

Summary

Project:	Arlington County Biosolids Upgrade	
Subject:	Biosolids Advisory Panel Meeting 3	
Date:	Tuesday, February 08, 2022	
Location:	WebEx	
Attendees:	John Bloom, C2E2 Sandra Borden, Crystal City Civic Association Paul Guttridge, Aurora Highlands Civic Association Joan McIntyre, EcoAction Arlington Claire Noakes, C2E2 Energy Committee Peter Robertson, Fiscal Affairs Advisory Commission Mary Glass, Arlington County Civic Federation Steve Young, Joint Facilities Advisory Commission	Tom Broderick, Arlington County Water Pollution Control Bureau Mike Collins, Arlington County Department of Environmental Services Lisa Racey, Arlington County Water Pollution Control Bureau Mary Strawn, Arlington County Water Pollution Control Bureau Charles Njoku, Arlington County Department of Environmental Services Peter Golkin, Arlington County Department of Environmental Services Brian Balchunas, HDR Brian Bakke, HDR Stephanie Spalding, HDR Rahkia Nance, HDR Jessica Host, HDR Samantha Villegas, Raftelis

Agenda

1. Introductions
2. Open Discussion on Background Materials
3. Biogas Utilization Discussion
4. Program Updates
5. Next Steps

Welcome and Introductions (S. Villegas and T. Broderick)

Samantha Villegas opened the meeting and greeted attendees to the third advisory panel meeting. Tom Broderick thanked attendees for participating and noted his plan to retire in March 2022. Mike Collins will serve as the Executive Sponsor of this program until a new bureau chief is hired.

Samantha asked the County team to introduce themselves and she shared details of how to use the WebEx virtual meeting platform and introduced the team.

Open Discussion on Background Materials (M. Strawn)

Mary Strawn described the roles and responsibilities of the project team.

She explained that HDR is the program manager and acts in an advisory capacity to the County to help define the scope and implementation plans for the program. In the future HDR will oversee the design and construction. HDR is prohibited in participating in any design or construction contracts for the program.

Mary also noted that Background Materials were included in the slide deck that was distributed to the Advisory Panel and the County team was available to answer any questions associated with this material.

Biogas Utilization Discussion (M. Strawn)

Mary explained the key fundamentals for biogas utilization which includes:

- Biogas is a byproduct of anaerobic digestion
- Steam is required for the thermal hydrolysis process

She then walked the group through each of the alternatives that were considered, the advantages and disadvantages of each one, and the combined heat and power/renewable natural gas (CHP/RNG) considerations.

The energy content of the biogas exceeds the process requirements for steam generation and building heat. The alternatives below focus on how to best use the biogas. Although flaring is anticipated to be minimal, the waste gas flare is a required component in each alternative.

ALTERNATIVE 1

Alternative 1 is the base case. In this alternative, biogas would be used for steam generation only and the excess biogas would be flared. It is not a viable long-term option as it does not beneficially use all of the biogas and thus does not meet the goals or intent of the project to provide a more sustainable outcome. Alternative 1 is only being used for comparison and is not under consideration for implementation.

ALTERNATIVE 2A AND 2B

Alternative 2 is combined heat and power to produce electricity and recover heat for steam generation for the thermal hydrolysis process. This can be done by engine generators or turbines, so there are two sub-alternatives (2A and 2B). The biogas would need to be cleaned to remove siloxanes, moisture and hydrogen sulfide.

In this alternative, the engines would produce about one-third of the power needed to run the plant. The County is anticipating going to 100% renewable power in the near future. It was noted that while combined heat and power systems have advanced in recent years, they are still complicated machines with multiple rotating parts with complex instrumentation. Significant operator attention and maintenance is required to keep the systems operational. The combustion of all of the biogas onsite produces more local air emissions than Alternatives 3A and 3B.

ALTERNATIVE 3A AND 3B

Alternative 3 is the production of renewable natural gas by cleaning the biogas to natural gas quality through removal of carbon dioxide and other impurities including those listed above. There are two sub-alternatives (3A and 3B), one for injecting the RNG into a natural gas pipeline and a second for directly using the gas as vehicle fuel as compressed natural gas. While the economics presented later show all of the biogas being upgraded to RNG with natural gas being used for steam production, the system would be designed such that biogas could be used on site for steam production (resulting in no natural gas use and less RNG production).

