ARLINGTON RE-GEN

Arlington County Water Pollution Control Plant

Solids Master Plan

Biosolids Advisory Panel

October 7, 2021

ARLINGTON VIRGINIA

Agenda

01	6:00 - 6:05	**Introductions**
02	6:05 - 6:10	**Rock-N-Recycle**
03	6:10 - 6:15	**Program Updates**
04	6:15 - 6:35	**Biogas Utilization and Recommendation**
05	6:35 - 7:05	**PFAS/Contaminants of Emerging Concern**
06	7:05 - 7:15	**Site Layout**
07	7:15 - 7:25	**Next Steps**

Introductions

Mary Strawn	**Tom Broderick**	**Lisa Racey**	**Peter Golkin**
Arlington County Water Pollution Control Bureau	Arlington County Water Pollution Control Bureau	Arlington County Water Pollution Control Bureau	Arlington County Dept. of Environmental Services

Brian Balchunas	**Stephanie Spalding**	**Rahkia Nance**	**Jessica Snead**	**Samantha Villegas**
HDR	HDR	HDR	HDR	Raftelis

02

Rock-N-Recycle

Rock-N-Recycle – September 18, 2021

Rock-N-Recycle – September 18, 2021

ARLINGTON RE-GEN

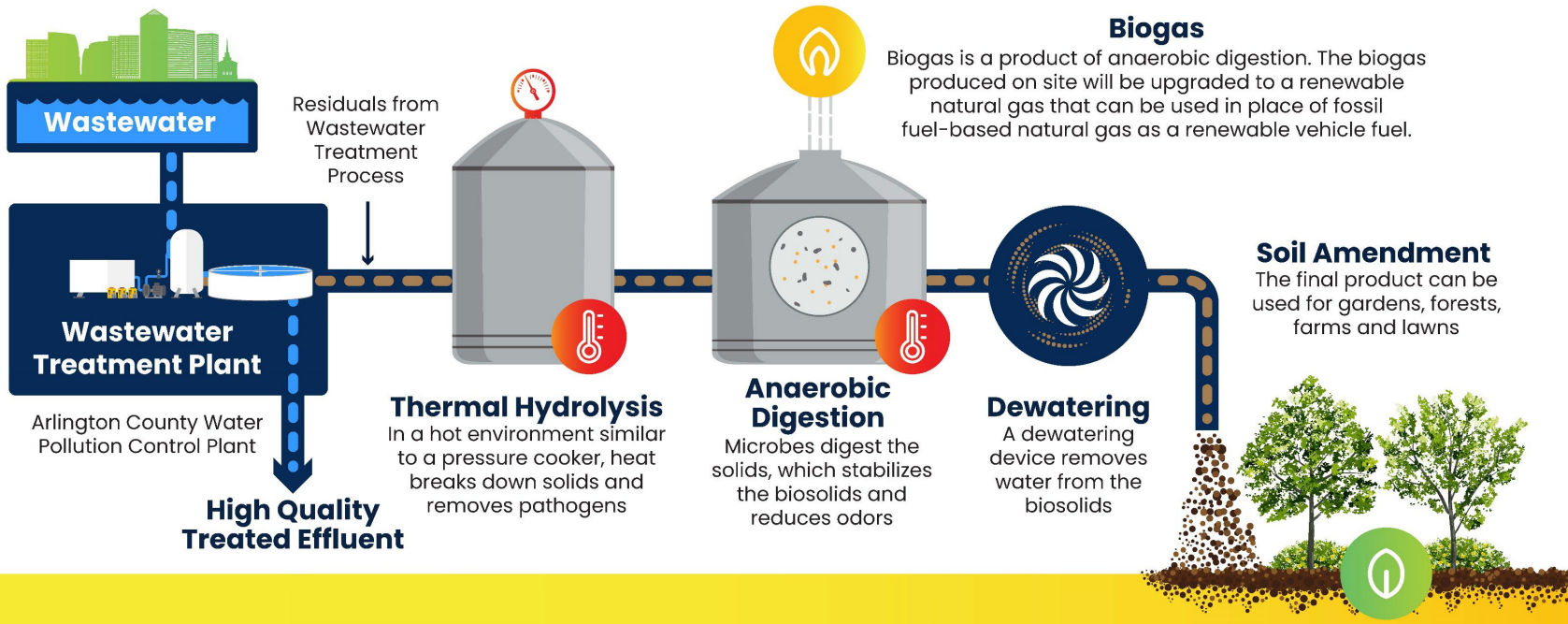
Arlington Re-Gen is part of the Arlington County Water Pollution Control Bureau's commitment to protecting public health and the environment, while recovering valuable resources with innovative processes that will also reduce our carbon footprint. We are implementing sustainable practices and cutting-edge technology to safely transform wastewater to a renewable energy source.

Mission
To create renewable energy and a soil-enhancing biosolids product using a safe and reliable transformation process.

Vision
To be a good neighbor within our community, a leader in efficiency in our industry, and a beacon of sustainability in Arlington County.

Purpose
To replace infrastructure in a manner that helps Arlington County meet its energy and carbon reduction goals.

Recovering renewable resources from wastewater



Rock-N-Recycle – September 18, 2021

03

Program Updates

Solids Master Plan Immediate Needs Projects

Replace Motor Control Center 1

- **Description:** Replace electrical equipment powering the initial wastewater treatment processes
- **Goals:** Improve safety and equipment reliability
- **Status:** Completed in Fall 2020

New Motor Control Center Installation

Headworks Improvements

- **Description:** Replace influent screens, screening handing equipment, scum concentrator, and improve building ventilation
- **Goals:** Improve safety, equipment reliability, and equipment performance
- **Status:** Construction starting Fall/Winter 2021 until Spring/Summer 2023

Bar Screens – Interim Level

Program Updates

"What"

- Data Analysis
- Condition Assessment
- Technology Review
- Process Evaluations
- Gas Utilization
- Air Emissions
- Site Development
- Facilities Plan

Completed

- Finalized data analysis and future projections
- Completed numerous technical evaluations for technical approach
- Provided recommendation on gas utilization
- Evaluated multiple site plan options
- Began air emissions modeling

Upcoming

- Program team working towards Draft Facilities Plan at end of 2021

Program Updates

“How”

- Risk Analysis
- Project Packaging
- Delivery Evaluation
- Procurement of Delivery Teams

