

PROJECT TITLE: Optimizing Biogas' Role in Meeting MN's Energy Goals

I. PROJECT STATEMENT

Opportunity: Anaerobic digestion of organic “wastes” from dairy, swine, poultry and beef operations, food processing and wastewater treatment plants promises multiple benefits, including: renewable electricity, synthetic natural gas, fertilizer, carbon and/or renewable energy credits, odor control and significant reductions in methane emissions, a greenhouse gas with 22 times more heat-trapping power than carbon dioxide. A 2009 NASA study found that the third largest contributing factor to atmospheric warming is livestock that emit methane. The precise size of the opportunity for biogas in Minnesota is hard to estimate because good data does not yet exist for some likely feedstocks, such as cheese whey and urban organic wastes.

- Conservatively, just the manure from ~7 million dairy cows and hogs could yield 17 billion cubic feet of biogas, approximately 3% of MN's electricity or 4% of natural gas.

Problem: Despite Minnesota's past investments in anaerobic digestion R&D projects, barriers to its widespread adoption remain. These barriers include:

- Lack of up-to-date information about feedstock location, cost, and availability;
- Poor understanding of the feedstock ratios that can optimize biogas production;
- Lack of awareness about new business models successfully used elsewhere; and
- A policy environment geared toward electricity production when that may not be the highest, best use of the biogas.

The goal of this project is to remove these remaining market, technical and policy barriers so that Minnesota can benefit from biogas's full economic and environmental potential.

II. DESCRIPTION OF PROJECT ACTIVITIES

Activity 1: Improve market information to maximize biogas production.

Budget: \$65,700

Data indicates that co-digestion of manure with other substrates results in increased methane production. Using substrates such as food waste, cheese whey or fats and greases for co-digestion with livestock manure or other organic materials will not only result in greater biogas production but will divert organic waste from landfill disposal.

The project team will analyze commercial experience and research globally to identify feedstock combinations that yield optimal gas output. Using existing literature the project team will develop a simple formulation tool to help estimate biogas methane yields from different mixtures of feedstocks. There is a large volume of state, national, and international co-digestion research studies to draw from to develop the formulation tool. A 2005 report from the Minnesota Department of Agriculture identified potential feedstocks for digestion from Minnesota industries such as food, grain, pulp and paper, domestic and livestock wastes, and crop residues. A 2007 report from Sebesta Blomberg examined digesting hog manure with corn stover and conducted preliminary experiments on wheat straw, sugar beet pulp, and green chopped switchgrass as additional co-digestion feedstocks. All of the research studies examined will be catalogued and available at www.mnbiogas.org. It is anticipated that this tool will be used by future projects to maximize biogas production. The tool will be developed as a foundational framework that can be expanded for future projects using additional funding resources.

Outcome	Completion Date
---------	-----------------

Develop a simple anaerobic digestion co-digestion formulation tool that will allow users to input various combinations of substrates to help estimate biogas yields for different substrate mixtures.	August 2012
---	--------------------

Activity 2: Address lack of geographic information to increase projects. Budget: \$138,900

The Minnesota Geospatial Information Center (MnGeo) and the project team will develop a GIS-based, interactive map that will help digester developers of all kinds identify optimal project sites based on proximity to the right mix of feedstocks and to local users of the resulting electricity and synthetic natural gas. GIS map layers would include, but not limited to:

- Co-digestion feedstock locations, volumes and costs;
- Livestock operations (type, size and biogas potential from manure digestion);
- Local utilities, including location of three-phase and single-phase electrical lines and injection points in the natural gas infrastructure;
- Industrial and commercial natural gas users; and
- Farm equipment suppliers for anaerobic digestion technologies (pumps, agitators, augers, etc.).

Outcome	Completion Date
Resolve key technical and market barriers with new multi-layer GIS anaerobic digester project siting tool available at www.mnbiogas.org .	January 2013

Activity 3: Identify policy gaps: create conditions for success. Budget: \$58,000

Experience in other states and countries highlights the importance of having the right public policies in place. Minnesota has some policies in place (renewable electricity standard, net metering, production incentive), but these have proven insufficient to stimulate a robust industry. A diverse biogas advisory group with knowledge of key barriers to anaerobic digester expansion will draw on the experience of other states and countries to develop consensus policy recommendations that will accelerate digester development in Minnesota. These recommendations will be presented to the LCCMR commission and the legislature to develop a legislative package for adoption.

