CALIFORNIA
AIR RESOURCES BOARD

Verifier Accreditation Training for Mandatory GHG Reporting

General Verification

Course 1.3 - Accuracy and Product Data

Verifier Accreditation Training for Mandatory Greenhouse Gas Reporting

Course 1: General Verification

1.1 Verification Context, Principles, and Program Overview

1.2 Stationary Fuel Combustion and Sorbent Sources

1.3 Accuracy and Product Data

1.4 Electricity Generating Units and Cogeneration

Course 1.3 Accuracy and Product Data

1. **Excluded Emissions Sources**
2. ***De minimis* Emissions**
   - Examples
   - Verification
3. Measurement Accuracy
4. Missing Data
5. Product Data

Excluded Emissions Sources - Not Reported to CARB §95101(f)

- EGUs designated as backup or emergency generators in air permit
- Portable equipment not part of oil and gas production
- Fire suppression systems and equipment
- Primary and secondary schools with a NAICS code of 611110
- Fugitive methane emissions from municipal solid waste landfills described in 40 CFR Part 98, Subpart HH
- Fugitive methane and fugitive nitrous oxide emissions from livestock manure management systems described in 40 CFR Part 98, Subpart JJ, regardless of the magnitude of emissions produced
- Agricultural irrigation pumps

Facilities solely powered by nuclear, hydro, wind, or solar are excluded, unless on-site combustion emissions ≥10,000 MT CO2e (see Course 1.4)

De Minimis Sources §95103(i)

- Sources with emissions that collectively are both
  - ≤ 3% of total facility or supplier emissions including biomass-derived fuel combustion; and
  - ≤ 20,000 MT CO2e
- Emissions may be estimated using reasonable alternative method
  - Not biased toward over or under estimation
  - Accuracy within +/-5% not required
- Not applicable to electric power entities
- Not applicable to covered product data

De Minimis Emissions – Potential Examples

- Infrequent fuel deliveries of propane where amount combusted during year can be estimated using hourly logged meter (uncalibrated meter)
- Sorbent used in emissions control systems for power plants (purchases)
- Diesel fuel from a single tank that is used for both reportable stationary combustion equipment and non-reportable mobile equipment (a "reasonable estimate" of reportable emissions is acceptable)
- CH_4 and N_2O emissions from a power plant using CO_2 CEMS

Verification of Emissions Identified as *De Minimis* §95103(i)

- Request documentation of data sources and emissions calculations reported as *de minimis*
- Assess reasonableness of alternative methods as well as accuracy of calculations
- Ensure appropriate categorization of exempt vs. non-exempt emissions reported as *de minimis*
- Evaluate uncertainty of emissions estimate to ensure total *de minimis* emissions are ≤ 3% facility emissions **AND** ≤ 20,000 MT CO2e

Group Participation Exercise 1.3.1: *De Minimis* Sources

An operator reports emissions for the following sources. Which sources can be reported as *de minimis*?

Source	Emissions (MT CO_2e)	% of Total
A	6,100	0.7%
B	9,900	1.2%
C	20,500	2.4%
D	352,000	42%
E	450,000	54%
Total	838,500	

Group Participation Exercise 1.3.1: *De Minimis* Sources - Solution

Sources A and B may be reported as *de minimis* sources using either:

- Alternative reasonable method,

OR

- Tier method with accuracy requirement relaxed as long as method and result are reasonable

Source	Emissions (MT CO_2e)	% of Total
A	6,100	0.7%
B	9,900	1.2%
C	20,500	2.4%
D	352,000	42%
E	450,000	54%
Total	838,500	

Group Participation Exercise 1.3.2: *De Minimis* Sources

A refinery operator reports the following GHG emissions sources. Which sources may be considered *de minimis*?

Emission Point	Type of Fuel	Source ID(s)	Emissions (MT CO_2e)	% of Total Emissions	Cumulative % of Total Emissions
P15	FCC Coke	RS7	1,116,740	31.54	100.00
P4	Refinery Fuel Gas - Utilities	RS12, RS15	696,314	19.67	68.46
P2	RFG – Fuels A	RS20, RS23/24	464,058	13.11	48.79
P8	RFG – Cracking	RS1	282,443	7.98	35.68
P1	Natural Gas	RS16	214,508	6.06	27.70
P12	Natural Gas	RS26	174,366	4.93	21.64
P12	Refinery Fuel Oil	RS3	155,762	4.40	16.72
P14	RFG – Fuels B	RS17/18/19	123,994	3.50	12.32
P3	RFG – Cracking	RS2	100,440	2.84	8.81
P9	Acid Gas	RS33	96,172	2.72	5.98
P8	RFG – Utilities	RS11, RS14	55,143	1.56	3.26
P1	Biomass-Derived	RS6	25,125	0.71	1.70
P10	Natural Gas	RS36/37/38	14,654	0.41	0.99
P4	CCR Offgas	RS4	12,321	0.35	0.58
P7	CCR Offgas	RS5	4,231	0.12	0.23
P12	Sour Gas	RS35/39	3,655	0.10	0.11
P6	Gas Oil	RS40	292	0.01	0.01
P7	Refinery Fuel Oil	RS12	0	0.00	0.00
				100.00	