Gas upgrading technologies are also complex systems. However, there are fewer rotating parts and thus requires less maintenance than CHP systems. Local emissions are less than Alternative 2. As the RNG is displacing fossil-fuel based natural gas in the gas distribution system, emissions from combustion of this RNG are considered similar to the emissions profile from the combustion of the natural gas it is displacing. Producing RNG also creates a revenue source.

Alternative 3A is considered to be a more reliable outlet as it is not dependent on continued use of compressed natural gas in the nearby bus depots. Alternative 3B is dependent on the fueling schedule of the bus facilities, continued use of compressed natural gas in the bus depots, and it may require additional gas storage at the bus facilities.

ALTERNATIVE 4

Alternative 4 provides both renewable natural gas and combined heat and power. A neighboring utility is currently implementing a similar process. Mary noted that Alternative 4 was dropped from consideration due to the capital costs and the complexity of the system.

RNG PATHWAYS (B. Balchunas)

Brian explained how renewable natural gas can be used in different ways. The Renewable Fuel Standard (RFS) is a transportation program. The U.S. Environmental Protection Agency (EPA) establishes renewable volume obligations for how much transportation fuel needs to be renewable on a yearly basis. There are different categories of renewable fuels and it is a virtual pipe program, meaning there must be a physical connection to a transportation end user. Participants must be able to demonstrate that the end use of gas produced is capable of being used for transportation purposes. The process is typically handled by third-party verifiers.

The physical gas is most likely going to be used locally in the short term. It can be sold to Washington Gas, to the County, to Arlington County schools, or other local users. Greenhouse gas offsets will depend on where the actual gas and RINs are used.

Brian then explained Renewable Identification Number (RIN) pricing and presented historical values of RINs and the value used in the base financial analysis.

ALTERNATIVES ANALYSIS (B. Balchunas)

Brian presented a financial analysis including the present value and capital costs of the shortlisted Alternatives (Alternatives 1-3). The RNG alternatives had the lowest present financial value. This value is heavily influenced by the value of RINs.

A non-financial criteria weighting and scoring exercise was also completed by the County. The non-financial factors were discussed, weighted, and scored. The non-financial analysis favored Alternative 3A, RNG into the pipeline.

A carbon footprint analysis was presented. Brian noted that this was not a full greenhouse gas inventory for the project (that is being completed and will be presented later), but rather focused on the carbon footprint of the biogas utilization piece. Brian also noted that the carbon emissions from the biogas, through combustion or carbon dioxide removal, are considered biogenic carbon as they originate from biological sources (short-term carbon cycle) and not from stored fossil fuels (long-term carbon cycle). While these biogenic emissions will be reported, they are not included in the carbon footprint analysis.

Both Alternatives 2 and 3 showed significant carbon footprint reductions relative to current solids handling operations. It was noted that the carbon footprint reduction for Alternative 2 (CHP) would be reduced as the County is projected to have 100 percent renewable electricity by 2025. Therefore electric-related emissions would already be zero. However, the generation of renewable power onsite could allow for currently forecasted renewable sources to be used elsewhere.

As the main drivers for the financial analysis are electricity and RIN pricing, Brian presented a sensitivity analysis showing the “break-even” net financial value at different electricity and RIN prices. Several scenarios were evaluated with different RIN and electricity pricing and the majority of these scenarios were favorable to the RNG alternatives.

BIOGAS UTILIZATION RECOMMENDATIONS (M. Strawn)

Mary noted that County staff recommends proceeding with Alternative 3 (RNG), with a preference for Alternative 3A (RNG into the pipeline) based on the results of both the financial and non-financial analyses.

Next Steps (S. Villegas)

Mary noted that the next Advisory Panel meeting would be in late spring and will focus on Program communication, branding, and the website as well as further discussion of the biogas utilization strategy and GHG emissions.

In the interest of time, the program updates were not presented but they are included in the slide deck for review. Samantha thanked the group for their participation and questions. She noted that the entire presentation is available for review and asked the group to reach out if they had any additional questions.