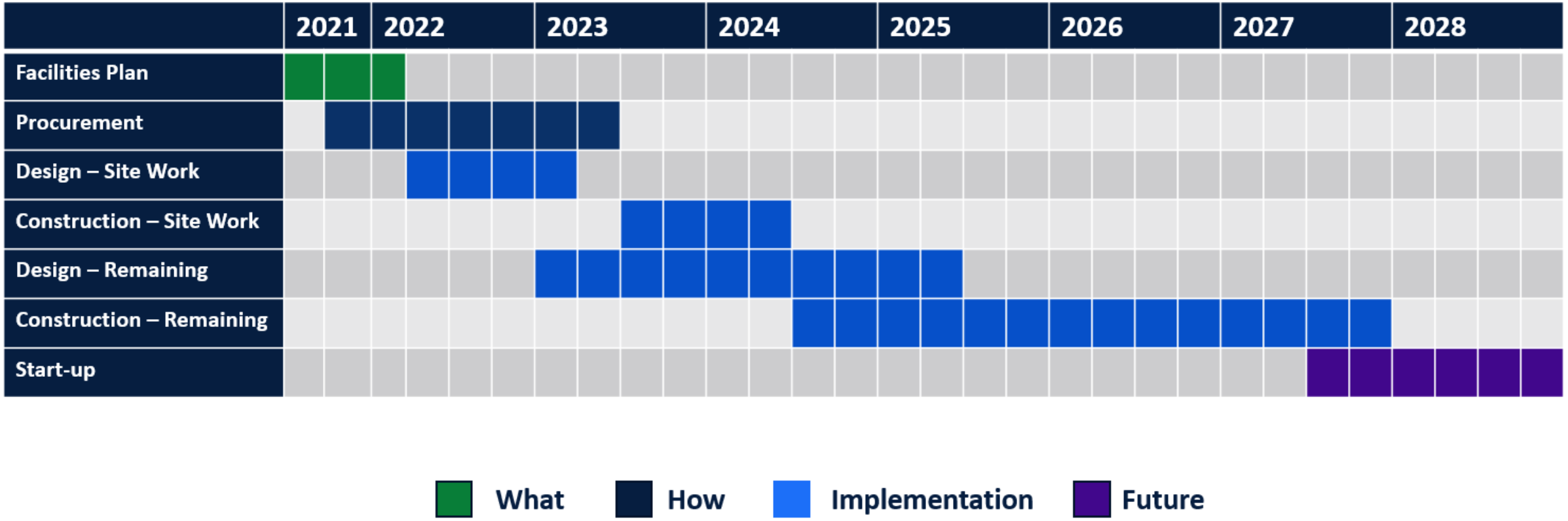
Completed

- Completed delivery risk assessments
- Identified potential project packages for delivery
- Evaluated project packages against project risks

Upcoming

- Select delivery model and packages
- Begin procurement of delivery teams

Preliminary Schedule Overview



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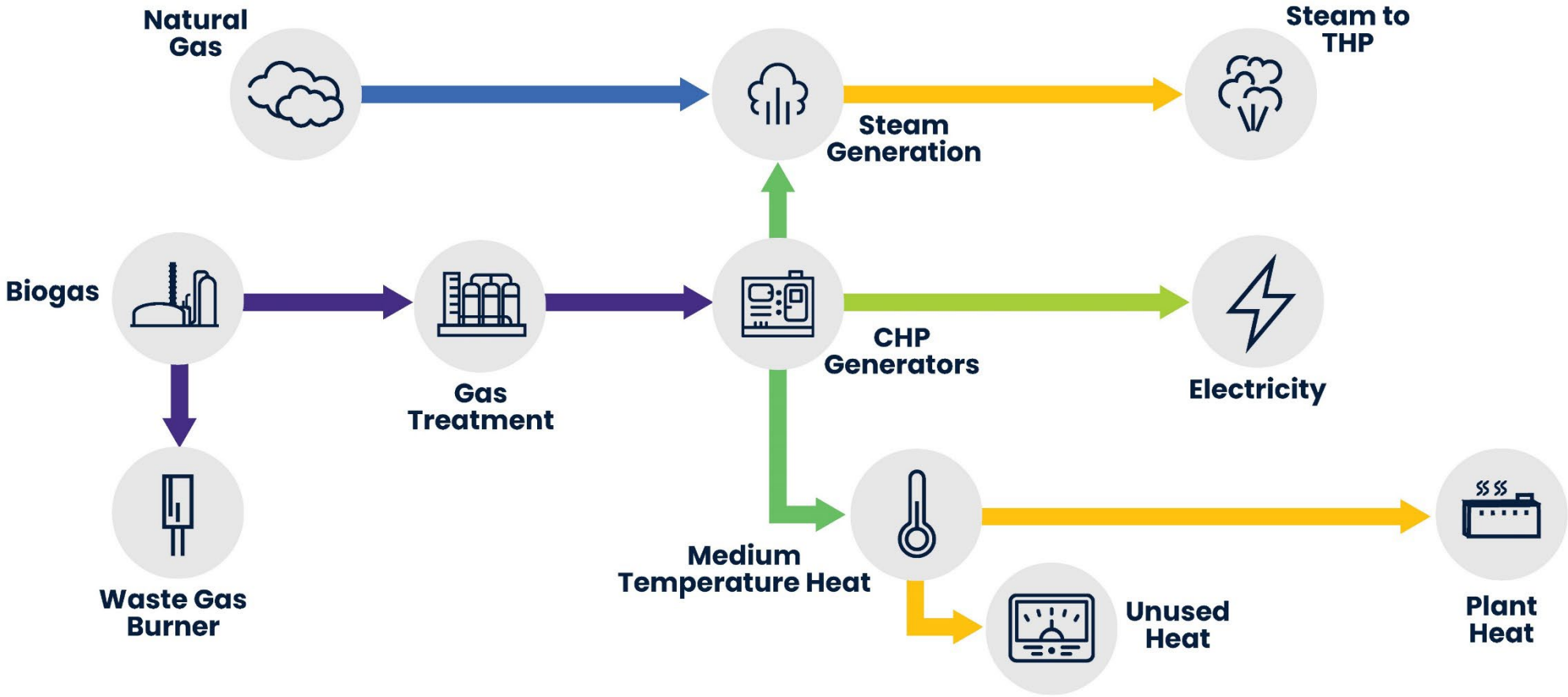
Biogas Utilization and Recommendation

