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IDENTIFYING BARRIERS AND POTENTIAL SOLUTIONS TO FACILITATE ANAEROBIC DIGESTER PROJECTS IN IDAHO: ROUNDTABLE REPORT

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Policy Roundtable Participants

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Policy Roundtable Overview

In April 2011, the Center for Advanced Energy Studies' (CAES) Energy Policy Institute (EPI) conducted a policy roundtable to examine anaerobic digesters and waste to energy in Idaho's Magic Valley. CAES convened a diverse set of stakeholders for the roundtable, each with a different perspective to weigh the utility of anaerobic digestion systems. This roundtable was unique because the attendees were asked to participate as knowledgeable individuals, rather than speak on behalf of their respective agencies, organizations, and companies. This ensured an open exchange, resulting in a more candid flow of information. The objective of the meeting was for participants to discuss the benefits, costs, challenges, and possible path forward for the implementation of anaerobic digester systems in the Magic Valley. Ultimately, participants were asked to identify consensus recommendations to help promote further discourse surrounding this technology.

Prior to the roundtable, EPI developed a basic briefing document, reproduced in the Appendix, which anticipated major discussion about opportunities for community digesters. At the roundtable, participants quickly made it known that serious discussion of the much more capital-intensive community digesters was premature because of the major challenges and risks to making projects economically sustainable. In the words of one participant, Idaho is known as the "graveyard of failed anaerobic digester projects." However, the participants agreed that there are sophisticated developers with sound business models working in tandem with dairy farmers, which may result in successful project outcomes. These project designs have the potential to utilize a number of revenue streams and overcome operational difficulties to pencil out economically, even in a low-cost electricity state like Idaho. Because of the multiple revenue streams required for profit, some farmers are skeptical of the projects and view them as increased risk to an already challenging industry. For these reasons, roundtable participants concentrated on recommendations that increased the chances of project success through policy incentives, technological research, and information exchange.

Because of their affiliations as either a regulator or regulated utility, representatives from the following did not endorse or reject any of the recommendations: the Public Utilities Commission, the Department of Environmental Quality, Idaho Power Company, and Intermountain Gas.

Although opinions on the utility of anaerobic digester projects were wide-ranging, the group came up with consensus recommendations. Please note that these recommendations cover all potential actors and are not an agenda for EPI. The consensus recommendations were:

Recommendation #1:

Facilitate the formation of an interdisciplinary group to develop (utilizing existing information and research) a straw man policy and strategy to overcome barriers for anaerobic digesters. The straw man provides a starting point for discussion with Idaho government organizations.

Potential actions to overcome the barriers were:

a. Identify potential ways for the bioenergy industry to link with agricultural tax exemptions or develop anaerobic digester specific tax exemptions.
b. Develop operating/production incentives apart from the agricultural incentives.
c. Increase revenues through market development for byproducts and increasing the value of the byproduct (e.g. reducing the byproduct weight for shipping or conversion to a more value-added product).
d. Development of a skilled workforce to increase operating efficiency through technical schooling, continuing education opportunities, or operator certification.
e. Develop a clearinghouse for lessons learned and best practices in anaerobic digesters.
    i. Coordinate with the Agricultural Research Service (ARS)
    ii. Provide research results on successful operations

Recommendation #2:

A study to identify potential ways for the bioenergy industry to link with agricultural tax exemptions or develop anaerobic digester specific tax exemptions, and develop an understanding of the unintended consequences of these linkages (e.g. risk of loss of agricultural exemptions). Also study legal operating structures that work and do not work for anaerobic digesters.

Recommendation #3:

Request that the Center for Advanced Energy Studies (CAES) initiate, but not lead, an Idaho-centric collaborative steering committee of industry and researchers to direct and facilitate new technologies or new processes for anaerobic digesters for the purpose of problem solving and resolution of funding issues.

a. Suggested name: Anaerobic Digester Forum
b. Potential members include (but are not limited to): Cargill Corp., Simplot Corp., U.S. Department of Agriculture, Agriculture Research Service, Natural Resources Conservation Service, Idaho National Laboratory.

