]

Verifiers should:

- Have a well-defined scope of verification;
- Use appropriate data sampling techniques;
- Focus on high-risk areas; and
- Use interviews with personnel and visual observation.

4.2(b)(11) Material Misstatement

1.3(b)(255) 'Material Misstatement'. Any **discrepancy**, **omission**, or **misreporting**, or aggregation of the three, identified in the course of verification services that leads a verification team to believe that the total reported emissions (metric tons of CO_2e) or reported industrial product data contains **errors greater than five percent**, as applicable, in an emissions data report. Material misstatement is calculated separately for emissions and industrial product data, as specified in section 4.2(b)(11)(i) of this Part.

- **Discrepancies:** any differences between the reported emissions or industrial product data and the verifier's review of emissions or industrial product data for a data source or product data subject to data checks in paragraph (8) of this subdivision [4.2(b)(8)]. This does not include errors due to rounding.
- **Omissions:** any emissions or product data the verifier concludes must be part of the emissions data report but were not included by the reporting entity in the emissions data report.
- **Misreporting:** duplicate, incomplete or other emissions/product data the verifier concludes should, or should not, be part of the emissions data report.

4.2(b)(11) Material Misstatement Cont.

Equation 4.2-1:

$$Percent\ error\ (emissions) = \sum \frac{[Discrepancies + Omissions + Misreporting] * 100\%}{Total\ reported\ covered\ emissions}$$

Or

Equation 4.2-2:

$$Percent\ error\ (product\ data) = \sum \frac{[Discrepancies + Omissions + Misreporting] * 100\%}{Total\ industrial\ product\ data}$$

Emissions Data Report Conformance

- Examples of non-conformance:
  - Improper missing data procedures used;
  - Incorrect emissions factor used;
  - Calibration requirements not met; or
  - Process emissions not separated from combustion emissions in CEMS measurement.
- Verifiers should focus on information reported in the emissions data report (other regulatory conformance such as record keeping does not need to be evaluated).
- All non-conformance should be noted in the issues log even if it is identified by the Reporting Entity and the issues log should be shared with the Reporting Entity.

Conflict-of-Interest

4.4 Conflict-of-Interest (COI)

1.3(b)(86) 'Conflict-of-interest'. A situation in which, because of financial or other activities or relationships with other persons, a person is **unable or potentially unable** to render an **impartial** verification statement of an existing or potential client's GHG emissions data report, or the person's **objectivity** in performing verification services is or might be otherwise compromised.

- Before each verification begins the verification body, must complete and submit to the Department a self-evaluation of conflict of interest.
- Conflict-of-interest can be high, low or medium:
  - High COI [4.4(b)]: verification cannot proceed
  - Medium COI [4.4(d)]: verification can proceed with a mitigation plan
  - Low COI [4.4(c)]: verification can proceed

4.3(g) Monitoring Conflict-of-Interest

- Verification bodies should monitor for COI that can emerge during verification services or after their completion.
- The Department should be informed in writing of any emerging COI as soon as possible.
  - Notifications must be submitted to the Department within 30 days.
  - The Department will determine if COI can be mitigated or if verification cannot continue.
- Arrangements and relationships that may cause COI or perceived COI should be monitored for 1 year after verification services end.
- The verification body shall report to the Department any changes in its organizational structure, including mergers, acquisitions, or divestitures, for one year after completion of verification services.

Reporting Requirements

1.7(e) GHG Monitoring Plan Requirements

- Facility operators and suppliers must complete a GHG Monitoring Plan.
- The GHG Monitoring Plan is the guiding document that should explain how emissions are calculated at a given facility.
- The GHG Monitoring Plan must include:
  - Identification of positions responsible for collection of emissions data;
  - Explanation of process and methods used to collect all necessary data related to emissions calculations; and
  - Description of procedures and methods used for quality assurance, maintenance and repair of all instrumentation (CEMS, flow meters, etc.).
- The GHG Monitoring Plan may rely on other internal documents such as P&ID or SOPs.
- The GHG Monitoring Plan must be continuously updated to reflect changes in production processes, monitoring instrumentation, or QA procedures.

1.5 Greenhouse Gas Reporting Content

- GHG Emissions Data Reports must include:
  - General facility information such as location, DECID;
  - Assigned Designated Representative;
  - Corporate parent, NAICS codes, and cogeneration; and
  - Reporting of facility level energy input and output
    - Reporting electricity and thermal energy purchases/acquisitions used for activities that generate emissions or products
    - Must include information on the energy provider.
- Note that increases and decreases in facility emissions of >5% require a narrative description of the cause.

1.4(g) Measurement Accuracy Requirement

- Measurement devices must be calibrated prior to the year data collection begins.
- Measure devices must be calibrated according to the manufacturer's recommendations or a method specified in Part 98.
- Recalibration must be performed at least **every 36 months**, or sooner if that is recommended by the manufacturer, or the device is replaced or repaired due to being out of calibration.
- Standards used for calibration should be traceable to NIST or other similar body responsible for measurement standards.
- Flow meters, mass and volume measurement devices, pressure differential devices, devices used to measure total pressure and temperature must be selected, installed, operated and maintained to **ensure accuracy within ±5%**.
    - Some devices may require field accuracy assessment in years between calibrations.
- If calibration or recalibration fails operators that did not perform field accuracy tests will need to demonstrate to verifiers that data used in emissions calculation is accurate.
    - If the data provided by the device informs >5% of facility emissions or product data failure to prove accuracy should be noted as a nonconformance.

