



Scope 3 GHG Inventory Guidance

For U.S. Dairy Cooperatives and Processors



This U.S. dairy-specific guidance document has been reviewed by the GHG Protocol and is in conformance with the requirements set forth in the Corporate Value Chain (Scope 3) Accounting and Reporting Standard

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Table of Contents

NOTE: This document contains numerous hyperlinked tools and resources. It is, therefore, best viewed and used in PDF rather than print format.

Table of Contents	1
Introduction	3
Background	3
Steps to Creating a Scope 3 Inventory	6
Significant Scope 3 Categories in U.S. Dairy	12
Purchased Goods and Services	12
Capital Goods	14
Fuel and Energy Related Activities (Not Included in Scope 2)	17
Upstream Transportation and Distribution	21
Waste Generated in Operations	23
Upstream Leased Assets	25
Downstream Transportation and Distribution	27
Downstream Leased Assets	30
Appendix: Insignificant Scope 3 Categories in U.S. Dairy	32
Business Travel	32
Employee Commuting	34
Processing of Sold Products	36
Use of Sold Products	38
End of Life Treatment of Sold Products	41
Franchises	43
Investments	45
Works Cited	47
Additional Resources	48

List of Terms

GHG - Greenhouse Gas; any gas that contributes to the greenhouse effect and climate change by absorbing infrared radiation. There are seven greenhouse gases accounted for by the GHG Protocol: carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), sulfur hexafluoride (SF₆), nitrogen trifluoride (NF₃), hydrofluorocarbons (HFCs), and perfluorocarbons (PFCs).

SBT - Science Based Target; greenhouse gas reduction target adopted by companies to achieve the level of decarbonization necessary to keep global temperatures from rising above 2 degrees Celsius compared to preindustrial temperatures. In October 2019, the ambition requirements for SBTs increased to “well below 2 degrees.”

CDP - Formerly the Carbon Disclosure Project; a global platform that collects, and publicly displays environmental performance data from companies, cities, states and regions to inform investor, and shareholder decision-making.

Reporting Processor - The dairy cooperative, manufacturing company, or processing company utilizing this guidance tool in preparation to publicly disclose its greenhouse gas emissions inventory.

CNG - Compressed natural gas; methane stored at high pressure.

LNG - Liquefied natural gas; a cooled mixture of methane and ethane.

LPG - Liquefied petroleum gas; flammable hydrocarbon gases including propane and butane.

CO₂e - Carbon dioxide equivalent; a standardized unit used to normalize and report emissions of greenhouse gases.

GWP - Global Warming Potential; a relative measure of the potential of a specific GHG to absorb infrared radiation and influence climate change. GWP values are used to calculate the carbon dioxide equivalent of a GHG, with CO₂ being the benchmark (GWP = 1) and other GHGs having values many times greater than CO₂ (e.g. GWP of methane = 28).

Emission Factor - The emission rate of a greenhouse gas for a given source.

Activity Data - Data related to the magnitude of emissions from various anthropogenic activities.

Scope 1 Emissions - Direct emissions from owned or controlled sources.

Scope 2 Emissions - Indirect emissions from the generation of purchased energy.

Scope 3 Emissions - All indirect emissions (not included in scope 2) that occur in the value chain of the reporting company, including both upstream and downstream emissions.

GHG Protocol - A standards organization developed by the World Resources Institute (WRI) that establishes comprehensive global standardized frameworks to measure and manage greenhouse gas (GHG) emissions from private and public sector operations, value chains and mitigation actions.

Environmentally Extended Input-Output Database - Based on national economic and environmental statistics. These databases have advantages over process-databases in that they cover the complete economy, eliminating the need for cut-offs in life cycle assessment.

Introduction to this Tool

Within the last few years, global realization of the necessity to implement climate change mitigation strategies has become paramount. As a result, organizations such as the Science Based Targets Initiative have mobilized in an effort to engage companies to set climate goals on par with those of the 2015 Paris Climate Agreement—keeping global temperatures from rising more than two degrees Celsius. Furthermore, the Science Based Targets Initiative introduced more ambitious climate targets in October 2019, targeting global temperature stabilization to “well below 2 degrees.”

Many large dairy purchasing companies have already set or have pledged to set a Science Based Target (hereafter “SBT”). For these companies to meet their SBTs, they require a comprehensive account of their supply chain GHG emissions each year to track progress over time. Therefore, large consumer-facing companies such as these increasingly expect their suppliers to collect and externally disclose their GHG emissions data.

Scope 3 Emissions in U.S. Dairy

Similar to many other industries, the majority of GHG emissions in U.S. dairy arise from supply chain activities upstream of the dairy processors or cooperatives. More specifically, over half of the industry’s GHG emissions are generated on the dairy farm as a result of feed production, manure management, and enteric processes. From both dairy retailers’ and processors’ perspectives, upstream on-farm emissions, along with other processes such as transportation, are considered Scope 3, indirect emissions. As a result, this guidance places particular importance on upstream Scope 3 GHG accounting, although guidance on both upstream and downstream Scope 3 GHG emissions is included to be as comprehensive as possible and account for all 15 Scope 3 GHG categories identified by the GHG Protocol. (Figure 1.0 Below)

Although guidance on all 15 Scope 3 categories is included in this resource, the categories determined to emit the most GHGs in the U.S. dairy supply chain comprise the main component of this document. The categories that are considered insignificant and/or non-integral to composing a dairy processor Scope 3 GHG inventory are appended at the end of the document. These categories are deemed insignificant because the basis for determining their associated

emissions is not significant in the U.S. dairy value chain. For the purposes of this guidance, insignificant Scope 3 categories in U.S. dairy either do not contain a large quantity of emissions, and/or are not feasible to account for due to lack of relevant data, resources and/or time.

However, a caveat to this rule is that the relative importance of individual Scope 3 categories may vary depending on the composition of the reporting processor’s supply chain. If possible, reporting processors should attempt to account for emissions from all Scope 3 categories. Furthermore, the reporting processor should not exclude any Scope 3 category that is expected to contribute significantly to their total Scope 3 emissions. However, if resources and time are limited, this guidance recommends taking inventory of emissions from the Scope 3 categories in the main component of this document first, followed by emissions from the categories in the Appendix section. Table 1.0, page 4, differentiates between significant and insignificant Scope 3 categories in the U.S. dairy value chain.

In addition, reporting processors may refer to the “Setting the Scope 3 Boundary” section of this guidance, located on page 8.



(Figure 1.0) Differentiating between upstream and downstream in the U.S. dairy value chain from dairy processing perspective

Defining Scope 3 Indirect Emissions

The Greenhouse Gas Protocol defines Scope 3 emissions as “all indirect emissions (not included in Scope 2) that occur in the value chain of the reporting company, including both upstream and downstream emissions.”¹¹ Since on-farm emissions are both retailers’ and dairy processors’ Scope 3 emissions, and they comprise such a large proportion of U.S. dairy’s total GHG inventory, it is imperative that said emissions are accurately accounted for and quantified.

Purpose

This guidance document is intended to assist U.S. dairy cooperatives and processing companies to accurately account for and calculate their Scope 3 GHG emissions.

It is intended to coincide with the Innovation Center for U.S. Dairy’s [Scope 1 & 2 GHG Inventory Guidance](#). Therefore, cooperatives and processors that utilize this guidance document should ensure they implement the same organizational boundary for Scope 1, 2 and 3. The Greenhouse Gas Protocol does not permit reporting companies to vary their organizational boundary for each Scope. For more guidance on setting organizational boundaries, refer to the Inventory Management Plan chapter of The Innovation Center’s [Scope 1 & 2 GHG Inventory Guidance](#).

For the purposes of credibility and consistency, this document is primarily based on the Greenhouse Gas Protocol’s [Corporate Value Chain \(Scope 3\) Accounting and Reporting Standard](#), as well as the Greenhouse Gas

Differentiating Between Significant/Feasible and Insignificant/Unfeasible Scope 3 Categories in U.S. Dairy	
Significant Scope 3 Categories	Insignificant Scope 3 Categories
Purchased Goods and Services	Business Travel
Capital Goods (unless processor does not purchase operational equipment in reporting year)	Employee Commuting
Fuel and Energy Related Activities	Processing of Sold Products
Upstream Transportation and Distribution	Use of Sold Products
Waste Generated in Operations	End of Life Treatment of Sold Products
Upstream Leased Assets (unless processor does not have large portfolio of leased assets as a lessee)	Investments
Downstream Transportation and Distribution	Franchises
Downstream Leased Assets (unless processor does not have large portfolio of leased assets as a lessor)	

(Table 1.0) Differentiating between significant and insignificant Scope 3 categories in U.S. dairy based on emissions quantities and feasibility of accounting

U.S. Dairy Industry Supply Chain GHG Emissions Categorization - Processing Point of View	
Supply Chain Stage	GHG Emissions Scope
Feed Production	Scope 3 (Possible Scopes 1, 2 for cooperatives)
Milk Production	Scope 3 (Possible Scopes 1, 2 for cooperatives)
Milk Transport	Scope 3 (Scopes 1, 2 if processor or cooperative owns/controls fleet)
Processing	Scopes 1, 2
Packaging	Scope 3
Distribution	Scope 3 (Scopes 1, 2 if processor or cooperative owns/controls fleet)
Retail	Scope 3
Consumer	Scope 3

(Table 1.1) Differentiating between Scope 1, 2 and 3 emissions from U.S. dairy cooperatives’ and processors’ perspectives

Protocol's [Technical Guidance for Calculating Scope 3 Emissions](#).

This guidance document coincides with the FARM (Farmers Ensuring Responsible Management) Environmental Stewardship program (below). Managed by the National Milk Producers Federation, FARM obtains relevant on-farm data to quantify Scope 3 GHG emissions from Purchased Goods and Services, U.S. dairy's largest Scope 3 emissions category.

The FARM Environmental Stewardship calculator (FARM ES) uses a model based on a rigorous peer-reviewed [life cycle assessment of fluid milk](#) conducted by the Applied Sustainability Center at the University of Arkansas as well as IPCC Tier 2 methodologies.⁷ FARM ES provides an efficient and effective way to comprehensively estimate on-farm GHG emissions and energy use, and incorporates data from over 500 dairy farms across the nation.

Additional resources are referenced throughout the document that provide useful information and data relevant to certain necessary calculations.

Although this guidance document is designed to equip reporting processors with the tools and resources necessary to compose their own Scope 3 inventory, Scope 3 GHG accounting is an onerous task. If the reporting entity has sufficient financial resources, it is recommended that a consultant be hired for the first year of conducting a Scope 3 inventory. This ensures professional and expert GHG accounting and sets a baseline standard for the company to model going forward.

If possible, the consultant should compose a consolidated list of resources used in the Scope 3 accounting exercise, so that the reporting processor may utilize them in future reporting years. The consultant's expertise in combination with this accounting guidance resource should combine to serve reporting processors with a strong foundation of Scope 3 GHG support.

The FARM (Farmers Assuring Responsible Management) Environmental Stewardship Program



The Farmers Assuring Responsible Management (FARM) Environmental Stewardship (ES) program area helps track and communicate a dairy farm's environmental achievements and sets a path for continuous improvement.

- The tool provides a comprehensive estimate of greenhouse gas emissions on dairy farms.
- It is based on a scientific, peer-reviewed model that incorporates IPCC Tier 2 methods and life cycle assessment research.

[The program website](#) offers a variety of tools and resources that explain the program, support continuous improvement efforts and give information on the model methodology.

Steps to Create a Scope 3 Inventory

This section provides background information on the overall process of developing a Scope 3 GHG inventory. It includes the chronological steps processors should use to sufficiently account for its Scope 3 emissions.

Developing an accurate and representative Scope 3 inventory can be an arduous task. It contains significantly more categories than Scopes 1 and 2; therefore, it is recommended that the reporting dairy processor or cooperative thoroughly reviews and understands the steps involved in accounting and reporting a Scope 3 inventory.

A chronological list of the steps involved in creating a sufficient Scope 3 inventory are presented in Figure 2.0. More detailed descriptions of what each step entails are included below. Several of the steps have specific requirements that must be met according to the [GHG Protocol Corporate Value Chain \(Scope 3\) Standard](#).

Defining Business Goals

Before reporting processors begin measuring their Scope 3 emissions, it is important to identify which business goal(s) to pursue by taking an inventory. By clearly understanding and defining business goals at the start of the Scope 3 accounting and reporting process, reporting processors can better allocate limited resources for developing the most effective operational boundary possible. This saves time and money. For more information on operational boundaries, consult the Inventory Management Plan chapter of the [Scope 1 and 2 GHG Inventory Guidance](#).

Furthermore, identifying which business goals to achieve can potentially offer economic incentives for dairy stakeholders throughout the supply chain. Not only is measuring and managing GHG emissions the right thing to do, it often makes financial sense.

A more detailed breakdown of common business goals (from the [GHG Protocol Corporate Value Chain Accounting and Reporting Standard](#)) that reporting companies identify and pursue by taking a Scope 3 GHG inventory are depicted in Table 2.0 on page 7.