Please let the project team know if you would like the County to present project information, provide meeting materials or graphics, or print brochures for your group.

Question	Response
Consider providing an acronym list with background information.	Agreed.
Please keep in mind other civic association meetings when scheduling stakeholder meetings.	Understood.
What is the plant currently doing for solids handling and what is the current status quo?	<p>We thicken and dewater the sludge and then that is mixed with lime. The lime addition is a chemical stabilization process that results in a Class B biosolids product. This is a lower quality than Class A, which is what we will produce after the upgrades. The biosolids product is hauled off site and applied on agricultural fields in Virginia.</p> <p>The existing processes are beyond their useful life and need to be replaced. Since the last biosolids upgrades in the mid-1990s, there have been significant advancements in recovering resources from the solids and providing a higher quality end-product.</p> <p>Following the upgrades, there will be fewer restrictions and Arlington would have the opportunity to give the Class A biosolids product to residents and use it in the Parks department for landscaping. The upgrades will significantly reduce the volume of the solids, so there will be a lot less material and fewer trucks.</p>
Why not count the renewable energy as helping to meet the County's goal of 100% renewable energy by 2025?	<p>While the County will have 100% renewable energy by 2025 through other means, it is acknowledged that additional renewable energy production is a positive. It is possible that the County could sell renewable energy credits (RECs) or buy fewer RECs because of the renewable energy produced onsite.</p> <p>Based on the group discussion at this Advisory Panel meeting, the financial and sensitivity analyses have been updated to include a base REC value of \$4.50 per MWh. Updated figures are attached to these notes. The inclusion of RECs does reduce the net present financial value of Alternative 2A by approximately \$700,000. However, Alternative 3 retains a significant financial advantage.</p>
The Blue Plains facility in DC is producing electricity on site. What is their experience so far? What is the downtime of their	We can reach out to our colleagues at DC Water for their perspective. However, it is not the best comparison because DC Water

<p>equipment? What are we doing to make the equipment more reliable?</p>	<p>sized their system differently than we would in the County, which results in them flaring more gas. The proposed equipment is not unreliable but it does need to be monitored and maintained.</p> <p>We are currently updating a database of what those mid-Atlantic utilities with anaerobic digestion are doing with their biogas. Most facilities flare biogas and don't use it beneficially. Some facilities have difficulty keeping engines in operation, but we will follow up with them and clarify what the uptime is if they have engines.</p>
<p>The County is committed to obtaining 100% renewable electricity. Even after the County achieves this goal, CHP would still get credit and reduce greenhouse gas emissions to meet the net zero carbon goals. The County will need additional renewable energy as the biosolids plant comes online, as buses are electrified, etc.</p> <p>The suggestion seems to be that the County using renewable electricity from CHP would not benefit the County's goal.</p>	<p>See response above. We have updated Alternative 2 to include the value of RECs.</p>
<p>Was there a consideration in evaluating a smaller sized option under Alternative 1 where you processed only 30% of biosolids and so you could flare less and the remaining 70% of the biosolids could continue the current operations of being hauled offsite?</p>	<p>Regardless of the thermal hydrolysis and digestion size, more biogas would be produced than what is required to run the steam boiler for thermal hydrolysis alone (Alternative 1). Therefore, we would need to flare about 70% of the produced gas regardless of the sizing.</p> <p>In order to land apply or beneficially reuse the biosolids, they must be stabilized. This is currently done through chemical addition (lime). These upgrades will stabilize the raw solids through thermal hydrolysis and digestion. The resulting biosolids will still be trucked out for beneficial use and land application, but the volume will be reduced by about 50%. The digestion process converts the other 50% of the solids into the biomethane.</p> <p>Operating parallel systems (thermal hydrolysis/anaerobic digestion in parallel with lime stabilization) would be complex and could lead to other operational and</p>

