Course 1.4: Handout 1.4.3. Comprehensive Case Study/Homework – CARB Training 2024

You are verifying the Moo Cow Dairy, which produces salted and unsalted butter and also produces cheese. Moo Cow operates two natural gas cogeneration units that deliver both steam and electricity to the plant. Natural gas is supplied by PG&E, which provides monthly measured HHV. The two cogeneration units have submeters that separately measure fuel volume and are used to report GHG emissions data to CARB using a Tier 2 calculation. Calibration information is only available for Unit 1. Unsalted butter and cheese were reported as covered products.

Approximately 10 MT CO_2e emissions from natural gas used for comfort heating was not included in the emissions data report. It represents less than 1% of the total emissions.

Complete the following 11 exercises in advance of training session.

Exercise 1: Complete the sampling plan (emissions & *covered* product data only) using the data in Attachment 1 on page 3.

Moo Cow Sampling Plan

	Rank by Magnitude of Emissions			Rank by Risk Uncertainty for Emissions	
Emission Source	**Reported Emissions (MT)**	**% Contribution to Total Emissions**	**Rank by Emissions**	**Rank by Uncertainty**	**Explanation/Rationale for Uncertainty Ranking**
Unit 1	39,737	54	1	Medium	High risk of misstatement using internal submeters to report emissions
Unit 2	34,199	46	2	High	High risk of misstatement using internal submeters to report emissions
Natural gas usage for comfort heating	unknown	unknown	3	Medium	Medium risk. Small emissions source, but source may have been incorrectly omitted from emissions data report.

Covered Product Data	**Quantity (short tons)**	**Rank by Quantity**	**Rank of Calculation Uncertainty**	**Explanation/Rationale for Uncertainty Ranking**
Butter	40,025	1	High	Lack of experience reporting product data. New reporting requirement. High risk of mis-reporting data.
Cheese	16,381	2	High	Lack of experience reporting product data. New reporting requirement. High risk of mis-reporting data.

<u>Complete qualitative risk narrative</u> – Answers provided are illustrative for purposes of instruction and are not all based on information provided

Note: some of the narrative has already been completed by a member of your verification team.

	Description
1. Data acquisition equipment;	Unit 2 submeter that measures fuel flow may not have been calibrated. **High risk of mis-reporting.**
2. Data sampling and frequency;	No other fuel sampling requirements. **Low risk**.
3. Data processing and tracking;	Reasonable accounting system, but low confidence in the staff that are using the system. **Medium risk**.
4. Emissions calculations;	NG reporting uses simple Tier 2 calculation. **Low risk**.
5. Product data;	Revised reporting requirement. Risk of misreporting associated with *salted* butter not being reported. Low confidence in staff. **High risk.**
6. Data reporting;	Facility has a complicated energy disposition diagram for their cogeneration facility. Requires a careful conformance check. **Medium risk.**
7. Management policies or practices in developing emissions data reports.	The new employee reporting data was not trained on how to compile data from the production database; no written policies regarding data integrity and poor communication between accounting and engineering staff. **High risk.**

2019 Emissions Data Report
Facility Name: Moo Cow

GHG Quantity

CO_2 equivalent emissions (excluding biogenic) from subpart C - AA: **73,936** Metric Tons
Covered CO_2 equivalent emissions: **73,936** Metric Tons

Dairy product facility [95115(n)(16)]:
Annual quantity of butter (covered product data): **40,025** short tons
Annual quantity of cheese (covered product data): **16,381** short tons

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Subpart C: General Stationary Fuel Combustion

Unit Name: Cogen Unit 1
Fuel: Natural Gas
Calculation Methodology: Tier 2 (Equation C-2a)
Fuel Emission Details
Total CO_2 emissions: **39,737** Metric Tons
Annual Volume of Fuel Combusted: 735,500,000 scf
Annual Average High Heat Value: 0.001019 MMBtu/scf
Fuel Specific CO_2 Emissions Factor: 53.02 kg CO_2/MMBtu

Unit Name: Cogen Unit 2
Fuel: Natural Gas
Calculation Methodology: Tier 2 (Equation C-2a)
Fuel Emission Details
Total CO_2 emissions: **34,199** Metric Tons
Annual Volume of Fuel Combusted: 633,001,000 scf
Annual Average High Heat Value: 0.001019 MMBtu/scf
Fuel Specific CO_2 Emissions Factor: 53.02 kg CO_2/MMBtu

Exercise 2: List the data you will need to see before your site visit, what you will observe while visiting the facility, and the staff individuals you want to meet.

