Executive Summary

Overcoming barriers to biogas use for renewable energy

Barriers to Biogas Use for Renewable Energy (OWSO11C10)

The Central Issue
Flaring or otherwise not recovering biogas is a lost opportunity for cost savings and environmental benefit. The U.S. EPA reports that few wastewater treatment plants with anaerobic digestion beneficially use their biogas beyond process heating. Thus, there must be actual or perceived barriers to the broader use of biogas to produce combined heat and power (CHP). Subscribers need to understand those barriers and demonstrated solutions to fully recover heat and power from this at-hand resource.

Context and Background
According to the 2011 U.S. EPA Combined Heat and Power Partnership (CHPP) report, 43% of U.S. wastewater treatment facilities (WWTFs) greater than 1 mgd operate anaerobic digestion. Only 8% of these facilities generate electrical or thermal energy using biogas. The potential to generate renewable energy from wastewater is significant. As noted by the CHPP, renewable energy from biogas has the potential to supply up to an additional three million MWh/year of power that can be used onsite at WWTFs or distributed back into the electric grid. This research set out to determine why more of the WWTFs with anaerobic digestion are not generating renewable energy from biogas, and to find the solutions by asking facility managers who are successfully doing it.

Findings and Conclusions
Inadequate payback and lack of available capital remain the dominant barriers to recovering power through anaerobic digestion with combined heat and power production. Other top barriers fall into the categories of regulatory policy factors and human decision-making factors.

- The largest, most widespread barriers are economic, related to higher priority demands on limited capital resources or to perceptions that the economics do not justify the investment. Better whole life cost and benefit estimation methods are needed. Legislation to assist in financing CHP projects would be a boost.
- Outside agents such as power utilities for CHP and gas utilities for renewable compressed natural gas can be barriers. More information exchange and customer outreach could help.
- Air permitting requirements can create an extremely significant barrier in specific geographies and situations. Document the relative performance of flaring and other non-recovery/fuel-wasting devices against CHP with regard to nitrogen oxides (NOx) and carbon monoxide (CO) emissions. Put this information in front of permitting agencies as a way to promote these recovery technologies. Move biogas to the Department of Energy (DOE) list of renewable energy.
- The size and type of public agency decision-making bureaucracy/configuration can help or hinder biogas use. A surprisingly high percentage of survey and focus group respondents from smaller-capacity (5-10 mgd) facilities have found means to justify biogas use projects, while the midsized plants (10-25 mgd) identified inadequate gas production as a barrier. Enhancement of gas production, for example, co-digestion with food waste, can help overcome this barrier.

Management and Policy Implications
In some states, there is a lack of government policy recognition of biogas as a valuable renewable energy source in renewable energy credit (REC) programs and renewable portfolio standards (RPS). This results in biogas use projects being ineligible for incentives for which other, competing renewable energy projects are eligible. A concerted effort to re-evaluate this omission could help greater numbers of wastewater treatment facilities install CHP technologies to fully utilize this valuable resource.

“Limitation of capital funds is a major barrier to implementing a CHP project. Ongoing challenges to rehabilitate aging facilities, which is necessary to maintain the District’s mission, take priority. This issue could not be overcome by 20-30 year paybacks for biogas use projects.”

Carrie Clement, WLSSD (MN)
BARriers to Biogas Use for Renewable Energy

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Related WERF Research

<table>
<thead>
<tr>
<th>Project Title</th>
<th>Research Focus</th>
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</thead>
<tbody>
<tr>
<td>LCAMER: An Assessment Tool for Managing Cost-Effective Energy Recovery from Anaerobically Digested Wastewater Solids: Version 2 (OWSO4R07hT)</td>
<td>The LCAMER (Life Cycle Assessment Manager for Energy Recovery) tool compares the relative life-long merits of one energy recovery system to another for wastewater treatment plant application. It was updated in 2012 with new technical and economic information. LCAMER includes estimates of air emissions from CHP systems.</td>
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<td>Energy Efficiency in Wastewater Treatment in North America: A Compendium of Best Practices and Case Studies of Novel Approaches (OWSO4R07e)</td>
<td>Showcases many of the types of CHP systems addressed in the CHP-SET tool and elsewhere. Details the application of systems that recover heat and power from biogas. Provides information that can be useful for recovering energy from biogas.</td>
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<tr>
<td>State of the Science on Biogas: Treatment, Cogeneration and Utilization in High Temperature Fuel Cells and as a Vehicle Fuel (OWSO10C10a)</td>
<td>Details four key areas related to energy recovery from biogas.</td>
</tr>
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<td>Evaluation of Biogas Treatment Efficiency for the Elimination of Siloxanes (OWSO10C10)</td>
<td>Cleaning up biogas to remove contaminants, such as the compounds containing silicone from personal care products, is a costly process required to recover heat and power from biogas. Cost of energy recovery facilities is a common barrier to their use. New cogeneration technology drives lower biogas contaminant standards to protect equipment from siloxane deposits. The direct effects of siloxanes remains poorly understood and there is a lack of a standard sampling and analytical protocol for reporting siloxane concentrations in biogas. This project:</td>
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<tr>
<td>Co-Digestion of Organic Waste Products with Wastewater Solids (OWSO5R07)</td>
<td>Evaluates co-digestion of organic waste such as food waste with wastewater solids in anaerobic digesters at lab, pilot, and full-scale to increase biogas production at wastewater treatment facilities. This project includes:</td>
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