



Evidence Attachment #1: Idaho Milk Products Case Study

Environmental Market Driven Value Chain Decarbonization through Anaerobic Digestion¹
(Fall 2023)

Idaho Milk Products is a privately held, vertically integrated international milk processing company that supplies a variety of dairy ingredients to customers around the world. Idaho Milk Products is a significant processor within Idaho's agribusiness sector, processing nearly 1.6 billion pounds of milk annually of the state's nearly 16.6 billion pounds of total milk production.²

This case study highlights the farm-level anaerobic digestion and advanced manure management systems present within Idaho Milk Products' supply chain. Bio-digestors system investments profiled demonstrate how demand for environmental attribute certificates (i.e., carbon/greenhouse gas offset credits) facilitate the execution of greenhouse gas (GHG) management projects that deliver high quality and durable flows of emissions reductions/removals. The business partnerships that have developed and operate the bio-digestion systems serve as examples of how supply and demand for environmental attribute certificates in various forms help the marketplace identify and pursue the least cost path to GHG abatement.³

Within the Idaho Milk Products supply chain, the [*Bettencourt Dairy #6*](#) and *Big Sky West* digestion systems have been operating for over a decade. Together, these systems process manure from nearly 12,000 cows, transforming that feedstock into renewable energy (estimated at 21.5 million kWh/yr. of electricity). These two systems also deliver an estimated 106,000 MT CO₂e in annual emissions reduction.⁴ At least in some regulatory compliance marketplaces like California's Low Carbon Fuel Standard (LCFS), there are several digester to renewable energy pathways. This case is not exhaustive of all possible uses of digester outputs, which may, for example, include renewable natural gas (RNG) for electricity generation or fueling vehicles. The digestion process also results in multiple valuable outputs associated with emissions benefits, namely sustainable livestock bedding and fertilizer.

These two digester systems, along with two additional digester development projects currently in construction at Bettencourt Daries, have—at least in part—been financially feasible as a result of environmental attribute certification (e.g., offset credit) transactions with low carbon fuel

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² https://www.nass.usda.gov/Quick_Stats/Ag_Overview/stateOverview.php?state=IDAHO

³ For additional information on anaerobic digestion technology, we recommend: Labatut, R. A., & Pronto, J. L. (2018). Sustainable waste-to-energy technologies: Anaerobic digestion. In Sustainable food waste-to-energy systems (pp. 47-67). Academic Press.

<https://www.sciencedirect.com/science/article/abs/pii/B9780128111574000048>

⁴ Statistics gathered from U.S. Environmental Protection Agency AgStar Database, <https://www.epa.gov/agstar/agstar-data-and-trends>.

standard (LCFS) marketplaces in western states (see figure 1 below).⁵ Dairy bio-digestion projects have grown tremendously in recent years, as have the annual quantities of credits from dairy systems entering the LCFS marketplace (see figure 2 below).⁶ While the systems described here are connected to a specific type of regulatory compliance marketplace that has demonstrated some success in managing transportation fuel emissions, livestock and agricultural digestion systems may also be able to engage with non-regulatory (i.e., voluntary) carbon marketplaces both now and in the future.⁷ We propose that the general theme of any such marketplace in which environmental attribute certificates are transacted is consistent: in many cases market-based instruments have historically shown evidence of real GHG benefits in corporate value chains resulting from an economically rational approach.

Evidence also exists indicating that the U.S. Dairy sector has enough scaled farm operations to feasibly continue to increase national digestion system capacity in the years to come.⁸ Dairy industry stakeholders see the ongoing ability to participate in the LCFS marketplace(s)—along with increased clarity and guidance about corporate value chain emissions (scope 3) accounting and reporting—as necessary for continued investment in increasing the number of livestock waste digestion systems. The existence of environmental marketplaces are key enablers of decarbonization in dairy product corporate value chains.

⁵ Projects in construction: <https://www.shell.us/about-us/projects-and-locations/shell-downstream-bovarius--biomethane-facility--wendell-idaho--.html>; <https://www.shell.us/about-us/projects-and-locations/shell-downstream-friesian-biomethane-facility-wendell-idaho.html>.

⁶ As compiled and analyzed by Dr. Aaron Smith (UC Davis); Figure 2 plot/image citation: [Low Carbon Fuel Standard | Aaron Smith \(ucdavis.edu\)](#) based on California Air Resources Board (CARB) data.