	<p>maintenance issues. This option would not be feasible for implementation.</p>
<p>How often would flaring be done?</p>	<p>We have conservatively estimated 5% of the gas will be flared. The goal will be to be less than that but the economic analysis is based on 5%. We are trying to get that as low as possible. Flaring is necessary when the downstream processes are not available, so the flaring schedule will be dependent on the maintenance of the gas utilization equipment.</p>
<p>I am not sure that the assessment of the no-net impact of localized emissions is what we should be looking at. The comparison should be with the transition of the bus system to electric - which would be no emissions. Is the emissions impact that is on-site significantly higher and there is no mitigation that it would justify continuing having these emissions and you could phase out some electrification?</p>	<p>We understand that if Arlington Transit (ART) Washington Metropolitan Area Transit Authority (WMATA) were to switch to electrification, their emission profile would change. However, we believe there still would be demand for natural gas and renewable natural gas elsewhere. If it is not used at the transit facilities, that renewable natural gas could be put into the pipeline and used somewhere else. If we inject it into the pipeline, it is not dependent on the gas being used by ART and WMATA. We have had discussions with the gas utility, and they have confirmed that their desire to have renewable natural gas is not dependent on them selling gas to ART and WMATA.</p>
<p>The County's goal is carbon neutrality so we should be thinking of building a facility that contributes to that goal.</p>	<p>Since we would be displacing fossil fuels, any biogas that we put into the grid means less fossil fuel based natural gas that has to be extracted.</p>
<p>I wasn't able to make the connection between these proposals and the idea of displacing fossil fuels. What I could find on the EPA's website is that biofuels could over 30 years have less greenhouse gas emissions as compared to gasoline, but this does not appear to be what you are talking about. Dominion's grid mix has changed significantly in the last eight years. Does the electricity offset replace fossil fuels? Does applying Class B biosolids onto agriculture land produce methane? How is doing something that produces more methane reducing our emissions and offsetting fossil fuels?</p>	<p>All of the biogas utilization alternatives start with the same amount of methane from the digestion process. This methane is used to make steam, generate electricity, used offsite to fuel vehicles or in households, or it is combusted in the flare. All of the methane is converted to carbon dioxide (CO₂). This carbon dioxide is considered biogenic – from the short-term carbon cycle. None of this methane is released to the atmosphere.</p> <p>The offset presented is purely from displacement of fossil fuels and not related to emissions from the current lime stabilization process (land applied or otherwise).</p> <p>All options evaluated produce the same amount of biogenic carbon – the carbon dioxide in the raw biogas, the carbon dioxide</p>

	<p>from the combusted methane, and the carbon dioxide released from biosolids that have been land-applied. No methane will be generated and released to the atmosphere as a result of these upgrades.</p> <p>By generating RNG, we are replacing the fossil fuel-based gas with a renewable gas regardless of where it is used.</p> <p>The biogenic carbon will be reported as an emission in the full greenhouse gas inventory. However, it does not fall in the scope of a greenhouse gas emission.</p>
<p>Is the whole premise behind the greenhouse gas savings is the idea that biogenic greenhouse gas emissions don't count?</p>	<p>Yes, there is still carbon dioxide going into the air, but it is already a part of the natural short-term carbon cycle.</p>
<p>There is a lot of CO2 removal that is part of Alternative 3 and it is all in one place. Any possible way to reduce the emission of the CO2 as a greenhouse gas by beneficial use or other method such as hydrogen production?</p>	<p>Carbon sequestration from carbon dioxide emissions is an emerging field and technologies can be monitored for potential implementation in the future.</p> <p>Most generation of hydrogen from methane gas results in carbon dioxide emissions (removing the hydrogen from the methane). There are some novel processes that are trying to convert methane into hydrogen and graphite with no carbon dioxide emissions. These processes are currently being tested in Australia.</p> <p>One of the County's goals is to maintain flexibility for new technologies as they are developed and proven.</p>
<p>Is the carbon dioxide output equal in every Alternative? Des Alternative 3 just emit it in one place so it is more easily recovered?</p>	<p>Yes, the biogenic carbon dioxide output is the same in all alternatives. The difference in Alternative 3 is that the carbon dioxide in the biogas is removed prior to combustion of the methane fraction</p>
<p>Use doesn't have to be local so under Alternative 3A you are selling the gas to the local utility who sells it to some transportation use downstream?</p>	<p>The ultimate sale of the gas would have to be worked out – there are many options that could exist. Brian reviewed the various pathways of the RIN program as part of the presentation. The sale of the gas does not necessarily need to be to the local gas utility. Transactions will likely be handled by a third-party broker.</p>
<p>There are so many different parties that may want to claim the credits. Aren't the purchasers of RINs using this to reduce the</p>	<p>The Water Pollution Control Plant may not be able to claim the reductions, but the County could claim the reductions if the renewable</p>