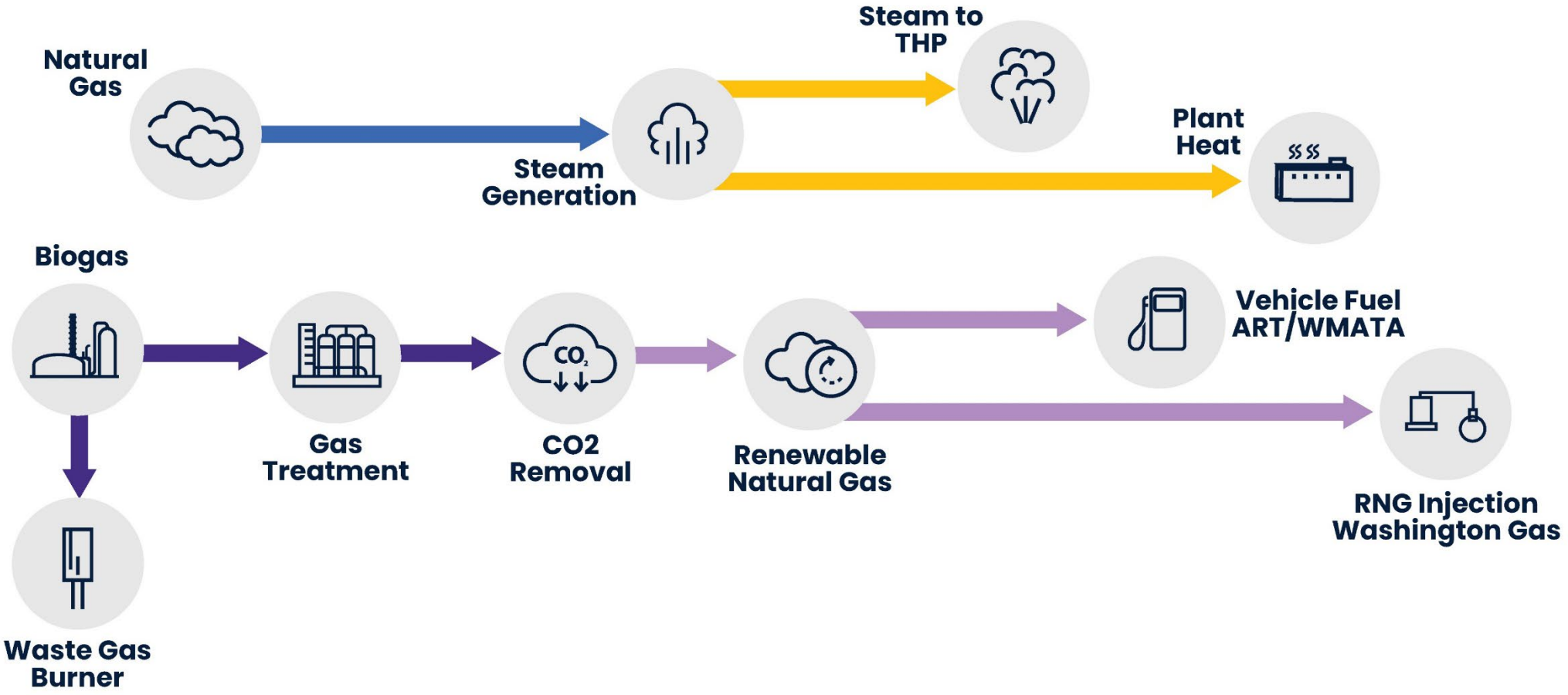
Gas Utilization Evaluation

- Comparison of three main options
  - Process and building heat
  - Generation of on-site electricity and heat for wastewater treatment processes
  - Production of renewable natural gas for use offsite
- Comparison across multiple metrics
  - Financial (capital and present worth)
  - Carbon reductions (including social cost of carbon)
  - Non-economic analysis
- Facilitated analysis completed by Arlington project team

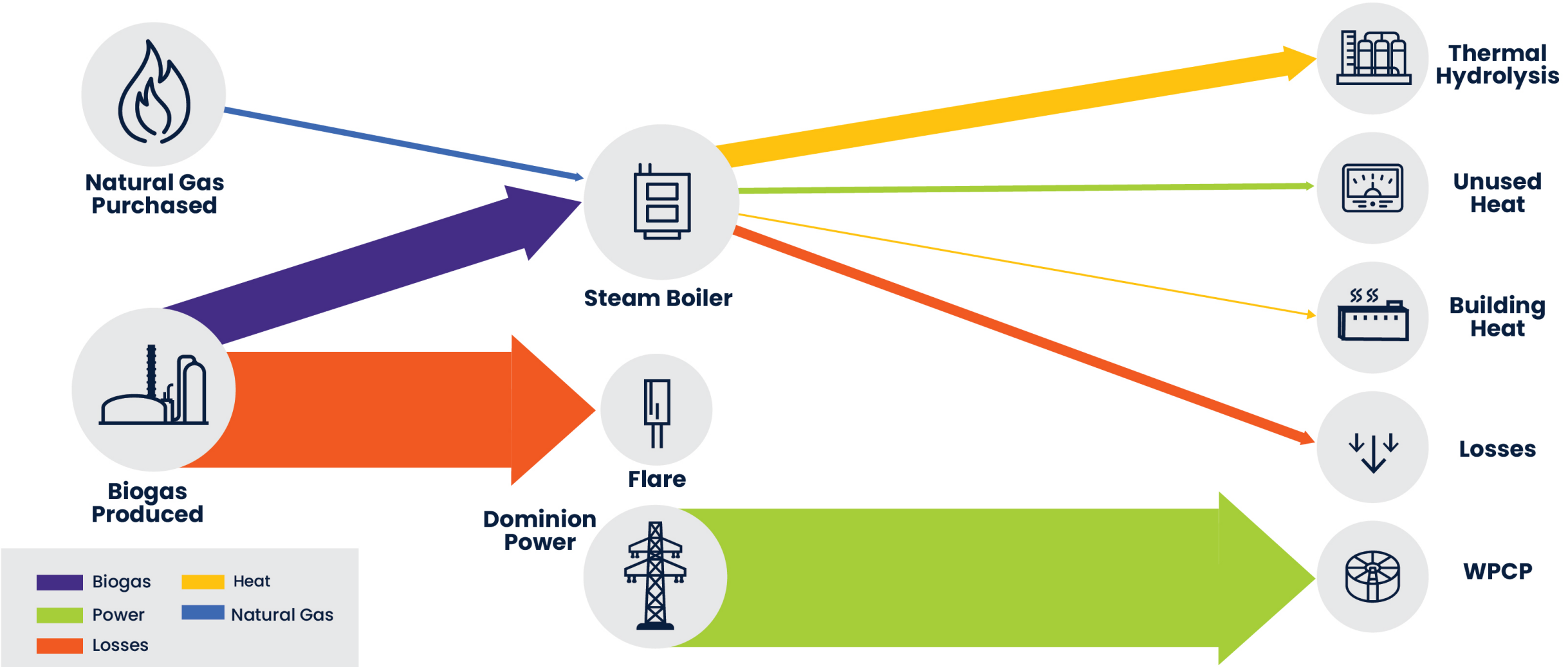
Biogas Used in Engines for Electricity and Heat