⁷ About the LCFS (California Air Resources Board, CARB), <https://ww2.arb.ca.gov/our-work/programs/low-carbon-fuel-standard/about>.

For additional background and context on Low Carbon Fuel Standard (LCFS) policy, we recommend: Yeh, S., Witcover, J., Lade, G. E., & Sperling, D. (2016). A review of low carbon fuel policies: Principles, program status and future directions. *Energy Policy*, 97, 220-234. (<https://www.sciencedirect.com/science/article/abs/pii/S0301421516303901>).

Figure 1.

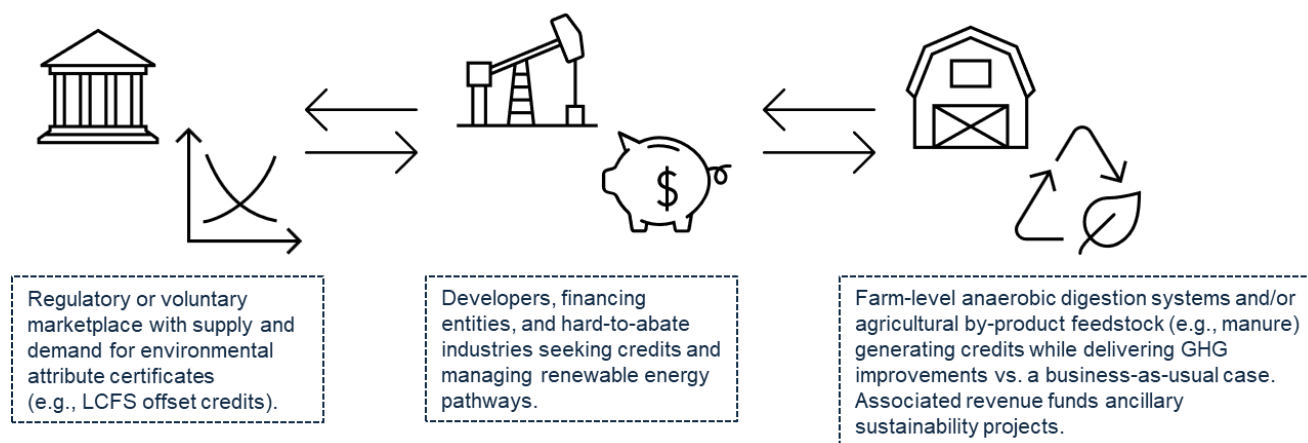


Figure 2.

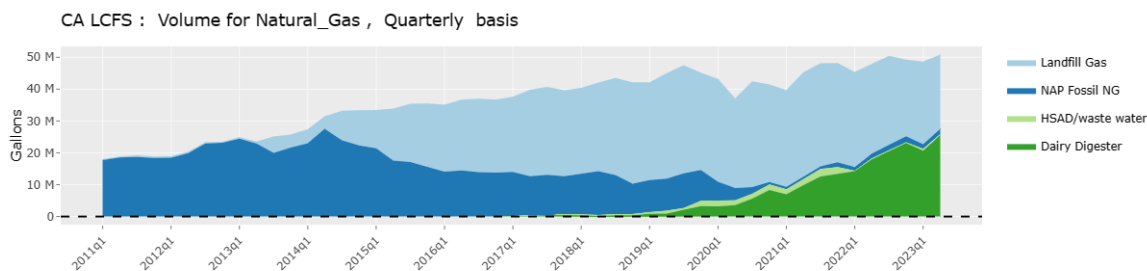


TABLE 1. Summary of Idaho Milk Products' Supply Chain Anaerobic Digester Systems:

Digester Project	Location	Cumulative Project Investment	Project Capacity	Status	Ancillary Benefits
Big Sky West Dairy	Gooding, Idaho	Not available.	1,500 kW (biogas to electricity)	Active	• Reduced manure management costs • Renewable fiber bedding source for cows • Odor reduction • Organic fertilizer source
Bettencourt Dairy #6	Wendell, Idaho	\$66 million	Estimated 12 million kWh/year. (from EPA AgStar data)	Active	• 175,000 gallons of clean water/day for irrigation • 40 tons of fiber/day for cow bedding • 10,000 gallons of salt concentrate/day removed from land application • 350,000 gallons manure digestate/day as organic fertilizer source
Shell Downstream Bovarius (Bettencourt Dairies)	Wendell, Idaho	\$160 million	400,000 MMBtu	Estimated commissioning Nov 2023	• To be determined
Shell Downstream Friesian (Bettencourt Dairies)	Wendell, Idaho	\$170 million	350,000 MMBtu	Estimated commissioning March 2025	• To be determined