1.4(g) Measurement Accuracy Requirement – special cases

- Exemptions to calibration requirements:
  - Financial transaction meters;
  - Upstream ethanol and additive meters used to ensure gasoline blendstock percentages for finished gasoline; and
  - Non-financial transaction meters used by public utility gas corporations for reporting natural gas supplier emissions if they demonstrate conformance with Chapter III of Title 16.
- Alternative calibration schedules:
  - Units and processes that operate continuously with infrequent outages may request to postpone calibration or inspection until the next scheduled maintenance outage.
  - Postponement request must be approved by the Department.
- Stock measurement and tank drop measurement are subject to the ±5% requirement. Uncertainties in the beginning and end amounts are subject to verifier review for material misstatement.

1.11 Standardized Methods

- Reporting Entities must use the standardized methods and materials from 40 CFR 98.7 or a similar method published by a listed organization.
- All methods must be documented in GHG Monitoring Plan.
- Alternative methods can be used if it is demonstrated to the Department that they are more accurate than methods in 40 CFR 98.7.

1.4(e) Limited Alternative Emissions

- Limited alternative emissions calculations allow operators more flexibility in calculating emissions for sources that make up a very small portion of their overall emissions.
  - Cannot be more than **3%** or a facility's total (including emissions from biomass).
  - Cannot be more than **20,000 metric tons CO_2e**.
  - Can be estimated using a method of the operator's choosing that **does not need to be approved by the Department** but must not be significantly biased towards over-estimation or under-estimation.
  - Calculation method must be accurate enough that emissions are unlikely to exceed the 3% or 20,000 MT CO_2e threshold.
  - Limited alternative emissions must be separately identified in the emissions data report.
  - Determination of CO_2e must still follow the standards in Part 253.

1.4(f) Biomass-Derived Fuels

- Biomass-derived fuels must be separately identified in the Emissions Data Report.
- Biomass-derived fuel emissions count towards the emissions thresholds for Reporting Entities and large emissions sources.
- Reporting Entitites must separately identify, calculate, and report direct CO_2 emissions from biomass-derived fuels.
    - Note however that this requirement does not apply to steam generating units that combust MSW (using equation C-2c of Tier 2), or units using Tier 4 monitoring and reporting.
- For solid waste, the Reporting Entity needs to report the mass of wood residuals recovered from waste streams.
- Reporting Entities using wood residuals as fuel must report the dry mass received, information about the supplier, and if the wood was removed from New York.
- For biomethane, the Reporting Entity must report the MMBtu delivered by each vendor, information about the vendor, and information about facility where the biomethane was produced.
- 2.7(e) describes the appropriate procedures for biomass CO_2 determination for mixed fuels.
- 4.2(i) describes types of documentation and methods for verifying biomass-derived fuels.

1.4(h) Product Data

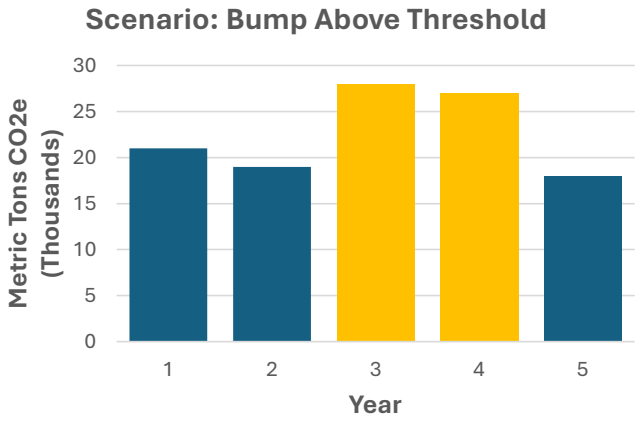
(337) 'Product Data'. The sector-specific data specified in this Subparts 2 and 5 of this Part, including requirements in 40 CFR Part 98 (Amended November 18, 2024) (see Table 1, section 200.9 of this Title).

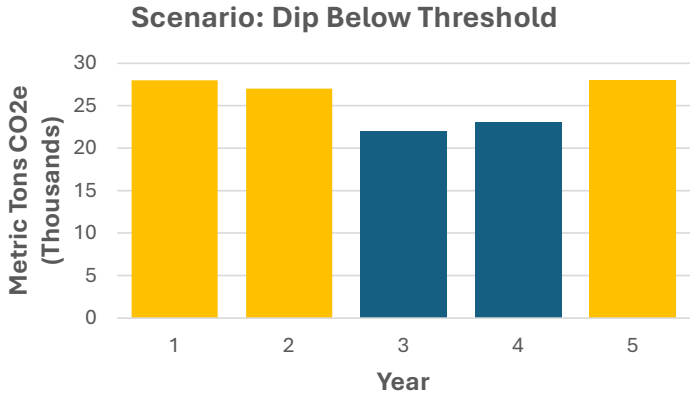
(220) 'Industrial Product Data'. All product data or annual production data as required under section 2.22 of this Part.