The participants also discussed overcoming the barriers to limited investment in the demonstration of new technologies at a broader scale. In this area, potential actions to overcome the barriers were:

c. Working with existing digester operators and owners to encourage and incentivize demonstration of new technologies.
    i. Promoting collaborative efforts and providing a collaborative infrastructure between public and private entities for the demonstration

of new technologies. The Dairy Management Institute may be a good organization to foster and coordinate these efforts.

The roundtable's recommendations seek to provide a wider availability of information for potential anaerobic digestion system developers and owners. A better understanding of the available resources and business models will likely contribute to more successful projects.

The following is the briefing memo as presented to the participants for review prior to the roundtable in April 2011.

Introduction, Purpose, and Recent Events

Anaerobic digestion is a complex process in which organic matter is broken down by bacteria in the absence of oxygen. The end result is biogas and a solid residual or effluent. The biogas can be used to generate electricity, be sold to a natural gas utility, or be used to help power industry or farm operations. Since the residual is "relatively pathogen-free," it can be used as animal bedding or as a soil amendment, among other uses. (Petcash, 2011). Dairy waste to energy in Idaho has the potential to reduce greenhouse gases, enhance environmental sustainability, increase the proportion of renewably generated electricity, and to provide economic benefits for farm owners and rural communities. A report by the Idaho Strategic Energy Alliance (ISEA) Biogas Task Force (2009) identified community digesters from a number of dairies to generate electricity as the "most viable" option for "success in the immediate future" (p. 7), although there were only two anaerobic digesters on dairy farms at the time of the report's writing. [1] Despite the potential benefits, there are significant barriers to the widespread adoption of anaerobic digesters for dairy waste to energy, and in particular the production of electricity. Many of these barriers are related to costs and regulatory policy. As a result, a policy roundtable to investigate and recommend next steps that have the potential to address these barriers is warranted.

Important developments have occurred at a regional and national level since the drafting of the ISEA report. A comprehensive national policy to address carbon emissions through a cap-and-trade program linked to the Clean Air Act would have made biogas more attractive economically, but it is now off the table for the foreseeable future. The game-changing development of shale gas plays in the United States has led to cheap natural gas for the short-term and large increases of domestic reserves for the long-term, which will likely make the purchase of biogas less competitive. At the same time, California's comprehensive climate change policies and the widespread commitment to Renewable Portfolio Standards by a number of states help to provide potential markets for electricity produced from dairy waste. Finally, other important dairy states such as Wisconsin, with 25 manure digesters in operation

[1] For a detailed assessment of biogas in Idaho, view the ISEA report at http://www.energy.idaho.gov/energyalliance/d/biogas_resources_report.pdf

as of 2010 and at least one community dairy digester project, have demonstrated that state, local, and industry collaboration can achieve a modicum of success (U.S. Environmental Protection Agency, 2010).

Likewise, the closing of the Idaho legislative session resulted in some laws that will have a likely effect on the drivers and market penetration for anaerobic digesters. The expansion of the "Right to Farm" law is aimed at avoiding nuisance lawsuits brought against farming operations, but it has the potential to be a disincentive for some owners to control odor from dairy operations through the utilization of anaerobic digestion. Also, the failure to extend beyond June 2011 the current sale-and-use tax rebate to purchasers of equipment to generate electricity from renewable sources, including anaerobic digesters, removes a significant incentive for farm owners. This briefing document provides a beginning point for discussion and background about the opportunities, challenges, and policy issues surrounding the adoption of community digesters for dairy waste to energy.

Background

Historical data suggests that digesting animal manure for energy has been around since 10th century Assyrians used it to heat water (Lusk, 1998, p. 2-2). In 1859, the first anaerobic digestion plant was built in India, and in 1895, the English recovered biogas from a sewage treatment facility and used it to power street lamps (McCabe, 1957). While digesters continue to remain a popular energy source in Europe, they were not widely used in the U.S. until a few decades ago. The energy crisis of the 1970s and high costs in the early 1980s caused Americans to look toward alternative energy sources. During this time period, many digesters were constructed on dairy farms in theU.S., but most of them are no longer operational. In fact, one study found that only 28 of the 57 digesters built in the 1970s and 1980s were still in production in 1998 (Scruton, 1999).