This case study provides evidence that engagement with environmental marketplaces through environmental attribute certificate transactions can enable carbon intervention projects in agricultural sectors such as dairy. Such interventions yield tangible, ongoing GHG emissions benefits compared to business as usual without the anaerobic digestion system investment. Moreover, the improved manure (i.e., agricultural byproduct/waste) management enables actions associated with additional environmental benefits such as water reutilization, returning nutrients to soil, and a renewable source of livestock bedding. With these benefits in mind, and the role of environmental offset credit transactions in the marketplace, dairy farming systems such as those profiled here support the need for GHG Protocol and SBTi standards/guidance to acknowledge and clearly stipulate how corporate value chain GHG accounting and reporting may leverage market-based approaches to climate change mitigation as SBTi target setting companies (and their value chain business partners) approach both near-term and mid-century climate action commitments.

Evidence Attachment #2: An example of data collected by a bio digestion system, which shows consistent flow of intended benefits.

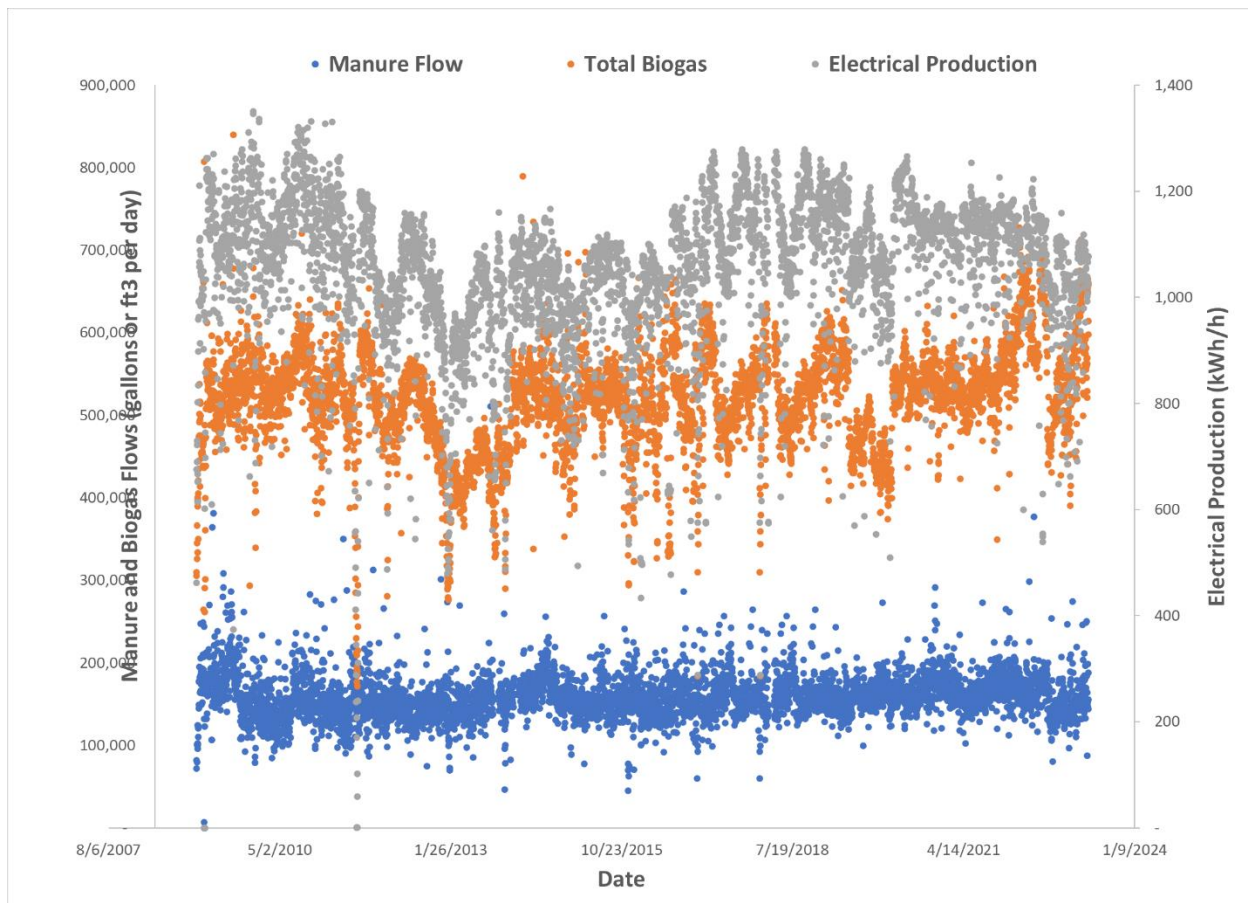
The following shows historical performance data of the Big Sky West dairy manure digester in Gooding, Idaho, including the resulting renewable electricity and GHG emissions reductions. The credits associated with this digester are transacted in the LCFS marketplace through the Dairy and Swine Manure (DSM) pathway.

