



Vermont Energy & Climate Summit **Pitch Submission Form**

1. Pitch Submitted By (Your Name or Organization):

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4. Pitch Title: (one line)

Biogas Collaborative Working Group (BCWG)

a collaborative group between University of Vermont, St. Francis Xavier University (Nova Scotia), and Glowink (a Vermont company based in Montgomery Center)

5. Pitch Summary: (one paragraph)

BCWG has been established at UVM to focus on improving quantitative understanding of the processes governing the release of biologically-generated gases from natural and engineered systems. The working group will be established by the four founding members (Holmén, Danks, Risk, Osborne) and broadened to create an interdisciplinary technical group at UVM that is knowledgeable on gas emissions, their measurement, and the needs in diverse application areas to enable the BCWG to both advance current GHG emissions research and contribute to industry needs for biogas leak detection. Also, Sensor Capability at UVM will be developed by completing a pilot study on biogas/biomethane detection (both gas differentiation and sensor miniaturization) utilizing mobile sensing technology developed by Professor David Risk (StFX). By first developing the basic capability at UVM to deploy the StFX equipment locally in a pilot project, BCWG will strengthen the team's biogas sensing and data analysis/validation skillset for broader future application of the technology. Finally, BCWG Cross-Training/Fertilization on Biogas Research Needs will be carried out. Initial work conducted over a 2-year period will involve training and participation of various interdisciplinary groups within UVM active in biogas-related research (agriculture, animal science, community development, engineering, natural resources and sustainability) to gain technical knowledge, application area insight/perspective, and develop a broad foundation of expertise on biogas related problems and research needs/approaches. BCWG will develop a student exchange agreement between StFX and UVM for long-term research collaboration on biogas sensing technology development. Finally we will prepare for long-term research phases whereby certain equipment would be acquired by UVM to outfit a technical group to undertake mobile gas survey projects. Teams would seek additional funding from US DOE, USDA, US Forest Service and industry, continuing to work closely with StFX/Glowink to ensure scientific development of the gas sensing technology and enhanced capabilities such as additional gases and particle sensing capabilities.

6. What energy sector(s) does this Pitch apply to? (Check all that apply):

- xEnergy Efficiency
- Electricity
- xTransportation
- xThermal Heating &/or Cooling
- All (Total Energy)
- None: Non-energy related carbon reduction proposal

7. Which criteria category(ies) does it address? (Check all that apply):

- xEconomic Activity
- xAffordability
- Vulnerable Vermonters

❑ xOther (air quality and health)

8. Scale of impact on Vermont's energy and climate goals: If this proposal came to fruition, how might it move the needle in helping to meet Vermont's energy and climate goals by 2025 and/or 2050? Please outline assumptions and, if available, provide calculations.

*Biogas converted to biomethane has the potential to represent 5% or more of natural gas consumption in Vermont, significantly reducing methane emissions. The Renewable Natural Gas (RNG) program recently issued by the Vermont PUC is a major incentive to increase the supply of biogas/biomethane in Vermont and also in other States. LincolnRNG, a project on the 3,000-acre Goodrich Farm in Salisbury, Vermont was approved in May 2015 to convert dairy farm manure, corn silage and local brewery waste to RNG using an anaerobic digester [VTDigger 2016]. Vermont Gas Systems plans to blend this biomethane with RNG from existing solid waste facilities outside Vermont (i.e. upstate New York) with the traditional fossil fuel supply in their pipeline system. Sources of biogas are agricultural based (farm digesters), landfills, water treatment plants, etc. Uses of biomethane include substitution of pipeline gas, LNG for heavy duty trucks, ethanol, and potentially jet fuel. BCWG's **initial** objectives are twofold, the focus being:*

1. *differentiation of biogas from natural gas (a safety issue relating to source of a leak),*
2. *development of miniaturized gas sensors to affix to vehicles, including biomethane transporting trucks and drones, to acquire and store continuously gas data which would be uploaded to the Cloud when connected allowing a master algorithm to interpret the data autonomously.*

Once there 2 objectives have been achieved (2 years) the BCWG will expand into other methane and greenhouse gas reduction programs worldwide, expanding members internationally.

9. Benefits/costs of this proposal for Vermont and Vermonters: Including, where possible, economic, financial, social, and environmental.

BCWG's R&D is aimed at helping the biogas/biomethane industry expand in Vermont, the US northeast, and worldwide. The biogas industry will have positive effects on the economy, education, investments, and environmental including health

A highly proficient scientific and technical base will be developed at UVM, collaborating with Glowink and StFX. Glowink's expertise is in international energy and all aspects of Carbon Capture, Utilization, & Storage, including introducing Consolv Technologies (now Shell) to SaskPower which culminated in the world's largest post combustion plant capturing 3,000 t/d of CO₂ from the Boundary Dam, SK coal-fired power plant flue gas, pipelining and injecting supercritical CO₂ into the Weyburn oil field for EOR.

StFX and Glowink have worked together for over a decade. StFX is a world leader on detecting extremely small levels of gas emissions at the ppb level, much lower than an operator would be checking for and possibly a precursor to a larger event (leak). The algorithms developed by StFX allow the mobile detection systems (in a pickup truck acquiring data on the fly) to not only detect gas anomalies in real time but also provide an indication of the source since GPS and wind machines are utilized. See link below:

<http://fluxlab.ca/>

An example of a Glowink/StFX project is MSEEL, funded by the DOE, see link below:

<https://basil.stfx.ca:5001/sharing/au5i0NyqB>

StFX and Glowink intend to support technically BCWG and establish an exchange student program to transfer expertise and eventually sensor equipment so that UVM could operate independently, and remain scientifically and technically up-to-date.

10. Decision-makers necessary for this proposal to be adopted or move forward (e.g., Legislature, Governor, a regulatory agency, a business, organization, media outlet, or financing institution, etc.)

BCWG believes that once the initial objectives have been met that BCWG will be able to self sustain itself and continue to expand. During the first 2 years it will be necessary to secure limited funding and so we have applied for a Gund Institute Catalyst Award. We believe that the initial R&D will be of interest to industry in Vermont, the rest of the US, Canada (especially Quebec where biogas projects are developing), and abroad, leading to R&D funding and contract project work.

11. Strategy and key considerations: Outline the overall strategy, including gaps, barriers and opportunities for moving this proposal forward.

All the elements to move this initiative forward are in place other than the funding for the initial objectives. It would help greatly if the BCWG goals are known throughout the various government agencies.

12. Timeline: To meet our 2025 goals, we need some proposals that can be implemented in the next couple of years as well as some “game changers” that will bend the curve even further out. What timeline do you foresee for your proposal to be developed and implemented?

BWCG initial objectives are ready to be implemented over the next 2 years. Limited funding has been requested from the Gund Institute Catalyst Award Program and we are investigating other government funding opportunities as well as from industry. Expansion would then take place, geographically as well as other climate change issues such as methane reduction.