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Interest in California Dairy Manure Methane Digesters Follows the Money

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Inside…

Key Points:

- California has legislated a 40% reduction in manure methane emissions by 2030 from its largest source: 1.7 million dairy cows.
- One of the means of achieving that goal has been on-farm dairy manure methane digesters. Digesters not only help reduce dairy manure methane emissions, they capture renewable natural gas.
- The state has used a carrot approach by awarding grants to dairies to capture and recycle manure methane gas for energy, helping offset millions of dollars of costs.
- The financial incentives and energy market opportunities created by California's Cap-and-Trade and Low Carbon Fuel Standard (LCFS) programs are the main sources of revenue for dairy digester projects.
- The risk of policy change to the Cap-and-Trade program and the LCFS is low in California, but risk may be higher for projects outside of California trying to capitalize on credits.

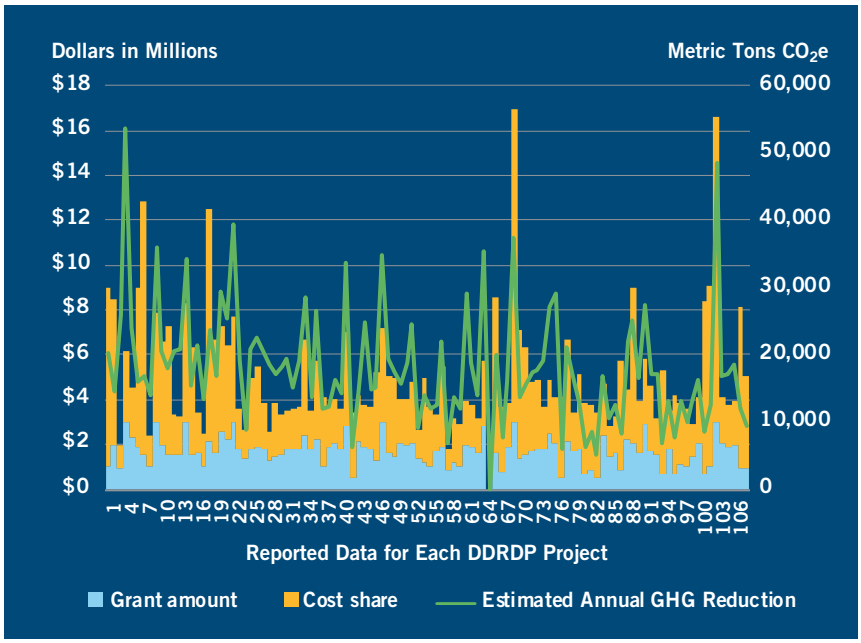
Introduction

California's 1.7 million dairy cows are the largest source of methane in the state, and the biggest concentration of dairy-related methane in the country. So, when the state focused on reducing greenhouse gas (GHG) by adopting rules for methane emissions in 2017, dairies were in the spotlight. California's legislated goal for 2030 is to reduce dairy manure methane emissions by 40% below 2013 levels.

One of the means of achieving that goal has been on-farm dairy manure methane digesters. Digesters not only help reduce dairy manure methane emissions, they capture renewable natural gas (RNG). When biogas is upgraded to natural gas specifications and used in the transportation sector of the California fuel market, it is 25-30 times more valuable than fossil natural gas.

California has used a carrot approach to dairy digesters, as a state law currently prohibits methane regulations on dairies and cattle farms until 2024. The state's Dairy Digester Research and Development Program (DDRDP) has awarded more than $183 million grants for 108 digester projects *(Exhibit 1)*. (For perspective,

EXHIBIT 1: Project Cost (Grant and Cost Share) vs. Emission Reduction



Source: California Dept. of Food and Agriculture

255 digesters are operating on U.S. livestock farms as of March 2020, according to the latest data tracked by EPA's AgSTAR program.)

This wave of digester developments on California dairy farms has spurred interest in the technology nationwide. Dairy producers outside California may be watching for long-term environmental mandates in their states, but it's the immediate financial incentives and energy market opportunities that are grabbing attention.

Drivers Behind Digester Growth

Consumers are demanding a smaller carbon footprint of their products as a way to reduce global GHG emissions. They've succeeded in influencing some lawmakers and many retailers. Retailers in turn are pressuring their suppliers to reduce emissions, which is felt by the entire dairy supply chain – a contributing factor behind renewed interest in dairy digesters.

While digesters have been used for electrical generation in the past 20 years, the market landscape has changed. The low cost of electricity means fewer power purchase agreements cover the cost of digester projects, and many are shutting down or converting to RNG. According to DDRDP data, current biogas end-use in California is 9% for electricity and 91% for RNG.

The incentives driving digester development, besides the grant program, include two California action measures: the Cap-and-Trade program and the Low Carbon Fuel Standard (LCFS).