BIG SKY ELECTRIC RNG										
YEAR	YEARS	COWS	TOTAL BIOGAS	ELECTRICITY	GHG RED	%GHG RED	PERFORM I	PERFORM II	EVs Fueled	Homes
	#	HWCE*	SCF Biogas	MWh	MT CO _{2eq}	% Farm	SCF/HWCE/d	HWCE/KW	Cars/Year	Homes/Year
Project History	14.3	4,704	2,698,464,569	132,060	375,403	36.6%	110.0	4.46	2,143	869

HWCE is Holstein Wet Cow Equivalent based on ASABE average manure production of 150 lbs. manure/HWCE/day at 17 lbs. VS/HWCE/day.

The EV cars and houses is one or the other, depending on use of the electricity and using U.S. national average electric consumption.

The % GHG reduction is based on an assumed 92 lbs. of energy adjusted milk/HWCE/day and a PNW dairy average lifecycle GHG footprint for the farmgate of 1 lbs. CO_{2eq}/1 lbs. FPCM.



BIG SKY ELECTRIC RNG													
YEAR	INFLUENT FLOW	TOTAL BIOGAS	ENGINE BIOGAS	FLARE BIOGAS	ELECTRICITY	VS LOADING	SBP	HRT	ENGINE EFF	ENGINE EFF	% FLARE	ENGINE LOAD	
	GPD	SCF/day	SCF/day	SCF/day	kWh/h	lbs. VS/day	SCF/lbs. VS	days	SCF Biogas/kWh	% HHV	%	%	
2019	159,122	507,312	492,189	15,123	1,093	77,788	6.52	19.49	18.8	33.3%	3.0%	72.8%	
2020	168,171	521,724	484,097	37,457	1,123	82,212	6.35	18.44	18.0	34.8%	7.2%	74.8%	
2021	167,547	536,175	482,782	53,393	1,114	81,907	6.55	18.51	18.1	34.6%	10.0%	74.3%	
2022	162,330	571,613	482,551	89,061	1,063	79,356	7.20	19.11	18.9	33.0%	15.6%	70.8%	
2023	160,787	582,859	504,869	77,990	1,015	78,602	7.42	19.29	20.7	30.2%	13.4%	67.7%	
Average	163,591	543,937	489,298	54,605	1,081	79,973	6.81	18.97	18.9	33.2%	9.8%	72.1%	

Evidence Attachment #3: Time series data analysis and interpretation notes relating environmental markets with U.S. dairy digester capacity.

While the above case study does not establish a statistical causal link between the launch of LCFS regulatory marketplaces (or other voluntary carbon markets) and the development of livestock bio-digestion systems, the Idaho Milk Products supply chain does provide useful evidence supporting the corporate supply chain decarbonization benefits of market-based approaches. It is a reasonable assumption that the potential for ongoing revenue from generation of environmental credits (i.e., various forms of attribute certificates) is instrumental in both project financing and additional sustainability initiatives that are enabled by advanced manure management. For instance, according to publicly available LCFS credit pathway data from the California Air Resources Board (CARB), there are approximately 141 active dairy manure digestion systems across 10 U.S. states currently certified to generate credits for the California LCFS marketplace.⁹

Below, we have performed initial analysis on EPA AgStar data to demonstrate how dairy digester system capacity has changed over time in the U.S. relative to the implementation of LCFS marketplaces in western states (and additional U.S. states are also considering LCFS policies). We propose that this analysis suggests a potential causal link between this specific policy design, which enables a marketplace for a type of environmental attribute certificate. The related credit transactions likely play a significant role in both financing and development of anaerobic digester projects, which have direct links to corporate value chain decarbonization (including for SBTi target setting corporations). We acknowledge that further research would be necessary to establish a plausible causal relationship, but such econometric/causal inference analysis is outside of the scope of this submission of evidence. We see the primary barrier to carrying out such analysis being the lack of a viable control jurisdiction in which no regulatory (e.g., LCFS) or voluntary carbon marketplace is available. Currently, because the LCFS marketplaces in the U.S. accept credit generation from other states, no obvious control group has been identified.