In 1978 during the midst of the energy crisis, Congress passed the Public Utility Regulatory Policies Act (PURPA). The goal of PURPA was to create a market for non-utility operations to sell their renewable energy to local utilities. These non-utility power producers now provide about 7% of the country's power (Department of Energy, 2010). Today, some anaerobic digester operations use biogas to provide electricity for their farms, while others choose to connect to the electrical grid and sell their power to utilities. According to the ISEA, the decision of whether or not an operation sells its biogas or electricity is normally an economic one. If the revenue from biogas recovery is greater than the capital cost of recovery, then it is likely that the operation will connect to the power grid and sell the biogas to utilities (Idaho Strategic Energy Alliance, 2009).

Benefits of Anaerobic Digestion in the Dairy Sector

Anaerobic digesters used on dairy farms have the potential to lessen greenhouse gas emissions and to generate electricity from a renewable source. Dairy cows in the U.S. emit an estimated 5. 5 million metric tons of methane into the atmosphere annually, which accounts for nearly 20% of U.S. methane emissions (U.S. Environmental Protection Agency, 2010). According to the EPA, methane has more than 20 times the heat trapping capacity of carbon dioxide (U.S. Environmental Protection Agency, 2011). Since manure emits methane into the air, the anaerobic digestion process houses the manure in an oxygen-free environment and prevents the methane and other greenhouse gases from escaping into the atmosphere. The manure can then be converted into biogas, which can be used to generate electricity. In 2009, anaerobic digesters across the U.S. produced approximately 374,000 megawatt-hours (MWh), providing electricity for an estimated 33,000 homes (U.S. Environmental Protection Agency, 2010).

Sanitation hazards and odor can be alleviated from the use of anaerobic digesters. At any dairy farm, cow manure is a considerable waste management issue. Since manure is added to the digester daily, this process provides a safe way to dispose of waste, which has significant impacts on controlling animal disease and preventing potential groundwater contamination. One of the biggest complaints from citizens about dairy farms is the odor. Between May and November 2001, the Idaho State Department of Agriculture (ISDA) received 916 complaints from citizens regarding foul dairy odors in the Magic Valley (Steubner, 2002). Since then, several digesters have been installed in the Magic Valley. According to a communication from the Idaho State Department of Agriculture, after several digester installations in the Magic Valley, only 256 dairy odor complaints were reported in 2010. A representative from the Department of Environmental Quality claims that the decrease in complaints is likely attributed to the anaerobic digesters that had been constructed during that time period. [2] Anaerobic digesters not only serve as a waste management tool, they also mitigate odor and improve overall air quality, thus improving the quality of life for neighbors and preventing costly nuisance law suits for farm owners. It is not clear what effect Idaho's HB210, the recent

[2] (Personal Communication, 2011). [*CORRECTION: At the roundtable this figure was called into question. Subsequent research has led to a revision. EPI confirmed with the Idaho State Department of Agriculture that there were 948 total nuisance complaints called into the hotline during its first year of operation (2001) for the Magic Valley. Of the 948 complaints, 916 of them were attributed to one farm.]*

expansion of the "Right to Farm" law that is aimed at reducing lawsuits, will have on the potential demand for odor control in dairy operations provided by anaerobic digesters.

Anaerobic digestion provides a potential source of income, although the net economic impact of constructing a digester is dependent upon how well the digester's biogas and effluent are utilized (Liebrand and Ling, 2007). Whether the dairy farm owner or a third party builder garners the profits, biogas does provide a possible revenue stream. The same is true for the remaining dirt-like substance that remains after the biogas is removed. Some farm owners use the effluent for animal bedding, while others choose to sell it as a soil additive. The direct sale of the biogas and byproducts is not the only economic benefit; the indirect or induced effects of a farm owner spending income generated from sales or hiring for anaerobic digester operations is important to rural communities.

Over the past four decades the U.S. has experienced an increase in the use of anaerobic digesters on dairy farms, primarily due to technological improvements, government incentives, and economic benefits (See Table 1).

Table 1. Number of Operating Anaerobic Digesters by Year

Year	# of Operating Digesters in the U.S.
1972	1
1998	28
2007	95
2010	157

Sources: Scruton (1999), Liebrand & Ling (2007), United States Environmental Protection Agency (2010).