Group Participation Exercise 1.3.2: *De Minimis* Sources - Solution

Emission Point	Type of Fuel	Source ID(s)	Emissions (MT CO_2e)	% of Total Emissions	Cumulative % of Total Emissions
P15	FCC Coke	RS7	1,116,740	31.54	100.00
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P7	*Refinery Fuel Oil*	*RS12*	*0*	*0.00*	*0.00*
				100.00	

Threshold for *de minimis* is BOTH <3% of total emissions and <20,000 MT CO_2e

Course 1.3 Accuracy and Product Data

- Excluded Sources
- De minimis Emissions
- **Measurement Accuracy**
  - **Accuracy requirements**
  - **Calibration**
  - **Verification**
- Missing Data
- Product Data

Measurement Accuracy Requirements

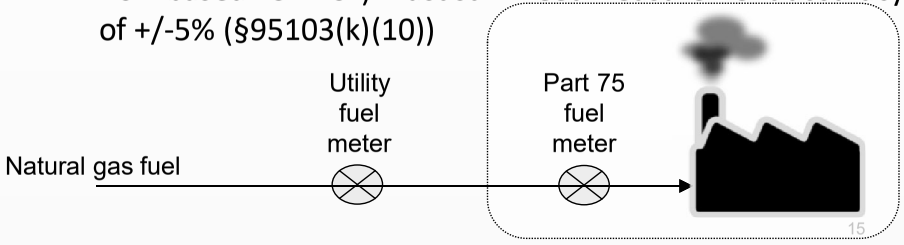
1) §95103(k) applies to covered emissions and covered product data from covered entities (subject to Cap-and-Trade Regulation)
   - Requires covered data measurements to be +/-5% accurate
   - MRR calibration requirements more stringent than 40 CFR Part 98
2) 40 CFR Part 75 power plants have unique accuracy requirements
   - Must meet 40 CFR Part 75 Appendix D requirements
   - Total emissions must still be +/-5%
3) Facilities subject to 40 CFR Part 98 use accuracy requirements in 40 CFR §98.3(i)

MRR Measurement Accuracy §95103(k)

- Section 95103(k) applies to monitoring of fuel and feedstock consumption; process stream flow; steam flow; density, specific gravity, MW measurements; mass and liquid flow measurements; chromatographs, spectrometers, calorimeters and scales
- Specific provisions for inventory, stock and tank-drop measurements are specified in §95103(k)(11)
- MRR requirements follow 40 CFR §98.3(i) for fuels and feedstocks with several key differences:
  - More specific calibration requirements
  - May postpone calibration if approved by CARB in writing, but still must demonstrate accuracy using CARB-approved method
  - Measurement device accuracy (+/-5%) applies for devices used to calculate covered emissions and covered product data

Facilities Subject to 40 CFR Part 75

- Primarily applies to electric generating units (EGUs)
- Must meet 40 CFR Part 75 Appendix D accuracy requirements
- Exempt from MRR-specific calibration requirements in §95103(k)
  - Except that facilities using Part 75 Appendix G §2.3 (fuel flow based "CEMS") must still meet measurement accuracy of +/-5% (§95103(k)(10))



Facilities Subject to 40 CFR Part 98.3(i)

- Recalibration required at zero flow and an upstream point
- Calibration procedures not specified - an "industry standard" may be used (40 CFR §98.3(i)(1)(i))
- For orifice meters, transmitter calibration requires
  - If 3 transmitters, +/-2% for each, or overall accuracy of +/-6%
  - If 2 transmitters, +/-2% for each, or overall accuracy of +/-4%
- Requirement to inspect orifice plate during calibration at least once every 3 years (40 CFR §98.34(b)(1)(iv))
- Calibration may be postponed if device cannot be calibrated until next scheduled maintenance outage (40 CFR §98.3(i)(6)); MRR requires CARB approval of postponement

Data Not Subject to MRR Measurement Accuracy Requirements under §95103(k)

- Exempt biogenic CO_2 emissions, geothermal emissions, and some vented and fugitive emissions from oil and gas production (emissions not covered under C&T)
- Emissions measured using financial transaction meters
  - Verifier confirms no ownership connection between fuel supplier and purchaser §95103(k)(7)
- Emissions reported and verified as de minimis
- Individual emissions sources reported under 40 CFR Part 75
  - 40 CFR Part 75 has its own accuracy requirements
- Electricity generation or thermal output estimates
- Fuel usage, when not used to calculate emissions (CEMS)
- All combustion emissions from biomass fuels where the facility is not subject to C&T, including CH_4 and N_2O (biomass power plants)

MRR Calibration Requirements §95103(k)

- Calibration procedures must be documented in the GHG Monitoring Plan
- All inspection and calibration information must be made available to verifiers
- Perform calibrations according to either
  - Original equipment manufacturer's (OEM) documentation, or
  - 40 CFR §98.3(i)(1)(iii) if OEM is unavailable, except a minimum of three calibration points must be used
- If OEM is not available, or if another method is deemed to be more accurate, then alternate method can be used
  - **ALL** alternative methods used must be approved by CARB (§95109(b))
- Includes other requirements such as photo of orifice plate, and documentation of "as found" condition

Updated from 2020 training. See errata.