The following graphic outputs show our analysis of EPA AgStar data as of Fall 2023. The data sample has been filtered to operational and in-construction U.S. digester systems with dairy manure feedstocks for all available years. Retired systems are outside the scope of the present analysis. These data do not indicate which digester systems participate in or have connections to environmental marketplaces. However, **given the relatively high capital costs and existence of LCFS marketplaces currently in California, Oregon, and Washington (and**

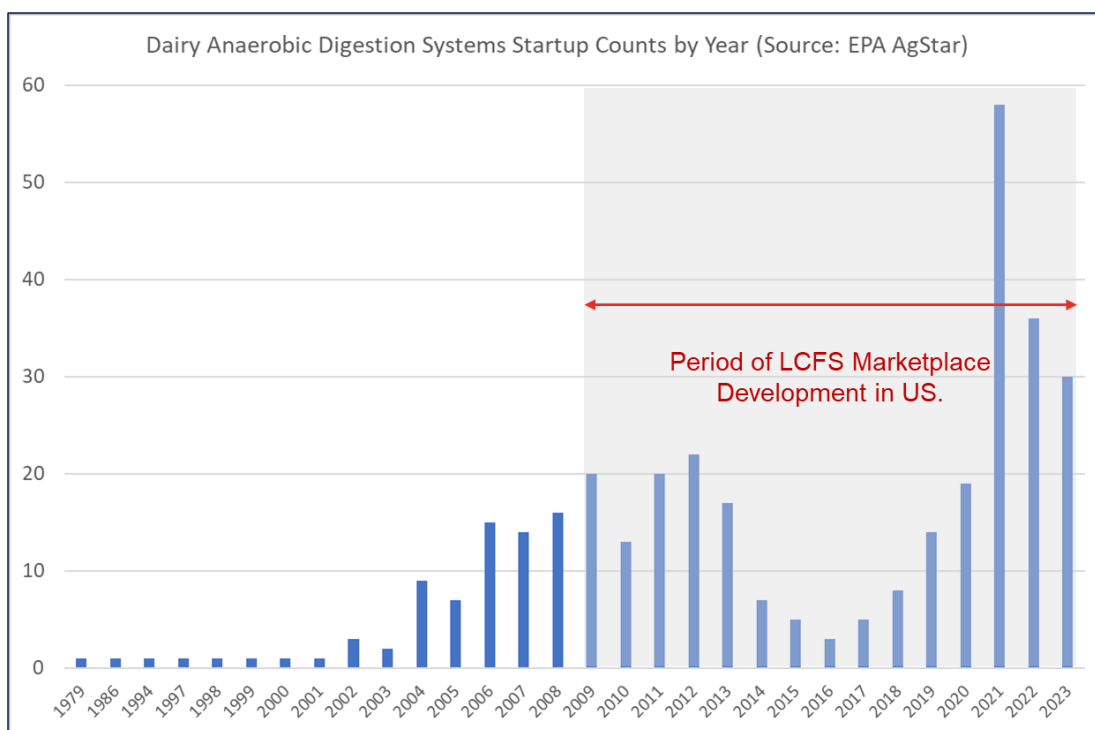
⁹ Data acquired/accessed in October 2023 through correspondence with CARB. General program site: <https://ww2.arb.ca.gov/our-work/programs/low-carbon-fuel-standard>.

British Columbia, Canada), we argue that at least some portion of digester growth since approximately 2009, when California's LCFS policy was first approved (implementation began in 2011), was directly caused by the demand for environmental attribute certificates. Anecdotally, the Idaho Milk Product digester systems profiled above came online beginning in 2009.