Possible reasons for the increased number of operating digesters include:

- **Improved Technology.** Digester designs are more efficient and easier to maintain than they were 20 years ago. (Safferman, 2008).
- **Nuisance Issues.** Growing concerns about manure management practices as well as odor issues are causing dairy farm owners to examine anaerobic digesters as a solution. (U.S. Environmental Protection Agency, 2011).
- **Rising Energy Costs.** As the price of electricity increases, many farm owners have turned their sights toward alternative energy methods to mitigate the cost of dairy operations.
- **National Commitment to Reduce Carbon Emissions.** The U.S. Department of Agriculture (USDA) and dairy industry agreed to a voluntary goal of 25% reduction in dairy carbon emissions by the year 2020. To adhere to this commitment, anaerobic digesters may be built at more U.S. diaries.
- **More Government Support.** Because of PURPA and renewable portfolio standards, power utilities are more receptive to purchasing biogas to meet these standards. Since the government aims to accomplish its commitment to reduce carbon emissions, they are providing more monetary assistance than ever before. From 2003-2009, the USDA has awarded over $37 million toward anaerobic digestion systems (United States Environmental Protection Agency, 2010).
- **Carbon Credits and Renewable Energy Certificates.** Methane that is captured and prevented from escaping into the environment may be qualified to receive carbon credits and be sold in a voluntary market, and electricity generated from biogas may qualify for Renewable Energy Certificates.

Even though the U.S. has witnessed significant growth of anaerobic digesters in the past decade, they are still vastly underutilized. Taking the size of the dairy operation into consideration, the USDA estimates that over 8,000 dairy farms would be good candidates for anaerobic digesters (United States Environmental Protection Agency, 2010). Since only 157 digesters are currently operating, that means that about 98% of farms that could be using digesters, are not. This indicates that the barriers to widespread adoption of anaerobic digesters are quite significant.

Challenges to Anaerobic Digestion Technology

The largest challenge in determining whether or not a farm owner will adopt anaerobic digestion technology comes down to economics. Even though there is a greater availability of government financial support, digesters are capital intensive. Depending on the number of cows, intended purpose, and sophistication, small anaerobic digesters can cost anywhere from $25,000 to $3 million (Balsam, 2006). A farm owner's decision to construct a digester becomes even more difficult when the digestion system has questionable paybacks. Producing biogas for sale involves costly processing. In addition, since natural gas has varying rates depending on pipeline connectivity and available markets in a region, anaerobic digestion may make more sense in one place than another. In October 2010, the average price of natural gas sold to electric power consumers in Idaho was $3.67/thousand cubic feet versus Florida consumers who paid $6.04/thousand cubic feet (Energy Information Administration, 2011). This means that based on energy costs, in some states there is more of an incentive than in others to produce biogas via anaerobic digestion.

The amount of work required to operate an anaerobic digester may also deter some farm owners from constructing one. Most digesters take anywhere from 30 minutes to an hour to operate daily, so questions arise such as, "Does the farm owner have the time?" or "Can the farm owner afford to hire someone to run it daily?" Even if a farm owner has the time or the resources to run the digester, additional time and resources are required for other issues, such as maintenance and repair, or marketing to find appropriate uses for the byproducts (Liebrand, 2007).

Since the average digester has the capability to produce electricity at a higher rate than needed to power the farm, some sell excess power to utility companies (Scruton, 1999). Anaerobic digestion systems are usually located in sparsely populated areas, so interconnection fees are even more expensive since the power "has to cross significant utility infrastructure" (Idaho Strategic Energy Alliance, 2009, p. 25). The ISEA (2009) also notes that under the current system, the cost of interconnection is borne by the digester provider, even though "the public, the utility and the developer all benefit" (p. 25). Linking distributed generation from an on-site biogas generator to the electric power grid is not only costly, but it raises safety, quality, political, procedural and legal issues (Haynes, 2007). Even if the digester provider can afford the interconnection fees, connecting to the grid still raises challenges with the public utilities. Buying power from dairies is a risk for utilities—if the dairy owner fails to provide a power source consistent with the contract, the utility bears the burden. In order to mitigate this risk, public utilities have strict guidelines when entering into contracts with dairy owners (Idaho Strategic Energy Alliance, 2009). One survey from 2007 found that negotiating with the local utility companies was often the biggest challenge for farm owners (Lazarus, 2008). Considering all the barriers associated with anaerobic digestion technology, it is worth noting that most farm owners may not have all the necessary expertise to handle these issues, and it can be complicated and costly to find someone who does.