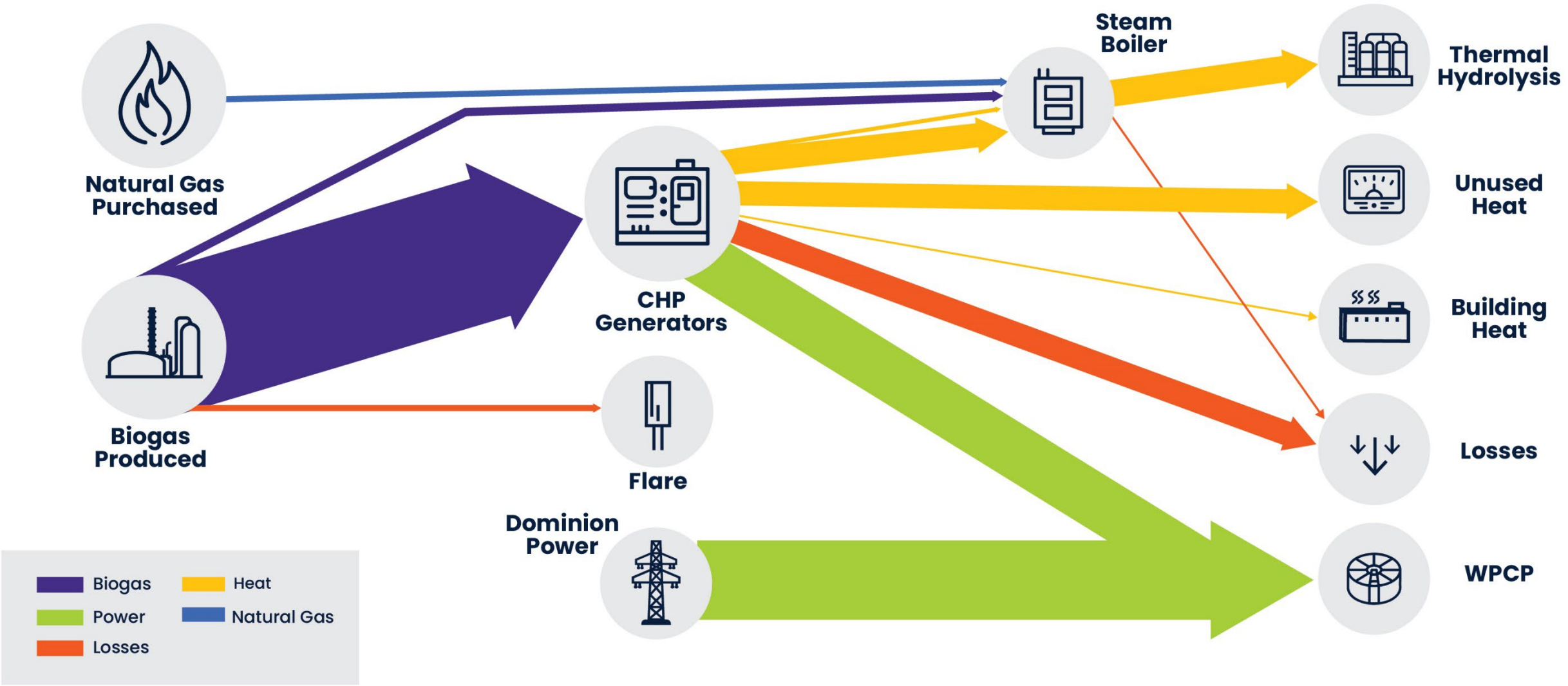
Biogas Upgraded to Renewable Natural Gas



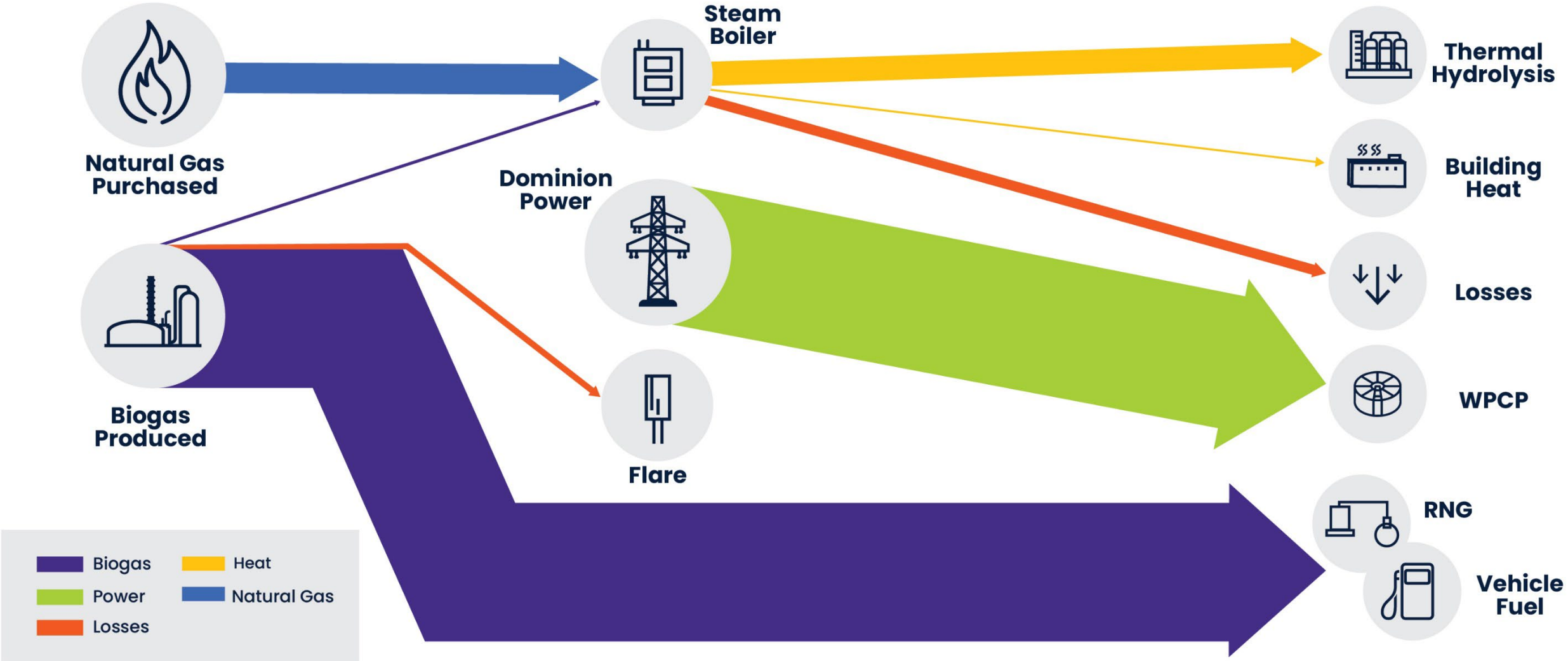
Alternative 1 – Process and Building Heat