All of these business goals outlined by the GHG Protocol are germane to reporting processors in U.S. dairy. However, it is up to the reporting processor to identify which business goals it intends to pursue. Often, large dairy purchasing companies may expect reporting processors to collect and disclose their GHG inventories, which is categorized under the “Enhance stakeholder information and corporate reputation through public reporting” goal (page 7, Table 2.0). While this should be a priority, reporting processors can incentivize Scope

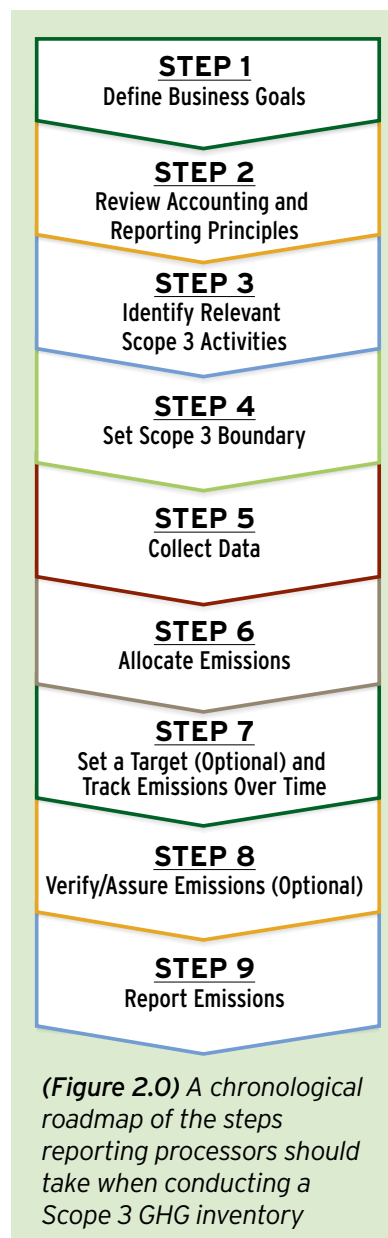
3 GHG accounting and measurement by pursuing business goals that may help identify cost-saving opportunities or operational hotspots for GHG emissions.

This guidance therefore recommends that reporting processors pursue business goals that accommodate customer requests and goals that are mutually beneficial.

All four goals listed (page 7) are relevant to U.S. dairy. Marketplace expectations, however, should be prioritized in scenarios where reporting processors lack adequate time or dedicated resources to developing a Scope 3 inventory.

Reviewing Accounting and Reporting Principles

Much like the [GHG Protocol Corporate Standard](#), on which the Scope 1 & 2 GHG Inventory Guidance is based, the GHG Protocol [Corporate Value Chain Accounting and Reporting Standard](#) requires that reporting processors’ Scope 3 inventories “represent a faithful, true, and fair account” of their emissions.² Reporting processors should ensure that they abide by all five principles outlined below: (page 7, Table 2.1)



(Figure 2.0) A chronological roadmap of the steps reporting processors should take when conducting a Scope 3 GHG inventory

GHG Protocol Corporate Value Chain Business Goal Table

Business Goal	Details
Identify and understand risks and opportunities associated with value chain emissions	<ul style="list-style-type: none"> Identify GHG related risks in the value chain Identify new market opportunities Inform investment and procurement decisions
Identify GHG reduction opportunities, set reduction targets, and track performance	<ul style="list-style-type: none"> Identify GHG 'hot spots' and prioritize reduction efforts across the value chain Set Scope 3 GHG reduction targets Quantify and report GHG performance over time
Engage value chain partners in GHG management	<ul style="list-style-type: none"> Partner with suppliers, customers, and other companies in the value chain to achieve GHG reductions Expand GHG accountability, transparency, and management in the supply chain Enable greater transparency on companies' efforts to engage suppliers Reduce energy use, costs, and risks in the supply chain and avoid future costs related to energy and emissions Reduce costs through improved supply chain efficiency and reduction of material, resource and energy use
Enhance stakeholder information and corporate reputation through public reporting	<ul style="list-style-type: none"> Improve corporate reputation and accountability through public disclosure Meet needs of stakeholders (e.g. investors, customers, civil society, governments), enhance stakeholder reputation, and improve stakeholder relationships through public disclosure of GHG emissions, progress toward GHG targets, and demonstration of environmental stewardship Participate in government- and NGO-led GHG reporting and management programs to disclose GHG-related information

(Table 2.0) Common business goals identified & pursued by reporting companies when conducting a Scope 3 inventory

GHG Inventory Accounting and Reporting Principles

Principle	Description
Relevance	GHG inventory reflects company's GHG emissions, and allows external and internal entities to use data for making decisions
Completeness	All GHG emissions sources within the inventory boundary are accounted for and reported; if exclusions are made, a detailed disclosure is included in their place
Consistency	Methodologies are the same across different scopes and categories of emissions to ensure robust performance tracking over time
Transparency	All assumptions and references to associated calculation methodologies/data sources are clearly and openly disclosed
Accuracy	Ensure GHG calculations are correct and reduce uncertainty as much as possible*

(Table 2.1) Accounting and reporting principles that reporting processors should abide by when composing a comprehensive GHG inventory

NOTE: * More information on accounting for uncertainty in Scope 3 quantification can be found in Appendix B of the [GHG Protocol Corporate Value Chain Accounting and Reporting Standard](#). In addition, the World Resources Institute provides an [Uncertainty Calculation Excel Tool](#) with an accompanying [Uncertainty Guidance Document](#).

Identifying Relevant Scope 3 Activities

Given the limited resources that most organizations have to manage their Scope 3 GHG emissions, it is imperative that the relevancy of sources be determined. Identification of the relevant Scope 3 categories is a critical step that can be dependent on several factors including:

- The size of the Scope 3 category (its contribution to the reporting processor's total GHG emissions)
- The importance of the Scope 3 category to key stakeholder groups (is the information being requested)
- The ability of the reporting processor to reduce the Scope 3 emissions from certain categories

Depending on the reporting processor's consolidation approach, certain categories of Scope 3 emissions may be accounted for in its Scope 1 and/or 2 inventories. Furthermore, the reporting processor may voluntarily exclude certain Scope 3 categories from its inventory so long as a justified and transparent explanation is included in its place.

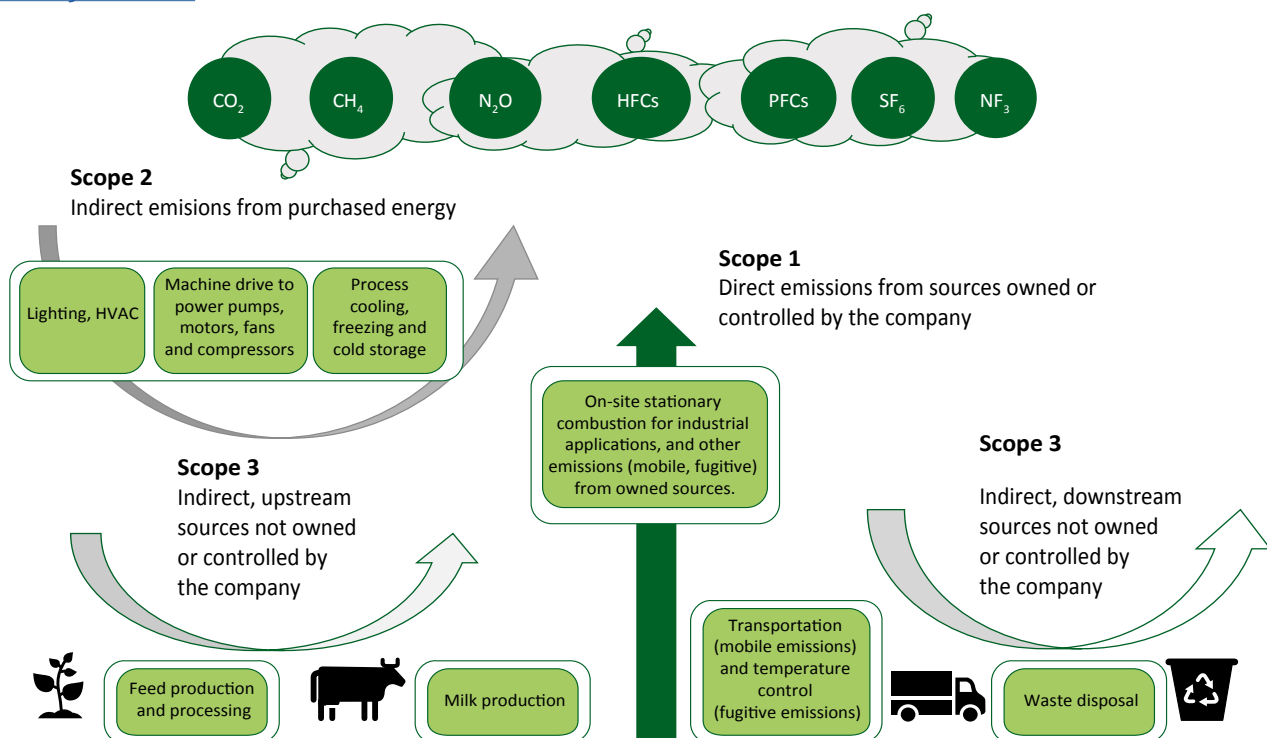
Each Scope 3 category has a minimum required boundary that all reporting processors must adhere to. These minimum boundaries are available in chapter five of the [Corporate Value Chain Accounting and Reporting Standard](#).

Setting the Scope 3 Boundary

Reporting processors should include all Scope 3 GHG emissions from each category to the extent feasible. Often times, reporting processors may not be able to procure necessary data from various emission sources in their supply chain. As stated, reporting processors may include a transparent and justified explanation as a substitute. However, if certain Scope 3 categories in the dairy supply chain are significant sources of emissions, such as Purchased Goods and Services, reporting processors should report emissions data in this category. The [GHG Protocol Corporate Value Chain Accounting and Reporting Standard](#) Table 6.1, outlines the criteria that reporting entities should use to determine if each Scope 3 category is significant.

Several Scope 3 categories may not apply to the reporting processor. For example, smaller processors may not own franchises or have investments. In this case, it is permissible to either report zero emissions for these categories or simply state that the category is not applicable.

To ensure reporting processors account for all GHG emission sources, they should map their value chain in order to identify all relevant categories of their Scope 3 inventory. The map should include a list of dairy farmers and the milk volumes purchased from each farm.



(Figure 2.1) Common Scope 1, 2 and 3 emission sources in the dairy processing industry

Scope 3 GHG Inventory Guidance

This value chain map can be achieved through contacting suppliers and obtaining relevant on-farm data relative to GHG emissions categories. [The FARM Environmental Stewardship Program](#) (discussed in more detail in Scope 3: Purchased Goods and Services, (page 12) is particularly useful for obtaining these data. In addition, the reporting processor should procure a list of the types and quantities of the different dairy products it sells.

For the Scope 3 categories that do apply to reporting processors, abiding by this guidance will ensure that the minimum boundary of GHG emissions are accounted for. However, reporting processors may consult Table 5.4 of the [GHG Protocol Corporate Value Chain Accounting and Reporting Standard](#) for more details.

To account for changing supply chain partners over time, reporting processors should select a fixed starting date to encompass all Scope 3 emissions over the reporting year. For example, one option is to sync the reporting of Scope 3 accounting at the start of the processor's fiscal year. This is a processor decision. Regardless of the fixed starting date, the Scope 3 boundary should account for the company's emissions over one full year (i.e. January 1 through December 31). When utilizing this guidance resource, reporting processors should select their start date, and account for emissions from that date until the same date the following year. Reporting processors may find it easiest to set their fixed starting date for the reporting year at the outset of the accounting exercise.

Collecting Data

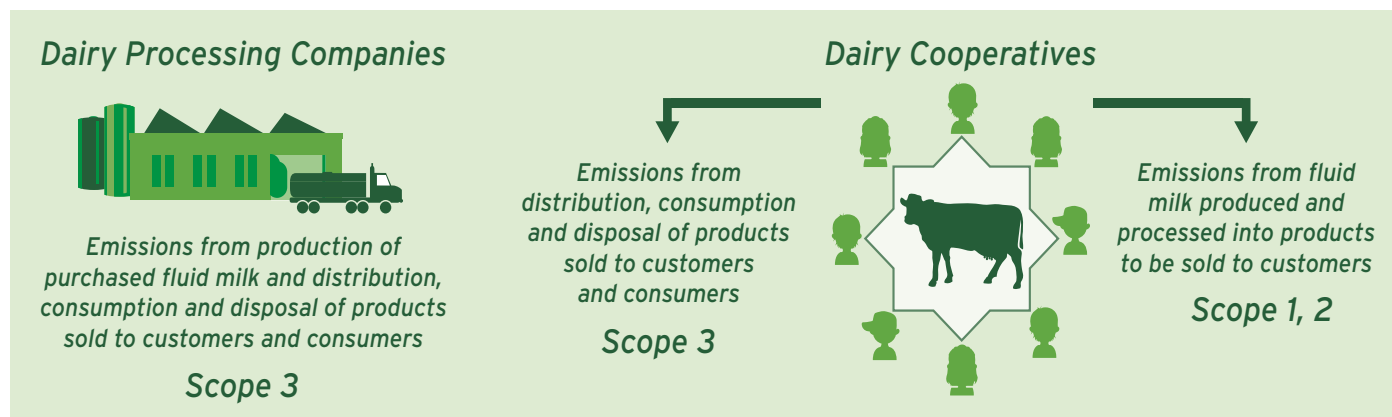
Scope 1 and Scope 2 data are often much easier to collect as opposed to Scope 3. This is due to the greater amount of external engagement reporting processors must do in order to procure the information

necessary to complete a Scope 3 inventory. As a result, the [GHG Protocol Corporate Value Chain Standard](#) recommends prioritizing data collection efforts that are likely to contribute most significantly to the reporting processor's Scope 3 GHG emissions.

In the dairy industry, the largest proportion of GHG emissions arise from on-farm activities such as enteric emissions, feed production and manure management. From the reporting processor's perspective, these emissions would be categorized in the Scope 3: Purchased Goods and Services section since these on-farm practices are directly related to producing raw milk that ultimately ends up at processing plants. Many dairy cooperatives process significant portions of the fluid milk they produce; therefore, this is a crucial differentiation to note when composing a Scope 3 inventory. Figure 2.2 clearly depicts which scopes of GHG emissions apply to different dairy processing business scenarios.

As for the other categories, relative proportions of Scope 3 GHG emissions are subjective to each individual reporting processor. For example, some reporting processors, which manufacture a wide variety of dairy products, have more processing facilities than others and, as a result, have a larger quantity of capital goods, waste, and/or distribution networks. To determine their Scope 3 priorities, they may conduct a Scope 3 screening to estimate which categories contribute most significantly to their overall inventory.

The GHG Protocol outlines other methods of prioritizing data collection. This guidance, however, strongly recommends conducting a Scope 3 screening and prioritization based on the magnitude of requests from larger consumer-facing companies seeking granular data from processors' activities.