In August 2010 the Great Plains Institute published a comprehensive overview of biogas policy in the United States, examining federal and state policy mechanisms to grow the biogas industry. Through a series of phone interviews with key interests, GPI developed a slate of additional policy options for consideration. These high level recommendations are ripe for additional discussion to develop specific legislative proposals and language. This report will be used as a foundational document for the Minnesota biogas advisory group to ensure all members are starting with the same set of information, and will accelerate the group's development of consensus policies specifically tailored to Minnesota's needs.

Outcome	Completion Date
Address biogas policy barriers with a set of consensus policy recommendations from advisory group representing government, industry, academia and the environmental community.	September 2012

Activity 4: Outreach, education and dissemination of results. Budget: \$37,400

The project team and advisory group members will develop a multi-pronged outreach strategy to ensure all relevant interests become aware of technical tools developed through this project. One of the main deliverables from this activity will be the development of the www.mnbiogas.org website where the technical and policy resources developed through this project will reside.

The website will be populated with additional technical resources (both domestic and international), company contacts, and general information about biogas development. The website is intended to become the definitive biogas resource for the state of Minnesota. Additional outreach opportunities will include workshops and/or presentations at targeted existing meetings/conference about technical and policy tools to reach key audiences. The project team will also develop reports and/or factsheets to support outreach activities. None of these activities will include lobbying.

Outcome	Completion Date
Increase in the number and success of digesters by educating key audiences about the policies and technical tools from this project.	June 2013

III. PROJECT STRATEGY

A. Project Team/Partners

Partners receiving ENRTF appropriation

- *Great Plains Institute*: responsible for project management, coordination with MN Geo to perform GIS data collection, development of web and communication resources, and facilitation of advisory group for biogas policy development.
- *Minnesota Geospatial Information Office*: primary partner responsible for development of Web-based GIS application.
- *MN Agri-Growth Council*: conduct outreach to Minnesota’s agriculture and food industry to collect feedstock information for co-digestion formulation tool and GIS application.
- *Biobusiness Alliance of Minnesota*: build business relationships with global biogas technology providers to leverage international biogas experience to contribute to development of GIS application and policy development; develop international technology and policy resources for website and coordinate technical assistance support from the International Renewable Energy Technology Institute’s System for Technology Transfer (IRETI-STT) to support co-digestion formulation tool and GIS web application.
- *University of Minnesota, Dept. of Bioproducts and Biosystems Engineering*: primary partner responsible for reviewing past co-digestion studies and developing the co-digestion formulation tool.

Partners contributing resources: All partners requesting an appropriation from the ENRTF will contribute in-kind resources. Additional partners contributing resources include the Agricultural Utilization Research Institute (feedstock research assistance) and the MN Department of Agriculture (data collection and project outreach).

B. Timeline Requirements

Project will be conducted over a two year period to allow sufficient time to develop technical and policy resources and to conduct outreach and education on technical resources.

C. Long-Term Strategy and Future Funding Needs

Establish a policy framework that stimulates a world-class digester industry that can help MN achieve its statutory renewable energy and climate goals, and result in a self-sufficient industry.