Funding Options and Assistance

Financing is often the largest hurdle in adopting digestion technology, and the government has stepped in to subsidize the cost and make it easier for farm owners to obtain digesters. Loans, grants, production incentives, tax exemptions and tax credits are all common methods of assistance provided at the state and national levels (Bracmort, 2010). Some of the most widely used financing mechanisms include the Rural Energy for America Program (REAP) (Section 9007), Value Added Producer Grants, Environmental Quality Incentives Program, Conservation Innovation Grants, Sustainable Agriculture Research and Education Funding Opportunities, and third-party private ownership using the Build, Own, Operate, Transfer (BOOT) Model. Even though there are diverse resources and funding options available, digesters are typically far more expensive than any one loan or grant will finance. It is important to note that farm owners typically have to utilize several funding options and revenue streams in order for digester projects to be financially viable.

Many funding options are available but some farm owners may not know where to begin when looking for assistance. In February 2011, U.S. Environmental Protection Agency's AgSTAR Program published the *Industry Directory for On-Farm Biogas Recovery Systems*. This list is comprised of over 260 contacts including consultants, developers, energy service providers, finance specialists, even universities. These individuals specialize in working with farm owners to find the best financing options. Generally speaking, as long as the farm owner earns 50% or more of their income from the agricultural operation, they are eligible for assistance.

Project Types

While the vast majority of digesters are smaller farm scale operations, some farm owners choose to pool resources to build a community digester.

Table 2: Farm Scale, Centralized, and Multiple Farm Projects

Project Type	Number of Operating Projects
Farm Scale	143
Centralized/Community	12
Multiple Farm	2

Source: US Anaerobic Digester Status Report, United States Environmental Protection Agency (2010).

A multiple farm project refers to a design where multiple farms transport their waste (either by truck or underground piping) to a neighboring dairy's digester. A centralized or community digester means that several farms transport their waste to one central digester that is usually not located on anyone's farm. Community digesters are typically much larger than what is found on farm scale or multiple farm operations. The presence of multiple project types presents another challenge in implementing digestion technology.

Individual Farm Scale:

When a farm owner is the sole proprietor of a digester, it mitigates conflict as he or she is the only one who makes decisions for the dairy. What kind of digester to build, who operates and maintains it, and how it will be funded are decisions that are solely made by the owner. However, digesters are expensive, and if a dairyman has a large herd, bearing the financial burden of startup costs can be difficult. Individual farm scale digesters make up about 90% of all operating digesters in the U.S.

Community Structures:

Community and multiple farm digesters are convenient for farm owners whose dairy operations are too small to install an individual digester. This project type is advantageous because the capital cost, operating and maintenance costs, and risk are all borne by the group rather than an individual (Liebrand, 2007). When multiple dairies feed into the same digester, more biogas is produced than they would individually. This is beneficial because five farm owners with smaller operations are less likely to connect to the power grid individually, but collectively they have more potential to make a profit by selling the biogas or electricity to local utilities.

Without careful planning, community structures can be problematic. Biohazards are a possible challenge to community structures because combining waste from multiple farms poses a potential for pathogens to be transferred between farms. This type of model needs to have procedures in place to mitigate the biosecurity risk that is associated with multiple farms using one digester (Liebrand, 2007). When a community structure exists, accountability becomes ambiguous. If several farms combine waste, it becomes difficult to determine who is accountable in emergencies such as groundwater contamination. Logistical questions with permitting can also be confusing.

Business Models

Anaerobic digestion projects can be executed under several different business models. The most common models include ownership by the dairy, the utility, or a developer. Individual dairy owned digesters are often purchased from a developer and placed on a farm owner's land. Individual dairy ownership means that the dairy is solely responsible for the operation and maintenance of the equipment (Idaho Strategic Energy Alliance, 2009). This can be either time consuming if the farm owner must operate the digester, or costly if the farm owner must hire someone to operate the system. However, with this model, the dairy owner keeps any potential profit and anything made from the sale of biogas is returned to the farm. Similar to individual dairy ownership, multiple dairies can cooperatively own a digester. If several dairies choose to own a community digester as discussed above, startup costs become less of a burden on each dairy owner. However, transparency issues arise because it can become unclear when determining who gets what percentage of the profit (Liebrand, 2009).