Meters Not Subject to §95103(k) Calibration Requirements

- When financial transaction meters are used (§95103(k)(7))
  - Verifier assumes data is measured accurately
- Non-financial transaction meters used by Public Utility Gas Corporations, meeting accuracy requirements of the CPUC
  - Verifier assumes data is measured accurately
- When "best available information/methods/data" are allowed (§95103(h))
  - Must still demonstrate measurement accuracy of data (+/-5%)
- Upstream ethanol and additive meters for gasoline blendstocks, applicable to §95121 transportation fuel suppliers (§95103(k)(7))

Recalibration Frequency and Accuracy Requirements §95103(k)(4)

- See Measurement Accuracy and Missing Data Guidance
- Shortest recalibration frequency is required
  - According to applicable subpart of 40 CFR Part 98
  - As recommended by manufacturer
  - When meter is replaced
  - Once every 36 months (or once every 6 years for refinery/H_2 plant (§95103(k)(6)(A)(1))
- Calibration may be postponed when calibration would result in operational disruption – requires CARB approval

Failed Calibrations*

- If meter fails calibration, verifier must identify a nonconformance and confirm total period of invalid data
  - Data collected since the date of the last accurate calibration is generally considered invalid data
  - Section 95103(k)(6)(B) provides for annual field accuracy tests in years between successive calibrations, to limit duration of invalid data

*See missing emissions data and excluded covered product data provisions later in Course 1.3

Verification of Measurement Accuracy

- Include assessment of meter accuracy risk in sampling plan
  - Higher risk for covered emissions, covered product data, and larger, more uncertain sources
  - Low risk for non-covered emissions and small sources
- Confirm all measurements claimed as exempt meet specified exemption requirements
  - Financial transaction meter criteria (§95103(k)(7))
  - Public utility gas meters must meet CPUC requirements
  - Exempt biomass measurement (C&T §95852.2(a))

Meter System Verification Issues

- Does the operator have an effective procedure for ensuring accuracy of the meters relevant to CARB reporting?
- Are the meter specifications appropriate for the application (e.g. fluid type, flow range, temperature range)?
- Was the meter installed per manufacturer specifications (e.g. required straight pipe lengths upstream and downstream)?
- Is the meter being maintained and operated per manufacturer specifications?
- Was the meter calibrated for the full period of data reporting, per U.S. EPA and MRR calibration requirements?
- Do the meter calibrations demonstrate required meter accuracy?

Addressing Meter System Issues in the Verification Risk Assessment (1 of 2)

- Verification risk assessments must address risk of inaccurate data from meter system issues
- Every verification team should include personnel knowledgeable about meter systems
- GHG Monitoring Plan should describe the meter system (specifications, calibrations, operation, maintenance)

Addressing Meter System Issues in the Verification Risk Assessment (2 of 2)

Complete documentation on high risk meters should be obtained and reviewed during the verification

- OEM specifications on fluid type, range, and temp. vs. in-service use
- OEM installation requirements vs. as-built confirmation
- OEM operation and maintenance procedures vs. in-service procedures
- OEM calibration procedures vs. in-service procedures
- Accuracy requirements for each meter and failed calibration procedures

Meter System Factors Contributing to Higher Verification Risk

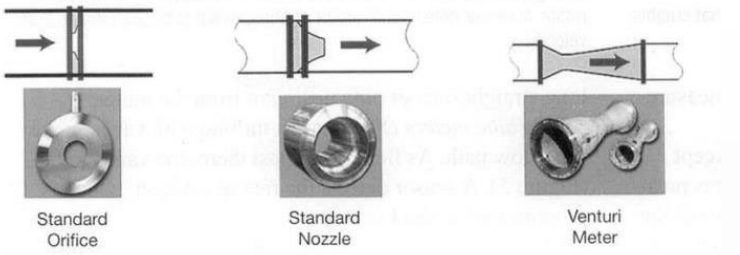
- Meters operated only by the reporting facility (particularly when no independent supplier data is available to compare to metered results)
- Meters that provide data used in the calculation of any covered product data
- Complex metering systems that require multiple sensors
- Meter systems with sparsely available OEM and facility documentation
- Meter systems with infrequent calibrations (over one year) and no intervening field accuracy assessments

Meter System Factors Contributing to Lower Verification Risk

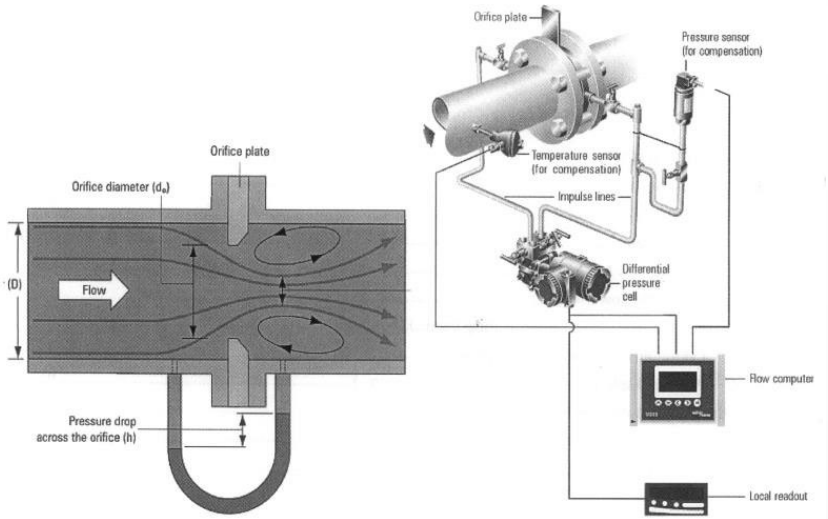
- Meters producing data for minor and *de minimis* emission sources
- Meters exempt from §95103(k) measurement accuracy requirements
  - Meters solely used to collect data on non-covered emissions and non-covered production
  - Financial transaction meters where supplier (meter operator) is independent of facility operator (see §95103(k)(7))