**Optimizing Biogas' Role in Meeting MN's Energy Goals
2011-2012 Detailed Project Budget**

IV. TOTAL TRUST FUND REQUEST BUDGET: \$300,000 2 years

BUDGET ITEM	AMOUNT
Personnel	
Project manager, Great Plains Institute, manage project outcomes, coordinate policy development and project outreach, (40% FTE): Two-year position, 40% of salary, 40% of benefits	\$ 39,400
Policy development and project outreach, Great Plains Institute, (5% FTE): Two-year position, 5% of salary, 5% of benefits	\$ 6,500
GIS project coordinator, Great Plains Institute, (17.5% FTE): Two-year position, 17.5% of salary, 17.5% of benefits	\$ 17,200
Communications coordinator, Great Plains Institute, report production and website development (17.5% FTE): Two-year position, 17.5 % of salary, 17.5% of benefits	\$ 14,100
Research and data collection, Great Plains Institute, collect data points for GIS map (20% FTE): One-year position, 20% of salary, 20% of benefits	\$ 8,600
Contracts	
website development contract: contractor yet to be identified but will provide website architecture, template design and web code construction	\$ 15,000
Biobusiness Alliance of Minnesota: maximize international business relationships to leverage biogas experience from around the globe to develop co-digestion formulation tool, GIS application and policy development.	\$ 50,000
Minnesota Geospatial Information Office (MnGeo): design and develop multi-layer GIS anaerobic digester project siting tool.	\$ 78,600
University of Minnesota Department of Bioproducts and Biosystems Engineering: collect and review existing co-digestion feedstock data to develop formulation tool.	\$ 60,500
Minnesota Agri-Growth Council: in-state travel expenses for outreach to agricultural and food industry in order to provide feedstock data from specific processing facilities.	\$ 3,000
Travel: In-state travel for Great Plains Institute staff. Mileage estimate based on 10 meetings and project dissemination opportunities over two-year project (200 miles per meeting x.55cents a mile = \$1100). Remaining is meal per diem and lodging for project staff.	\$ 3,100
Printing/material production: Printed final policy report (100 copies), printed GIS user guide (300 copies) and project factsheets (4 factsheets x 500 copies). Printing estimates based on past report production costs.	\$ 4,000
TOTAL ENVIRONMENT & NATURAL RESOURCES TRUST FUND \$ REQUEST	\$ 300,000

V. OTHER FUNDS

SOURCE OF FUNDS	AMOUNT	Status
In-kind Services During Project Period:		
Great Plains Institute: process facilitation and policy development.	\$ 21,000	Secured
Minnesota Department of Agriculture: data collection and project outreach.	\$ 1,000	Secured
Minnesota Agri-Growth Council: membership outreach to assist with data collection, policy development and project outreach assistance.	\$ 6,000	Secured
Biobusiness Alliance of Minnesota: International technology and industry connections, business model development.	\$ 15,000	Secured
Funding History: Energy Foundation, 2009-2010. Grant to develop a research paper to better understand barriers to anaerobic digestion project development.	\$ 28,000	Secured

Optimizing Biogas' Role in Meeting MN's Energy Goals

Organization Description

The Great Plains Institute (GPI) is a non-partisan non-profit corporation based in Minneapolis, serving 10 Midwestern states and the province of Manitoba. The Institute brings together key public and private leaders to identify and implement policies, technologies, research and educational efforts that will accelerate the transition to a renewable and low-carbon energy system, and a society that is economically, environmentally and socially sustainable and prosperous over generations.

Our core competency is to foster consensus, then action, on critical energy issues. We help broad and diverse stakeholders reach agreements on difficult policy and technology issues. We then work with elected officials and others to translate that consensus into new public policies, accelerated technology deployment, research efforts and educational campaigns.

For example, in June of 2007, a GPI-led stakeholder group called Powering the Plains released the region's first consensus-based 50-year Energy Transition Roadmap for achieving a renewable and low-carbon energy economy. The Midwestern Governors Association, GPI, and its partners then parlayed this Roadmap into aggressive energy and climate accords signed by ten Midwestern governors and the premier of Manitoba in November 2007:

www.midwesterngovernors.org and www.midwesternaccord.org. The Institute is now working with the Midwestern Governors Association, the Midwestern Legislative Conference, the Corporation for a Skilled Workforce, the Organization of MISO states, and companies and environmental groups across the region to implement these agreements.

Project Manager Qualifications

This project will be led by Amanda Bilek, an energy policy specialist with the Great Plains Institute. Amanda was formerly at the Minnesota Project where she developed deep expertise on anaerobic digester technology and valuable industry connections during her six-year tenure. Amanda worked with a project team to study the economics, impacts on soil quality, and potential of weed seed destruction from Minnesota's first on-farm digester at the Haubenschild dairy farm. Ms. Bilek participated in a research project at the Haubenschild farm testing fuel cell technology as an alternative generation option for biogas utilization. And her project work and coordination helped establish one of Minnesota's five on-farm digesters through a 2005 LCCMR appropriation to implement pilot digester technology at a mid-sized dairy farm in Minnesota. She has also authored • and coordinated development of • several digester reports, factsheets and web resources. Amanda graduated from the University of St. Thomas in 2001 with degrees in political science and environmental studies, and grew up on a diversified crop and livestock farm in Wadena County, Minnesota.

Additional management and oversight will be provided by Brendan Jordan, manager of the Great Plains Institute's Next Generation BioEnergy Program.