(Figure 2.2) Differentiating GHG emissions between dairy processing companies and dairy cooperatives

In its calculations, Scope 3 uses the same emission factor approach as Scopes 1 and 2. The emission factors, however, are different and could come from an Environmentally-Extended Input Output (EEIO) life cycle database to account for all phases of the emissions' lifetime. (See page 2, List of Terms)

When possible, reporting processors should collect primary data, which is sourced from specific activities throughout their own value chain. However, this may not be possible as certain companies upstream and/or downstream in the value chain may not be able to supply the reporting processor with primary data. In this case, reporting processors may use secondary data, which is less specific, but gives an industry-average estimation on the GHG emissions from specific activities based on magnitude. Refer to the [GHG Protocol Corporate Value Chain Accounting and Reporting Standard](#), (Table 7.3) for additional guidance and explanation on primary and secondary data.

Allocating Emissions

In many instances, reporting processors may receive a certain proportion of suppliers' fluid milk, as farms may sell their milk to numerous customers. Additionally, reporting processors often distribute their dairy products to different customers and retailers.

This dynamic receiving and distributing setup in the dairy processing industry makes allocation necessary. Allocation is the process of partitioning the emissions from various categories based on the quantity or amount of good or product purchased/sold. According to the [GHG Protocol Corporate Value Chain Standard](#), there are two scenarios where allocation is necessary. (see Table 2.2)

The GHG Protocol strongly urges reporting entities to avoid allocation whenever possible. This is because allocating emissions adds uncertainty to calculations. Allocation is avoided by collecting granular data. The best approaches to collect granular data are:

- Obtain GHG data from value chain companies on dairy products purchased or sold specifically
- Sub-meter energy use and other activity data where possible
- Use engineering models to estimate emissions from each produced dairy product

For reporting processors that must allocate emissions for certain Scope 3 categories, additional guidance and examples are provided in Chapter 8 of the [Corporate Value Chain Accounting and Reporting Standard](#). Specifically, reporting processors may find Table 8.2 particularly useful to determine if allocation is necessary, as this graphic depicts examples of data necessary. (Table 8.2 shows examples of data need and the allocation method to use.)

Setting a Target and Tracking Emissions Over Time

Reporting processors may choose to set a Scope 3 reduction target and track emissions reductions over time. In the U.S. dairy industry, large consumer-facing dairy purchasing companies, most likely, will be interested in setting targets and tracking emissions over time. This is due to the fact that these companies are larger than the majority of dairy processing companies, and therefore have a much larger Scope 3 GHG footprint. Also, while the majority of dairy processing companies are privately owned, many dairy buyers are publicly traded and face increased shareholder requirements for public, non-financial disclosure of topics such as GHG emissions.

As mentioned in the introduction, the primary purpose of this guidance is to assist dairy processors to accurately measure their Scope 3 GHG emissions to accommodate the needs and requests of larger dairy purchasers. The Science Based Targets Initiative requires companies to set Scope 3 targets whenever Scope 3 emissions represent greater than 40 percent of total emissions (Scope 1 + Scope 2 + Scope 3)

Allocation Scenarios in Dairy Processing	
Allocation Scenario	Example
One facility/activity/vehicle/production line/business unit produces multiple outputs	The same dairy processing plant produces milk and cheese
Emissions are only quantified for an entire facility/activity/vehicle/production line/business unit, rather than fractionally	A dairy customer only purchases yogurt from a processing company that manufactures milk, cheese, yogurt and whey OR A processor purchases only a subset of a given supplier's milk

(Table 2.2) Common allocation scenarios and examples in U.S. dairy

emissions combined). Large dairy customers such as supermarkets are increasingly requesting suppliers to set SBTs as part of the customers' own SBT commitments. Therefore, reporting processors may consult Chapter 9 of the [Corporate Value Chain Accounting and Reporting Standard](#) for information regarding GHG reduction target setting and tracking over time.

Verifying/Assuring Emissions

Similar to setting targets and tracking progress, assurance is optional in the Scope 3 inventory process as well. However, when feasible, reporting processors should attempt to verify their Scope 3 inventory. Doing this will increase both the processing company's and other stakeholders' confidence that the Scope 3 inventory abides by the GHG Protocol reporting principles of completeness, accuracy, consistency, transparency and relevance.

The two most common forms of assurance are first-party assurance, and third-party assurance. First-party assurance involves people from within the reporting processing company who were not directly a part of measuring and quantifying the Scope 3 inventory. Third-party assurance involves people from an external organization who were not a part of composing the Scope 3 inventory, nor who are affiliated with the reporting entity.

If the reporting processor decides to conduct an assurance process of its Scope 3 inventory, this guidance recommends utilizing a third-party verifier. This ensures more independence from the reporting company, mitigating any bias or conflict of interest that may arise from a first-party audit. Chapter 10 of the [GHG Protocol Corporate Value Chain Accounting and Reporting Standard](#) contains guidance on how to properly conduct the assurance process.

Reporting Emissions

This guidance strongly recommends that reporting processors publicly disclose their comprehensive GHG inventory through the CDP (formerly Carbon Disclosure Project) [Climate Change Questionnaire](#).

The CDP is a globally-recognized nonprofit organization that collects and externally displays environmental performance data from companies, cities, states and regions so that investors and purchasers may make informed decisions and identify sustainability strategies. The CDP has three questionnaires – Forestry, Water and Climate Change – that various reporting organizations

may utilize to disclose their environmental metrics. The Climate Change Questionnaire collects information related to GHG emissions specifically and represents a credible and renowned platform by which dairy processors may effectively report their Scope 1, 2 and 3 GHG inventory.

The Climate Change Questionnaire includes an array of both qualitative and quantitative questions. The quantitative questions request GHG metrics that are specific to the reporting entity.

Many of the qualitative questions, however, request information that pertains to the U.S. dairy industry as a whole. As a result, reporting processors may consult the [CDP Climate Change Questionnaire Response Guidance](#) to guide their CDP Climate Change responses, and/or to familiarize themselves with the types of responses that are sufficiently detailed for the CDP questionnaire.

As for the quantitative CDP Climate Change questions, the GHG inventory information collected and calculated in the U.S. dairy processing Scope 1, 2 and 3 accounting and reporting guidance literature is sufficient. This guidance literature abides by the [GHG Protocol Corporate Standard](#), and/or [Corporate Value Chain Standard](#), identified by the CDP as a robust and acceptable protocol by which to account for and calculate GHG emissions.

Chapter 11 of the [GHG Protocol Corporate Value Chain Accounting and Reporting Standard](#) includes more detailed information on the required and optional GHG information a reporting processor must and may include in its GHG inventory disclosure.

Chapter at a Glance

- Defining Purchased Goods and Services
- Identifying Sources
- Collecting Activity Data
- Data Collection Guidance

Scope 3: Purchased Goods and Services

This section provides guidance on how to identify and account for Scope 3 indirect GHG emissions from dairy processors' purchased goods and services upstream in the value chain.

1

Defining Purchased Goods and Services: The Purchased Goods and Services Scope 3 category captures 'cradle-to-gate' GHG emissions from all products purchased by the reporting processor in the reporting year. In other words, any and all GHG emissions created from producing products and/or services up to when they leave the farm are accounted for under the Purchased Goods and Services category. This excludes any emissions from sources owned or controlled by the processor (for example farm operations owned by the cooperative organization).² Therefore, Scope 3: Purchased Goods and Services captures the GHG emissions associated with the on-farm production of raw milk that the reporting processor purchases, as well as materials purchased to package and distribute dairy products. GHG emissions from Purchased Goods and Services account for roughly three quarters of the industry's total emissions; therefore, accurate and detailed accounting and reporting procedures for this category are paramount.

Dairy processors may also purchase an array of other goods and/or services necessary to further process fluid milk into products like cheese and yogurt. Although it is beyond the scope of this guidance document, the Scope 3 GHG emissions from Purchased Goods and Services for products other than fluid milk also must be calculated in order to produce a complete summary of GHG emissions from this category.

2

Identifying Sources: Raw milk generally comprises the largest portion of goods purchased from dairy suppliers, and the on-farm processes necessary to produce raw milk are the largest contributor of dairy supply chain GHG emissions. A more detailed breakdown of the dairy production processes and the main GHG emissions associated with each process are included below:

GHG Emissions Associated with On-Farm Milk Production Processes	
Process	GHG Emissions Generated
Nitrogen fertilizer production	CO ₂
Manure and chemical crop fertilizer application	N ₂ O
Manure/urine deposition on pasture crops	N ₂ O
Energy consumption in field operations, drying and processing of feed crops and fodder	CO ₂
Crop processing into by-products and concentrates	CO ₂
Feed transport from production site to feeding site	CO ₂
Enteric fermentation from ruminant cows	CH ₄
Direct and indirect emissions from manure storage	CH ₄ and N ₂ O

(Table 3.0) Processes involved in producing raw milk upstream from the processing phase of the dairy value chain and their associated GHG emissions

Scope 3: Purchased Goods and Services

2

As mentioned above, the U.S. dairy industry's largest source of GHG emissions comes from the farm. More specifically, a comprehensive [life cycle assessment for fluid milk](#)⁸ conducted by the Innovation Center for U.S. Dairy found that GHG emissions in the U.S. dairy industry are divided into proportions identified in Table 3.1.

Enteric emissions, manure management and feed production alone comprise over 70 percent of the industry's GHG emissions. From a reporting processor's perspective, these areas (in addition to packaging) are considered purchased goods and services. Accurately accounting for emissions from this category is an extremely important component of a reporting processor's Scope 3 inventory.

U.S. Dairy Industry Fluid Milk GHG Emissions Allocation	
Fluid Milk Production Process	Approximate GHG Emissions
Enteric Emissions	26%
Manure Management	25%
Feed Production	20%
Refrigeration and Packaging	9%
Distribution, Retail and Consumer	20%

(Table 3.1) Approximate source allocation of U.S. dairy GHG emissions according to comprehensive fluid milk LCA

NOTE: GHG emissions from conversion of land for crop growing (land use change) should also be reported. However, according to the [GHG Protocol Agricultural Guidance](#), these emissions should be reported in a special 'Biogenic Carbon' category that is not included in Scope 1, 2, or 3, but rather as a separate category.

3

Collecting Activity Data: In order to account for and quantify Scope 3: Purchased Goods and Services, this guidance recommends using the Supplier-Specific method, which entails collecting farm level data from each milk supplier. This method is designed to collect more granular data from value chain emissions because it captures specific information associated with each purchased good or service.

4

Data Collection Guidance: This guidance recommends utilizing the [FARM Environmental Stewardship program](#), managed by the National Milk Producers Federation. This on-farm evaluation collects data on milk production, herd size, energy, crop and feed production and manure management through a limited set of questions. The tool allows dairy cooperatives and processors to obtain accurate and specific data necessary to generate a scientifically robust estimate of GHG emissions from the production of raw milk, while reducing the burden on farmers. Collecting and then aggregating accurate farm-level data associated with all of the processes involved in producing raw milk will reflect a comprehensive Scope 3: Purchased Goods and Services inventory associated with dairy processors' purchased raw milk.

If the reporting cooperative or processor is a large company that sources from many different farms, the FARM Environmental Stewardship module has a [sampling protocol](#) that is based on the "stratified random sampling" concept. It takes a number of factors into account to generate an on-farm GHG footprint that is applicable and representative of the entire reporting processor's supplier footprint. This eliminates the need for larger reporting processors to obtain supplier-specific data from all of its farms, which may pose a significant logistical and financial burden.

NOTE: Data collection guidance for Purchased Goods and Services is based on the FARM Environmental Stewardship module. FARM ES calculations are based on a model informed by the best available peer-reviewed science. For details on the model's methodologies and scope, visit the [FARM website](#) and "[Dairy farm greenhouse gas impacts: A parsimonious model for a farmer's decision support tool](#)".⁷

Chapter at a Glance

- Defining Capital Goods
- Identifying Sources
- Collecting Activity Data
- Data Collection Guidance
- Calculation Approach

Scope 3: Capital Goods

This section provides guidance on how to account for and calculate Scope 3 indirect GHG emissions from the production of capital goods procured by the reporting processor in the reporting time frame.

1

Defining Capital Goods: The Greenhouse Gas Protocol defines capital goods as “final products that have an extended life and are used by the company to manufacture a product, provide a service, or sell, store, and deliver merchandise.”¹ This category captures emissions associated with the production and manufacturing of capital goods used in the reporting processor’s direct operations. The only Scope 3: Capital Goods emissions that need be accounted for are from newly purchased and/or acquired capital goods in the reporting year. Capital goods previously owned before the reporting year should not be included in this section.

2

Identifying Sources: Common capital goods that dairy processors use to produce retail-ready milk and other dairy products are listed below. The arrow represents the chronology associated with dairy processing from raw milk receiving through producing retail-ready milk.

Common Capital Goods in U.S. Dairy Processing	
Processing Stage	Capital Good
Raw Milk Inflow	Holding Tanks
	Filters
	Separators
	Standardizers
Pasteurization	Boilers
	Combustion Turbines
	Process Heaters
	Cooling Equipment
Homogenization	Homogenizers
Finishing and Packaging	Automated Fillers
	Cold Storage Tanks
	Forklifts and Other Off-Road Equipment
Other	Air Conditioning Equipment



(Table 4.0) Common capital goods in U.S. dairy processing to be accounted for in Scope 3: Capital Goods

Scope 3: Capital Goods

3

Collecting Activity Data: Dairy processing is rather infrastructure-heavy throughout the processing phase, demanding an array of machines and equipment to transform the raw milk brought in from the farm into consumer-ready products. Therefore, emissions from capital goods may be a significant source of Scope 3 emissions in the value chain. In order to collect robust product-level data on each capital good, the GHG Protocol recommends using the Supplier-Specific method. However, this may be often difficult for reporting processors to consult each and every capital good supplier for GHG inventory data specific to each piece of equipment. Therefore, this guidance recommends using the Hybrid method, which is a balance between acquiring capital good supplier-specific activity data when available, and using industry average data to fill in gaps. For each capital good, the reporting processor should try to obtain as much of the following information as possible:

Supplier-Specific Methodology for Capital Goods Activity Data	
Capital Good Supplier Activity Data Category	Activity Data to Collect
Fuel and Electricity Information	Capital good suppliers allocated Scope 1 and 2 data (see Chapter 8 of the GHG Protocol Scope 3 Standard and the Innovation Center's Scope 1 and 2 GHG Inventory Guidance for additional guidance)
Raw Material Information	Mass/volume of material inputs, mass/volume of fuel inputs, distance from origin of raw material inputs to capital good manufacturer
Waste Information	Capital good suppliers waste output quantities in capital good manufacturing

(Table 4.1) Activity data to be collected on capital goods using the Supplier-Specific method. This methodology should be used first to obtain all relevant information available from the reporting processor's capital goods suppliers. Then, secondary data may be used to fill in remaining gaps.