Data requested prior to site visit	Rationale/citation
Monthly production quantities for cheese and butter	§95115(n)(16)
Monthly sales data for cheese and butter, and an explanation about on-site inventory storage capacity where product has been produced but not yet sold	Provides confidence that production data is reasonable when compared with sales data
Copy of all 12 monthly natural gas invoices, including Dec. 2018 and Jan. 2020	Supports combustion emissions calculation
Evidence that there is only 1 utility natural gas meter for the facility	Confidence that all natural gas has been accounted for
Calibration data for submeters	Confirm accuracy of meter per §95103(k)
Data/systems to be observed during site visit	**Rationale/citation**
Meters for cheese and butter	Confirm accuracy of production quantities for covered product data per §95103(k)
Meters for natural gas: observe operation; confirm appropriate placement for accurate measurement; confirm meter model matches calibration and installation information provided	Confirm accuracy of meter per §95103(k)
Data acquisition and handling system for natural gas submeters: ask staff to recreate data reports for one month of last year, and for previous day	Confirm accuracy and completeness of fuel usage report; confirm report matches emissions data report
Accounting system for paying gas bills	Need to connect payment with gas usage for additional evidence of accuracy and to ensure emissions from all gas meters are being reported
Monthly submeter fuel flow data – comparison with revenue meter billing from PG&E	Please compare monthly submeter data with PG&E in a spreadsheet and explain any discrepancies.
Air district permit summary page listing all combustion sources	Confidence that all emissions sources have been reported

Exercise 3: Identify the people you want to meet with during the site visit.
Accounting staff in charge of sales receipts and utility payments. Staff that oversees calibration and scale accuracy assessments. Staff that weighs products, purchases (inputs), and tracks product inventory.

Exercise 4: You have completed your data request and sent it to the client. However, despite several requests, the client has not provided you with the requested data. Your site visit is scheduled for a week from today, and you have several other verifications to complete in the near future, and postponing the site visit is difficult. What should you do?
Keep careful track of your evidence and issues log, as well as your communications and request for information in case your client is unable to correct errors before the verification deadline and you have to explain the cause of the adverse verification statement. Consider sending an issues log which indicates that lack of evidence or demonstration of accuracy of the reported data will result in an adverse verification statement.

Exercise 5: What is the purpose of the opening meeting?
Establish a good working relationship with the reporting entity. Provide an agenda for the site visit. Establish reporting responsibilities of data reporting staff. Identify who is in charge of the data management system.

Exercise 6: How would you verify the natural gas consumption in each of the cogeneration units?
Compare calibration frequency used by operator with the frequency specified by the original equipment manufacturer (OEM). Compare total fuel usage from submeters with PG&E data.

Exercise 7: How would you verify the covered product data? How would you confirm that they are covered products?

To verify a covered product: The verifier must evaluate the measurement system that provides the amount of production reported for each product. The measurement system could include truck tickets, purchase and sales records, production logs and scale weights saved to a production database. This includes drilling down to monthly, daily, or hourly production rates to understand how the data are derived and tracked at the facility. After performing direct data checks on production data, verifiers should request records used for reporting to other agencies that could corroborate the accuracy of the data reported to CARB.

To confirm a product is covered: The verifier should compare the operator's written description of each product with each product listed in Table 9-1 of the cap-and-trade regulation, as well as the definitions in §95102(b) for each product. Verifiers must also review handouts from verifier training and other published guidance provided by CARB staff. Verifiers are encouraged to contact CARB staff with questions when it is unclear if a product is covered under the MRR.

Exercise 8: Based on your observations during the site visit, the information provided at the beginning of the case study, and their emissions data report, document issues and concerns in the issues log.