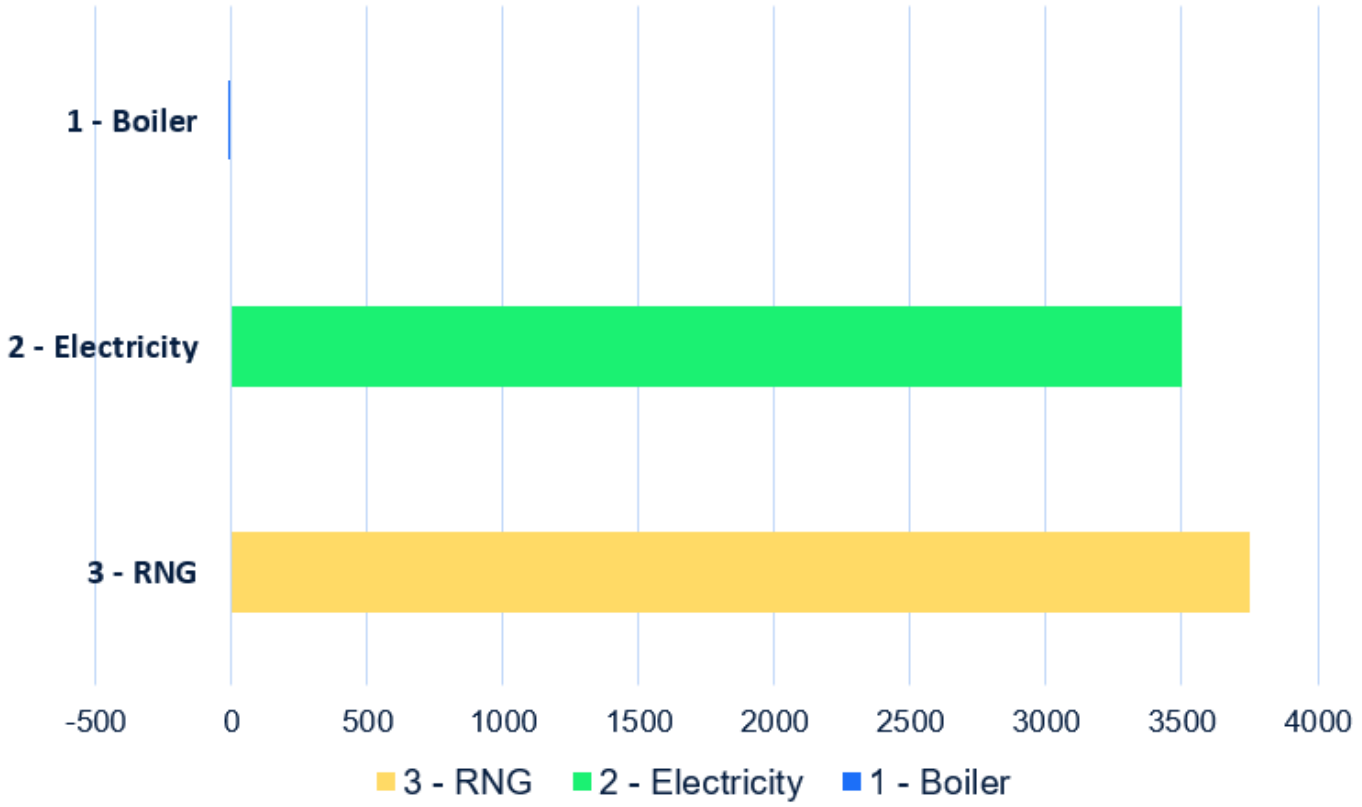
Alternative 2 – On-site Electricity and Heat



Alternative 3 – Renewable Natural Gas



Reductions in CO_2 Emissions Electricity and Natural Gas Only

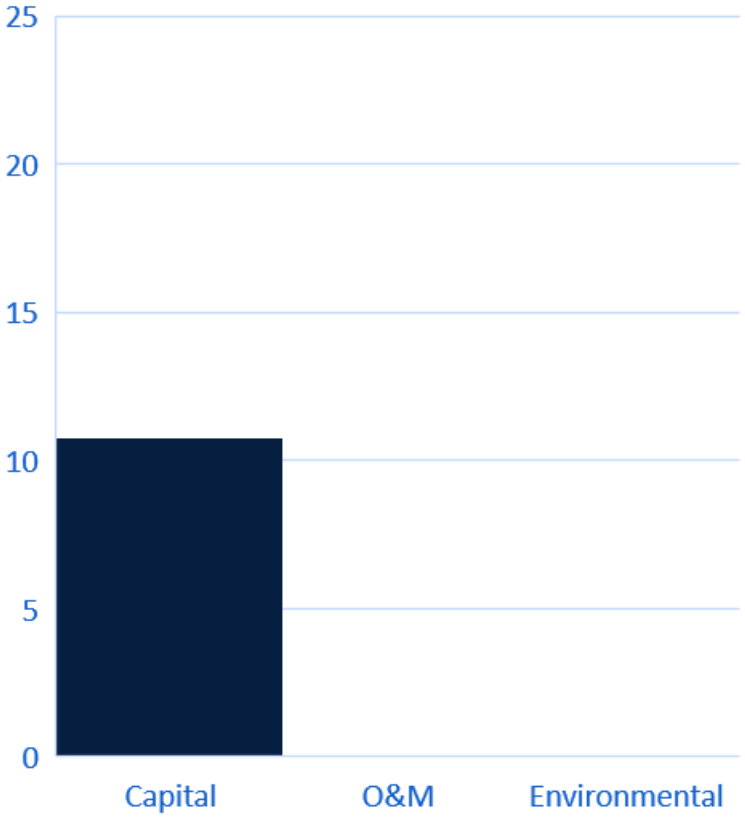


3,500 MT/year CO_2 =

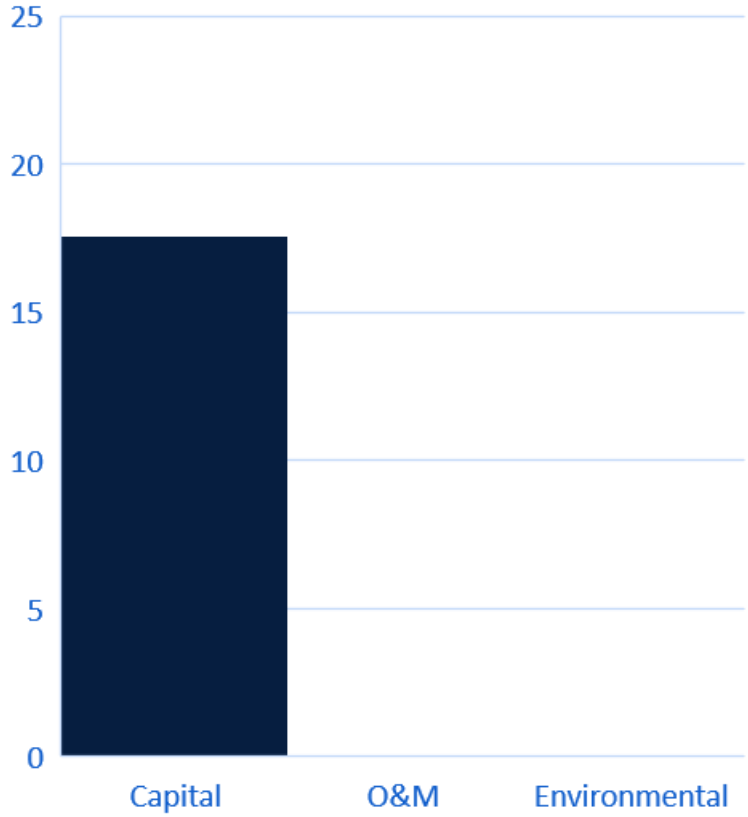
400,000 gallons of gas or
340,000 gallons of diesel or
Emissions from 760 vehicles or
660,000 therms of natural gas or
Electricity for 640 homes or
Energy for 420 homes