In a utility owned model, the utility pays for the capital costs to build a digester on someone's farm. The utility, the farmer, or a third party is responsible for the operation and maintenance of the equipment. The utility will compensate the farmer for the use of the land, often by providing electricity for the dairy operation (Idaho Strategic Energy Alliance, 2009).

Developer ownership means that a third party developer or investor builds and owns the digester on a dairy owner's farm. The developer is entitled to all profits from the digester, but is also responsible for the operation and maintenance of the system (Idaho Strategic Energy Alliance, 2009).

Community Structures in Action

The state of Wisconsin has more operating digesters than any other state in the nation. With roughly 25 digestion systems in place, Wisconsin has an estimated energy production of over 95,000 MWh/year (United States Environmental Protection Agency, 2010). Wisconsin is such a large dairy state that it creates a greater opportunity for digestion technology to be studied. Organizations like the Energy Center of Wisconsin (ECW) apply their expertise toward studies that allow Wisconsin farm owners to better understand and utilize anaerobic digestion technology. The recently published *Wisconsin Agricultural Biogas Casebook* (Kramer, 2009) has compiled data from of all dairy digesters in the state including farm size, project type, business models, and which operations have utility agreements. An analyst at the ECW notes that many dairy owners who are interested in obtaining a digester use resources like the *Wisconsin Agricultural Biogas Casebook* to look at other operations nearby, consider the variables, and decide which model best suits their needs.[3] According to the project manager for the Dane County community digester, since potential digester owners are able to learn from the experiences of other operations, collaboration between developers, farm owners, utilities and local government is often more effective than other states with fewer projects to model after.[4]

Dane County, Wisconsin recently began generating electricity on a community digester that collects waste from three dairies. Former Wisconsin Governor Jim Doyle allocated $6.6 million in the 2009-2011 state budget to pay for two new community digesters in Dane County. So far, only the first digester has been built, and $3.3 million in state funding has gone toward the project. The remainder, $12 million, has been financed by Clear Horizons, LLC, who owns the digester (County of Dane, 2010). Dane County claims that this community digester is estimated to generate roughly $2 million worth of electricity each year—enough to power over 2,500 homes (County of Dane, 2010). Community structures, including the Dane County example, are most effective when farms are close in proximity. A Clear Horizons, LLC employee also notes that farm proximity is a considerable factor when determining the cost effectiveness of a community digester.[5] Since manure must be hauled from the farms to the digesters, a key factor in the success of a community digester is ensuring that the cost of hauling waste to the digester is less than the amount of electricity that can be generated by that waste.

[3] (Personal Communication, 2011).
[4] (Personal Communication, 2011).
[5] (Personal Communication, 2011).

<u>Idaho's Dairy Industry:</u>

Idaho is currently one of the largest dairy states in the nation. With over 600,000 cows, Idaho has the fourth largest cow population in the U.S., behind California, Wisconsin, and New York (United States Department of Agriculture, 2010). Of those 600,000 cows, over 70% of them reside in the Magic Valley (Idaho Strategic Energy Alliance, 2009, p. 11). Over the last few decades, Idaho dairy farms have decreased in number, but increased in size (United States Department of Agriculture, 2010). Some attribute this phenomenon to costs of production, business organizations of dairy farms, and the fact that increased productivity of milk cows has forced structural changes within the industry (Outlaw, 1996).

Table 3: Idaho Dairy Farm Statistics, 2010

	1991	2007	2010
Licensed Dairies	1,952	648	584
Number of Mature Cows	178,000	507,000	519,552
Average Herd Size	91 Cows	783 Cows	889 Cows

Source: Tech Help, 2010

The decrease in number of dairies plus the increase in herd size means that manure production becomes denser over a smaller area of land. Currently, 126 dairy farms in Idaho have over 1,000 mature cows (Idaho Strategic Energy Alliance, 2009). This means that at least 126 dairies could potentially make successful candidates for anaerobic digestion systems, yet there are less than five digesters currently operating on Idaho's dairy farms. However, Rock Creek Dairy in Filer is currently collaborating with New Energy One to build an anaerobic digester that will generate electricity using the waste from three dairies. The project is estimated to cost $12-$14 million and should be operational by August 2012 (Carlson, 2010). The Idaho Strategic Energy Alliance (2009, p. 11) estimates that if anaerobic digesters were placed on every farm, with over 1,000 cows, the Magic Valley has significant potential to provide electricity, as well as stimulate job creation in Idaho.