Wide Range of Flow Meter Types Used

Differential Pressure Meters (including orifice, nozzle, venturi, wedge and Pitot tube meters)



Orifice Plate Meters are the Most Common



Orifice Plate Meters (1 of 2)

- Common application for gas and steam flow meters
- OEM specified installation - minimum straight pipe lengths required upstream and downstream for linear flow
- Orifice meters have three sensors that must be separately calibrated (static pressure, differential pressure and temperature)
- Orifice plates must be installed correctly and must be inspected to check for deposits or etching of orifice - see §95103(k)(6)
- The +/-5% meter accuracy requirement applies to the entire meter (i.e. sum the errors from each of the three sensors)

Orifice Plate Meters (2 of 2)

- During verification, graph flow to look for sudden changes or creep
- If plate replaced or serviced, look for sharp change in flow on service date
- During site visit, check that plate is installed correctly (engraved face upstream)
- Measure pipe diameter, upstream and downstream of straight run
- Take photos of installation for future reference

Verifier Guidance on DP meters:

https://www.arb.ca.gov/cc/reporting/ghg-ver/verifiers/DP-meter-guidance.pdf (password provided when accredited)

Orifice Plate Example Calibration Record

Orifice Plate - Meter Tube Information

Tube I.D. 1.939 Plate I.D. 1.732
Orifice Taps Pipe ☐ Flange ☐
Orifice Fitting: Serial No. _____
Sr. ☐ Jr. ☐ Simplex ☐ Flg. ☐
Plate Inspection
Plate Clean Yes ☐ No ☐
Plate Damaged Yes ☐ No ☐
Plate Change ☐ Tube Change ☐
Removed _____ " Installed _____ "

Differential

Found _____ " Left _____ " Test Method PK ☐ W.C. ☐
Temp. Comp. Yes ☐ No ☐ W.C. Temp. _____ °F
W.P. Zero As Found _____
Friction Test: O.K. ☐ Reset ☐

Found				Left			
Up		Down		Up		Down	
PK/WC	Rec	PK/WC	Rec	PK/WC	Rec	PK/WC	Rec
		0.05					0
		74.99					75
		149.98					150

Thermometer

	Found		Left	
Range	Test Ther	Rec	Test Ther	Rec
High		197.08		200
Flow		66.73		
Low		0.005		0

Static Pressure

Found			Left		
D.W.		Rec	D.W.		Rec
PSIG _____	PSIG	-.14	PSIG _____	PSIG	0
+A.P. _____	+A.P.	249.85	+A.P. _____	+A.P.	250
PSIA _____	PSIA	499.29	PSIA	PSIA	500

Date 4-11-12 Time 200 a.m. p.m.
Tester Joe Bright
(I Hereby Certify That The Information Herein Is Correctly Stated)

Orifice Plate Example Calibration Record

Meter Type	Manuf	Type
ORIFICE	ALLEN BRADLEY	EFM
S.N. 1	S.N. 2	Model No.
DP-07292135	SP-09070828	N/A
DP Range	SP Range	Static Set
200	3000	PSIG
Taps	SP Conn.	D.P. Cutoff
FLANGE	US	

Static Tests

SP Test Inst.	Serial No.	SP Avg Initial	SP Avg Final
CRYSTAL 33	2262-738439	406.000	405.000

As Found Test	As Found Meter	As Left Test	As Left Meter
405.100	405.000	405.000	405.000
0.000	0.000	0.000	0.000

Differential Tests

DP Test Inst.		Serial Number	
CRYSTAL 33		2262-738439	
DP Avg Initial	DP Avg Final	WP Zero	AP Zero
51.300	46.300	-.100	-.100
Leak Found	Pen Lag	Arc	Friction / Drag
No	N/A	N/A	N/A

As Found Test	As Found Meter	As Left Test	As Left Meter
0.000	-0.100	0.000	0.000
100.000	99.800	100.000	100.000
200.000	199.600	200.000	200.000
150.000	149.600	150.000	150.000
50.000	49.700	50.000	50.000
0.000	-0.100	0.000	0.000

Temperature Test

Temp Type	Serial No.	Scale
EFM	CH105F2T4	
Temp Range	Temp Test Inst.	Serial No.
0-249.8	OTHER	111541364

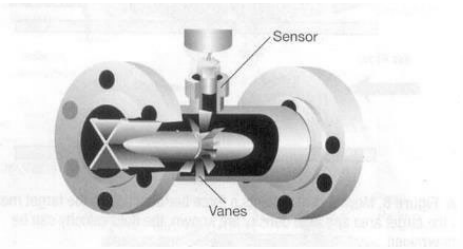
As Found Test	As Found Meter	As Left Test	As Left Meter
76.700	76.000	76.000	76.000