Source: https://www.epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references

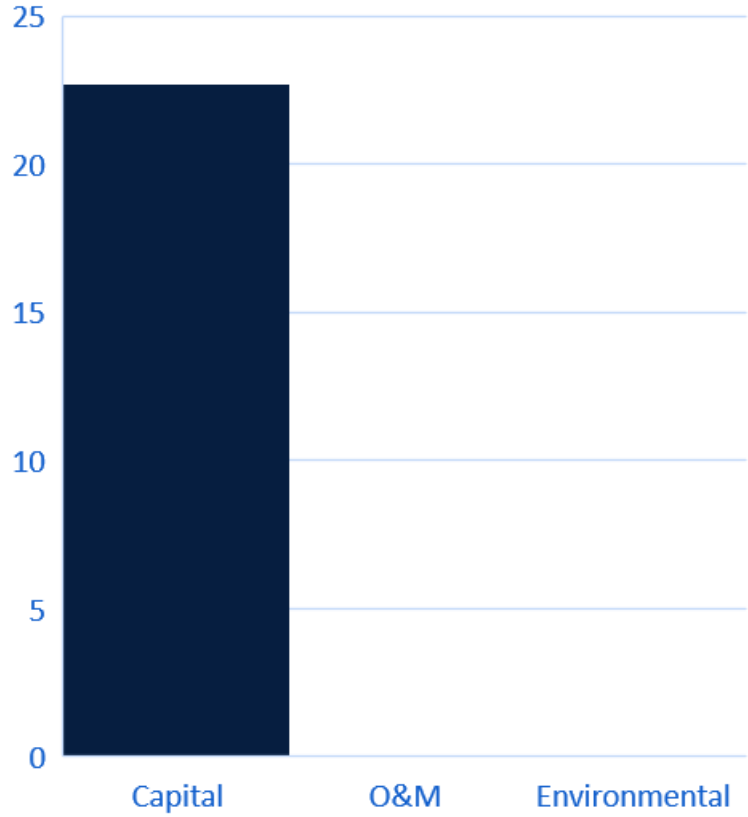
Total Capital Costs (with Base Assumptions)



1 – Process and Building Heat

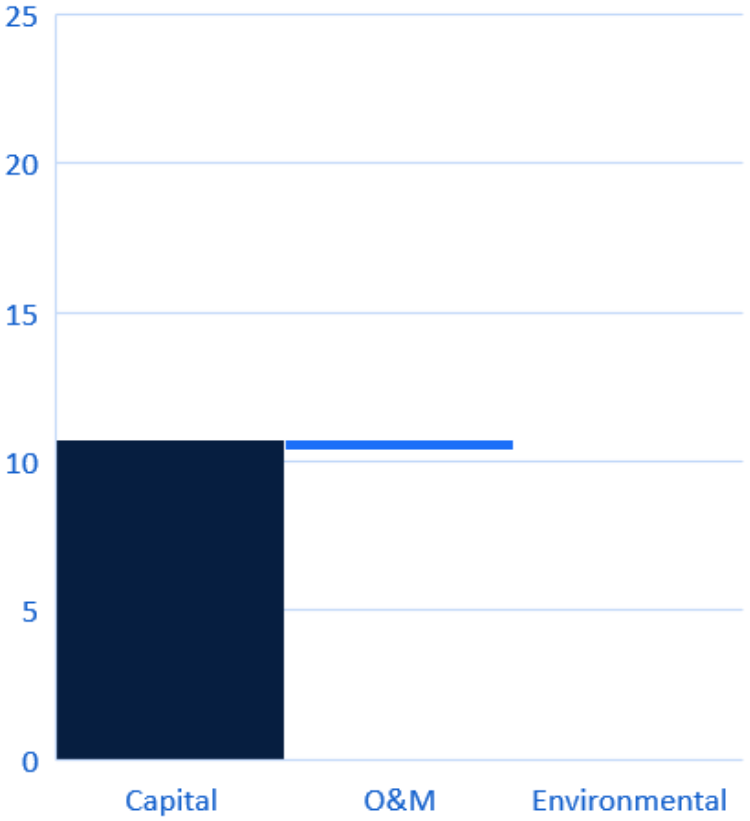


2 – Onsite Electricity and Heat



3 – Renewable Natural Gas

Add in O&M Costs (present worth, with Base Assumptions)