A. The individual responsible for preparing the emissions data report has been with the parent company for several years, working in accounting in Illinois, but this is that person's first year working at the California plant and first year being responsible for reporting emissions.
B. While visiting the plant, the plant engineer passes along some information about the production line, suggesting that in August there were several incidences where the scales used to measure cheese output weren't working correctly. When that happened, the company made a best-estimate of the volume of cheese produced during that time.
C. Although natural gas combustion is reported for the two cogeneration units separately, your visual inspection of the fuel flow meter and company records for Unit 2 indicates that the meter may not have been properly calibrated in 2019.
D. The GHG Monitoring Plan was written in 2010 and has not been updated. It does not indicate responsible staff, there are no records of meter calibrations or location of submeters, and it refers to an outdated version of the MRR.
E. Air district permit shows waste oil is allowed to be combusted when natural gas is not available.
F. Comfort heating is provided by a natural gas heater, which is billed under a different PG&E account than the cogeneration system.

Issues Log for Moo Cow

#	Description of Issue/Source	Regulation Citation	Impact on GHG Data	Action Required by Reporting Entity	Resolution
1	A: Data checks. Staff responsible for reporting GHG data is new to the job.	95131(b)(8)	Clarification needed	Please provide a more detailed description of the source of each data set and how that data was tracked and used in calculations.	
2	B: Quantity of cheese produced included in the emissions data report may have been estimated using "sales" data.	95115(n)	Clarification needed	Please provide written documentation of the data processing steps and describe the process via webinar next week. Section 95131(b)(14)(A) does not allow use of missing data substitution for covered product data.	
3	C: No evidence has been provided regarding measurement accuracy for submeter for Unit 2.	95103(k)(2)	Non-conformance	Provide calibration records for 2018 and 2019.*	
4	D: GHG Monitoring Plan does not address training and meter calibration dates.	95105(c)	Non-conformance	Please update the GHG Monitoring Plan and email a copy to me.	
5	E: Air district permit includes ability to combust waste oil if supply of natural gas is interrupted.	95115 and 98.32-33(a)	Non-conformance and material misstatement if waste oil was actually combusted in 2019	Provide evidence whether waste oil was or was not combusted in 2019.	
6	F: Natural gas used for comfort heating was not reported in the emissions data report.	95115 and 98.32-33(a)	Non-conformance	Provide evidence that emissions from all natural gas combustion is reported. See 95115(h) for aggregation of units by unit type categories.	
7	From page #1 of the case study Quantity of butter produced included in the emissions data report does not include salted butter.	95102(b) 95115(n)(16) 95103(l)	Non-conformance	Follow up with CARB staff to confirm which products are required to be reported. Is *salted* butter included in definition of *butter*? Entity may exclude any covered product data except for cement products-must estimate those data and report.	
8	From Attachment 10-4: An explanation or comparison of cheese production vs. sales data has not been provided.	95131(b)(8)(E)	Clarification needed	Please ask accounting to send me the inventory tracking sheet Moo Cow uses for its corporate reporting and loss prevention accounting. Also, please explain how production data compares with sales data (is there a large inventory storage of products?).	

***** *The challenge as a verifier is how to communicate with independence. You know Moo Cow should have reported emissions using the PG&E meter that is assumed to be accurate, but you may NOT tell them this. The relationship (ratio) between the submeter data can be used to allocate the gas from the revenue meter to each unit. As long as the total emissions are accurate, a "reasonable" allocation between units is acceptable.*

Exercise 9: You prepare to close out your site visit. First you **complete your issues log** where applicable while on site, completing as much as possible. What issues would you share with the client at the end of the day?

Let them know you will be asking about measurement accuracy for the submeters (§95103(k)), why the operator chose to report data using submeters, and whether additional natural gas was not reported from comfort heating. Clarify that the GHG Monitoring Plan specified in §95105(c) must be updated and emailed to the VB within 10 days. Remind them you will be asking the head engineer about the scales (§95103(k)) used to measure cheese when he returns from vacation. Provide a date that the issues log will be sent via email to the reporting entity. Clarify that if errors are not corrected and issues are not resolved, an adverse verification statement must be submitted.

Exercise 10: During the site visit, you are given copies of PG&E natural gas invoices. You review the data in the Tier 2 Calculation Sheet from Cal e-GGRT (Attachment 10-1) and compare it to the data from PG&E (Attachment 10-2 and 3). You are also given background documentation on production numbers (Attachment 10-4). What additional issues (if any) would you add to the issues log?