<p>carbon content of their fuel supply that they then sell to buyers and then those fleets also want to claim a reduction? So you have all the different players claiming the credit? Is this a scope 1/ scope 2 greenhouse gas credit or site versus source emissions situation that you end up with on the electricity side?</p>	<p>natural gas was used within the County as transportation fuel. Regardless of where the gas is utilized, the offset of fossil fuel based natural gas would be realized, which would result in global greenhouse gas reductions.</p>
<p>In the case of electricity, if we generated the electricity and we sold the renewable energy credits, the purchaser would be claiming the greenhouse gas reduction? With the RFS program you can sell the RINs and claim the greenhouse gas reduction?</p>	<p>The nuance here is that the RFS is a highly regulated and certified program within the EPA and the renewable energy credits (RECs) are voluntary.</p> <p>The two programs have not necessarily been tied together through any formal program. For maximum accounting benefit, you would use the RNG for vehicle fuel within the County to claim the emission reduction in the County Climate Action Plan and the RINs. Please see the response to written questions for further details on the financial incentives and emission credits.</p> <p>As noted above, the value of RECs has been added to the monetary value of Alternative 2. Updated financial graphs are attached to this presentation.</p>
<p>There seems like there are a lot of parties that would want to claim the reduction.</p>	<p>That is one of the challenges in thinking of the County's emissions goal. There is potential even outside of the RFS to go through voluntary markets where there are emissions reductions, but it may not be through the program. To meet the County's goals, you would want to align the financial and emissions reduction benefits of RNG.</p>
<p>One suggestion is on the electricity side Arlington County is willing to retire those renewable energy credits (RECs) and claim all of the greenhouse gas gain and that can be monetized and shown as using carbon accounting as a benefit under that option.</p>	<p>As noted above, the value of RECs has been added to the monetary value of Alternative 2. Updated financial graphs are attached to this presentation.</p>
<p>Should one alternative (CHP) include the social cost of Carbon and the RNG alternatives not include it to recognize the benefit of renewable energy? Or should the value of electricity for the CHP alternative be increased to reflect this benefit?</p>	<p>After review, the project team feels the best way to monetize the value of the renewable energy from Alternative 2 is to include the value of RECs in the analysis. As noted above, updated financial graphs including the RECs are attached to this presentation.</p>
<p>Could you review Alternative 3 and what exactly is happening with the carbon dioxide that is removed?</p>	<p>The biogas that is created in the digestion process is 60% methane and 40% carbon dioxide, which is true of all the alternatives.</p>

	<p>The carbon dioxide removal here is a physical or absorption removal process where the carbon dioxide ultimately gets vented.</p> <p>It is no different from the other alternatives where the carbon dioxide would be vented into the atmosphere through combustion (flaring or CHP).</p> <p>All the alternatives have the same amount of biogenic carbon dioxide.</p>
<p>As an original advisory board member, one of the most important drills we did was rank criteria with internal stakeholders. We were trying to balance the finances with other factors. While safety is the top consideration, the residents would have likely ranked local emissions, noise, and visual impacts higher than County staff. To what extent did you go back and use this original input?</p>	<p>We were mindful of the concepts as we completed this exercise. However, it is unlikely that the results would have changed if we revisited the internal stakeholder ranking. For example, we are factoring the aspects in during the development of the Facilities Plan and reviewing use of screening walls and sound attenuation where appropriate.</p> <p>Arlington County will review the approach with HDR. It is not likely that an advisory panel ranking exercise would change the results. The panel members from the local communities agreed that they would have likely weighted the community issues higher, which would have then favored Alternative 3.</p>
<p>On the scoring, safety gets the lowest score for 3A and 3B. Do you have more details on that and future opportunities?</p>	<p>Alternatives 3A and 3B scored lower on safety because of the high-pressure systems to remove carbon dioxide. They were scored lower from a risk perspective. All appropriate safety measures will be accounted for in the design.</p> <p>For future opportunities, we are putting in the highest gas treatment currently available in order to inject the gas into the pipeline. Alternative 3 allows other potential uses for that gas in the future including CHP. You are paying for the investment now instead of later.</p>
<p>When you go through the greenhouse gas analysis, are you going to take into account embodied carbon? Will there be a distinction between the options that that study will give us more information about? Will you analyze the status quo rather than just the changes?</p>	<p>The current greenhouse gas analysis is strictly an operational analysis and not the embodied carbon emissions from the manufacturing of the equipment or construction activities. For these alternatives there is not a significant difference for</p>