- Aluminum production (2.1), cement production (2.3), glass production (2.8), iron and steel production (2.10), and lead production (2.11) must report **Product Data** as specified in those sections.
  - Product data that is not industrial product data should be evaluated for conformance only.
- Large Emissions Sources must report **Industrial Product Data** associated with the NAICS codes found in Table 2-9:
  - Must be evaluated for conformance and material misstatement;
  - Data can be excluded for any reason but must be excluded if it is inaccurate; and
  - Must provide an estimate of the quantity of product data excluded.

1.2(n) Cessation of Reporting and Verification for Reduced Emissions

- Large emissions sources must report and verify emissions until they are below the threshold for three consecutive years.
- Fuel suppliers that cease supplying fuel in New York must have their emissions verified only in the first year they report zero emissions.
- Facilities that no longer have any GHG-emitting processes or are shutdown must submit an emissions data report for the year operations cease and the year of non-operation that follows. This does not apply to temporary cessation of operation. [1.2(o)].





Questions?

New York Specific Provisions

- Differences in exemptions
- Differences in Accounting Methodology
- Upstream Out-of-State Emissions
- Solid Waste
- Electronics Manufacturing
- Aluminum Manufacturing

New York Specific Provisions

- Verification is not required for electricity producers that report to RGGI or electric power entities.
- Part 253 does not have any offset provisions.
- All CO_2e conversions for reporting under Part 253 must use GWP20.
  - Important when verifying facilities with high methane emissions.
  - GWP20 values used are established in 6 NYCRR Part 496.

Greenhouse Gas	GWP20	GWP100
CO_2	1	1
CH_4	84	28
N_2O	264	265

Values from the IPCC AR5 Report

Upstream Out-of-State Emissions

2.18 Upstream Out-of-State Emissions

- Fuel suppliers must report the upstream out-of-state emissions for all fossil fuel or petroleum products sold to an end user in New York.
- Facilities must report the upstream out-of-state emissions for all fossil fuel or petroleum products consumed or used at the facility.
- These emissions are calculated using emission factors found in Table 2-6 and Table 2-7.
- Suppliers and facilities reporting natural gas emissions can use basin specific emission factors listed in Table 2-7 if they can demonstrate the origin of the natural gas using invoices, bills of lading, or other fuel analytical data.
- This does not apply to biogenic fuels, combustion of MSW, or any non-fossil fuels.
- Note, fuel suppliers have additional reporting requirements.

Fuel or Product Categories

Fuel Suppliers must report the quantity of fuel supplied to end users in New York by category:

- Natural Gas (butane, ethane, pentanes plus, etc.)
- Coal
- Diesel/Distillate Fuel
- Gasoline/Blendstocks
- Kerosene/Jet Fuel
- LPG (butylene, ethylene, propane, etc.)
- Petroleum Coke
- Residual Fuel
- Asphalt and Road Oil
- Lubricants
- Waxes
- Miscellaneous Petroleum Products
- Special Naphthas

2.18(b) Requirements for Fuel Suppliers

- Requirements for Fuel Suppliers include:
  - Quantity of fuel reported as specified in Table 2-6;
  - The name and physical address of the upstream entity that sold the fuel to the fuel supplier; and
  - Transportation distance from the fuel production facility to the New York border in miles and the mode of transportation used.
    - If multiple modes of transport are used the supplier should report the distance traveled by each.

2.18(b)(4) Liquid Fuel Suppliers

- Liquid Fuel Suppliers must include:
  - The API gravity;
  - Carbon ratio in units of percent by weight;
  - Sulfur ratio in units of parts per million by weight;
  - Low heating value and high heating value in units of MMBtu per barrel;
  - The portion of biofuels blended into the petroleum fuel in percent; and
  - The modes used to transport the petroleum fuel from the fuel production facility to the New York border including, but not limited to, transport by rail, ocean tanker, barge, truck, or pipeline.

2.18(b)(5) Coal Suppliers

- Coal Suppliers must include:
  - The high heating value;
  - The type of coal imported including anthracite, bituminous, sub-bituminous, or lignite;
  - The methods used to transport the coal to the New York border including, but not limited to, transport by conveyor belt, truck, barge, ocean vessel, or train; and
  - The percentage of total imported coal that is cleaned or processed to remove impurities.