Attachment 10-1:
Tier 2 Calculation Sheet from Cal e-GGRT (Equation C-2a)

Month	**Unit 1 [Fuel]** Volume (scf)	**Unit 2 [Fuel]** Volume (scf)	**Units 1 and 2 [HHV]** (MMBtu/scf)
January	63,803,700	47,842,700	0.001021
February	62,365,000	48,399,000	0.001018
March	63,200,000	51,260,000	0.001019
April	64,050,000	53,060,000	0.001017
May	61,243,150	60,273,150	0.001023
June	62,450,000	60,550,000	0.001016
July	63,321,000	57,341,000	0.001019
August	65,498,000	60,506,000	0.001019
September	64,376,660	53,376,660	0.001013
October	65,587,690	55,587,690	0.001019
November	59,800,000	54,000,000	0.001019
December	39,804,800	30,804,800	0.001023
Total	735,500,000	633,001,000	0.001019

$$CO_2 = 1 \times 10^{-3} * Fuel * HHV * EF \quad \text{(Eq. C-2a)}$$

Total CO_2 = 0.001 MT/kg x scf x MMBtu/scf x 53.02 kg/MMBtu

Unit 1 CO_2 = 0.001 x 735,500,000 x 0.001019 x 53.02 = 39,737
Unit 2 CO_2 = 0.001 x 633,001,000 x 0.001019 x 53.02 = 34,199
Total CO_2 = 39,737 + 34,199 = 73,936 MT CO_2 (Ignore CH_4 & N_2O)

Attachment 10-2: PG&E Gas Usage (Verified as accurate)

Month	PG&E Invoice (Therms)
January	1,139,871
February	1,132,307
March	1,172,016
April	1,200,099
May	1,253,318
June	1,267,911
July	1,240,629
August	1,296,523
September	1,206,730
October	1,242,820
November	1,169,951
December	621,746
Total	13,943,920

$$CO_2 = 1 \times 10^{-3} [0.1 * Gas * EF] \qquad \text{(Eq. C-1a)}$$

CO_2 emissions estimate based on PG&E billing meter in therms =
MT CO_2 = 0.001 MT/kg x 0.1 MMBtu/therms x 13,943,920 therms x 53.02 kgCO_2/MMBtu
= 73,931 MT CO_2

Attachment 10-3:
Cross-check conducted by the verification team of the Moo Cow submeter and PG&E data

Moo Cow submeter data (MT CO_2)	PG&E data (MT CO_2)	Difference
73,936	73,931	-5 (0.007%)

Attachment 10-4: Monthly Butter and Cheese Production and Sales Data (in short tons)

Month	Butter Production	Butter Sales	Cheese Production	Cheese Sales
January	3,249	3,538	1,366	1,001
February	3,227	3,506	1,476	0
March	3,340	3,495	1,298	0
April	3,420	3,541	1,300	2,089
May	3,572	3,718	1,287	5,421
June	3,614	3,189	1,099	2,321
July	3,536	3,215	1,552	2,237
August	3,695	3,495	1,484	1,876
September	3,439	3,198	1,567	1,023
October	3,542	3,498	1,209	456
November	3,334	2,774	1,378	0
December	2,057	2,832	1,365	0
Total	40,025	39,999	16,381	16,424

Note to verifier: Carefully review the data in this table.
The sum of each product for all 12 months in the bottom row is accurately summed in the Table.

Data for the month of June is missing.

Using sales data to corroborate production data is a reasonable cross-check if the verifier understands how inventory is managed at the facility. Explain to the operator that providing sales data to the verification team provides additional confidence in the reported production data. This is considered good practice for reviewing covered product data.

Exercise 11: You submitted your log of issues to the Moo Cow operator on June 1st. Several issues involve correctable errors. It is now mid-July and you have not been provided with information on submeters as part of the GHG Monitoring Plan. There have been no other responses to your Issues Log. What do you do?

Even if it is likely that the reporting entity will fix the errors, notify the reporting entity and CARB via email of the potential adverse (emissions data) verification statement at least 14 days before the verification deadline.