Considerations for Farm Owners to Decide About Anaerobic Digester Utilization

Whether or not a farm owner chooses to install a digester depends on;

- Farm logistics: Are the farm's unique circumstances (i.e. number of cattle, type of digester) conducive to a cost-effective operation?
- Local utilities: If an intended use of the digester is selling biogas or electricity to utilities, farm owners should ensure that they have access to negotiate with local utilities and make sure that a demand for the energy even exists. Furthermore, electricity rates need to be studied to ensure their project will be profitable.
- Access to financing mechanisms: Dairy owners need to examine what funding mechanisms are available and what they can qualify for. If a dairy cannot afford the capital costs on their own, look to other methods such as shared ownership or a private developer.
- Available skill-sets: Since digesters must be operated on a daily basis, farmers should guarantee that they have the resources to and available skill-sets to maintain and operate the system.
- Level of risk aversion: How much risk is the individual farm owner willing to assume? If the answer is very little, a community or cooperative structure may be the best fit.
- Farm proximity (for community structures only): If waste needs to be transported to a digester, this is an added cost. Farmers need to calculate the distance in which they can transport the manure to the digester and still have a profitable operation.

The decision to adopt anaerobic digestion technology on a dairy farm is complex. Further research needs to be conducted to determine whether policy and market shifts may make anaerobic digestion more feasible in the future.

Questions to think about for the roundtable:

- What is the most effective structure for economic development purposes? Individual or community? Farm, cooperative, or third party ownership?

- What should the role of state and local governments be in enabling the adoption of anaerobic digesters?

- What are the potential markets for electricity generation and biogas?

- What investment incentives are necessary to make the projects targeted at these markets successful?

<u>**References:**</u>

AgSTAR. (2011). *Online AgSTAR Digest: Winter 2011.* United States Environmental Protection Agency. Retrieved April 4, 2011 from http://www.epa.gov/agstar/news-events/digest/2011winter. html.

Balsam, John. (2006). *Anaerobic digestion of animal wastes: Factors to consider.* National Sustainable Agriculture Information Service. Retrieved March 31, 2011, from, http://www.attra.org/attra-pub/anaerobic.html#system.pdf.

Bracmort, Kelsi. (2010). *Anaerobic digestion: greenhouse gas emission reduction and energy generation.* (CRS Publication No. R40667). Congressional Research Service. Washington, DC: Retrieved March 30, 2010 from, http://ncseonline.org/NLE/CRSreports/10Jun/R40667.pdf.

Carlson, Brad. (2010). *Rock Creek energy plant to take waste from multiple dairies.* Idaho Business Review. Retrieved April 4, 2011 from, http://idahobusinessreview.com/2010/12/28/rock-creek-energy-plant-to-take-waste-from-multiple-dairies/.

County of Dane. (2010). *County Executive Falk, Farmers Help Start Operation of Dane County "Cow Power" Facility.* Retrieved April 6, 2011 from, http://www.countyofdane.com/press/details.aspx?id=2362.

Department of Energy. *Public Utility Regulatory Policies Act of 1978 (PURPA).* Retrieved March 28, 2011, from http://www.oe.energy.gov/purpa.

Haynes, Rusty and Check Whitaker. *Connecting to the Grid, A Guide to Distributed Generation Interconnection Issues, 5th Edition, 2007,* Interstate Renewable Energy Council (IREC), Connecting to the Grid Project.

Idaho Strategic Energy Alliance (2009). *Biogas generation and Use in Idaho: A Report by the Idaho Strategic Energy Alliance Biogas Task Force.*

Independent Statistics and Analysis, US Energy Information Administration. (2011). *Natural Gas Prices.* Retrieved March 30, 2011 from, http://www.eia.doe.gov/dnav/ng/ng_pri_sum_dcu_SID_a.htm.