2.18(b)(6) Natural Gas Suppliers

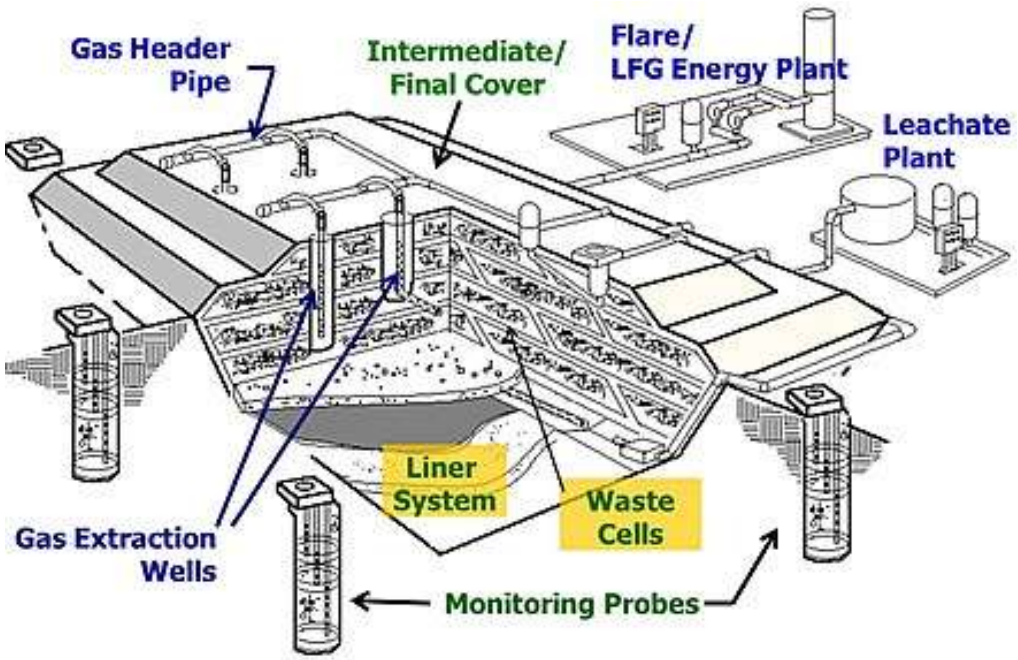
- Natural Gas Suppliers must include:
  - The low heating value and high heating value of the imported natural gas in units of MMBtu per Mscf (one thousand standard cubic feet); and
  - The mass fraction of methane of the imported natural gas.

Solid Waste

2.13 Solid Waste Management

- Part 253 covers both MSW (Part 98 Subpart HH) and Industrial Waste (Part 98 Subpart TT) landfills.
- Operators must report:
  - Methane generation (based on waste in place records back to 1960 or the year the landfill opened);
  - Methane collection and destruction; and
  - On-site combustion (Section 2.7).
- Total emissions will be modeled methane generation with the quantity of actual gas collected in a GCCS system subtracted.
  - Some gas collection systems are fully integrated and automatically calculate the total CH_4.
  - Other systems are combinations of flow meters, concentration monitors, pressure and temperature sensors, from which the facility must calculate total CH_4.
  - The type of system used should be documented in the GHG Monitoring Plan.
- CO_2 found in landfill gas is biogenic and therefore is not reported as emissions.
  - Gas is typically 45-60% methane with a default assumption of 50%.

2.13 Solid Waste Management



- Landfill gas is typically either combusted on-site or sent off-site to a landfill gas-to-energy facility or gas upgrading facility.
- If landfill gas is sent to a different facility that facility becomes responsible for the emissions.
- If gas is combusted on-site the combustion emissions must be included in the facility's report.
- Either way the total gas captured must be reported by the landfill operator so it can be subtracted from the modeled methane generation.
- Gas flared in unmetered passive flares is not subtracted from methane generation, but facilities must indicate their use

2.13 Solid Waste Management: DOC and k values

For MSW Landfills:

- Use a default DOC fraction of 0.22 or obtain Department approval to use a different DOC value.
- A "k" value of 0.038 is required.

For Industrial Landfills:

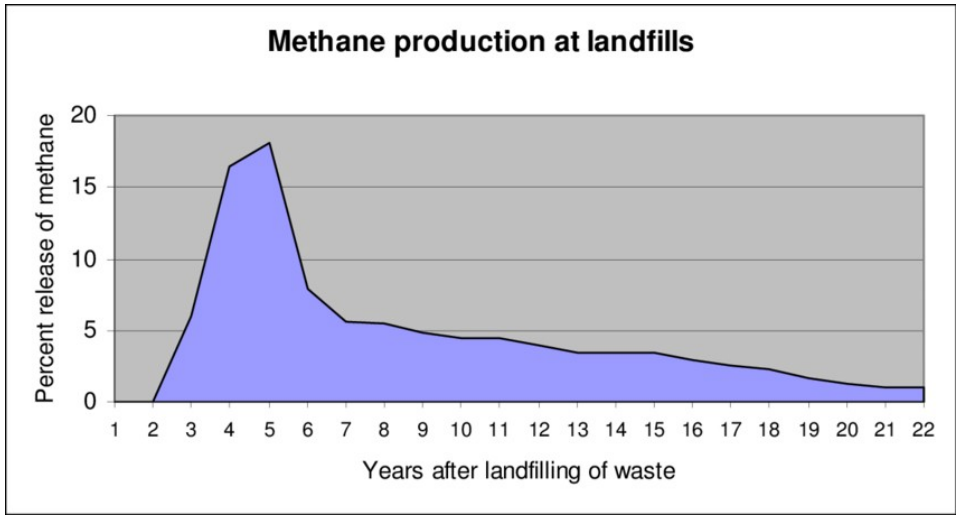
- Must use DOC and "k" values for wet climates as found in Part 98 Table TT-1.
- The use of multiple DOC and "k" values may be required if different types of industrial waste are accepted at the facility.