4

Data Collection Guidance: Similar to Scope 3: Purchased Goods and Services, reporting processors may consult several internal resources as a means of procuring primary activity data from their capital goods suppliers. These resources include:

- Internal data systems
- Publicly available GHG reports detailing emissions from sourcing and manufacturing capital goods
- User manuals

Capital goods, which may not have readily available supplier-specific data, may have to use secondary emission factors to fill the gaps where primary activity data is not included. It is important to note that if the reporting processor uses secondary emission factors, it must disaggregate and then overwrite them with supplier-specific data. For example, if the reporting processor collects supplier-specific data only on Scope 1, Scope 2 and waste, all other emissions associated with said capital good must be estimated using secondary data. Specific equations necessary for factoring in disaggregation of secondary emission factors are included in the Calculation Approach section.

Relevant emission factors can be found in the following sources:

- [GHG Protocol website](#)
- Supplier-developed emission factors (if the capital good supplier conducted an LCA study on its products)
- [Life cycle databases](#)
- Industry associations
- Government or multilateral agencies

Scope 3: Capital Goods

5

Calculation Approach: Reporting processors may use the equation (below) as a baseline calculation to quantify GHG emissions from capital goods. The equation assumes that the reporting processor's capital good supplier(s) only have supplier-specific data on Scope 1, Scope 2 and waste emissions, and all other GHG emissions data associated with the production of said capital good must be accounted for using secondary data.

Equation for All Capital Goods Purchased

$$\begin{aligned} & \Sigma \text{ Allocated Scope 1 and Scope 2 Emissions of Capital Good Supplier (kg CO}_2\text{e)} \\ & \quad \text{PLUS (+)} \\ & \Sigma \text{ Mass of Waste Generated from Capital Good Production (kg) X Waste Activity Emission Factor} \\ & \quad \text{(kg CO}_2\text{e/kg)} \\ & \quad \text{PLUS (+)} \\ & \Sigma \text{ Quantity of Capital Good (kg, units, \$) X Capital Good Emission Factor (Excluding Scope 1, Scope 2} \\ & \quad \text{and Waste Emissions Generated by Producer) (kg CO}_2\text{e/kg or unit or \$)} \end{aligned}$$

If the reporting processor is able to procure 100% of the supplier-specific data, leaving no need for gaps to be filled in with secondary data, the following equation should be used.

Equation for All Capital Goods Purchased

$$\begin{aligned} & \Sigma \text{ Allocated Scope 1 and Scope 2 Emissions of Capital Good Supplier (kg CO}_2\text{e)} \\ & \quad \text{PLUS (+)} \\ & \Sigma \text{ Mass or Quantity of Material Inputs for Capital Good Production (kg) X Cradle-to-Gate Emission} \\ & \quad \text{Factor for Material (kg CO}_2\text{e)} \\ & \quad \text{PLUS (+)} \\ & \Sigma \text{ Transport Distance of Material Inputs to Capital Good Supplier (km) X Mass or Volume of Material} \\ & \quad \text{Input (tons or TEUs) X Cradle-to-Gate Emission Factor for Capital Good Delivery Vehicle Type} \\ & \quad \text{(kg CO}_2\text{e/ton or TEU/km)} \\ & \quad \text{PLUS (+)} \\ & \Sigma \text{ Mass of Waste Generated from Capital Good Production (kg) X Waste Activity Emission Factor} \\ & \quad \text{(kg CO}_2\text{e/kg)} \end{aligned}$$

Chapter at a Glance

- Defining Fuel and Energy
- Identifying Sources
- Collecting Activity Data
- Data Collection Guidance
- Calculation Approach

Scope 3: Fuel and Energy Related Activities

This section provides guidance on how to account for and calculate Scope 3 indirect GHG emissions from the production of fuel and energy that the reporting processor purchases.

1

Defining Fuel and Energy Related Activities: This category accounts for emissions from purchased fuels and electricity much like Scope 1 and 2. However, the key difference is that the reporting processor's Scope 3 GHG emissions from purchased fuel and electricity comprise those emissions arising from the extraction, production and transportation of the fuel and electricity that it purchases, not the consumption. For example, if a reporting processor consumes 100 kWh of fuel, and 200 kWh of electricity in the reporting year, then its Scope 3: Fuel and Energy Related Activities inventory would be the GHG emissions associated with extracting, producing and distributing that quantity of fuel and electricity over a given distance to the reporting processor (end consumer). Therefore, it is important for the reporting processor to use emission factors that exclude GHG emissions from combustion in their calculations.

2

Identifying Sources: Table 5.0 (below) gives a more detailed depiction of the upstream fuel and electricity production activities relevant to reporting processors:

Scope 3 Fuel and Energy Related Emissions Sources		
Emission Source	Description	Example
Purchased Fuels	Extraction, production and transportation of fuels	Coal mining, gasoline refining, biofuel production, natural gas distribution
Purchased Energy	Extraction, production and transportation of fuels used to produce electricity, steam, heating, and cooling	Coal mining, fuel refining, natural gas extraction
Transmission & Distribution Losses	Fuel and/or electricity that escapes either in generation at the plant, or in transmission to the reporting processor	Electricity loss through the transmission line due to resistance

(Table 5.0) Upstream fuel and energy production processes that represent Scope 3 sources to dairy processors

Scope 3: Fuel and Energy Related Activities

3

Collecting Activity Data: Quantifying a wholly representative Scope 3: Fuel and Energy Related Activities inventory requires several equations, each demanding different activity data and different emission factors. The appropriate activity data that corresponds to each emission source is included in Table 5.1 (below).

Relevant Activity Data and Emission Factors for Scope 3: Fuel and Energy Related Activities		
Emission Source	Activity Data Needed	Emission Factor Needed
Purchased Fuels	Type and amount of all fuels directly consumed	Fuel provider-specific - for extraction, production and transportation per unit of fuel consumed at processing facility, by fuel type and region
Purchased Energy	Quantities of electricity, steam, heating and cooling purchased (sub-divided by supplier, or grid region)	Utility-specific - for extraction, production and transportation of fuels consumed by processing facility per MWh of elec./steam/heat/cooling generated Available in eGRID2016 Datafile (XLSX) EPA eGRID sub-region emission factor database
Transmissions & Distribution Losses	Electricity, steam, heating and cooling per unit of consumption; divided by grid region	Utility-specific - transmission & distribution loss rate, specific to grid where processing facility's energy is generated and consumed Available in EPA eGRID sub-region emission factor database

(Table 5.1) Activity data and emission factors to be collected to compose a full account of Scope 3: Fuel and Energy Related Activities inventory

4

Data Collection Guidance: For Purchased Fuels: Reporting processors may reference a number of resources to obtain this activity data, such as:

- Reporting processor's own Scope 1 inventory
- Fuel suppliers

Emission factor resources (if necessary):

- Life cycle databases, available on the [GHG Protocol website](#)
- [EPA eGRID database](#)

For Purchased Electricity: This category requires that the reporting processor disaggregate the total quantity of electricity, steam, heat or cooling purchased by either supplier, or grid region. Resources for this data are as follows:

- Reporting processor's own Scope 2 inventory
- Government agency energy management departments
- Energy suppliers/generators

Scope 3: Fuel and Energy Related Activities

4

Emission factor resources:

- Supplier-developed emission factors
- Life cycle databases, available on the [GHG Protocol website](#)
- [EPA eGRID database](#)

For Transmission & Distribution Losses: This category requires that the reporting processor apply the percentage of transmission and distribution losses to the total quantity of electricity, steam, heat, or cooling purchased. Resources for this data are as follows:

- Reporting processor's own Scope 2 inventory
- Resources for transmission and distribution loss percentages
- [EPA eGRID database](#)

5

Calculation Approach: This guidance recommends using the Supplier-Specific method for all three emission sources within this category. This method involves collecting fuel, electricity and T&D loss rates data specifically from the reporting processor's suppliers. The corresponding equations for each emission source are included below.

Once the reporting processor has accounted for GHG emissions from all three sources in this category, the individual source totals may be aggregated to quantify the complete Scope 3: Fuel and Energy Related Activities inventory.

Equation for For Purchased Fuels

\sum (Fuel Consumed (kWh, m³, etc.) X Upstream Fuel Emission Factor (kg CO₂e/kWh, m³, etc..))
Where: Upstream Fuel Emission Factor = Life Cycle Emission Factor - Combustion Emission Factor

Equation For Purchased Electricity

\sum (Electricity Consumed (kWh) X Upstream Electricity Emission Factor (kg CO₂e/kWh))

PLUS (+)

(Steam Consumed (kWh) X Upstream Steam Emission Factor (kg CO₂e/kWh))

PLUS (+)

(Heat Consumed (kWh) X Upstream Heat Emission Factor (kg CO₂e/kWh))

PLUS (+)

(Cooling Consumed (kWh) X Upstream Cooling Emission Factor (kg CO₂e/kWh))

Where: Upstream Emission Elec./Steam/Heat/Cooling Emission Factor = Life Cycle Emission Factor - Combustion Emission Factor - Transmission & Distribution Losses

NOTE: The \sum in this equation represents summing across either electricity suppliers or regions.

Scope 3: Fuel and Energy Related Activities

5

Equation for Transmission and Distribution

Σ (Electricity Consumed (kWh) **X** Elec. Life Cycle Emission Factor (kg CO₂e/kWh) **X** T & D Loss Rate (%))

PLUS (+)

(Steam Consumed (kWh) **X** Steam Life Cycle Emission Factor (kg CO₂e/kWh) **X** T & D Loss Rate (%))

PLUS (+)

(Heat Consumed (kWh) **X** Heat Life Cycle Emission Factor (kg CO₂e/kWh) **X** T & D Loss Rate (%))

PLUS (+)

(Cooling Consumed (kWh) **X** Cooling Life Cycle Emission Factor (kg CO₂e/kWh) **X** T & D Loss Rate (%))

NOTE: The Σ in this equation represents summing across either electricity suppliers or regions.

Chapter at a Glance

- Defining Transportation and Distribution
- Identifying Sources
- Collecting Activity Data
- Data Collection Guidance
- Calculation Approach

Scope 3: Upstream Transportation and Distribution

*This section provides guidance on how to account for and calculate Scope 3 indirect GHG emissions from transportation and distribution of products purchased by the reporting processor from its Tier 1 suppliers.**



Quick Tip: *Tier 1 suppliers refer to the farms that the reporting processor has a purchase order for goods and services

1

Defining Upstream Transportation and Distribution: Upstream transportation and distribution refers to the transportation and distribution services that the reporting processor purchases over the reporting period. Any transportation and distribution service not purchased by the reporting processor is classified as downstream transportation and distribution. Therefore, if the reporting processor hires an external company owning its own fleet of delivery trucks to distribute the processor's products, the GHG emissions from those trucks would constitute the reporting processor's Scope 3: Upstream Transportation and Distribution emissions. However, if the reporting processor does not purchase the transportation and distribution service, the resultant GHG emissions would be accounted for in Scope 3: Downstream Transportation and Distribution.

Furthermore, if the reporting processor's Tier 1 supplier purchases from a supplier as well (the reporting processor's tier 2 supplier), emissions from the transportation and distribution between the Tier 1 and 2 suppliers are accounted for in Scope 3: Purchased Goods and Services.

2

Identifying Sources: Much like the Scope 1: Mobile Combustion Emissions guidance, accounting for Scope 3: Upstream Transportation and Distribution emissions sources involves identifying the mobile emission sources in the reporting processor's value chain that are owned and/or operated by other companies.

Common Mobile Emission Sources in U.S. Dairy Transportation and Distribution		
Common Scope 3 Mobile Combustion Sources		Common Fuels Used
On-Road Vehicles	Combination trucks and fluid milk trucks	Diesel fuel, gasoline, bio-diesel
Off-Road Vehicles (Mobile Machinery)	Forklifts and non-road equipment	Diesel fuel, gasoline, propane
	Construction equipment	Diesel fuel

(Table 6.0) Common Scope 3 mobile emission sources and accompanying fuels used in the dairy value chain

Scope 3: Upstream Transportation and Distribution

3

Collecting Activity Data: Again, like Scope 1: Mobile Combustion Emissions, key activity data is needed to calculate Scope 3: Upstream Transportation and Distribution emissions. Fuel use data or distance-traveled data can both be used for calculating Scope 3: Upstream Transportation and Distribution GHG emissions. If the distance-traveled approach is used, some additional information on the vehicle characteristics is required.

Activity Data for Mobile Emission Calculations	
Data Type	Common Fuels Used
Vehicle Characteristics	Type and model year
Distance Traveled	Miles, kilometers
Fuel Type	Gasoline, diesel, fuel oil, CNG, LNG, LPG
Fuel Amount	Gallon, liter, barrel, cubic foot, cubic meter

(Table 6.1) Activity data to be collected for each mobile combustion emissions source not owned or operated by the reporting processor

4

Data Collection Guidance: Sources for activity data necessary to calculate Scope 3: Upstream Transportation and Distribution data include:

- Aggregated fuel receipts from suppliers
- Purchase records from suppliers
- Internal transport management systems³

5

Calculation Approach: Use the [GHG Protocol Mobile Combustion GHG Emissions Calculation Tool](#) as in the Scope 1: Mobile Combustion Emissions guidance. Ensure that 'Scope 3' is selected under the 'Scope' column in the 'Activity Data' tab. This tool developed by the GHG Protocol has the appropriate emissions factors built in. It automatically calculates Scope 3 emissions from transportation and distribution so long as the appropriate activity data is included.