Our interpretation of the data visualized below is consistent with evidence from other reputable sources, namely a recent UC Davis review of LCFS markets.¹⁰ The December 2022 US Davis Clear Center report on dairy sector methane management (and significant progress) is also a highly relevant reference document.¹¹ Additionally, the USDA recently released its report to the U.S. Congress on the state of voluntary carbon markets. A statement from that report's findings is telling of the connection between environmental marketplace instruments and decarbonization tactics:

"Farmers, ranchers, and forest landowners can generate carbon credits by adopting practices to reduce emissions or sequester carbon on their land, and carbon markets may incentivize them to adopt new practices by generating additional income from carbon credit sales. Carbon credits may also help companies achieve GHG reduction goals..."¹²

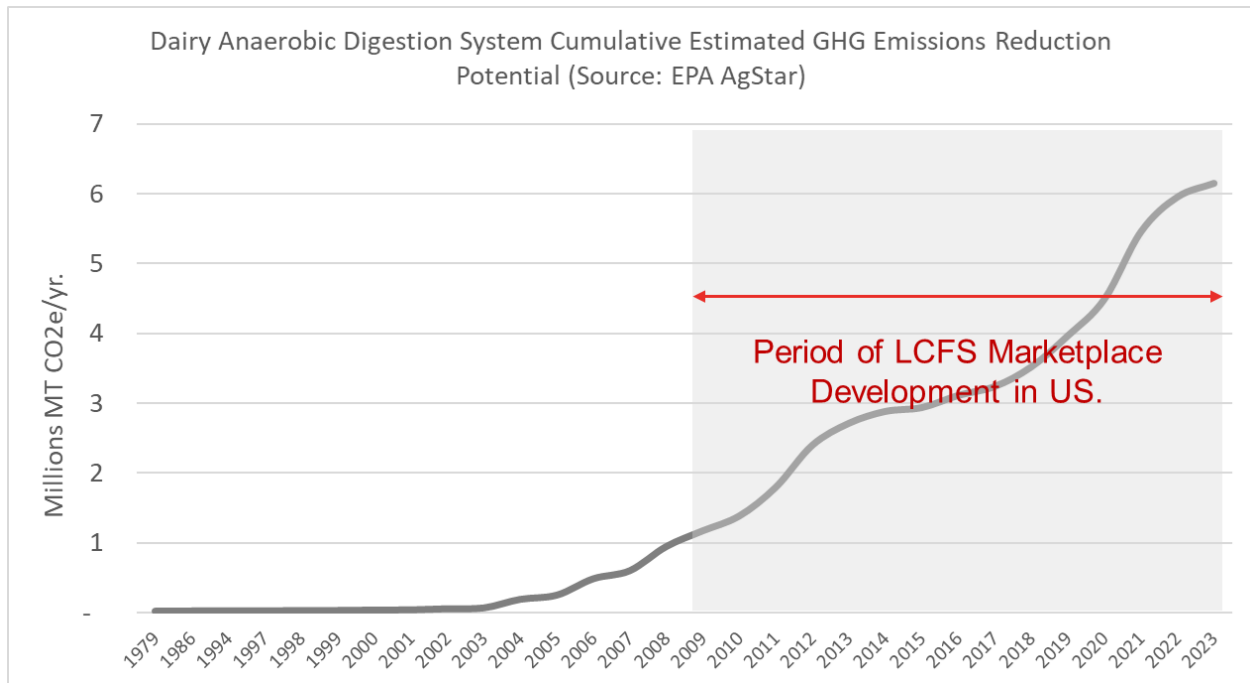
Associated Data Analysis:



¹⁰ Multijurisdictional Status Review of Low Carbon Fuel Standards, 2010–2020 Q2: California, Oregon, and British Columbia (2021). <https://escholarship.org/uc/item/080390x8>.

¹¹ From UC Davis CLEAR Center: https://clear.ucdavis.edu/sites/g/files/dgvnsk7876/files/inline-files/Meeting-the-Call-California-Pathway-to-Methane-Reduction_0.pdf.

¹² USDA Report Release (October 2023), <https://www.usda.gov/media/press-releases/2023/10/23/usda-releases-assessment-agriculture-and-forestry-carbon-markets>.



The two charts provided here are based on a sample of 351 digester systems. Given that we know approximately 141 systems are currently connected with approved credit pathways just in the state of California's LCFS marketplace, we propose that it is highly likely that at least some portion of the U.S. digester system development (and associated decarbonization) would not have occurred in the absence of environmental marketplace opportunities to transact environmental attribute certificates (a hypothetical counterfactual scenario). For reference, the gray box in each chart is meant to cover enactment and implementation activity periods associated with California, Oregon, and Washington marketplaces (including policy/implementation amendments). These marketplace policies were established in 2009, 2016, and 2023, respectively.