$$G_{CH4} = \left[\sum_{x=S}^{T-1} \left\{ W_x \times DOC_x \times MCF \times DOC_F \times F \times \frac{16}{12} \times \left(e^{-k(T-x-1)} - e^{-k(T-x)} \right) \right\} \right] \quad \text{(Eq. TT-1)}$$

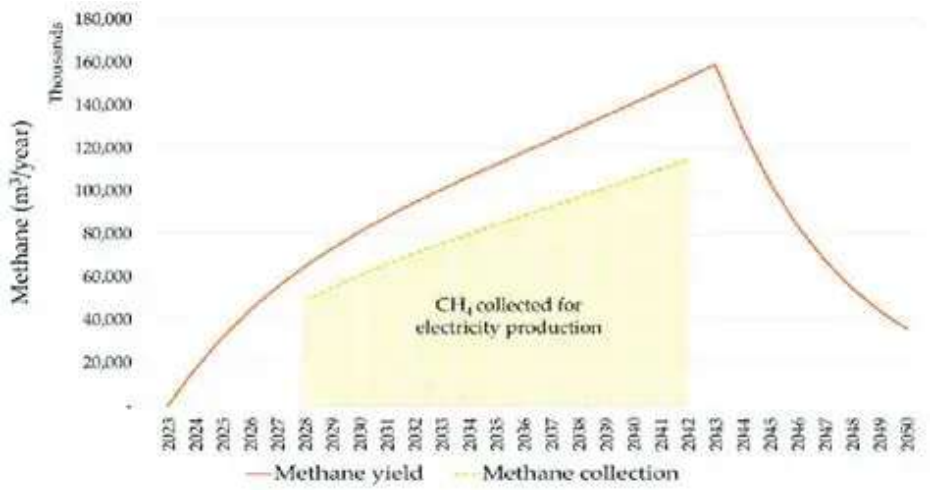
Both MSW and Industrial landfills should use oxidation factors from Table HH-4 based on the type of landfill cover/methane flux:

$MG = G_{CH4} \times (1 - OX)$ (Eq. HH-5)

Methane Generation Over Time

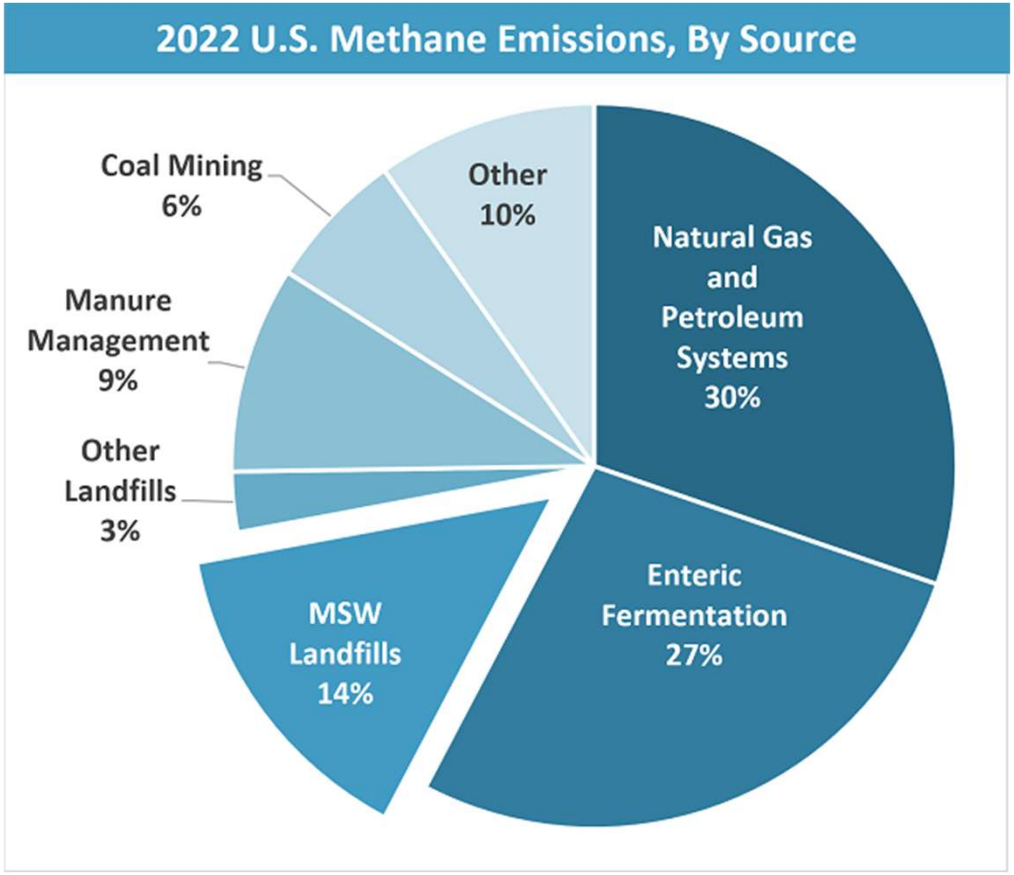


Methane generation peaks 5-6 years after landfilling and is fairly low after 20 years.