Meter Tube / Plate Data

Fitting Manuf.	Type	Serial No.	Tube ID	Plate Bore	Beta Ratio
OTHER	FLANGE	N/A	4.026	1.000	0.25

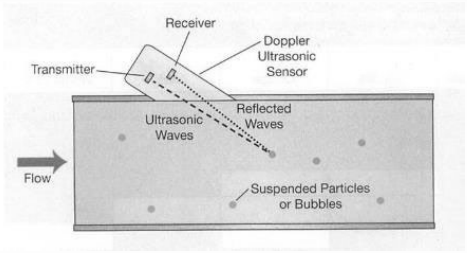
Inspect Plate	Plate Clean	Mic Plate	Plate Cond.	Plate Changed	New Plate
Yes	Yes	Yes	Good	No	

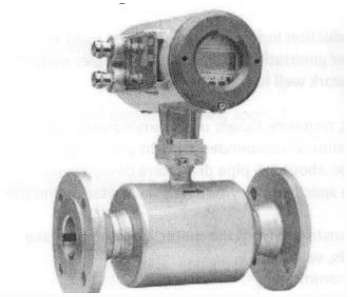
Other Flow Meters - Turbine Flow



- Requires temperature and pressure correction (normally internal)
- Best application is steady fluid flow
- Requires flow straightener vanes or long runs of straight pipe
- Internal parts should be inspected periodically for wear or corrosion

Other Flow Meters - Ultrasonic





- Two types – Doppler and Time-of-Flight
- Common use in natural gas transmission
- Requires long straight pipe upstream and downstream
- These are low maintenance meters

Natural Gas Combined Cycle Electric Generating Unit Fuel Flow Meters

- Most report CO_2 under 40 CFR Part 75 Appendix G 2.3
  - This reporting is commonly referred to as CEMS CO_2 reporting, but it is based on fuel flow measurements; it does not make use of stack gas CO_2 and exhaust gas flow meters
  - These facilities use CEMS software to calculate CO_2 emissions based on fuel gas flow from an orifice meter and heat content from a gas chromatograph
  - Calibration standards per 40 CFR Part 75 App. D (sum of three sensor errors 4% or less, and orifice inspection within tolerance)
  - Verify meters meet §95103(k)(10) - exempt from §95103(k)(1-9)
  - Supplier fuel data normally available for comparison to reported fuel flow and heat content data

Group Participation Exercise 1.3.3: Measurements and Monitoring

- An operator of an electricity generating facility subject to Subpart D discovers that a natural gas fuel meter had drifted since the last calibration by 2%, and instead of resetting the scale to match the reference value, the operator replaces the meter
  - What information should the verifier request?
  - What actions should the verifier take?

Group Participation Exercise 1.3.3: Measurements and Monitoring - Solution (1 of 2)

What information should the verifier request?

- Calibration schedule to determine if frequency meets OEM requirement
- Dates and operating schedules for old meter removal and new meter installation - are there data gaps?
- Qualifications of person installing and calibrating new meter
- Initial calibration records for new meter
- OEM manual to determine if meter is fit for purpose - was it designed for that type of gas or liquid, moisture content, and pressure range?
- Explanation of which parts of the metering system are examined and evaluated for accuracy and which inputs are used to estimate flow
- Unless same meter type is used to replace the meter, ensure units of measurement in the measured output are the same

Group Participation Exercise 1.3.3: Measurements and Monitoring - Solution (2 of 2)

What actions should the verifier take?

- If both (old and new) meters are demonstrated to be +/-5% accurate, then meters are deemed correct
- If meter is not accurate, identify in issues log
  - Determine whether reporter used a temporary method or a CARB-approved alternate method (confirm with CARB)
  - Determine whether reporter used missing data provisions
  - Method(s) should be described in GHG Monitoring Plan
- Review CARB's Measurement Accuracy and Missing Data Provisions Guidance

Course 1.3 Accuracy and Product Data

- Excluded Sources
- De minimis Emissions
- Measurement Accuracy
- **Missing Data**
  - **Types and Requirements**
  - **Missing Data Options**
  - **Evaluation and Verification**
- Product Data

Types of Missing Data §95129

- If reporting under 40 CFR Part 75: use of 40 CFR Part 75 missing data provisions
- For units with CEMS: use applicable 40 CFR Part 60/75 provision (95129(b)/(i)) , Tier 4 of Subpart C
- Fuel characteristic data for stationary fuel combustion sources (SFC) §95129(c)
  - High heat value of non-pipeline natural gas
  - Carbon content of mixture of petroleum coke and coal
- Fuel consumption data for SFC sources §95129(d)
  - Gallons of diesel fuel
  - Therms of natural gas
  - Wood waste or other biogenic sources