If the reporting processor chooses to use an alternate method of calculating Scope 3: Upstream Transportation and Distribution emissions, data sources for appropriate emission factors include⁵:

- Transportation carriers
- Government agencies (i.e. [EPA](#), [IPCC](#))
- [The Climate Registry](#)
- [GHG Protocol website](#)
- Industry associations

Chapter at a Glance

- Defining Operations
- Identifying Sources
- Collecting Activity Data
- Data Collection Guidance
- Calculation Approach

Scope 3: Waste Generated in Operations

This section provides guidance on how to account for and calculate Scope 3 indirect GHG emissions from disposal and treatment of waste generated by the reporting processor.

1

Defining Waste Generation in Operations: This Scope 3 category specifically captures emissions generated from the handling and disposal of waste generated in the reporting processor's owned and/or operated facilities. It is important to note that CO₂ emissions from biomass materials are reported outside of the scopes in a separate memo item. Since much of dairy processing waste is generated from biomass materials, reporting processors should account for CO₂ emissions from waste in an appended memo. However, CH₄ (methane) and N₂O (nitrous oxide) emissions are still accounted for in the scopes for this category. Furthermore, this category accounts for all future emissions deriving from the reporting processor's waste in the reporting year.

U.S. dairy processing generally yields little solid waste, making this a rather insignificant Scope 3 source for reporting processors. However, the American dairy processing industry does generate significant quantities of wastewater that produce GHG emissions when treated and/or disposed of.⁴ Undoubtedly, reporting processors will produce varying quantities of wastewater depending on the number of processing facilities and the type of dairy products produced.

2

Identifying Sources: Table 7.0 identifies key procedures in the dairy processing industry that produce waste. Depending on the dairy products produced by the reporting processor, these waste sources may or may not apply. Reporting processors should consult the table based on products produced.

Source: UNFAO

Typical U.S. Dairy Processes that Produce Waste		
Dairy Process	Waste Source	Waste Type
Milk Receiving	Storage tank washing, pipeline washing and sanitizing	Wastewater
Whole Milk Processing	Cleaning operations between product changes	Wastewater
Cheese/Whey/Curd Processing	Whey production, wash water, curd particles	Wastewater
Butter/Ghee Processing	Butter washing	Wastewater
Milk Powder Processing	Cleaning, fine dust emission from drying	Wastewater
Condensed Milk/Cream/Khoa Processing	Coagulated milk, fine cheese curd particles	Wastewater
Wastewater Purification	Resulting sludge after purification	Solid Waste

(Table 7.0) Waste-producing processes typical of the U.S. dairy industry's processing activities

Scope 3: Waste Generated in Operations

3

Collecting Activity Data: This guidance recommends using the Waste-Type-Specific method to account for and calculate GHG emissions from the reporting processor's third-party handled waste. This entails differentiating between waste types and the disposal method for each waste type. Reporting processors should collect the following:

- Waste produced per quantity of product (i.e. m³ of wastewater per gallon of fat and protein corrected milk)
- Different waste types associated with dairy processing
- Waste treatment applied to each waste type (i.e. landfill, wastewater treatment, recycling)

4

Data Collection Guidance: Third-party waste handlers often charge companies based on method of waste disposal, so this is a relatively easy way for reporting processors to identify waste disposal methods that apply. Waste management bills often contain this specific information. Furthermore, appropriate emission factors necessary for calculating operation-derived waste can be found in a variety of databases, including:

- [IPCC Guidelines](#)
- [Life cycle databases](#)
- Industry associations

If a third-party waste handler does not charge based on waste disposal method, this guidance recommends using the Average-Data method. It involves using average emission factors for each disposal method (i.e. landfill) and multiplying these emission factors by quantities of each waste type.

5

Calculation Approach: Reporting processors may use the calculation equation below to account for Scope 3: Waste Generated in Operations.

Once the reporting processor applies this equation for each waste type, simply aggregating the CO₂e for each waste type will yield the total GHG emissions from waste management. Alternatively, reporting processors may utilize the [US EPA's Waste Reduction Model](#) to quantify emission in this category.

Equation for Waste Generated in Operations

$$\Sigma (\text{Waste Produced (tons or m}^3) \times \text{Specific Emission Factor for Waste Type (kg CO}_2\text{e/ton or m}^3))$$

Chapter at a Glance

- Defining Leased Assets
- Identifying Sources
- Collecting Activity Data
- Data Collection Guidance
- Calculation Approach

Scope 3: Upstream Leased Assets

This section provides guidance on how to account for and calculate Scope 3 indirect GHG emissions from sources the reporting processor leases upstream in its supply chain.

1

Defining Upstream Leased Assets: If the reporting processor does not own all of its processing facilities and/or equipment, but rather leases them, the associated GHG emissions from these assets may be accounted for in this category depending on the GHG inventory consolidation approach utilized.

If the reporting processor has adopted the Operational Control approach, GHG emissions from operation of leased facilities/equipment are considered under Scope 1 and Scope 2, despite not being owned by the reporting entity. However, if another consolidation approach has been implemented, the Scope 3 emissions in this category include the Scope 1 and 2 emissions of the reporting processor's lessor(s).

2

Identifying Sources: GHG emission sources from leased assets can be calculated as detailed in the methodology for Scope 1 and 2 inventories. By aggregating Scope 1 and 2 emissions from all leased assets (buildings, equipment etc.), the reporting processor can clearly define its Scope 3: Upstream Lease Assets inventory.

GHG Emission Sources from Leased Assets		
Leased Asset	Emissions	Scope
Processing Facilities/Office Space	Fuel consumed, refrigerant leaked, process emissions	Scope 1
	Electricity consumed, steam consumed, heat consumed, cooling consumed	Scope 2
Equipment/Machines	Fuel consumed	Scope 1
	Electricity consumed	Scope 2

(Table 8.0) GHG emission sources from leased assets

3

Collecting Activity Data: This guidance recommends using the Asset-Specific method, outlined by the [GHG Protocol Corporate Value Chain Standard](#). This method involves obtaining data specific to each and every asset that the reporting processor leases. For each leased asset, the reporting processor should collect activity data outlined in Table 8.0. If the reporting processor is unable to obtain the fuel and energy data associated with each leased asset, other methods of accounting for Scope 3: Upstream Leased Assets emissions can be found in the [GHG Protocol Technical Guidance for Calculating Scope 3 Emissions](#).

Scope 3: Upstream Leased Assets

4

Data Collection Guidance: Much like Scope 1 and 2 accounting, the necessary activity data for this category can be collected via many different methods:

- Utility bills
- Purchase records
- Meter readings
- Internal IT systems

Appropriate emission factors are available from an array of different sources as well, such as:

- The [EPA GHG Emissions Factors Hub](#)
- [Life cycle databases](#)
- Other government agencies such as the [IPCC](#), and [Climate Registry](#)
- Industry associations
- Company-developed factors if applicable

5

Calculation Approach: The following equation represents the appropriate methodology for calculating Scope 3: Upstream Leased Assets using the Asset-Specific method:

Calculating Scope 3: Upstream Leased Assets using the Asset-Specific Method

Scope 1 Emissions from Upstream Leased Assets

(Fuel Consumed \times Fuel Emission Factor (kg CO₂e/fuel unit)) $+$ (Refrigerant Leakage (kg) \times Refrigerant Emission Factor (kg CO₂e/kg))

PLUS (+)

Scope 2 Emissions from Upstream Leased Assets

(Electricity, Steam, Heating, Cooling Consumed (kWh)) \times (Electricity, Steam, Heating, Cooling Emission Factor (kg CO₂e/kWh))

EQUALS (=)

Scope 3 Emissions from Upstream Leased Assets

Scope 3: Upstream Leased Assets Inventory $= \sum$ Scope 3 Emissions from All Upstream Leased Assets

Reporting processors may use the [GHG Emissions from Purchased Electricity](#), [GHG Emissions from Stationary Combustion](#), and [Refrigeration and Air-Conditioning Equipment Excel tools](#) as resources to assist in quantifying emissions in this category. They all have built-in GHG Protocol emission factors in order to streamline GHG emissions from fuel, electricity, steam, heat, cooling and refrigeration.

If the reporting processor only leases a section, or portion of the facility, and the facility lacks sub-metering infrastructure, then energy consumption may be allocated using an estimation based on the share of space the reporting processor leases (based on floor space). This may be calculated using the following equation:

Equation for Section or Portion Leases

Reporting Processor's Used Space (m²) / (Building's Total Area (m²) \times Building Occupancy Rate) \times Total Building Energy Use (kWh)

Chapter at a Glance

- Defining Transportation and Distribution
- Identifying Sources
- Collecting Activity Data
- Data Collection Guidance
- Calculation Approach

Scope 3: Downstream Transportation and Distribution

This section provides guidance on how to account for and calculate Scope 3 indirect GHG emissions from transportation and distribution of sold products not owned or operated by the reporting facility.

1

Defining Downstream Transportation and Distribution: Downstream Transportation and Distribution refers to the transportation and distribution services that the reporting processor does not purchase over the reporting period. Any transportation and distribution service purchased by the reporting processor is classified as Upstream Transportation and Distribution. Therefore, if the reporting processor receives or sells product from/to another company that pays for all transportation and distribution needs, the GHG emissions from said transportation and distribution would constitute the reporting processor's Scope 3: Downstream Transportation and Distribution emissions.

Furthermore, emissions resulting from storage of the milk downstream from the reporting processor are accounted for in this category. For example, GHG emissions arising from leaking refrigerants, as well as fuel and/or electricity used to refrigerate the sold milk in the distribution trucks are included in this category.

Differentiating Between Upstream and Downstream Transportation and Distribution in U.S. Dairy		
Scenario	Entity	
	Reporting Processor	Retailer
If reporting processor does not pay for transportation of dairy products to retailer	Scope 3: Downstream Transportation and Distribution	Scope 3: Upstream Transportation and Distribution
If reporting processor does pay for transportation of dairy products to retailer	Scope 3: Upstream Transportation and Distribution	Scope 1 & 2 Or Scope 3: Downstream Transportation and Distribution

(Table 9.0) Differentiation of transportation and distribution of dairy throughout the U.S. dairy value chain.

2

Identifying Sources: Much like the Scope 1: Mobile Combustion Emissions guidance, accounting for Scope 3: Downstream Transportation and Distribution emissions sources involves identifying the mobile emission sources in the reporting processor's value chain that are owned and/or operated by other companies.

Scope 3: Downstream Transportation and Distribution

2

Downstream Transportation and Distribution Emission Sources		
Downstream Activity	Infrastructure	Emission source
On-Road Vehicles	Combination trucks and fluid milk trucks	Diesel fuel, gasoline, bio-diesel
	In-truck refrigeration	Leaking refrigerants
Warehouses and Distribution Centers	Refrigeration	Purchased electricity, leaking refrigerants
Retail Facilities	Refrigeration	Purchased electricity, leaking refrigerants

(Table 9.1) Activity data to be collected for each mobile combustion emissions source not owned or operated by the reporting processor

3

Collecting Activity Data: Again, like Scope 1: Mobile Combustion Emissions, key activity data is needed to calculate Scope 3: Downstream Transportation and Distribution emissions. Use the Distance-Based method to quantify downstream transportation emissions, which requires the following activity data:

Activity Data for Mobile Emission Calculations	
Data Type	Information Needed
Vehicle Characteristics	Type and model year
Distance Traveled	Miles, kilometers
Fuel Type	Gasoline, diesel, fuel oil, CNG, LNG, LPG
Fuel Amount	Gallon, liter, barrel, cubic foot, cubic meter

(Table 9.2) Activity data to be collected for each mobile combustion emissions source not owned or operated by the reporting processor

Activity Data for Refrigerant Leakage	
Data Type	Information Needed
Type of Equipment	In-truck refrigeration, warehouse refrigeration, retail refrigeration
Refrigerant Used	HFC type, PFC type
Annual Leakage Rate	Percent
Total Refrigerant Charge	Pounds

(Table 9.3) Activity data to be collected for each refrigeration source not owned or operated by the reporting processor

Scope 3: Downstream Transportation and Distribution

4

Data Collection Guidance: Sources for activity data necessary to calculate Scope 3: Downstream Transportation and Distribution data include:

- Aggregated fuel receipts from customers
- Purchase records from customers
- Internal transport management systems³
- Retailer equipment records
- Third-party transportation fleet records
- [Life cycle databases](#)

5

Calculation Approach: Use the [GHG Protocol Mobile Combustion GHG Emissions Calculation Tool](#) as in the Scope 1 Mobile Emissions guidance. However, this time ensure that 'Scope 3' is selected under the 'Scope' column in the 'Activity Data' tab. This tool, developed by the GHG Protocol, has the appropriate emission factors built in. It automatically calculates Scope 3 emissions from transportation and distribution so long as the appropriate activity data is input.

To calculate emissions from refrigeration throughout the downstream value chain, reporting processors may utilize the [GHG Protocol Refrigeration and Air-Conditioning Equipment calculation tool](#). It has built-in emissions factors for calculating refrigerant emissions and offers a variety of methods with instructions.

If the reporting processor chooses to use an alternate method of calculating Scope 3 upstream transportation and distribution emissions, data sources for appropriate emission factors include⁵:

- Transportation carriers
- Government agencies (i.e. [EPA](#), [IPCC](#))
- [The Climate Registry](#)
- [GHG Protocol website](#)
- Industry associations

Chapter at a Glance

- Defining Leased Assets
- Identifying Sources
- Collecting Activity Data
- Data Collection Guidance
- Calculation Approach

Scope 3: Downstream Leased Assets

This section provides guidance on how to account for and calculate Scope 3 indirect GHG emissions from owned assets that the reporting company leases to other parties.