Open landfills will always see increased methane production, but even after closure emissions may be above the threshold.

MSW vs Industrial Landfill methane emissions



USEPA. 2024. Inventory of US Greenhouse Gas Emissions and Sinks 1990-2022.

2.13 Solid Waste Management: Calculating Waste in Place

MSW Landfills:

- Can separate waste streams for reporting years.
- Can elect to report separate waste streams.
- Must use the default DOC and k values and cannot test waste for an alternate DOC
- Must use scales to report wet waste received if there are scales.
- Must report the number and type of vehicles delivering waste and their capacity in weight.
- Two options for historical data:
    1. Assume prior year data is the same as the first year there is data; or
    2. Base historical data on the population served by the landfill.

Industrial Landfills:

- Must separate types of waste streams.
- Measurement options for reporting years:
    - Direct mass measurements;
    - Direct volume measurement and waste stream density;
    - Mass balance procedures based on process inputs an outputs; or
    - Number of vehicle loads and capacity of each vehicle.
- Two options for historical data:
    1. Calculate waste disposal factor based on production data; or
    2. Base historical data on the total capacity of the landfill used.

2.13 Solid Waste Management: Verifying Emissions MSW landfills

- Historical waste data (prior to 2010) may not be available as a measured value. Estimates are appropriate if the methods in 98.343(a)(4) are followed.
- The current reporting year should have daily waste disposal quantities as measured values of wet waste received.
    - Facilities should have records of vehicle/container tare weights.
- If the facility has Department approval to use a different DOC value, the test data submitted to the Department does not need to be verified.
- The followind data from gas collection systems must be reported:
    - Methane concentration – typically determined with gas chromatography but can be determined with total gaseous organic concentration analyzers in which case sampling must be done for the NMOC correction factor;
    - Total gas flow rate; and
    - Temperature, pressure, and moisture content monitors (if necessary, this is sometimes automatically corrected for by the equipment).

2.13 Solid Waste Management: Verifying Emissions Industrial landfills

- Historical waste data may not always be available as a measured value, estimates are appropriate if the methods in 98.463(a)(2)(ii) are followed
- Current reporting year should have daily waste disposal quantities for each waste stream using any of the following methods
  - Direct mass measurement
  - Direct volume measurement and waste stream density
  - Mass balance procedures (process inputs and process outputs)
  - Number of trucks and the waste per load based on the working capacity of the vehicle

Challenges with Verifying Landfills

- Landfills cover a large area (potentially 100s of acres) with gas collection wells dispersed across the property.
- Historical Data records:
  - In the first year of verification the historical records for the landfill will need to be verified.
  - Data before 2010 may be not be measured consistently.
- Some facilities may be new to reporting or be closed facilities that have not reported in a long time.

2.19 Waste Haulers and Transporters

Threshold for verification is 25,000MT of emissions resulting from waste

$$CWE = (W_x * LWF) + (CW_x * CWF)$$

CWE: Combined Waste Emissions

Wx: Tonnage of waste exported for landfilling or unspecified waste

LWF: landfill waste factor = 5.71tCO_2e/metric tons waste

CWx: Tonnage of waste exported for combustion

CWF: combustion emission factor based on the emission factors for MSW found in Subpart C

Similar to landfills, waste haulers and transporters can apply to the Department for a revised DOC value which would change the landfill waste factor used. This does not need to be verified only checked for Department approval.

Reporting Requirements:

- Total mass of waste transported out of state.
- Information about the facility that received the waste.

Electronics Manufacturing

2.6 Electronics Manufacturing - Overview

- Manufacturing products include:
  - Micro Electro-Mechanical Systems (MEMS),
  - Liquid Crystal Displays (LCDs),
  - Photovoltaics (PVs), and
  - Semiconductors (including LEDs).
- Processes include:
  - Etching process using plasma generated fluorine atoms;
  - Cleaning of thin film deposition chambers with plasma generated fluorine atoms;
  - Cleaning wafers with plasma generated fluorine atoms;
  - CVD or other manufacturing processes using N_2O; and
  - Use of fluorinated heat transfer fluids to cool process equipment, control temperatures.

2.6 Electronics Manufacturing - Reporting

- Information Reported:
  - Fluorinated gasses (consumption and emission) including by-product gasses;
  - N_2O from CVD and other processes (consumption and emission);
  - Fluorinated heat transfer fluid emissions; and
  - Abatement system information.
- Reporting Methods:
  - Gas utilization factors and by-product emission factors based on process type; or
  - Stack test method, 8hr test of stack system to determine emissions during typical operation.
    - When using the stack test method, intermittent low use gases should be calculated using default factors.