Missing Data §95129

- Required by §95115(m) for stationary combustion sources
- Reporting entities must make every reasonable effort to collect valid data (§95129(d))
- Most invalid or missing emissions data can be replaced using provisions in §95129
- Missing data estimates are conservative and overestimate actual emissions
- Correctly substituted data is treated as "accurate" by verifier when evaluating material misstatement
- Does not apply to product data

https://www.arb.ca.gov/cc/reporting/ghg-rep/guidance/accuracy-missingdata.pdf

Types of Missing Data Required to be Substituted Under §95129

- If a facility has missing fuel consumption or fuel characteristic data, or steam data, missing data substitution is required by §95129
  - Verifier must note date and source of any missing data substitutions discovered during verification in the verification report (§95131(b)(13)(D))
- The following two examples do not trigger missing data because they do not impact data quality
  - Not following re-calibration frequency but subsequent calibration was found to be in compliance with measurement accuracy
  - A faulty temperature probe for a process that never changes temperature

Options for Missing Fuel Consumption Data under §95129(d)(1),(2), and (3)

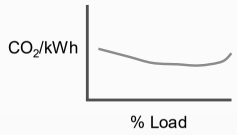
Option 1: Estimate using load ranges

Option 2: Estimate data capture rate for fuel consumption data, then use method prescribed by §95129(d)(2) based on data capture

Option 3: Use maximum potential fuel consumption rate if data capture rate is not available

Options for Missing Fuel Consumption Data under §95129(d)(1): Option 1: Load Ranges

- Eligible sources (electricity generation)
- Create and maintain fuel-specific databases
- Establish 10 operating load ranges or use approved alternate load ranges (units producing electrical or thermal output, only)
- Estimate using previous 720 hours of data, use higher load ranges, and max potential flow rate, if necessary
- Lookback period of 3 years



Options for Missing Fuel Consumption Data under §95129(d): Option 2: Data Capture

- Estimate data capture rate for fuel consumption data as required in §95129(d)(2)
- Data capture rate: (# obtained/# required x 100%)
- Use the following methods depending on capture rate

Data Capture Rate	Data Substitution Method
≥ 95%	Available process data
90-95%	90th percentile value recorded in current and previous 2 years
80-90%	95th percentile value recorded in current and previous 2 years
<80%	Maximum potential fuel consumption rate

Options for Missing Fuel Consumption Data under §95129(d): Option 3: Use Max. Value

- Applies if unit is unable to use options 1 or 2, because no quality-assured data is available in missing data lookback period
- Use maximum fuel consumption for the unit for each hour of missing data

Evaluating Missing Data for Tier 4 Units

- Do the missing CEMS data substitution procedures conform with applicable procedures in 40 CFR Part 60 and 75?
- If there was a serious CEMS breakdown, §95129(i) requires the reporter to:
  - Request and receive approval to use interim data collection procedures during the breakdown period
  - Change calculation methods and follow Tier 2 or Tier 3 requirements during the breakdown
- Review raw data, trace substitution by-hand to confirm correct method was used

Missing Fuel Characteristic Data §95129(c): HHV, CC, MW

- Reanalyze sample or analyze backup sample to obtain valid data
- Otherwise, estimate data capture rate

  (# obtained/# required x 100%)

Data Capture Rate	Data Substitution Method
≥ 90%	"Before and after" averaging
80-90%	Highest value recorded in current and previous 2 years
< 80%	Greatest of highest recorded of all records, or default in Table 1

Evaluating Missing Data for CH_4 and N_2O Emissions and Source Test Data

- Follow the missing data procedures for evaluating evidence as specified in §95129(d) - three options
- 40 CFR Part 75 and CEMS units also must follow §95129(d) for CH_4 and N_2O (unless de minimis) even though they do not use §95129 for CO_2
- If facility is using source testing to derive EF
  - Based on source test report, verify that source testing followed the CARB-approved test plan
  - Verify that calculations followed applicable procedures using source-specific EFs

Other Missing Data Substitution Requirements

- CARB-approved interim data collection procedure for fuel analytical data in case of equipment breakdown and loss of data >10% (§95129(h))
- Substitute missing steam production data based on data capture (§ 95129(e))
  - Can be complicated; contact CARB staff
- Note that a temporary method can be used to avoid missing data substitution - reporter notifies CARB and uses for <365 days (§95103(m)(4))

Missing Data Nonconformance

- If missing data affects greater than 20% of an emissions source, OR 5% or more of total emissions, a finding of nonconformance is issued and described in verification statement (§95131(b)(13)(C))
  - Includes fuel flow, fuel characteristics (HHV, CC, MW)
- If missing data procedure is used correctly, the substitute emissions data is defined as acceptable and does not impact evaluation of material misstatement (error = 0)

Verifying Missing Data Substitution §95131(b)(13)

- If ≤ 20% of missing data are substituted and verifier confirms that correct procedure was used, no nonconformance with 95131(b)(13) is issued
- If missing data procedures are followed correctly, data are defined as accurate and correct, even if the result of using the substituted data overestimates emissions
  - This is "built into" the regulation to incentivize reporters to minimize missing data

Group Participation Exercise 1.3.4: Missing Fuel Flow Data

Boiler burns natural gas to generate steam:

- At least 23% of the fuel flow data is missing
- HHV of gas is between 1,075 and 1,100 Btu/scf for 355 of 365 days
- Load range data is available per §95129(d)(1)
- Boiler only represents 4% of total facility emissions

What information should the verification team request?

Group Participation Exercise 1.3.4: Missing Fuel Flow Data - Solution

What information should the verification team request?