Kramer, Joe. (2009). *Wisconsin Agricultural Biogas Casebook.* Energy Center of Wisconsin. Retrieved April 4, 2011 from, http://www.ecw.org/ecwresults/biogas09_casestudy.pdf.

Lazarus, William F. (2008). *Farm based anaerobic digesters as an odor control technology. Background and policy issues.* United States Department of Agriculture.

Liebrand, Carolyn Betts and K. Charles Ling. (2009). *Cooperative approaches for implementation of dairy manure digesters.* USDA Rural Development, Research Report 217.

Lusk, P. (1998). Methane recovery from animal manures: The current opportunities casebook. Golden, CO, National Renewable Energy Laboratory. Retrieved March 25, 2011 from http://www. mrec.org/pubs/25145.pdf.

McCabe, J; W. Eckenfelder, eds. (1957).*Biological treatment of sewage and industrial wastes.* New York: Reinhold Publishing.

Outlaw, Joe L. and Robert E. Jacobson, Ronald D. Knutson, and Robert B. Schwart, Jr. (1996). *Structure of the U.S. dairy farm sector.* Dairy, Markets, and Policy: Issues and Options. Retrieved April 6, 2011 from, http://www.cpdmp.cornell.edu/CPDMP/Pages/Publications/Pubs/M4.pdf.

Petcash, D. (2011, February 22). *Cow power: Got alternative energy?* Retrieved March 28, 2011, from, http://www.ktvb.com/home/Cow.

Roth, Mike. (2011). *Idaho Dairy Focus Newsletter.* Retrieved April 11, 2011 from, http://dairyline.com/Idaho/April%202011%20Idaho%20Dairy%20Focus.pdf.

Safferman, Steven and Louis Faivor. (2008). Anaerobic digestion biogas-potential assay. *Michigan Dairy Review, (13)*4, 8-9.

Scruton, Daniel L. (1999). *Vermont methane pilot project initial literature search paper.* Vermont Department of Agriculture. Retrieved March 30, 2011 from, http://www.vermontagriculture.com/documents/whitepaper. pdf.

Shepel, Jan. (2011). *Dane County digester begins generation.* Wisconsin State Farmer. Retrieved April 9, 2011 from, http://www.wisfarmer.com/leadstories/119406499.html.

Steubner, Stephen. (2002). Raising a stink. *Factory dairies catch Idaho's Magic Valley by surprise*. Retrieved April 1, 2011, from, http://www.hcn.org/issues/224.

Tech Help. (2010). *Idaho Dairy Stats.* Retrieved April 11, 2011 from, http://www.techhelp.org/index.cfm?fuseaction=content.view&page=155.

United States Department of Agriculture. (2010). Overview of the United States Dairy Industry. Retrieved April 11, 2011, from, http://usda.mannlib.cornell.edu/usda/current/USDairyIndus/USDairyIndus-09-22-2010.pdf.

U.S. Energy Information Administration. *Average Price of Natural Gas Sold to Electric Powera Consumers, by State.* Retrieved April 15, 2011, from, http://www.eia.gov/pub/oil_gas/natural_gas/data_publications/natural_gas_monthly/current/pdf/table_21.pdf.

U.S. Environmental Protection Agency. *Accomplishments*. Retrieved April 1, 2011, from, http://www.epa. gov/agstar/about-us/accomplish. html.

U.S. Environmental Protection Agency. *Anaerobic digesters continue to grow in the U.S. livestock market.* Retrieved April 13, 2011, from, http://www.epa.gov/agstar/documents/2010_digester_update.pdf.

U.S. Environmental Protection Agency. *Methane.* Retrieved April 13, 2011, from, http://www.epa.gov/outreach/.

U.S. Environmental Protection Agency. *Ruminant livestock - Frequent questions*. Retrieved April 2, 2011, from http://www.epa.gov/rlep/faq.html.

U.S. Environmental Protection Agency. (2010). *U.S. anaerobic digester status report.* Retrieved March 27, 2011 from, www. epa.gov/agstar/documents/digester_status_report2010.pdf.

Washington State Department of Ecology. *Anaerobic Digester.* Retrieved March 25, 2011, from, http://www.ecy.wa.gov/programs.

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