1

Defining Downstream Leased Assets: This category accounts for emissions from leased assets that the reporting processor owns and rents to other companies. Although uncommon in the dairy processing industry, there may be occasions where a cooperative or large processing company leases one or several of its facilities and/or equipment to other companies. Contrary to Scope 3: Upstream Leased Assets, the reporting processor is the lessor in this category, which captures GHG emissions from any and all facilities, or equipment that are generated by the lessee.

Similar to Scope 3: Upstream Leased Assets, GHG emissions from owned, but not operated assets may be considered under Scope 1 or Scope 2 for the lessor, depending on the reporting processor's consolidation approach. Furthermore, this category of GHG emissions mirrors Scope 3: Upstream Leased Assets in that the leasing company's Scope 1 and 2 GHG emissions associated with the asset(s) are equivalent to the Scope 3: Downstream Leased Assets for the reporting processor.

2

Identifying Sources: By aggregating leasing companies' Scope 1 and 2 emissions from all reporting processor-owned assets (buildings, equipment etc.), the reporting processor can clearly define its Scope 3: Upstream Lease Assets inventory.

GHG Emission Sources from Leased Assets		
Leased Asset	Emissions	Scope
Processing Facilities/Office Space	Fuel consumed, refrigerant leaked, process emissions	Scope 1
	Electricity consumed, steam consumed, heat consumed, cooling consumed	Scope 2
Equipment/Machines	Fuel consumed	Scope 1
	Electricity consumed	Scope 2

(Table 10.0) GHG emission sources from leased assets

3

Collecting Activity Data: This guidance recommends using the Asset-Specific method, outlined by the [GHG Protocol Corporate Value Chain Standard](#). This method involves obtaining data that is specific to each and every asset that the reporting processor is the lessor to. For each asset, the reporting processor should collect activity data outlined in Table 10.0. If the reporting processor is unable to obtain the fuel and energy data associated with each asset, other methods of accounting for Scope 3: Downstream Leased Assets emissions can be found in the [GHG Protocol Technical Guidance for Calculating Scope 3 Emissions](#).

Scope 3: Downstream Leased Assets

4

Data Collection Guidance: Much like Scope 1 and 2 accounting, the necessary activity data for this category can be collected via many different methods:

- Utility bills
- Purchase records
- Meter readings
- Internal IT systems

Appropriate emission factors are available from an array of different sources as well, such as:

- The [EPA GHG Emissions Factors Hub](#)
- [Life cycle databases](#)
- Other government agencies such as the [IPCC](#), and [Climate Registry](#)
- Industry associations
- Company-developed factors if applicable

5

Calculation Approach: The following equation represents the appropriate methodology for calculating Scope 3: Downstream Leased Assets using the Asset-Specific method. It is the same methodology for Scope 3: Upstream Leased Assets:

Calculating Scope 3: Downstream Leased Assets using the Asset-Specific Method

Scope 1 Emissions from Upstream Leased Asset

(Fuel Consumed **X** Fuel Emission Factor (kg CO₂e/fuel unit)) **+** (Refrigerant Leakage (kg) **X** Refrigerant Emission Factor (kg CO₂e/kg))

PLUS (+)

Scope 2 Emissions from Upstream Leased Asset

(Electricity, Steam, Heating, Cooling Consumed (kWh)) **X** (Electricity, Steam, Heating, Cooling Emission Factor (kg CO₂e/kWh))

EQUALS (=)

Scope 3 Emissions from Upstream Leased Asset

Scope 3: Upstream Leased Assets Inventory = \sum Scope 3 Emissions from All Upstream Leased Assets

Reporting processors may use the [GHG Emissions from Purchased Electricity](#), [GHG Emissions from Stationary Combustion and Refrigeration and Air-Conditioning Equipment Excel tools](#) as resources to assist in quantifying emissions in this category. They have built-in GHG Protocol emission factors to streamline GHG emissions from fuel, electricity, steam, heat, cooling and refrigeration.

If the leasing company only leases a section or portion of the facility, and the facility lacks sub-metering infrastructure, then energy consumption may be allocated using an estimation based on the share of space the company leases (based on floor space). This may be calculated using the following equation:

Equation for Section or Portion Leases

Leasing Company's Used Space (m²) / (Building's Total Area (m²) **X** Building Occupancy Rate) **X** Total Building Energy Use (kWh)

Appendix: This category is not a priority in the U.S. dairy value chain, but is recommended for a comprehensive Scope 3 inventory.

Chapter at a Glance

- Defining Business Travel
- Identifying Sources
- Collecting Activity Data
- Data Collection Guidance
- Calculation Approach

Scope 3: Business Travel

This section provides guidance on how to account for and calculate Scope 3 indirect GHG emissions from business-related travel.

While this section is not a priority in U.S. dairy GHG accounting, reporting processors should include it to compose the most comprehensive Scope 3 inventory (account for prioritized sections first).

1

Defining Business Travel: Business-related travel emissions are considered Scope 3 indirect emissions if the method of transportation used by the traveling employee is not owned and/or operated by the reporting processor. If the vehicle used by the traveling employee is owned by the reporting processor, emissions from said vehicle would be accounted for under Scope 1 (if powered by fuel), or Scope 2 (if powered by electricity). Emissions from leased vehicles operated by the reporting processor are considered Scope 3, but are accounted for in Scope 3: Upstream Leased Assets. Emissions from employee commuting are accounted for in Scope 3: Employee Commuting.

Differentiating Mobile Emission Sources and Scopes		
Emitting Transportation Activity	Category	Scope
Operation of owned/controlled vehicles	Fuel/electricity consumption	Scope 1, Scope 2
Business travel in unowned/non-processor operated vehicles	Business travel	Scope 3
Transportation to and from work in unowned/non-processor operated vehicles	Employee commuting	Scope 3
Transportation in leased vehicles operated by reporting processor	Upstream leased assets	Scope 3

(Table 11.0) Differentiation of transportation-related emission sources

2

Identifying Sources: Identifying sources of emissions from business travel simply involves keeping track of any and all business trips via air, rail, bus, automobile (i.e. rental cars), or other travel methods. Reporting processors may also include emissions from hotel stays in this category. Although optional, including this information may give a more accurate and robust account of Scope 3 emissions from business travel. Hotel emissions are quantified using emission factors specific to hotel type (i.e. kg CO₂ per hotel night).

Scope 3: Business Travel

3

Collecting Activity Data: The [GHG Protocol Scope 3 Calculation Guidance](#) recommends using the Distance-Based method for calculating business travel-related emissions for reporting entities not significantly impacted by business travel as a contributor to overall Scope 3 inventory. This method requires keeping track of the distance traveled and transportation method used for all business trips in the reporting year. If activity data is not available for calculating emissions using the Distance-Based method, reporting processors may employ the Spend-Based method, which involves a different set of emission factors called secondary (EEIO) emission factors. By determining the total amount spent on business travel in the reporting year, the reporting processor may calculate emissions using these secondary emission factors. However, the GHG Protocol recommends using the Distance-Based method when possible.

Activity Data for Business Travel Emissions Calculations	
Data Type	Information Needed
Mode of Transport	Road, Rail, Water, Aircraft
Vehicle Characteristics	Type and Class
Distance Traveled	Miles, Kilometers
Passengers	Number of Passengers Traveling

(Table 11.1) Relevant activity data to collect for Scope 3: Business Travel accounting

4

Data Collection Guidance: Sources of activity data necessary to calculate Scope 3: Business Travel emissions include:

- Distance tracking reports through a travel agency or other travel providers
- Distance tracking through internal expense and reimbursement systems
- Annual employee surveys
- Emissions data obtained through travel providers

5

Calculation Approach: Use the [GHG Protocol's Mobile Combustion GHG Emissions Calculation Tool](#), which has built-in emission factors for various transportation methods, and will automatically calculate CO₂, CH₄ and N₂O emissions data from the reporting processor's input activity data. It is important to select 'Scope 3' under the 'Scope' column in the 'Activity Data' tab. If a reporting processor wishes to utilize a calculation resource other than the GHG Protocol's Mobile Combustion GHG Emissions Calculation Tool, the [U.S. EPA Climate Leaders GHG Inventory Protocol, "Optional Emissions from Commuting, Business Travel and Product Transport"](#)⁵ may be consulted.

Appendix: This category is not a priority in the U.S. dairy value chain, but is recommended for a comprehensive Scope 3 inventory.

Chapter at a Glance

- Employee Commuting
- Identifying Sources
- Collecting Activity Data
- Data Collection Guidance
- Calculation Approach

Scope 3: Employee Commuting

This section provides guidance on how to account for and calculate Scope 3 indirect GHG emissions from employee commuting.

While this section is not a priority in U.S. dairy GHG accounting, reporting processors should include it to compose the most comprehensive Scope 3 inventory (account for prioritized sections first).

1

Defining Employee Commuting: This Scope 3 category captures all GHG emissions generated from the reporting processor’s employee base traveling to and from work at the processing and/or manufacturing facilities and corporate offices.

Differentiating Mobile Emission Sources and Scopes		
Emitting Transportation Activity	Category	Scope
Operation of owned/controlled vehicles	Fuel/electricity consumption	Scope 1, Scope 2
Business travel in unowned/non-processor operated vehicles	Business travel	Scope 3
Transportation to and from work in unowned/non-processor operated vehicles	Employee commuting	Scope 3
Transportation in leased vehicles operated by reporting processor	Upstream leased assets	Scope 3

(Table 12.0) Differentiation of transportation-related emission sources

2

Identifying Sources: Depending on region, access to public transportation and processing facility location, employees may utilize a diverse array of transportation methods to commute to and from work. Therefore, employee commuting emissions may arise from sources such as automobile, bus, rail, air and subway. Reporting processors may also include emissions arising from employees working remotely in this category, although this is optional.

3

Collecting Activity Data: Commuting employees may contribute significantly to the Scope 3 inventory depending on company size. The [GHG Protocol Scope 3 Corporate Value Chain Standard](#) recommends using the Fuel-Based method, which requires collecting data on amount of fuel consumed through employee commuting. Data on the types and quantities/cost of various fuels consumed for all employees at all processing facilities may be difficult to collect. If so, the reporting processor may utilize the Distance-Based method, as in Scope 3: Business Travel, to accurately quantify emissions from employee commuting.

For Fuel-Based activity data and calculation methodology, use the Scope 3: Upstream Transportation and Distribution. The reporting processor may refer to this category if using the Fuel-Based approach. If the Distance-Based method is used, apply the methodology for Scope 3: Business Travel.

continued on next page

Scope 3: Employee Commuting

3

Activity Data for Employee Commuting Emissions Calculations

Data Type	Information Needed
Mode of Transport	Road, Rail, Water, Aircraft
Vehicle Characteristics	Type and Class
Distance Traveled	Miles, Kilometers
Passengers	Number of Passengers Traveling via Each Method

(Table 12.1) Relevant activity data to collect for Scope 3: Employee Commuting accounting

4

Data Collection Guidance: The reporting processor may distribute a survey or questionnaire to collect data on commuting habits. The survey should include the questions in Table 12.2 (below).

Employee Commuting Survey Questions

Survey Question	Applicable Metrics
How far do employees travel to and from work? (OR calculate distance from employee residence to processing facility)	Miles per day
How many days do employees commute per week?	Days per week
How many weeks do employees work per year?	Weeks per year
How many days per week do employees use different transportation methods	Days per week for each transportation method
If there is a car-pooling initiative among the company - <ul style="list-style-type: none"> • What's the proportion of employees carpooling? • What is the average carpooling occupancy per vehicle? 	Percentage of employees who carpool and/or Average persons per vehicle
If applicable - what is the energy used from employees who work remotely	kWh

(Table 12.2) Survey questions that are useful for collecting Scope 3: Employee Commuting data

5

Calculation Approach: Use the [GHG Protocol's Mobile Combustion GHG Emissions Calculation Tool](#), which has built-in emission factors for various transportation methods. It will automatically calculate CO₂, CH₄ and N₂O emissions data from the reporting processor's input activity data. This tool may be used to calculate Scope 3 emissions from employee commuting using both the Fuel-Based method and the Distance-Based method. It is important that the reporting processor ensures "Scope 3" is selected under the 'Scope' column in the 'Activity Data' tab

Once the reporting processor has obtained emissions for every employee at each processing facility, the reporting processor may simply aggregate commuting emissions from all company-owned or operated facilities to determine its total Scope 3: Employee Commuting footprint.

If a reporting processor wishes to utilize a calculation resource other than the GHG Protocol's Mobile Combustion GHG Emissions Calculation Tool, the [U.S. EPA Climate Leaders GHG Inventory Protocol, "Optional Emissions from Commuting, Business Travel and Product Transport"](#)⁵ may be consulted.

Appendix: This category is not a priority in the U.S. dairy value chain, but is recommended for a comprehensive Scope 3 inventory.

- ### Chapter at a Glance
- Defining Sold Products
 - Identifying Sources
 - Collecting Activity Data
 - Data Collection Guidance

Scope 3: Processing of Sold Products

This section provides guidance on how to account for and calculate Scope 3 indirect GHG emissions from processing of sold intermediate products by other processors further down the supply chain.

While this section is not a priority in U.S. dairy GHG accounting, reporting processors should include it to compose the most comprehensive Scope 3 inventory (account for prioritized sections first).

1 **Defining Processing of Sold Products:** Certain reporting processors may distribute their milk to other processors to be used for products such as ice cream, cheese, yogurt, etc. These products are considered intermediate products in dairy. The GHG Protocol defines intermediate products as those that “require further processing, transformation, or inclusion in another product before use, and therefore result in emissions from processing subsequent to sale by the reporting company and before use by the end consumer.”² The reporting processor’s Scope 3: Processing of Sold Products emissions are equivalent to other processors’ Scope 1 and 2 emissions down their supply chain.

