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Economic feasibility of converting cow manure to electricity: A case study of the CVPS Cow Power program in Vermont

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Poster prepared for presentation at the Agricultural & Applied Economics Association's 2011 AAEA & NAREA Joint Annual Meeting, Pittsburgh, Pennsylvania, July 24-26, 2011

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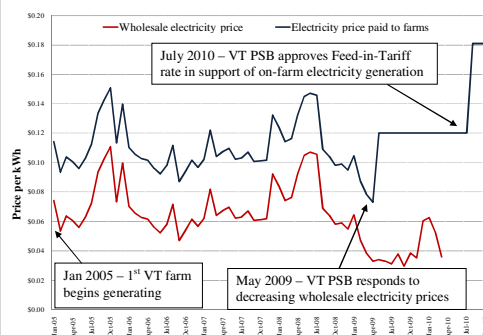
On-farm electrical generation fueled by methane from animal waste presents dairy farmers in Vermont an opportunity to invest in a renewable energy source which cuts greenhouse gas emissions, reduces farm related odors, manages a waste stream, and creates a new source of revenue. Initial capital investment costs are significant and information on the economic returns is important for project planning. The price paid to farms for electricity and the support from the community, electric utility provider, and legislative partners are key factors in determining project success.



Photo: Ethan Thompson, April 2011

Results

Electrical Rate History for CVPS Cow Power Farms



Incomes, Expenses, Return on Equity (ROE), and Return on Assets (ROA) of On-farm Anaerobic Digester Systems in Vermont ^a

	At the average electricity price received in 2008 (\$0.078 + \$0.04 = \$0.118)	At the electricity price received since July 2010 (\$0.141 + \$0.04 = \$0.181)
Income		
Electricity sales	\$227,448	\$349,841
Bedding used by the farms	\$80,418	\$80,418
Bedding sales to others	\$80,758	\$80,758
Coop premium	\$1,513	\$1,513
Other incomes	\$11,734	\$11,734
Total Annual Project Income	\$351,846	\$474,239
Expenses		
Maintenance and repairs	\$50,638	\$50,638
Labor	\$50,000	\$50,000
Interest payments	\$44,713	\$44,713
Insurance	\$10,270	\$10,270
Oil and fuel	\$7,601	\$7,601
Other expenses	\$11,148	\$11,148
Total Annual Project Expenses	\$174,470	\$174,470
Net project operational income	\$177,376	\$299,769
Total depreciation costs	\$166,456	\$166,456
Net Earnings	\$10,919	\$133,312
Total investment	\$2,028,466	\$2,028,466
Total loans	\$1,086,869	\$1,086,869
Average assets ^b	\$1,945,238	\$1,945,238
ROE ^c	1.13%	14.08%
ROA ^d	2.80%	8.56%

^a Nonfarm and noncash income, family living expenses, and taxes are not included in the calculations.

^b Average assets = Total investment - (Total depreciation costs / 2)

^c ROE = (Net Earnings + change in accounts receivable + change in inventory) / Average assets. For this calculation, change in accounts receivable and change in inventory are assumed = 0.

^d ROA = (Net project operational income - interest payment + change in accounts receivable + change in inventory) / Average assets. For this calculation, change in accounts receivable and change in inventory are assumed = 0.

Conclusions

- Project viability is affected by the electricity price paid to the farm, the price paid for recovered fibers, which can be used as animal bedding, and the heating fuel savings garnered from captured combustion heat.
- CVPS customers opt to pay a \$0.04 per kWh premium, amounting to over \$470k annually, to support local farms participating in the Cow Power program.
- Grant funding historically covers approximately 1/3 of total project cost, contributing significantly to project viability.
- Collaboration between CVPS, dairy farmers, CVPS electricity customers, federal and state agencies, and UVM Extension has been a key factor in overcoming barriers to success.



Clockwise from top left:
1. Digester structure and methane collection piping, Addison, VT.
2. 400 Kilowatt methane fueled electrical generator, Addison, VT.
3. Fiber recovered after the digestion process, ready for use as animal bedding and in landscaping, Addison, VT.

Photos: Ethan Thompson, April 2011

“The Cow Power program is helping bring our community together”, Marie Audet Blue Spruce Farm Bridport, VT

Special thanks to David Dunn at the CVPS, Vermont Extension System, and the participating dairy farmers of the CVPS Cow Power program.