Cap-and-Trade

Under the Cap-and-Trade program, regulated entities in California pay a fee to the state for their GHG emissions. This revenue funds the incentives for non-regulated sectors, like agriculture, to voluntarily reduce emissions.

The state established a declining cap on GHG emissions from entities covered by the Cap-and-Trade program. Each entity can then reduce its own emissions according to the cap, reduce emissions by an amount greater than the cap and generate credits, or purchase credits for emissions above the cap. These credits can be allowances issued by the state, or offsets created by voluntary GHG emission reduction projects like a dairy digester. The sale of allowances by the state and the purchase of offsets both generate revenue that can be used to fund the construction and operation of dairy digesters.

Low Carbon Fuel Standard (LCFS)

LCFS is another option that has generated revenue for dairy biogas. The LCFS works similarly to Cap-and-Trade but is focused on transportation fuels. Fuel suppliers are required to reduce the carbon intensity of their fuels by blending low carbon (non-fossil) fuels or purchasing credits from an entity with excess credits.

RNG for vehicle fuel produced from dairy digester biogas has some of the highest LCFS credits of any fuel; not only is dairy biogas a renewable non-fossil fuel, but the

EXHIBIT 2: Components of a 2,500 Cow Dairy Digester Project

On-Farm Components
Manure/Sand Separation/Removal – Required to keep large manure and sand particles out of the digester.
Digester – Contains the manure being digested and collects the gas produced.
H_2S Removal – Removes the H_2S component of the gas before it is transported offsite.
Blower – Moves the gas into the local low pressure biogas pipeline.
Off-Farm Components
Gathering Pipeline – Moves the low pressure biogas from the farm to the centralized location.
Gas Cleanup Equipment – Removes impurities in the gas to bring it up to pipeline quality standards.
Gas Compressor – Compresses the RNG and injects it into the utility pipeline

Source: Western United Dairies

process of producing RNG captures methane (a potent GHG) that would have been emitted into the atmosphere. California Air Resources Board regulators consider both of these factors when they set the credit value of RNG.

Credits Outside of California

Dairy producers outside of California have taken notice of its LCFS; California policies incentivize dairies in other states to install digesters to capture RNG. However, LCFS credits are dependent on the RNG being able to reach California through a natural gas pipeline. Both LCFS and Cap-and-Trade credits apply to digesters for other species, such as hogs; however the calculations for credit values will be different based on the baseline for each farm.

Nine Northeast and Mid-Atlantic states participate in the Regional Greenhouse Gas Initiative, a trading program for emissions aimed at reducing GHGs in the power sector. California, Oregon, British Columbia and Washington have agreed via the Pacific Coast Collaborative to reduce greenhouse gases and promote clean energy. The first three have existing LCFS programs in place and the Washington legislature is considering a program. In addition, more than a dozen states have adopted clean car standards, suggesting broader LCFS adoption.

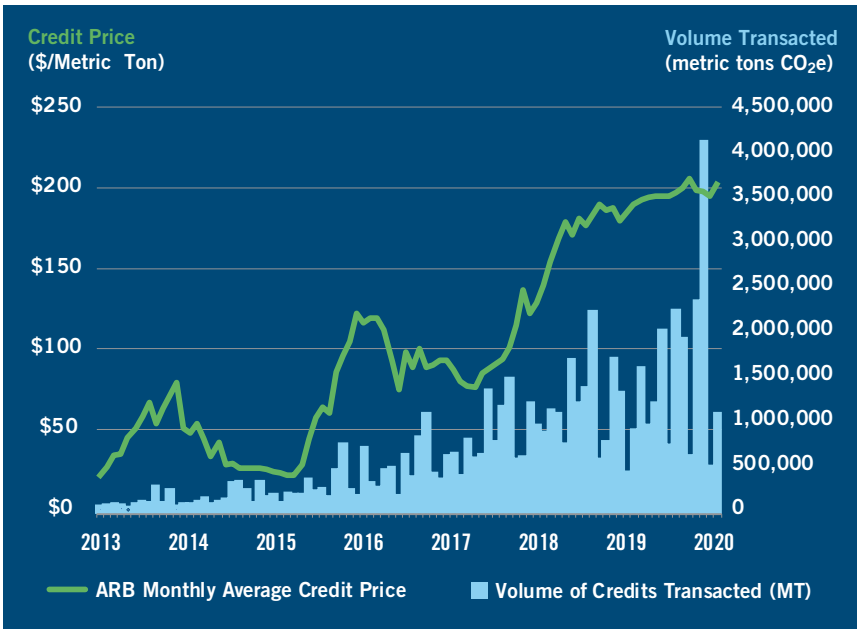
Digester Project Feasibility

Cost

Are methane digester investments worth making? The cost to install a dairy digester varies greatly depending on the dairy's location, size, manure management, and existing infrastructure but has dropped as technology improved and competition increased. The average investment for a herd of 2,500 cows is $3 million, depending on the manure equipment already in place, according to California's primary digester companies *(Exhibit 2)*. Scale is a key component. A minimum of 2,000 cows is the threshold in California, where the typical digester is a covered lagoon digester producing gas for pipeline injection. (Covered, ambient temperature lagoon digesters are designed for mild climate diluted manure streams like California's flushed dairies.) Generally, each additional 1,000 cows reduces the cost per cow of digester projects by 15%-20% (i.e. a 3,500-cow dairy digester would cost around $3.5 million).