2 **Identifying Sources:** Intermediate dairy processing mainly creates GHG emissions from fuel and electricity used at processing facilities, as well as from waste generated from said processing. However, collecting primary data on emissions from these sources can often be difficult and unrealistic, especially if the reporting processor distributes to a large quantity of intermediate processors. Therefore, reporting processors should use the Average-Data method to estimate emissions from sold intermediate product-derived GHG emissions.

3 **Collecting Activity Data:** Using the Average-Data method entails collecting information on the downstream intermediate processing activities in the reporting processor’s supply chain in order to select and apply the relevant industry-average emission factors.

Average Data Method - Processing of Sold Products	
Activity Data Categories	Information Needed
Intermediate processing activities	Coagulation, acidification, cutting, washing, draining, freezing, packaging, homogenizing, etc.
Allocation information	Mass, economic value

(Table 13.0) Activity data necessary to utilize the Average-Data method for quantifying Scope 3: Processing of Sold Products in the downstream supply chain.

Scope 3: Processing of Sold Products

4

Data Collection Guidance: Reporting processors may refer to purchasing records, internal data systems, and industry-average data from associations or databases to accurately identify the mass of dairy products sold to its intermediate suppliers.

Once the reporting processor has collected relevant information on the processes involved in further processing for every sold product, it should seek the appropriate emission factors that coincide with each process. Reporting processors may consult a variety of resources that publish robust emission factors relevant to intermediate product processing activities. Some of these resources include:

- [U.S.-specific GHG emission analysis for fluid milk processing plants⁴](#)
- [Life cycle databases](#)
- [The GHG Protocol website](#)
- Companies or manufacturers
- Industry associations
- Environmental organizations such as the [EPA](#), [IPCC](#), or the [Climate Registry](#)

From here, quantifying emissions from Scope 3: Processing of Sold Products is calculated by the equation below:

Intermediate Process Emissions

Mass of sold milk to intermediate processor **X** Emission factor for processing activity (kg CO₂e/kg FPCM)

The reporting processor should execute this calculation for every shipment of milk that endures a different intermediate process, making sure to apply the correct emission factor for each intermediate process, and factoring in the correct mass of milk that undergoes said processes. Once done, the reporting processor may aggregate emissions from all intermediate processes germane to its downstream supply chain to arrive at its total Scope 3: Processing of Sold Products footprint.

Scope 3: Processing of Sold Products Emissions

((Intermediate Process 1 Emissions) (kg CO₂e) **+** (Intermediate Process 2 Emissions) (kg CO₂e)
+)

Appendix: This category is not a priority in the U.S. dairy value chain, but is recommended for a comprehensive Scope 3 inventory.

Chapter at a Glance

- Defining Sold Products
- Identifying Sources
- Collecting Activity Data
- Data Collection Guidance
- Calculation Approach

Scope 3: Use of Sold Products

This section provides guidance on how to account for and calculate Scope 3 indirect GHG emissions from the use and consumption phase of sold milk and other dairy products by end consumers.

While this section is not a priority in U.S. dairy GHG accounting, reporting processors should include it to compose the most comprehensive Scope 3 inventory (account for prioritized sections first).

1

Defining Use of Sold Products: For U.S. dairy, the use of sold products is relatively easy to define, as fluid milk does not directly produce GHG emissions in its use phase. The [GHG Protocol's Corporate Value Chain Standard](#) requires that direct-use phase emissions are accounted for in this category, while indirect-use phase emissions are optional to report.

2

Identifying Sources: For fluid milk specifically, indirect-use phase emissions come from refrigerating the milk in the consumers' homes or businesses between point-of-purchase and complete consumption. Additionally, other dairy products such as cheese may produce indirect-use phase emissions if they are cooked, which demands fuel and/or electricity.

Measuring indirect-use phase emissions is often difficult. For this category, follow and adopt the methodology in Table 14.0.

GHG Emission Sources from Dairy Use Phase	
Use Phase Activity	Emissions Source
Refrigeration	Electricity Consumption
	Refrigerant Leakage
Cooking	Fuel Consumption
	Electricity Consumption

(Table 14.0) Common emissions sources from the use of dairy products by the end consumer

3

Collecting Activity Data: The reporting processor should first create and/or obtain a typical use-phase profile based on the average lifetime that the dairy product is in the "use" phase and implement relevant emission factors.

Use Phase Activity Data Collection Guideline	
Indirect Emissions Activity Data Category	Activity Data
Use Scenarios	Cooking (Roasting, Boiling, Microwaving, Frying)
Fuel Consumed	LNG, LPG, CNG, Propane (in therms, cubic feet, cubic meters)
Electricity Consumed	kWh
Refrigerant Leakage	HFCs, PFCs (in kg CO ₂ e)

(Table 14.1) Activity data to be collected to calculate indirect-use phase emissions from consumption of dairy.

Scope 3: Use of Sold Products

4

Data Collection Guidance: Developing a typical use-phase profile involves identifying the use phase scenarios (shown in table 14.1) for each product the reporting processor sells, and creating a weighted average based on each use scenario, length of use and quantity sold. Reporting processors may consult a variety of resources to obtain this information, such as:

- Industry recognized benchmark testing specifications
- Product category rules
- Previous emissions studies
- Consumer studies

5

Calculation Approach: Reporting processors can quantify their Scope 3: Use of Sold Products footprint using the calculation on page 40.

The calculation represents how to account for and quantify use phase emissions from dairy. For fluid milk, the only necessary equations to be included in the calculations are the Refrigerant Leakage, and Refrigerator equations. If the reporting processor sells dairy products that are often cooked, such as cheese, all the equations may need to be utilized in order to quantify an accurate and fully-encompassing account of Scope 3: Use of Sold Products inventory. Calculate emissions from each equation for each product sold, then aggregate all emissions from each equation to arrive at a total Scope 3: Use of Sold Products account.

Reporting processors may consult a variety of resources that publish robust emission factors relevant to stationary combustion and refrigerating activities. Some of these resources include:

- [Life cycle databases](#)
- [The GHG Protocol](#)
- Companies or manufacturers
- Industry associations
- Environmental organizations such as the [EPA](#), [IPCC](#), or the [Climate Registry](#)

For the reporting processor's convenience, the [GHG Protocol Stationary Combustion Excel Tool](#) with relevant emission factors for various fuels and electricity is linked. Furthermore, the [GHG Protocol Refrigerant Emissions Calculation Excel Tool](#) is linked.

Scope 3: Use of Sold Products

5

Calculating Scope 3: Use of Sold Products Footprint

Gas Stove Baking Equation

Σ (Total Lifetime Expected Uses of Product (i.e. meals cooked) **X** % of Total Lifetime Uses Using Gas Stove for Baking **X** Quantity Sold (lbs, kg) **X** Fuel Consumed per Use in this Scenario (therms, cubic meters, cubic feet) **X** Emission Factor for Fuel (kg CO₂e/fuel unit)

PLUS (+)

Gas Stove Burner Equation

Σ (Total Lifetime Expected Uses of Product (i.e. meals cooked) **X** % of Total Lifetime Uses Using Gas Burner **X** Quantity Sold (lbs, kg) **X** Fuel Consumed per Use in this Scenario (therms, cubic meters, cubic feet) **X** Emission Factor for Fuel (kg CO₂e/fuel unit)

PLUS (+)

Electric Stove Equation

Σ (Total Lifetime Expected Uses of Product (i.e. meals cooked) **X** % of Total Lifetime Uses Using Electric Oven/Burners **X** Quantity Sold (lbs, kg) **X** Electricity Consumed per Use in this Scenario (kWh) **X** Emission Factor for Electricity (kg CO₂e/kWh)

PLUS (+)

Microwave Equation

Σ (Total Lifetime Expected Uses of Product (i.e. meals cooked) **X** % of Total Lifetime Uses Using Microwave **X** Quantity Sold (lbs, kg) **X** Electricity Consumed per Use in this Scenario (kWh) **X** Emission Factor for Electricity (kg CO₂e/kWh)

PLUS (+)

Refrigerant Leakage Equation

Σ (Total Lifetime Expected Uses of Product (i.e. meals cooked) **X** % of Total Lifetime in Refrigerator **X** Quantity Sold (lbs, kg, gallons) **X** Refrigerant Leakage per Use in this Scenario (kg) **X** Emission Factor for Refrigerant (kg CO₂e/kg)

PLUS (+)

Refrigerator Equation

Σ (Total Lifetime Expected Uses of Product (i.e. meals cooked) **X** % of Total Lifetime Uses in Leaking Refrigerator **X** Quantity Sold (lbs, kg, gallons) **X** Electricity Consumed per Use in this Scenario (kWh) **X** Emission Factor for Electricity (kg CO₂e/kWh)

Appendix: This category is not a priority in the U.S. dairy value chain, but is recommended for a comprehensive Scope 3 inventory.

Chapter at a Glance

- Defining End-of-Life
- Identifying Sources
- Collecting Activity Data
- Data Collection Guidance
- Calculation Approach

Scope 3: End-of-Life Treatment of Sold Products

This section provides guidance on how to account for and calculate Scope 3 indirect GHG emissions from the end-of-life waste disposal and treatment of sold dairy products by the reporting processor.

While this section is not a priority in U.S. dairy GHG accounting, reporting processors should include it to compose the most comprehensive Scope 3 inventory (account for prioritized sections first).

1

Defining End-of-Life Treatment of Sold Products: This category captures GHG emissions associated with waste, much like Scope 3: Waste Generated in Operations. However, the key difference in this category is that it accounts for GHG emissions deriving from end-of-life waste disposal and treatment of dairy products sold by the reporting processor (in the reporting period). Like Scope 3: Waste Generated in Operations, this category accounts for emissions from biomass materials, and therefore CO₂ emissions must be accounted for outside any of the three scopes in a separate memo item. Methane and nitrous oxide emissions, however, are still accounted for within the scopes for this category. Rather than using the sheer volume of waste produced during dairy processing to quantify emissions, reporting processors should use the mass of product sold (including packaging).

Obtaining accurate and quality data on the proportions and distribution of waste management activities associated with sold products is often difficult for reporting processors. This category requires the reporting processor to disclose assumptions on its sold product lifetimes, as well as waste treatment methods.

2

Identifying Sources: Almost all dairy products sold on the U.S. market are packaged in recyclable materials. Recycling's emission factor is 0.0 kg CO₂e/kg since all the material re-enters the supply stream. Therefore, reporting processors should try to formulate the most accurate assumptions on what quantities of its sold products and/or packaging material does not actually get recycled, but rather goes to landfill, or incineration. In addition, dairy products are consumable, so waste from dairy processors in this category is likely to be much lower than the actual mass of products and packaging sold. As a result, reporting processors should consult industry average data on the proportion of sold products that get wasted (not consumed, and/or recycled).

Source: *Journal of Food and Dairy Technology*

Common Packaging Methods in U.S. Dairy		
Packaging Material	Dairy Products	Recyclable?
Plastic Based	Fluid milk, butter, cheese, ghee, whipped cream	Most
Glass Based	Fluid milk, ghee	Yes
Paper Based	Fluid milk, ice cream	Yes
Metal Based	Cheese spread, milk powder, ghee, whipped cream	Yes
Flexible Film Based	Cheese	In specific markets

(Table 15.0) Common U.S. dairy packaging materials and their recyclability⁶

Scope 3: End-of-Life Treatment of Sold Products

3

Collecting Activity Data: As mentioned above, reporting processors should use the mass of product sold in the reporting year to quantify emissions in this category. Furthermore, reporting processors should collect information on the distribution of their sold products in different waste management methods.

Activity Data Needed for Calculating Scope 3: End-of-Life Treatment of Sold Products	
Activity Data	Examples
Mass of sold dairy products (including packaging of individual consumable products, and packaging used to transport individual products)	Plastic milk cartons, cardboard boxes, glass jugs, paperboard milk cartons, metal cans, cellophane wrapping
Proportion of sold materials in different waste streams	% recycled, % landfilled, % incinerated

(Table 15.1) Relevant activity data necessary for Scope 3: End-of-Life Treatment of Sold Products accounting

4

Data Collection Guidance: Although collecting accurate data on dairy waste streams after products are sold may be difficult, many resources exist to assist with this procedure. Several are included below:

- Specific government directives on waste treatment (For the U.S.: [Facts and Figures about Materials, Waste and Recycling](#))⁶
- Industry associations that have conducted research into consumer disposal habits (if applicable)
- Average data on waste treatment from reporting processor's point-of-sale through end-of-life treatment

5

Calculation Approach: Much like Scope 3: Waste Generated in Operations, this category employs the Waste-Type-Specific method to calculate GHG emissions from the reporting processor's sold products and packaging. The appropriate equation is included below for reference. Reporting processors should ensure that they use an accurate and robust emission factor for each waste treatment method applicable to their supply chain. Resources such as the [EPA's Documentation for Greenhouse Gas Emission and Energy Factors Used in the Waste Reduction Model](#) include emission factor data for this category's emission calculations.

Scope 3: End-of-Life Treatment of Sold Products Footprint	
Mass of Sold Products and Packaging (kg) X % Recycled Waste X Recycling Emission Factor (kg CO ₂ e/kg)	
PLUS (+)	
Mass of Sold Products and Packaging (kg) X % Landfilled Waste X Landfill Emission Factor (kg CO ₂ e/kg)	
PLUS (+)	
Mass of Sold Products and Packaging (kg) X % of Incinerated Waste X Incineration Emission Factor (kg CO ₂ e/kg)	

Appendix: This category is not a priority in the U.S. dairy value chain, but is recommended for a comprehensive Scope 3 inventory.

Chapter at a Glance

- Defining Franchises
- Identifying Sources
- Collecting Activity Data
- Data Collection Guidance
- Calculation Approach

Scope 3: Franchises

This section provides guidance on how to account for and calculate Scope 3 indirect GHG emissions from the operation of franchises down the reporting processor's value chain.

While this section is not a priority in U.S. dairy GHG accounting, reporting processors should include it to compose the most comprehensive Scope 3 inventory (account for prioritized sections first).

