

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 CO₂e 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

| Emission Source | Rank by Magnitude of Emissions | | | Rank by Risk Uncertainty for Emissions | |
|-----------------|--------------------------------|-----------------------------------|-------------------|----------------------------------------|-----------------------------------------------|
| | Reported Emissions (MT) | % Contribution to Total Emissions | Rank by Emissions | Rank by Uncertainty | Explanation/Rationale for Uncertainty Ranking |
| Unit 1 | 39,737 | | | | |
| Unit 2 | 34,199 | | | | |
| | | | | | |

| Covered Product Data | Quantity (short tons) | Rank by Quantity | Rank of Calculation Uncertainty | Explanation/Rationale for Uncertainty Ranking |
|----------------------|-----------------------|------------------|---------------------------------|-----------------------------------------------|
| Butter | 40,025 | | | |
| Cheese | 16,381 | | | |

Complete qualitative risk narrative

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

| | Description |
|---------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Data acquisition equipment; | |
| 2. Data sampling and frequency; | |
| 3. Data processing and tracking; | Reasonable accounting system, but low confidence in the staff that are using the system. Medium risk. |
| 4. Emissions calculations; | |
| 5. Product data; | |
| 6. Data reporting; | |
| 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

CO₂ equivalent emissions (excluding biogenic) from subpart C - AA: **73,936** Metric Tons

Covered CO₂ 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

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 CO₂ 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 CO₂ Emissions Factor: 53.02 kg CO₂/MMBtu

Unit Name: Cogen Unit 2

Fuel: Natural Gas

Calculation Methodology: Tier 2 (Equation C-2a)

Fuel Emission Details

Total CO₂ 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 CO₂ Emissions Factor: 53.02 kg CO₂/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 |
|-----------------------------------------------|--------------------|
| | |
| | |
| | |
| | |
| | |
| | |
| Data/systems to be observed during site visit | Rationale/citation |
| | |
| | |
| | |
| | |
| | |
| | |

Exercise 3: Identify the people you want to meet with during the site visit.

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?

Exercise 5: What is the purpose of the opening meeting?

Exercise 6: How would you verify the natural gas consumption in each of the cogeneration units?

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

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: | | | | |
| 2 | B: | | | | |
| 3 | C: | | | | |
| 4 | D: | | | | |
| 5 | E: | | | | |
| 6 | F: | | | | |
| 7 | From page #1 of the case study | | | | |
| 8 | From Attachment 10-4: | | | | |

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?

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 |

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

$$\text{Total } CO_2 = 0.001 \text{ MT/kg} \times \text{scf} \times \text{MMBtu/scf} \times 53.02 \text{ kg/MMBtu}$$

Unit 1 CO₂ =

Unit 2 CO₂ =

Total CO₂ =

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 |

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

CO₂ emissions estimate based on PG&E billing meter in therms =

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 |
|---------------------------------------------|---------------------------------|------------|
| | | |

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 |
| 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.

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?