2.6 Electronics Manufacturing – Emissions Calculations

Emissions from input gas "i" in process type or process sub-type "j" (40 CFR Part 98 eq I-8).

$$E_{ij} = C_{ij} * (1 - U_{ij}) * \left(1 - (a_{ij} * d_{ij} * UT_{ij})\right) * 0.001$$

- C_{ij}: Gas consumed from eq I-13
- U_{ij}: Gas utilization factor (from table)
- a_{ij}, d_{ij}, UT_{ij}: Abatement system information

Emissions from input gas "i" from stack systems that are tested for fab "f" (40 CFR Part 98 eq I-21).

$$E_{if} = EF_{if} * C_{if} * UT_f + \frac{EF_{if}}{\left(1 - (a_{if} * d_{if})\right)} * C_{if} * \left(1 - UT_f\right)$$

- EF_{if}: emission factor from eq I-19
- C_{if}: gas consumed from eq I-13
- a_{if}, d_{if}, UT_f: Abatement system information

2.6 Electronics Manufacturing – Gas Consumption

- Gas consumption equation based on gas inventory balance for each fab:

$$C_i = (I_{Bi} - I_{Ei} + A_i - D_i) \quad \text{(Eq. I-11)}$$

- Facilities must estimate fab-wide gas-specific heel factors for each container type and gas used based on the trigger point for changing out a container.
- Fab-specific engineering models must be developed to determine an apportioning factor for each process type or sub type within a fab.
  - Details of this model must be in the GHG Monitoring Plan and be based on a quantifiable metric such as wafer starts or direct measurement.
  - Modeled consumption must be compared to actual consumption for one F-gas.
- Emissions of fluorinated heat transfer fluid equation based on mass balance:

$$EH_i = density_i * (I_{iB} + P_i - N_i + R_i - I_{iE} - D_i) * 0.001 \quad \text{(Eq. I-16)}$$

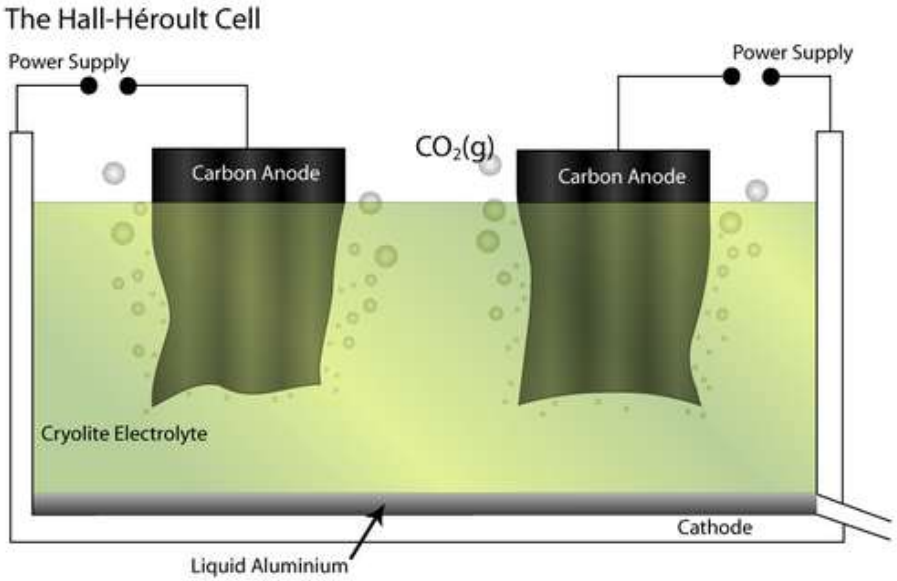
2.6 Electronics Manufacturing - Records

- Records to be reported under Part 253 include:
  - Gas inventory records such as deliveries and heel returns;
  - Fluorinated heat transfer fluid measurements and use;
  - Apportioning model for gas utilization in processes and measurements that confirm model accuracy;
  - Abatement systems maintenance records, supplier documentation, efficiency and uptime calculations; and
  - Stack testing records and calculations for fab-specific emission factors (if applicable).