- Fuel flow data and operator's method of missing data substitution (GHG Monitoring Plan)
- Data from another source, utility meter, or other fuel supplier
- Cause of missing data and steps taken to prevent future data risks
- A nonconformance exists because >20% of the data used to estimate flow data is missing (see §95131(b)(13)(C)), but substituted data considered accurate for purposes of material misstatement assessment

Group Participation Exercise 1.3.5: Missing Data

A boiler burns a mixture of natural gas and landfill gas (verified exempt) with the following data capture rates. How should missing data be substituted to calculate emissions?

	Natural Gas	Landfill Gas
Annual HHV (avg.)	955 Btu/scf	510 Btu/scf
% data capture of HHV	88%	100%
% data capture of CC	76%	0%
% flow data capture	88%	88%
Max HHV	1,045 Btu/scf	540 Btu/scf
95th percentile value of fuel flow (3yrs)	12,000 scfm	1,800 scfm
Fuel analytical data	86% CH_4, 7% CO_2	varies

Group Participation Exercise 1.3.5: Missing Data - Solution

- Natural Gas
  - Not pipeline quality (970 to 1,100 Btu/scf, and at least 90% CH_4, <5% CO_2)
  - Must use Tier 3 (measured CC)
  - Less than 80% data capture for carbon content, so use greatest of highest value or default from Table 3-1 (75%)
  - Fuel flow substituted using load ranges, if available, otherwise use 95% percentile value (>80% data capture)
- Landfill gas (biogas) emissions
  - Verified exempt (not covered), so may use either Tier 1 or Tier 2
  - Missing data substituted using §98.35 (average of before and after, and best available allowed)

Course 1.3 Accuracy and Product Data

1. Excluded Sources
2. De minimis Emissions
3. Measurement Accuracy
4. Missing Data
5. **Product Data**
   - **Covered Product Data**
   - **Verifying Covered Product Data**
   - **Product Data Verification Statement**

Covered Product Data (§95103(l)) (1 of 2)

- Required to support Cap-and-Trade Program direct allocation of allowances through product- based benchmarks
  - For each covered product, the operator must report a matching NAICS code and perform the activity listed with the product in Table 9-1
- Independent from emissions data verification
- Verifier must confirm that missing data were not used in place of actual product data
  - Missing data provisions DO NOT apply
- Covered products are listed in Sections 95110, 95113-95120, 95124, and 95156
  - Miscellaneous product data sources are identified in 95115(n)

Covered Product Data (§95103(l)) (2 of 2)

- For many covered products, data must be quantified on a production basis. Some covered products are quantified on a sales basis, and some are intermediate products.*
  - Check reporting requirements for each covered product to determine which method is required
  - Covered product data ONLY includes materials produced on-site
  - Use of sales data with an inventory adjustment is considered equivalent to production data for products that are sold

*Covered Product Data General Reporting and Verification Guidance

Verifying Covered Product Data §95131(b)(8)(E) (1 of 2)

- Plant engineering and operations may be separate from accounting and sales departments - be sure to check data with both sources, if applicable
- Verification is evidence-based - review raw data and compiled data from daily production records, accounting, and sales department to determine accuracy of reported data
- Product data might represent 95% of the risk of mis-reporting for some manufacturing facilities (and therefore most of your time during verification)

Verifying Covered Product Data §95131(b)(8)(E) (2 of 2)

- Types of information to request and check
  - Product inventory and stock records
  - Product sales records and contracts
  - Onsite and offsite product delivery records
  - Purchase and delivery records for inputs to products
  - Product measurement records
  - Other information that provides financial or direct measurement information about total products reported

Verifying Covered Product Data §95131(b)(7) Sampling Plan

- The verifier's risk analysis and sampling plan must include all covered product data
- The verifier must conduct an in-depth review for covered products identified as the highest risk, including detailed data checks and review of data management systems
- For all other covered products the verifier should at a minimum review the data management systems for data collection, and review data as needed, to reach reasonable assurance that each covered product meets the accuracy requirements of §95103(k)

Documenting Your Review of Covered Product Data

Your independent reviewer is probably not an expert in tomato processing, aluminum billet manufacturing, or paper towel production… therefore document your review of each type of covered product data and justify why your review is adequate to reach reasonable assurance


Requirements Specific to Measurement of Covered Product Data: Inventory, Stock, or Tank Drops § 95103(k)(11)

- All methods used to measure inventory, stock, or tank drops must achieve +/- 5% accuracy
- Quantification of a calendar year inventory adjustment or use of a material balance method must achieve +/- 5% accuracy annually
- Techniques used to quantify amounts stored at the beginning and end of a time period are not subject to calibration requirements
- Verifier must confirm whether a correctable error exists and once corrected, account for uncertainty in amounts stored at the beginning and end of a time period in material misstatement assessment

Verifying Covered Product Data Measurements (1 of 3)

- Verifiers should <u>not</u> assume what is reported is complete
- Evidence to request
  - Scope of all owned and operated assets
    - Establish that all covered product data are properly evaluated
    - Ensure that all relevant business relationships are understood
  - GHG Monitoring Plan
  - Documentation of procedures and results for each product measurement device
  - Calculation of volumes/masses of inventory, stock, or tank drop measurements (§95103(k)(11))