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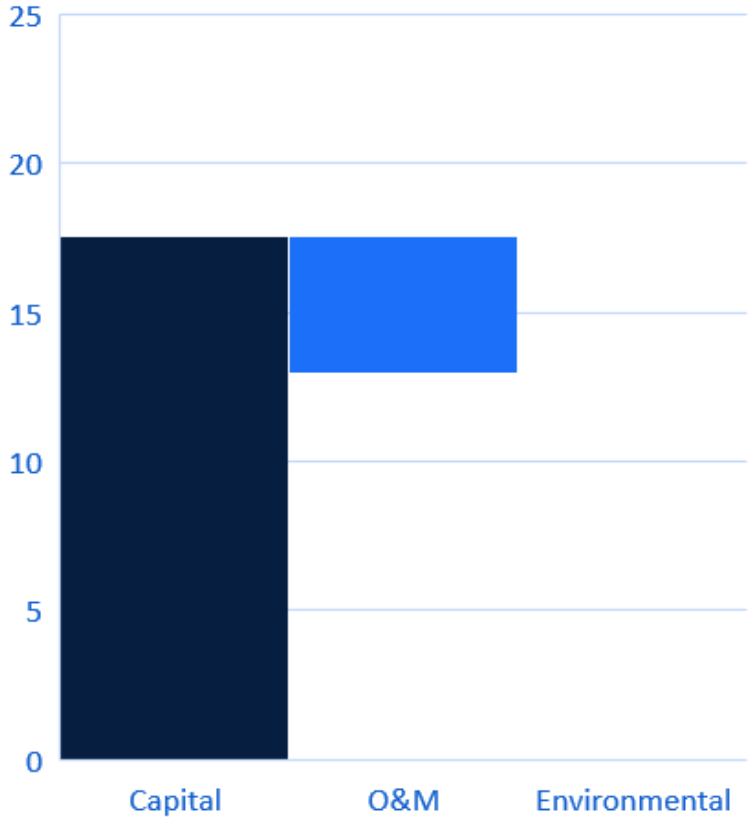
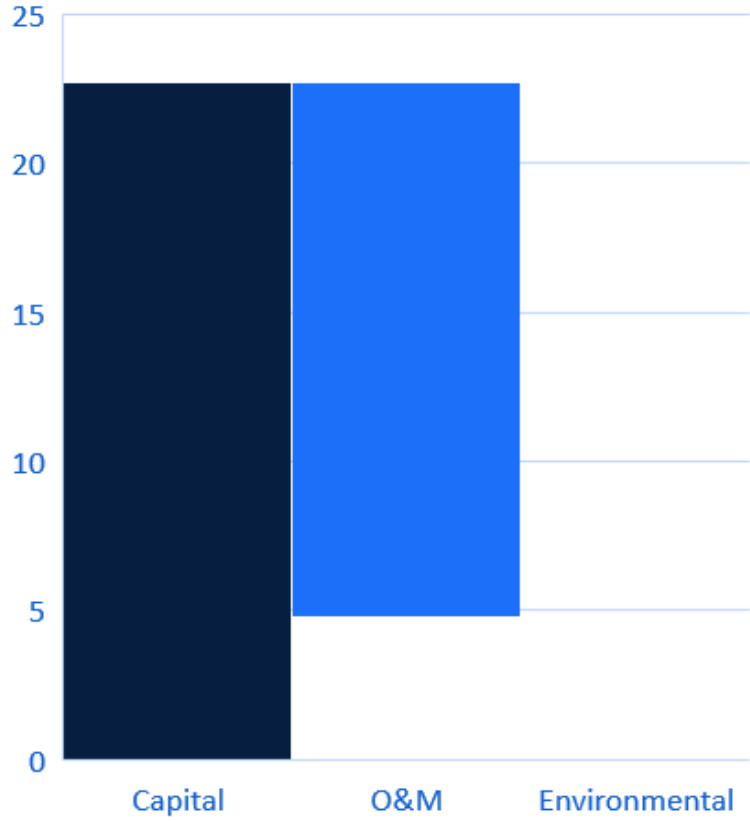
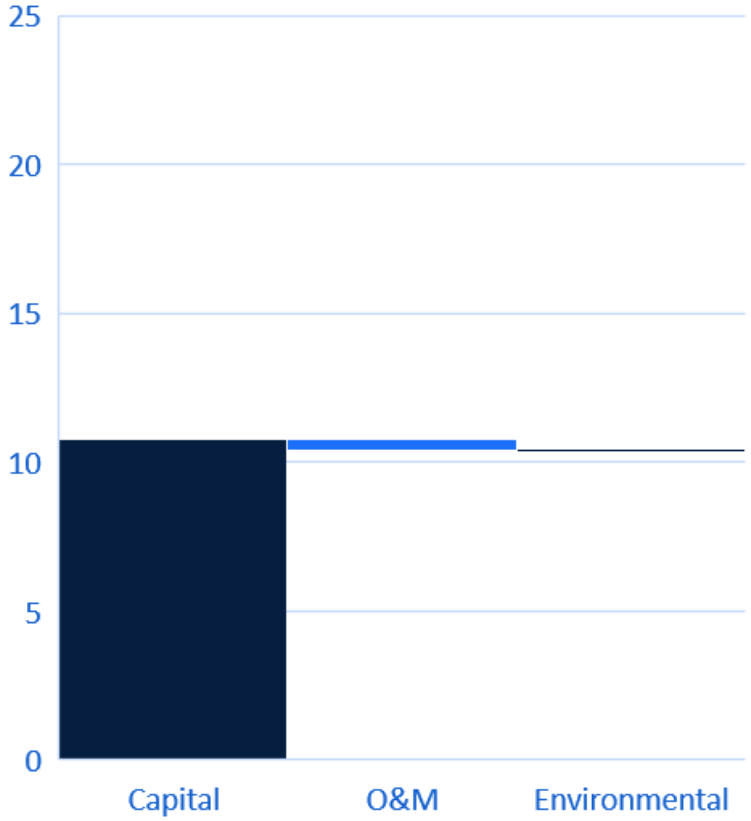


2 – Onsite Electricity and Heat



3 – Renewable Natural Gas

Add in Environmental Costs (with Base Assumptions)



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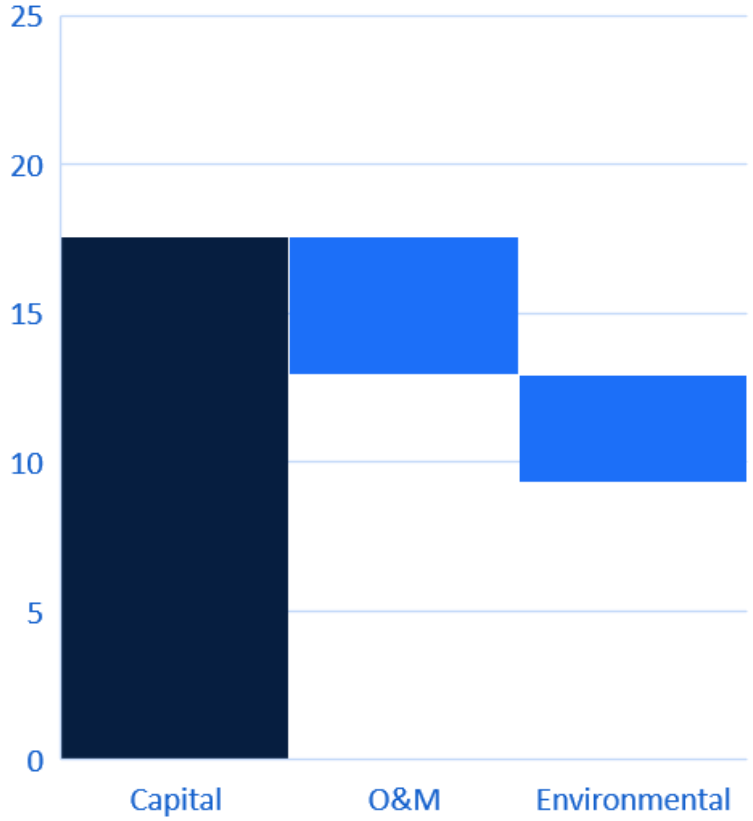

