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Memorandum

To: Mary Strawn, Chief Operating Engineer **Date:** November 4, 2016

From: Jeannine Cooper, Energy Program Analyst

Subject: Community Energy Plan Analysis for the Solids Master Plan

Summary

Using the digester gas produced in MESO or THP/MESO to offset electricity provides significant opportunity for the Arlington County Water Pollution Control Plant to be a resource recovery facility, reducing the carbon footprint by substantial amounts. In 2040, MESO and THP/MESO could reduce the plant's GHG emissions by 37 and 43 percent, respectively, compared to the LIME baseline. These reductions would be a significant contribution to County goals on climate action.

Background

In 2007, total emissions from the WPCP were 19,991 $mtCO_2e$, approximately 21% of the total government operations net emissions of 93,575 $mtCO_2e$ for that year. The Community Energy Plan sets a goal of a 76% reduction in emissions from government operations by 2050. Targets and goals for the Community Energy Plan for government operations include:

- 93,575 2007 baseline for government operations
- 70,181 2020 target
- 50,531 2030 target
- 40,237 2040 target
- 20,587 2050 goal for government operations

Assumptions used in the following analysis include:

1. Emission factors for electricity and natural gas were held constant through the study period.
    a. Electricity emissions factor is the 2012 SRVC rate from EPA's published eGRID emissions rates. 2012 is the latest year for which data is available. This is expected to decrease over time, which would result in fewer emissions per unit of electricity used, but was held steady in this analysis to isolate the impact of the changes at the plant. The amount of decrease is unknown and highly dependent on national and state policy.
    b. Natural gas emission factor is typically held constant each year. However, as more research is done to ensure accurate accounting, emissions factors may be updated to reflect actual emissions.
2. No energy use was accounted for any storage, cleaning, or movement of the digester gas from its point of production to its point of use.
3. No efficiency loss for using the digester gas in any other process was assumed.
4. The comparison for all data presented is the base case of lime stabilization.

Discussion

This analysis looks at three alternative solids treatment processes to the current lime stabilization process. Mesophilic Digestion (MESO), Mesophilic Digestion with Drying (MESO/DRY), and THP with Mesophilic Digestion (THP/MESO) all use significantly more energy than lime stabilization (LIME). MESO, MESO/DRY, and THP/MESO all produce energy. This analysis examines using 100 percent of the energy produced as natural gas to replace natural gas elsewhere (including in the ART transit fleet) and using the energy to replace electricity elsewhere on the plant site.

Energy consumption for each of the four alternatives was provided for year 2020, year 2040, and the design year. Results are presented below. For processing in the year 2020, the current LIME process represents only two percent of the plant's 2007 baseline carbon footprint, or about 426 $mtCO_2e$. There was a significant decrease in emissions from the plant due to the implementation of MP1, which improved nitrogen removal. Even with this decrease in overall emissions, the 2020 estimate for LIME energy use represents just under three percent of the 2012 plant footprint. With no other changes at the plant, LIME would continue to be a small portion of emissions from the plant. MESO, MESO/DRY, and THP/MESO provide significant impacts to the carbon footprint.

Year 2020 Impact – shown as percent change in 2020 from LIME

	Impact on *Plant* GHG Emissions		**Impact on *County Operations* GHG Emissions**	
Alternative	**Replacing Gas**	**Replacing Electricity**	**Replacing Gas**	**Replacing Electricity**
MESO	-8%	-33%	-2%	-9%
MESO/DRY	+14%	-11%	+4%	-3%
THP/MESO	-9%	-39%	-3%	-11%

Year 2040 Impact – shown as percent change in 2040 from LIME

	Impact on *Plant* GHG Emissions		**Impact on *County Operations* GHG Emissions**	
Alternative	**Replacing Gas**	**Replacing Electricity**	**Replacing Gas**	**Replacing Electricity**
MESO	-10%	-37%	-3%	-10%
MESO/DRY	+14%	-13%	+4%	-4%
THP/MESO	-11%	-43%	-3%	-12%

Design Year Impact – shown as percent change in 2040* from LIME

	Impact on *Plant* GHG Emissions		**Impact on *County Operations* GHG Emissions**	
Alternative	**Replacing Gas**	**Replacing Electricity**	**Replacing Gas**	**Replacing Electricity**
MESO	-13%	-47%	-7%	-23%
MESO/DRY	+16%	-17%	+8%	-9%
THP/MESO	-13%	-53%	-7%	-26%

*2040 selected because design year is beyond current projection years.

These results show that alternatives MESO and THP/MESO will reduce the Plant's carbon footprint if the digester gas produced replaces gas. All three alternatives will reduce the plant's carbon footprint if the digester gas produced replaces electricity. Offsetting either natural gas or electricity, MESO and THP/MESO will provide extremely significant reductions to the plant's carbon footprint.

Beneficially using the digester gas produced in MESO or THP/MESO to offset electricity provides significant opportunity for the Arlington County Water Pollution Control Plant to be a resource recovery facility, reducing the carbon footprint by substantial amounts. In 2040, MESO and THP/MESO could reduce the plant's GHG emissions by 37 and 43 percent, respectively, compared to the LIME baseline.

Further, looking at the targets for county operations, alternatives MESO and THP/MESO would substantially contribute to reaching the CEP goals for county operations if the digester gas offsets electricity use. Though projections for the plant's flow do not go out to 2050, even 2040 projections are quite remarkable, with MESO and THP/MESO reducing GHG from all county operations by 10 and 12 percent, respectively, compared to the LIME baseline.