Aluminum Production

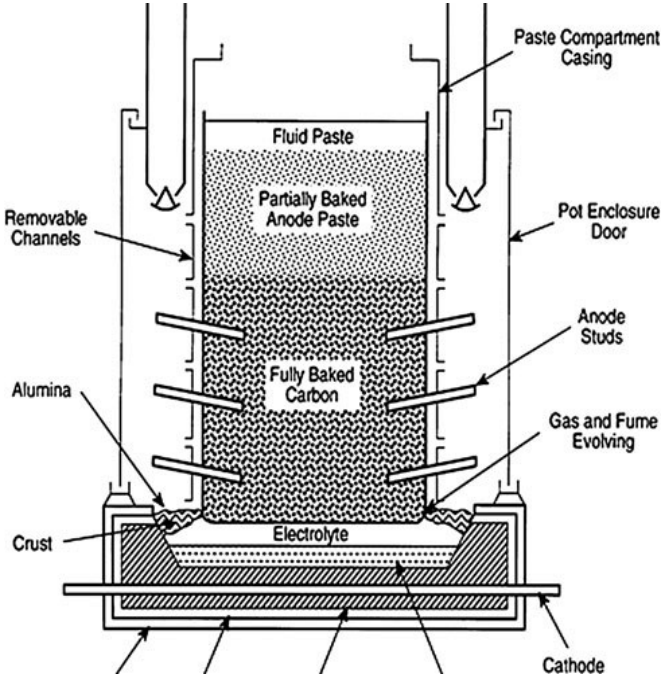
2.1 Aluminum Production - Overview

- Aluminum production facilities are defined as those that manufacture primary aluminum using the Hall-Héroult process.
- Emissions in aluminum production come from two primary sources:
  - Electrolysis (in both prebake and Søderberg cells), and
  - Anode baking (only for prebake cells).
- CO_2 emissions occur from anode consumption during electrolysis.
- CF_4 and C_2F_6 emissions occur from anode effects in the cells.



2.1 Aluminum Production – Reported Data

- Aluminum producers must report:
  - Type of smelter technology used;
  - Information about PFCs, including:
    - Anode effect frequency, overvoltage, and current efficiency,
    - Smelter slope coefficients,
    - Method used to measure anode effect frequency and duration (or overvoltage); and
  - Information about CO_2 based on cell type:
    - For Søderberg cells, the annual paste consumption and CO_2 emissions from the smelter, and
    - For prebake cells, the anode consumption and the CO_2 emissions from the smelter.



2.1 Aluminum Production – Emissions Calculations

- CF_4 emissions can be calculated two ways:
  1. Based on anode effect duration, which is measured as anode effect minutes per cell-day, or

$$E_{CF4} = S_{CF4} \times AEM \times MP \times 0.001 \qquad \text{(Eq. F-2)}$$

  2. Based on overvoltage.

$$E_{CF4} = EF_{CF4} \times MP \times 0.001 \qquad \text{(Eq. F-3)}$$

- The slope coefficient or overvoltage emission factor must be measured once every 10 years or if a relevant change is made in the control algorithm.
- C_2F_6 emissions are calculated based on the weight fraction of C2F6/CF4 which is measured every 10 years.

$$E_{C2F6} = E_{CF4} \times F_{C2F6/CF4} \times 0.001 \qquad \text{(Eq. F-4)}$$

2.1 Aluminum Production – Emissions Calculations cont

- Emissions from anode consumption (may be monitored with CEMS).
  - For prebaked anode cells use:

$$E_{CO2} = NAC * MP * \left(\frac{100 - S_a - Ash_a}{100}\right) * \frac{44}{12} \qquad (\text{Part } 98\ Eq.F-5)$$

  - For Søderberg cells use:

$$E_{CO2} = \left(PC * MP - \frac{CSM * MP}{1000} - \frac{BC}{100} * PC * MP * \frac{S_p + Ash_p + H_p}{100} - \frac{100 - BC}{100} * PC * MP * \frac{S_c + Ash_c}{100} - MP * CD\right) * \left(\frac{44}{12}\right) \quad (Part\ 98\ Eq.F-6)$$

- Prebaked anodes must also measure the CO2 from anode baking using:

$$E_{CO2PV} = (GA - H_w - BA - WT) * \left(\frac{44}{12}\right) \quad (Part\ 98\ Eq.F-7)$$

$$E_{CO2PC} = PCC * BA * \left(\frac{100 - S_{PC} - Ash_{PC}}{100}\right) * \left(\frac{44}{12}\right) \quad (Part\ 98\ Eq.F-8)$$

- Sulfur and ash content can be measured or default values from Part 98 Table F-2 can be used.

2.1 Aluminum Production – Records

- Part 253 requires the following records be maintained:
  - Anode effect or overvoltage measurements,
  - Last measurement of smelter specific slope coefficients/overvoltage emissions factors and mass fraction of C2F6/CF4,
  - Anode consumption measurements,
  - If facility does not use default values from Table F-2, measurement records of any tests performed, and
  - Aluminum production data.

The Department’s Role

Department Oversight

- Please reach out to the Department with any questions or concerns during verification.
- The Department has the authority to conduct audits of verifications including site visits and review of verification documents and notes.
- Audits of Verification Bodies may be done to review management systems, training, and COI practices.
- Auditing verification will ensure the integrity of the Mandatory Reporting Rule Program and help the Department determine areas where more training would be helpful.

Next Steps

- Please make sure that your application to the Department is complete.
- Submit the attestation form that you attended or watched the recording of this training.
- Once the Department has finalized a list of approved verifiers and verification bodies a list will be made available on the Mandatory Greenhouse Gas Reporting Verification website

Contact Info

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Mandatory Greenhouse Gas Reporting webpage:

http://dec.ny.gov/environmental-protection/air-quality/mandatory-greenhouse-gas-reporting

Questions?