Projects smaller than 2,000 cows may be viable if located near an existing pipeline, but is less common because an individual dairy's proportional share to build a centralized gas cleanup and injection facility is about $3million ($1,200 per cow). Location matters, as distance to reach the digester is a key driver of cost for the collection pipeline. If the dairy is half a mile away, that cost may total $200,000; if three miles away, it could exceed $1.5 million.

EXHIBIT 3: LCFS Credit Transfer Activity



Source: California Air Resources Board

The costs to address hydrogen sulfide (H_2S) within the biogas varies widely depending on local air quality regulations. These costs will be substantially higher in California and other areas with strict regulations. On smaller herds, the H_2S removal system tends to be the largest barrier because of its high fixed cost.

Revenue

On the revenue side, the value of California LCFS is the key component. The value of credits is determined by the carbon intensity goals set by the state and the demand from fuel suppliers. The state does not set the price, but can affect prices by setting the carbon intensity goals higher – fuel suppliers have to respond and ultimately drive up the price in order to reach the goals. The average monthly credit price for this year has been around $200 per ton of CO_2e – twice what the value was two years ago *(Exhibit 3)*. Volume spikes ahead of the price cap implemented July 1, along with worries around COVID-induced driving slowdowns, might have caused some panic selling.

The high value of LCFS credits reduces the incentive for California to put money into grants. With less upfront grant money available, the need for capital increases. Without an investment, reflecting grant awards, and a medium to high credit market, a dairy can receive $50-$200 gross revenues per cow per year. If a dairy has an investment in the project which includes the digester and ancillary components, the on-farm gas cleanup and the blower that moves the gas into the cluster pipeline that value can be $600-$800 per cow.

Gas utilities in California, aiming to lower their carbon footprint, are expressing interest in long-term contracts for RNG that are not exclusively tied to transportation. In these cases the returns are significantly lower but the capital cost of the system is generally paid by the utility and rate based on their customers.

Risks

Public Policy Changes

The LCFS target for 2030 is to reduce the carbon intensity of transportation fuels by 20% below 1990 levels. What happens after that date is not set, but the strong climate change concerns in California means the target is likely to become more stringent, not less. The value of credits depends entirely on the legislation that set the target, so changes to the legislation could change or eliminate the value of the credits. Well over 50% of the revenue from most projects generating credits comes from the credits. Profitability could also be jeopardized if project eligibility criteria changes.

Allocating millions of incentive dollars is a clear indicator of how much California values these projects. The risk may be higher for projects outside of California trying to capitalize on credits. Because California consumers are paying for high LCFS values at the fuel pump, some consumer groups may argue that Californians should not have to spend money for projects out of state.

Hidden Compliance Issues

It is possible for a project to be ineligible from the onset or to lose eligibility for generating credits along the way. The generation of credits must pass a test before value

can be assigned; the GHG emissions reductions must be Real, Permanent, Quantifiable, Verifiable, Enforceable, and Additional. One particular risk that comes with "additionality" is that if the state mandates digesters, then all existing digesters (not just in California) will be eligible only until the end of their current 10-year crediting period. After that, it would be very difficult to create LCFS credits.

Another risk to the entity that produces credits is that if it fails to comply with local environmental regulations during the period when a credit is generated, that credit can be devalued retroactively. For example, if the business generating credits is found in violation of local water quality regulations, the credits generated during the time of noncompliance are eliminated and the dairy may be required to provide replacement credits if they were sold. This would be the case even if the water issue had nothing to do with the methane capture project.

Conclusion

Through digesters and other methane reduction projects funded to date, the California Department of Food and Agriculture estimates 2.2 million metric tons of GHGs will be reduced each year. At the current rate, the dairy industry is half way to reaching its 2030 manure methane emissions goal.

On-farm dairy manure methane digesters are one of the most visible means of achieving the 2030 goal. California has awarded more than $183 million grants for 108 digester projects. In addition, the Cap-and-Trade program and LCFS are now the main sources of revenue for dairy digester projects. The risk of policy change to the Cap-and-Trade program and the LCFS is low in California, but risk may be higher for projects outside of California trying to capitalize on credits.

In California, the decision to invest in a digester is not a purely economic one. Starting in 2024, the state will have the authority to mandate manure methane emission reductions. Using incentive funding now to install a digester that merely breaks even is a wise choice for California dairies facing a future where the incentives end and penalties start. ■

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