WWU Biogas Proposal

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Executive Summary:

Western Washington University uses a natural gas steam plant to heat the buildings on campus. This use of natural gas accounts for a large portion of our carbon emissions each year, at approximately 33% of Western's total annual carbon footprint. We propose to reduce Western's carbon footprint, while simultaneously expanding its renewable energy portfolio, cutting down on landfill waste, and also producing valuable fertilizer, by replacing the natural gas that is used to heat campus with biogas generated from an anaerobic digester fueled by waste which would have otherwise ended up in a landfill.

We have identified two potential ways that Western could move forward with this proposal:

1. The first option is to have a large-scale on-campus generator, which we believe would be beneficial for the University on a number of fronts. These include educational opportunities, energy savings, the production of compost which can either be used directly by the University or sold, and an overall reduction of our carbon emissions, while simultaneously increasing institutional energy independence.
2. Should Western choose not to implement an on-campus biogas generation system, another option would be to partner with a gas utility company to facilitate the construction of an anaerobic digester on their end via a purchase agreement. This option would allow the University to directly purchase biogas, in order to reduce our carbon footprint and support development of greener energy technologies in the industry, without having to bear the upfront and operational costs of an anaerobic digester.

Statement of Need:

Western is a university that is committed to sustainability, which is evident in several

ways. First, on January 7, 2017, Western's president signed the American College & University President's Climate Commitment, which commits the university to monitor greenhouse gas emissions, work to reduce them, and move toward carbon neutrality. Furthermore, Western's Mission Statement and Strategic Plan includes the idea of sustainability, stating that Western should "serve as a model for institutional effectiveness, innovation, diversity, and sustainability" and act as a "responsible steward of resources." The statement continues, explaining that Western seeks to foster "a collaborative environment where faculty, staff, and students contribute to the mission of the University." Finally, The mere existence of an Office of Sustainability is, itself, also evidence of the University's commitment to sustainability, as well as to the fact that the University takes its Mission Statement and Strategic Plan seriously.

Additionally, Washington State has passed mandated greenhouse gas emissions reduction targets, which Western, being a public institution, is required to meet. These targets require that by July 1, 2020 greenhouse gas emissions be reduced by 15% from 2005 levels, 36% by 2035, and 57.5% by 2050. On the other hand, Western has set forth an even more ambitious goal to reach net zero carbon emissions by 2050 in the Climate Action Plan, which was adopted in 2010. For Western, our on-campus heating system is one of the largest contributors to our carbon footprint, so finding ways to reduce our natural gas usage there will help us to meet these state-mandated and personal goals.

Replacing natural gas, a fossil fuel, with biogas, which is a renewable energy, as a means to operate Western's steam plant to provide heat for campus is in line with the aforementioned goals, commitments, and ideals of Western Washington University. Biogas is produced in anaerobic digesters, by decomposing organic waste in an absence of oxygen. This process of organic waste decomposition results in the release of biogas, which is mostly made up of methane. Methane is an extremely potent greenhouse gas, with an effective heat-trapping potential that is 25 times greater than that of carbon dioxide. After the organic waste is decomposed, the released methane would be collected and burned to produce the steam that heats Western's campus. Biogas is considered to be a renewable energy because it removes methane from organic waste that would have otherwise been released directly into the atmosphere after decomposing in a landfill. After the methane is burned to provide the energy to heat campus, the result, as with all combustion reactions, is carbon dioxide and water. Because

methane is 25 times more effective at trapping heat than carbon dioxide, burning the methane to instead release carbon dioxide actually mitigates a huge amount of potential greenhouse gas emissions. Furthermore, since biogas is created from waste, production of it has the added benefit of reducing the amount of waste heading to landfills. What is more, the leftover remnants of the organic waste, after it has decomposed and the biogas has been removed from it, can be used as nutrient-rich compost or soil amendments, that has the added benefit of being largely odorless, as the gases that produce the unpleasant smells associated with compost have already been removed.

Project Description:

Goal: Our goals are to reduce WWU's carbon footprint, to move toward the development and implementation of sustainable green technologies, to provide valuable education opportunities, and to reduce our expenditure and reliance on fossil fuels.

Objectives: Our project will assist the University in meeting both the state-mandated carbon emissions reduction target of a 57.5% reduction below 2005 levels by 2050, as well as Western's own, more ambitious goal of carbon neutrality by the same year. Our project will contribute toward these ends by, depending on the exact implementation, offsetting the University's natural gas usage, either in whole or in part. In order to fully replace natural gas, 200 billion BTUs of biogas must be either produced or purchased annually, as Western is currently using 200 billion BTUs of natural gas, at a cost of approximately $1,000,000, to heat the campus each year. Either an agreement with a gas utility provider or a large-scale on-campus anaerobic digester could be tailored to fully meet this demand. Both of these options could, if it were desirable, be adjusted to instead meet only some portion of this total demand. A small-scale anaerobic digester would, however, only be able to meet a portion of the total energy demand.

Above all, this project must stand as a representation of the University's conscious efforts to actively move forward with its carbon reduction and sustainability goals, in order to uphold its commitments. Western has the capability to complete a project such as this via cooperation between its facilities and the surrounding community. As such, this project has the potential to benefit not just the campus, but also the surrounding community, by removing potential landfill

waste and mitigating greenhouse effects by preventing methane from being released into the atmosphere.

Budget:

The budget for this project will vary depending on the option(s) with which we choose to move forward. Furthermore, the budget will also depend on the scope of the project that is chosen -- a digester that would supply all of the biogas we need to completely replace natural gas would certainly bigger, and thus more expensive, than a digester that provides a portion of the gas we use. However, for reference we will provide some examples of what it has cost other universities to implement and anaerobic digester.

The UC Davis anaerobic digester, which processes 50 tons of feedstock into 12,000 kWh of electricity each day, was built in about six months and cost $8.5 million.

The program at the University of South Carolina, which was designed to convert some 57,000 tons of wood waste per year into heat, cost almost $20 million. The project at USC, had it been successful, was projected to save the university $2 to $2.5 million per year on natural gas expenditures -- bringing their heating costs down from $10.65 per 1000 cubic feet to $2.40 per 1000 cubic feet with biogas.

Ultimately, the project, if we choose to have an on- or near-campus digester, will have a substantial upfront cost, as shown by these examples, but could substantially reduce the unit price of heat generation. Alternatively, if we were to take the partnership route, we could avoid the large upfront cost and instead pay a premium rate, similar to the recent agreement between PSE and Western to create a wind farm.

Conclusion:

In conclusion, Western is a university that is committed to sustainability at our very core. We have taken strides to lessen our environmental footprint, including the new wind farm deal with PSE, composting and recycling practices on campus, the creation of an Office of Sustainability, banning bottled water from campus, installing solar panel displays, signing the

American College & University Presidents Climate Commitment, encouraging alternative transportation, and more. Replacing our natural gas-based heating system, which accounts for roughly one-third of our carbon footprint, with renewable biogas would be another significant step toward a sustainable future. There are multiple options available to approach this goal, and we are confident that an option that is suitable for Western can and will be found. Whether biogas is generated on-campus, near-campus, or off-campus via an agreement with a natural gas utility, or even a combination of these possibilities, we believe that biogas provides us with a significant opportunity to expand our renewable energy portfolio and help us meet our sustainability goals.