1

Defining Franchises: Franchises, although a very common business model, are not often implemented in the U.S. dairy processing industry. However, on the off-chance that a reporting processor owns a franchise network, this category accounts for the GHG emissions generated from the operation of said franchise(s). The [GHG Protocol Corporate Value Chain Accounting and Reporting Standard](#) defines franchises as businesses “operating under a license to sell or distribute another company's goods or services within a certain location.”¹ The Scope 1 and Scope 2 GHG emissions from these franchise locations that sell or distribute a reporting processor's dairy products are equivalent to the Scope 3 emissions accounted for in this category.

2

Identifying Sources: As briefly described above, Scope 3 GHG emission sources in this category arise from the operation of franchises downstream from the reporting processor. Collecting and accounting for Scope 1 and 2 GHG emissions at each and every franchise location will translate into a comprehensive Scope 3: Franchises inventory.

3

Collecting Activity Data: This guidance recommends using the Franchise-Specific method for collecting activity data, which requires the reporting processor to collect Scope 1 and 2 data specific to each and every franchise operating under its label. If franchisees have conducted a Scope 1 and 2 inventory, then simply applying the inventory to this category accomplishes this data collection strategy. However, if no such inventory exists, reporting processors should aim to collect activity data similar to the Scope 1 and 2 data collected in the Scope 3: Upstream/Downstream Leased Assets categories.

If the reporting processor is unable to obtain the fuel and energy data associated with each franchise, other methods of accounting for Scope 3: Franchises emissions can be found in the [GHG Protocol Technical Guidance for Calculating Scope 3 Emissions](#).

Table 16.0 (below) includes applicable activity data.

GHG Emission Sources from Franchises	
Emission Source	Scope
Fuel consumed, refrigerant leaked, process emissions	Scope 1
Electricity consumed, steam consumed, heat consumed, cooling consumed	Scope 2

(Table 16.0) Scope 1 and 2 GHG emission sources from franchises

Scope 3: Franchises

4

Data Collection Guidance: Much like Scope 1 and 2 accounting, the necessary activity data for this category can be collected via many different methods:

- Utility bills
- Purchase records
- Meter readings
- Internal IT systems

Appropriate emission factors are available from an array of different sources as well, such as:

- [The EPA GHG Emissions Factors Hub](#)
- [Life cycle databases](#)
- Other government agencies such as the [IPCC](#), and [Climate Registry](#)
- Industry associations
- Company-developed factors if applicable

5

Calculation Approach: The following equation represents the appropriate methodology for calculating Scope 3: Franchises using the Franchise-Specific method, and is the same methodology for Scope 3: Upstream/Downstream Leased Assets:

Calculating Scope 3: Franchises Using the Franchise-Specific Method	
Scope 1 Emissions from Franchise	
(Fuel Consumed X Fuel Emission Factor (kg CO ₂ e/fuel unit))	+ (Refrigerant Leakage (kg) X Refrigerant Emission Factor (kg CO ₂ e/kg))
PLUS (+)	
Scope 2 Emissions from Franchise	
(Electricity, Steam, Heating, Cooling Consumed (kWh))	X (Electricity, Steam, Heating, Cooling Emission Factor (kg CO ₂ e/kWh))
EQUALS (=)	
Scope 3 Emissions from Franchise	
Scope 3: Franchises Inventory = Σ Scope 3 Emissions from All Franchises	

Reporting processors may use the [GHG Emissions from Purchased Electricity, GHG Emissions from Stationary Combustion, and Refrigeration and Air-Conditioning Equipment Excel tools](#) as resources to assist in quantifying emissions in this category. They have built-in GHG Protocol emission factors to streamline GHG emissions from fuel, electricity, steam, heat, cooling and refrigeration.

If the franchise company only operates in a section or portion of the facility, and the facility lacks sub-metering infrastructure, then energy consumption may be allocated using an estimation based on the share of space the company leases (based on floor space). This may be calculated using the following equation:

Equation for Section or Portion Operation	
Franchise-Used Space (m ²)	/ (Building's Total Area (m ²) X Building Occupancy Rate) X Total Building Energy Use (kWh)

Appendix: This category is not a priority in the U.S. dairy value chain, but is recommended for a comprehensive Scope 3 inventory.

Chapter at a Glance

- Defining Investments
- Identifying Sources
- Collecting Activity Data
- Data Collection Guidance
- Calculation Approach

Scope 3: Investments

This section provides guidance on how to account for and calculate Scope 3 indirect GHG emissions from the reporting processor's investments in the reporting period.

While this section is not a priority in U.S. dairy GHG accounting, reporting processors should include it to compose the most comprehensive Scope 3 inventory (account for prioritized sections first).

1

Defining Investments: This category mainly applies to financial institutions and profit-driven investment companies. However, Scope 3: Investments may apply to a dairy processor/cooperative if it has joint financial control of another company, and/or directly influences subsidiaries and associate companies. Again, depending on the reporting processor's organizational boundary, GHG emissions may be accounted for in Scope 1 or 2. More specifically, if the reporting processor uses the equity share approach in its IMP, the GHG emissions from investments would then be equivalent to the share of investment it has in the investee under Scope 1 and 2. However, if using a control approach, emissions are categorized in Scope 3, as the reporting processor does not operate the investment company.

In this regard, the Scope 1 and 2 emissions from each and every investee operation are equivalent to the reporting processor's Scope 3: Investment emissions.

2

Identifying Sources: As briefly described above, Scope 3 GHG emission sources in this category arise from investee operations downstream from the reporting processor. Collecting and accounting for Scope 1 and 2 GHG emissions at each and every investee operation will translate into a comprehensive Scope 3: Investments inventory.

3

Collecting Activity Data: This guidance recommends using the Investment-Specific method for collecting activity data, which requires the reporting processor to collect Scope 1 and 2 data specific to each and every investee operation/company. If investee companies have conducted a Scope 1 and 2 inventory, then simply applying the inventory to this category accomplishes the data collection strategy. However, if no such inventory exists, reporting processors should apply the Average-Data method to fill in the gaps. This involves applying revenue data from the investee company, and combining it with Environmental Extended Input-Output data (from applicable life cycle databases, such as those listed on the [GHG Protocol website](#)) to estimate Scope 1 and 2 emissions.

For both methods, reporting processors should account for their proportion of emissions from the investee company based on their share of investment. For example, if a reporting processor has a 30 percent share of equity in a company, then the correct allocation of emissions from this investee company would equal its Scope 1 and 2 emissions multiplied by 0.30. Table 17.0 (page 46) includes applicable activity data.

Scope 3: Investments

3

GHG Emission Sources from Investments

Emission Source	Scope
Fuel consumed, refrigerant leaked, process emissions	Scope 1
Electricity consumed, steam consumed, heat consumed, cooling consumed	Scope 2

(Table 17.0) Scope 1 and 2 GHG emission sources from Investments

4

Data Collection Guidance: In addition to the appropriate EEIO data for estimating average emissions, reporting processors should consult their financial records, and/or GHG inventory reports of investee companies for the Investment-Specific method, if they exist.

If the reporting processor is able to obtain relevant GHG inventories from investee companies, no emission factors should be necessary, as the investee companies have already calculated their Scope 1 and Scope 2 inventories.

However, if the Average-Data method is employed, the reporting processor should disaggregate the EEIO emission factor, similar to Scope 3: Capital Goods. This allows for the reporting processor to account for only Scope 1 and 2 GHG emissions from the investee company, as opposed to all three scopes. This disaggregation process can often be arduous and, potentially, impossible. If so, the reporting processor may use the full EEIO factor as long as this information is transparently disclosed.

5

Calculation Approach: If utilizing the Investment-Specific method, the reporting processor's Scope 3: Investments inventory from this approach is simply the aggregate of all investee company's Scope 1 and 2 inventories multiplied by its equity share in each company.

Investment-Specific Method

$$\text{Scope 3: Investments Inventory} = \sum (\text{Scope 1 and 2 Inventories of Investee Company} \times \% \text{ Equity Share})$$

If utilizing the Average-Data method, the reporting processor's Scope 3: Investments inventory from this approach is the investee company's revenue multiplied by the corresponding emission factor for its sector. The quantity is then multiplied by the equity share in the investee company. Sum across all investee companies that employ this method to find the aggregated Scope 3: Investments inventory via the Average-Data method.

Average-Data Method

$$\text{Scope 3: Investments Inventory} = \sum ((\text{Investee Company Revenue} (\$) \times \text{Investee Sector Emission Factor (kg CO}_2\text{e}/\$ \text{ Rev.})) \times \% \text{ Equity Share} (\%))$$

Works Cited

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3. "Management of Waste From Animal Product Processing." FAO Corporate Document Repository, Food and Agriculture Organization.
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8. Thoma et al., "Greenhouse Gas Emissions of Fluid Milk in the U.S." University of Arkansas, 2010, <http://bit.ly/2a9Md64>

Additional Resources

- [WWF Climate Savers](#)
- [Climate Registry](#)
- [Pew Business Environmental Leadership Council](#)
- [Carbon Trust](#)
- [NASA's Goddard Institute for Space Studies](#)
- [Carbon Budget](#)
- [2018 Carbon Budget Report](#)
- [The U.S. Department of Energy Map](#)
- [Climate Change and Resource Scarcity](#)
- [The Impact of Corporate Sustainability on Organizational Process and Performance: The Harvard Business Journal](#), Robert G. Eccles, Ioannis Ioannou & George Serafeim

Resources for Setting Science Based Targets

- [Introduction to Science Based Targets](#)
- [Call to Action: Detailed Guidelines for Setting Science Based Targets](#)
- [Science Based Targets and CDP Scoring](#)
- [Best Practices for Setting and Achieving Science Based Targets](#): Presentation at the Climate Leaders Conference, March 2017.
- [Mind the Science](#)
- **Science Based Targets:** [Target setting pitfalls and lessons learned \(pdf\)](#)
- **Science Based Targets:** [Target setting pitfalls and lessons learned \(webinar\)](#)

Resources for Reducing GHG Emissions

Once a GHG emissions inventory has been developed and a reduction target has been adopted, a company should identify the main sources of GHGs and evaluate the cost-effectiveness of emission reduction measures. Below are resources, tools and webinars to assist companies in reducing GHG emissions.

Energy Efficiency

- EPA, Energy Star. 2011. [Energy Efficiency Improvement and Cost Saving Opportunities for the Dairy Processing Industry](#): A manual created by Energy Star to assist dairy processors in identifying energy efficiency improvements as an important way to reduce costs and to increase predictable earnings
- EPA, [Energy Star Portfolio Manager](#). An online tool that can be used to measure and track energy and water consumption, as well as greenhouse gas emissions associated with commercial buildings
- HVAC (heating, ventilation and air conditioning), [Climate Corps Handbook](#) Chapter 9. Overview of how to survey current HVAC system, analyze results of an energy audit for HVAC system and perform a financial analysis on recommendations of energy auditors
- Carbon Trust: [Heating, ventilation and air conditioning \(HVAC\) energy efficiency guide](#). A guide to improve energy efficiency of heating, ventilation and air conditioning, hot water and boilers
- **Lighting in commercial buildings**, [Climate Corps Handbook](#), Chapter 10. Describes how to identify lighting opportunities for energy savings in commercial buildings and how to develop estimates of energy usage and calculate the estimated savings potential
- **Demand Response and Smart Grid**, [Climate Corps Handbook](#), Chapter 16. Overview of demand response (DR) and possible energy savings and revenue opportunities

Additional Resources

- [Demand and Response Research Center](#). Publications and information on demand response and smart grid infrastructure to best inform end users how to temporarily reduce energy usage in response to either price or system reliability triggers
- [Carbon Trust Energy Management Self-Assessment Tool](#). An Excel workbook and guidance document that assess an organization's energy management
- [Carbon Value Analysis Tool](#). The Carbon Value Analysis Tool (CVAT) was created by the World Resource Institute to assist project managers with factoring the price of carbon when evaluating reduction projects
- **Carbon Trust**, [Buildings Energy Efficiency](#). Guide to improving building fabric and insulation and installing appropriate controls to save money and cut carbon emissions
- **Carbon Trust**, [Refrigeration: Improve energy efficiency of your chillers and refrigeration systems with our energy-saving guidance](#)
- [EPA Center for Corporate Climate Leadership](#). A list of free GHG inventory related webinars and events

Renewable Energy

- [The Department of Energy's Office of Energy Efficiency and Renewable Energy \(EERE\)](#). Provides information on industrial energy-consuming systems; boiler and steam system, compressed air, motors, fans, pumps and process heating
- [Property Assessed Clean Energy \(PACE\)](#). Energy efficiency financing opportunities
- [Database of State Incentives for Renewables and Efficiency](#). Overview of state and federal incentives and policies designed to help companies adopt renewable energy programs
- [Guide to Purchasing Green Power](#). A cooperative effort between the EPA, the U.S. Department of Energy, the World Resources Institute and the Center for Resource Solutions that provides current and potential buyers of green power with information about green power purchasing
- [Innovations in Voluntary Renewable Energy Procurement](#). A guide from National Renewable Energy Laboratory's (NREL) that outlines methods for expanding access and lowering cost for communities, governments and businesses

Mobile Emissions

- [Reduce Mobile Emissions, Vehicle selection](#). ACEEE Greener Cars Identify vehicles that are most fuel efficient and learn about market trends in automotive technology
- [EPA Green Vehicle Guide](#). Overview of vehicles, fuel use and the impact on both the environment and bottom line
- [Fuel Economy Guide](#), The U.S. Environmental Protection Agency (EPA) and U.S. Department of Energy (DOE). A guide to help buyers identify the most fuel-efficient vehicles

About the Innovation Center for U.S. Dairy®

The Innovation Center for U.S. Dairy® is a forum that brings together the dairy community to address the changing needs and expectations of consumers through a framework of shared best practices and accountability. Initiated in 2008 by dairy farmers through the dairy checkoff, we collaborate on efforts that are important both to us and our valued customers - priorities like animal care, environmental stewardship, food safety and traceability, and community contributions. The Innovation Center is committed to continuous improvement from farm to table, striving to ensure a socially responsible and economically viable dairy community.

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