Verifying Covered Product Data Measurements (2 of 3)

- How to evaluate evidence
  - Same calibration requirements as emissions data
  - Determine frequency of recalibrations meet rule requirements
  - Determine calibrations demonstrate meters within +/-5% accuracy
  - If accuracy spec not met and data not excluded, THEN verifier to document as "nonconformance" (§95103(k)(10))
  - Failure to correct a correctable error results in adverse verification statement

Verifying Covered Product Data Measurements (3 of 3)

- How to evaluate evidence
  - Inventory, stock, or tank drop measurements (§95103(k)(11))
    - Compare records and independent calculations to reported fuel consumed/product produced (beginning/end of year estimates)
    - Check that all measurement devices meet accuracy requirements
  - **No use of data substitutions**
- Note: Changes in Product Calculation Method must be approved by CARB (§95103(m))

How to Cross-check Data

- Data that are only used for reporting to ARB should be scrutinized very carefully
- After using the same method to re-calculate covered product data, ask for any other data that can be used as evidence to corroborate the reported data
  - Sales data with an inventory adjustment may be a good comparison
  - Ask for internal production reports that are used by accountants and corporate management; if everyone uses the data, it is more likely to be "correct"
- Document why the cross-check supports your findings

Excluded Product Data §95103(l)

- Data reporters are required to exclude portions of covered product data that are not measured accurately (and may elect to exclude accurate data)
  - Not an "all-or-nothing" allocation
- Does not impact the verification statement
  - Excluded covered product has no impact on assessment of material misstatement and conformance with measurement accuracy requirements of remaining covered product data

Reporting Excluded Product Data §95103(l)

- Missing or invalid covered product data is <u>still reported separately</u> using best available methods
  - Evaluated for conformance, but allocations are only provided for verified covered product data that are accurate
- **EXCEPTION:** For cement plants
  - Cement plants are not allowed to exclude product data because under reporting would INCREASE allocation
    - Clinker Consumed is in the dominator of the equation

Adjusted Clinker and Mineral Additives Produced = Clinker Produced x (1 + (Limestone and Gypsum Consumed)/Clinker Consumed))

Product Data Verification Statement

PRODUCT DATA REPORT (IF APPLICABLE)
For assistance completing or submitting this report, contact ghgverify@arb.ca.gov.

PART I: PRODUCT DATA REPORT INFORMATION

Reporting Year:	

PART II: VERIFICATION BODY INFORMATION

Verification Body Name:	

PART III: REPORTING ENTITY INFORMATION

Name of Reporting Entity:	CARB ID Number:

PART IV: VERIFICATION STATEMENT INFORMATION

1. This verification statement attests that the submitted data are (check one):
   - ☐ Reasonably assured of being free of material misstatement
   - ☐ NOT reasonably assured of being free of material misstatement
2. This verification statement attests that the submitted data are (check one):
   - ☐ Reasonably assured of being in conformance with the regulation
   - ☐ NOT reasonably assured of being in conformance with the regulation
   - ☐ NOT reasonably assured of being in conformance with the regulation, including NOT in conformance with §95131(b)(9): failure to correct data errors discovered during data checks
3. As a result of the selections above, the final verification statement is (check one):
   - ☐ Positive: Reasonably assured of no material misstatement and in conformance with the regulation
   - ☐ Qualified Positive: Reasonably assured of no material misstatement, but not reasonably assured in conformance with the regulation
   - ☐ Adverse: Not in conformance with §95131(b)(9) and/or not reasonably assured of no material

Group Participation Exercise 1.3.6: Covered Product Data Verification

A tomato processing facility reports the following product data. What verification statement(s) is likely?

	Reported by Operator	Verifier Calculated	Difference
Total Combustion Emissions (MT)	124,005	124,001	4 (0.003%)
Diced tomatoes (tons)	350,000	350,012	-12
Aseptic tomato paste (31%TSS) (tons)	154,505	154,499	6
Salted and dried zucchini slices (tons)	45,670		
Quantity of covered product data (tons)	504,505	504,511	6 (.001%)

Group Participation Exercise 1.3.6: Covered Product Data Verification - Solution

If zucchini is removed from emissions data report, verifier submits positive product data VS

	Reported by Operator	Verifier Calculated	Difference
Total Combustion Emissions (MT)	124,005	124,001	4 (0.003%)
Diced tomatoes (tons)	350,000	350,012	-12
Aseptic tomato paste (31%TSS) (tons)	154,505	154,499	6
~~Salted and dried zucchini slices (tons)~~ (non covered)	~~45,670~~		
Quantity of covered product data (tons)	504,505	504,511	-6 (.001%)

Other Product Data (Not "Covered")

- Verified for conformance, not +/-5% accuracy or material misstatement
- Only products in C&T Table 9-1 are "covered" product data
- Examples of product data that are <u>not</u> covered include
  - Rare earth oxide equivalents
  - Corn entering wet milling process
  - Cement production

Reminder: electricity, steam, and cooling energy are not covered products

Questions

Course 1: General Verification

Complete:

- 1.1 Verification Principles, Requirements, and Procedures
- 1.2 Stationary Fuel Combustion and Sorbent Sources
- 1.3 Accuracy and Product Data

Next:

- 1.4 Electricity Generating Units and Cogeneration