	<p>embedded carbon. We can discuss this further with the County.</p> <p>The full greenhouse gas inventory will compare the existing process to the future process. Arlington County also plans on implementing the Envision® V3 Sustainable Infrastructure Framework (Envision) as a means to achieve a more sustainable Program. While Envision has similarities to the Leadership in Energy and Environmental Design (LEED) program, it is geared towards broad and complex civil infrastructure projects. LEED is intended to evaluate interior spaces with the primary purpose of human occupancy.</p>
<p>On the sensitivity analysis, predicting electricity prices is difficult. The RIN pricing prediction seems more difficult. Is there a policy risk here?</p>	<p>There are some studies that are trying to forecast future RIN prices. This is certainly impacted by policy. The price used in the baseline scenario is a conservative value based on analysis of past values. There may be additional pathways available in the future including state programs and eRINs.</p> <p>Electricity forecasting numbers are from the U.S. Energy Information Administration.</p>
<p>For clarification, is the board briefing in May during one of their regular sessions? Is there a decision point that will come before the County board?</p>	<p>We have been briefing the Board in a written format through Manager’s Notes. We will continue this but are also willing to meet with the Board to review, as necessary.</p> <p>The next Board action would be approval of a delivery team contract, which would be more of an endorsement of the biogas utilization recommendation.</p>
<p>Panel members from the local communities expressed support for the recommendation of Alternative 3 (RNG) and noted that there is a real need for modernization of the solids handling equipment.</p>	<p>Thank you and noted.</p>

CHAT:

from Mary Glass to everyone: 6:01 PM

No problem. Just want to help.

from Brian Balchunas to everyone: 6:05 PM

Hi Sandra - quick note, there is a table in the full report with acronyms and abbreviations (just not the executive summary).

from SamanthaVillegas to everyone: 7:10 PM

Just checkin in with our quieter guests -- anyone have a question? Feel free to direct message me by selecting my name where it says "Everyone"

from Charles Njoku to everyone: 7:15 PM

Ofcourse, the Plant would always have the first refusal on RNG..

from Sandra Borden to everyone: 7:23 PM

I hope that we get to the Non-Financial Analysis and then I have some questions.

from SamanthaVillegas to everyone: 7:24 PM

Thanks Sandra - making a note of that.

from paul Guttridge to everyone: 7:39 PM

I think the non financial scoring process was thorough with good criteria per table 34 on page 69 of the full report, it just needed some additional stakeholder input.

from SamanthaVillegas to everyone: 7:40 PM

Thanks Paul

from Claire Noakes to everyone: 7:49 PM

Just as an fyi, there is a free tool for estimating embedded carbon in building materials at buildingtransparency.org

from SamanthaVillegas to everyone: 7:49 PM

Thanks Claire!

from Mary Glass to everyone: 7:53 PM

Impressive analysis by HDR, great explanations, good questions. I look forward to future discussions.

from SamanthaVillegas to everyone: 7:53 PM

Thanks Mary!

from SamanthaVillegas to everyone: 7:58 PM

If anyone must leave right at 8, please feel free -- we will be back in touch by email!

from Claire Noakes to everyone: 7:59 PM

Thank you for all these additional details and answering so many questions tonight

from SamanthaVillegas to everyone: 7:59 PM

Thanks to all who asked questions.