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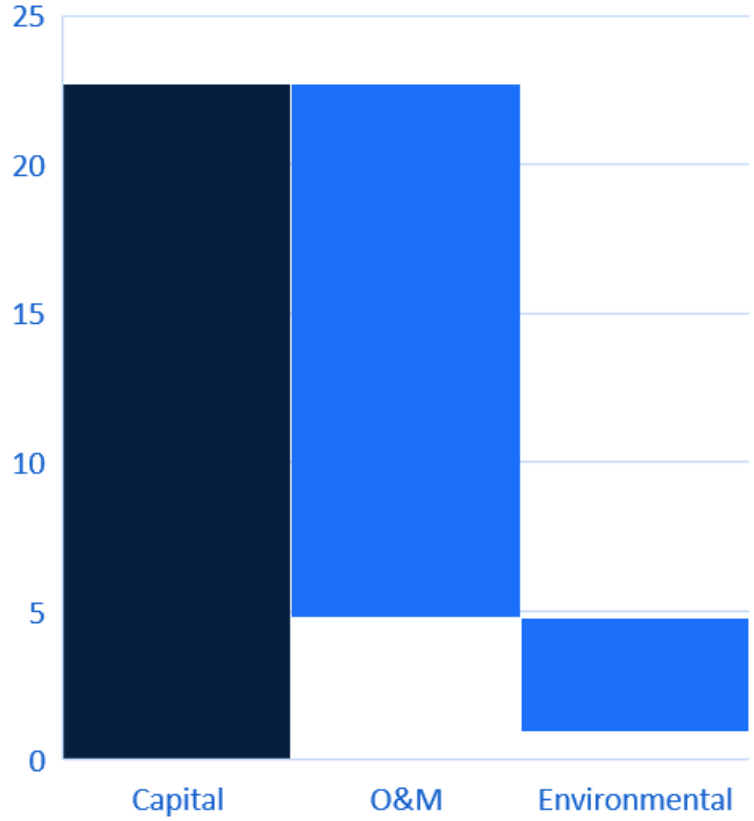
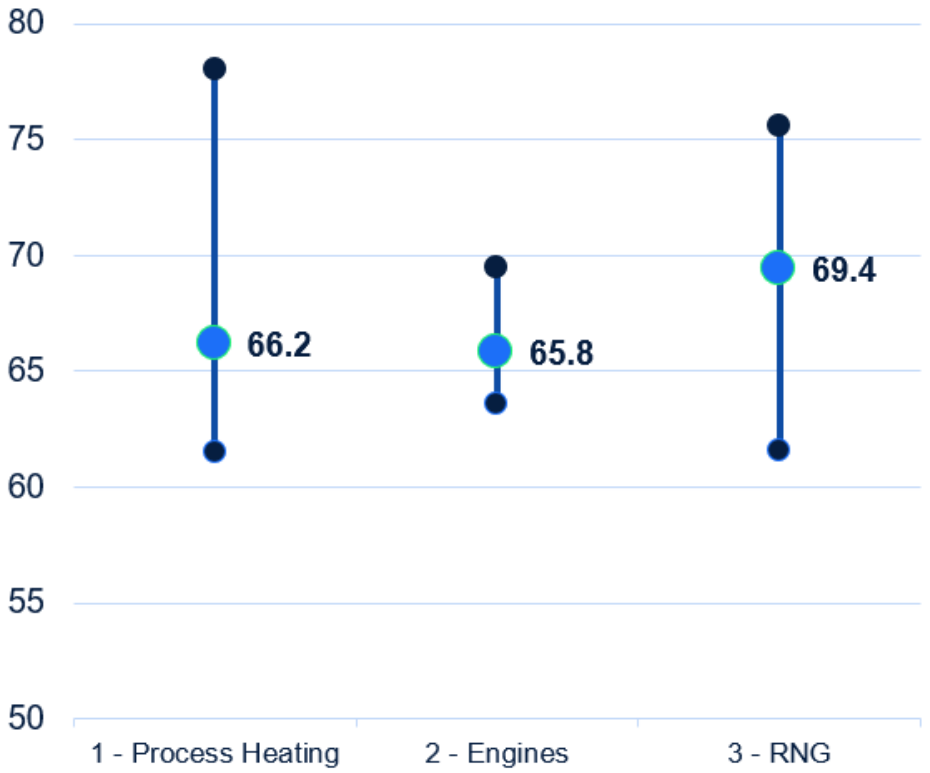


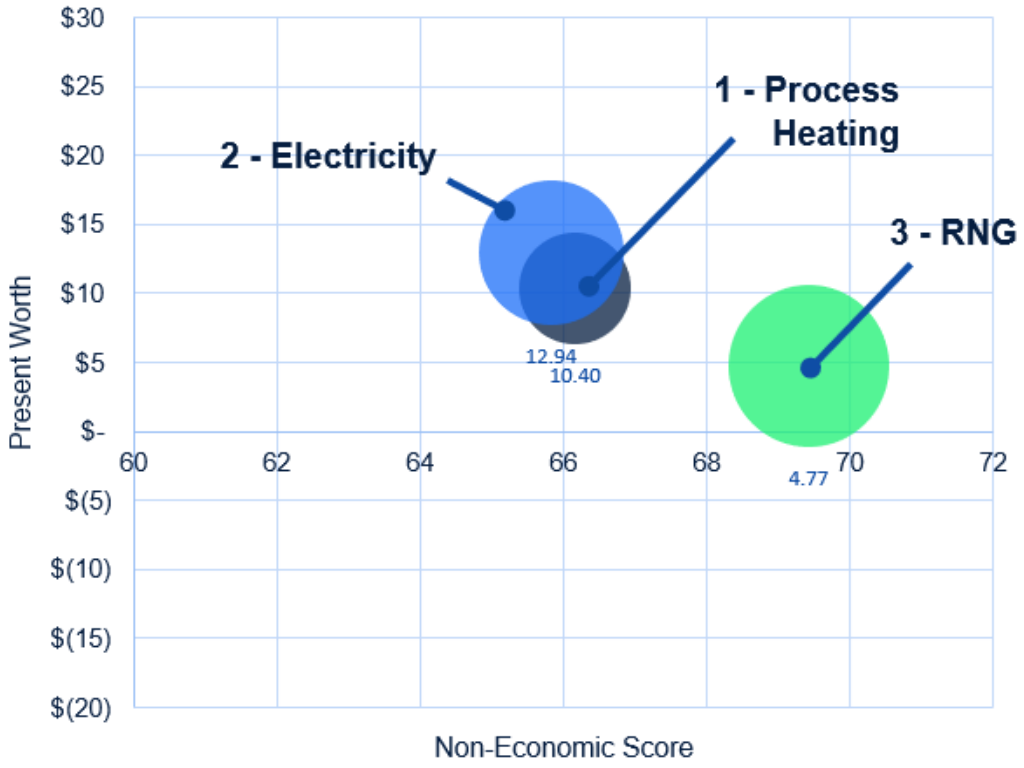
3 – Renewable Natural Gas

Non-Economic Criteria – Weighting and Scoring

Title	Characteristics
Localized Emissions	Produces emissions at plant site that may negatively impact air permitting requirements, cause neighborhood issues, or result in poor air quality in immediate area.
Noise	Generates excess noise that may impact neighbors or result in costly noise reduction measures
Visual Aesthetics	Is acceptable to the neighbors and general Arlington County community from a visual aesthetics standpoint.
Footprint	Sufficient space for operations and maintenance, does not take land space from current needs or potential future add ons.
Potential for Flaring	Provides multiple outlets for use of biogas or redundancy options to minimize the amount of biogas sent to the waste flare.
Operational Complexity and Reliability	Reliability of equipment and facilities, ongoing maintenance requirements, annual downtime for maintenance, number of components that could fail resulting in failure of system.
Safety	Risks for operation of system, including leaks, pressures, number of components, etc.
Resiliency	Provides for additional resiliency benefits for the WPCP and solids handling systems.
Future Opportunities	Maintains flexibility for modifying approach should market conditions change.

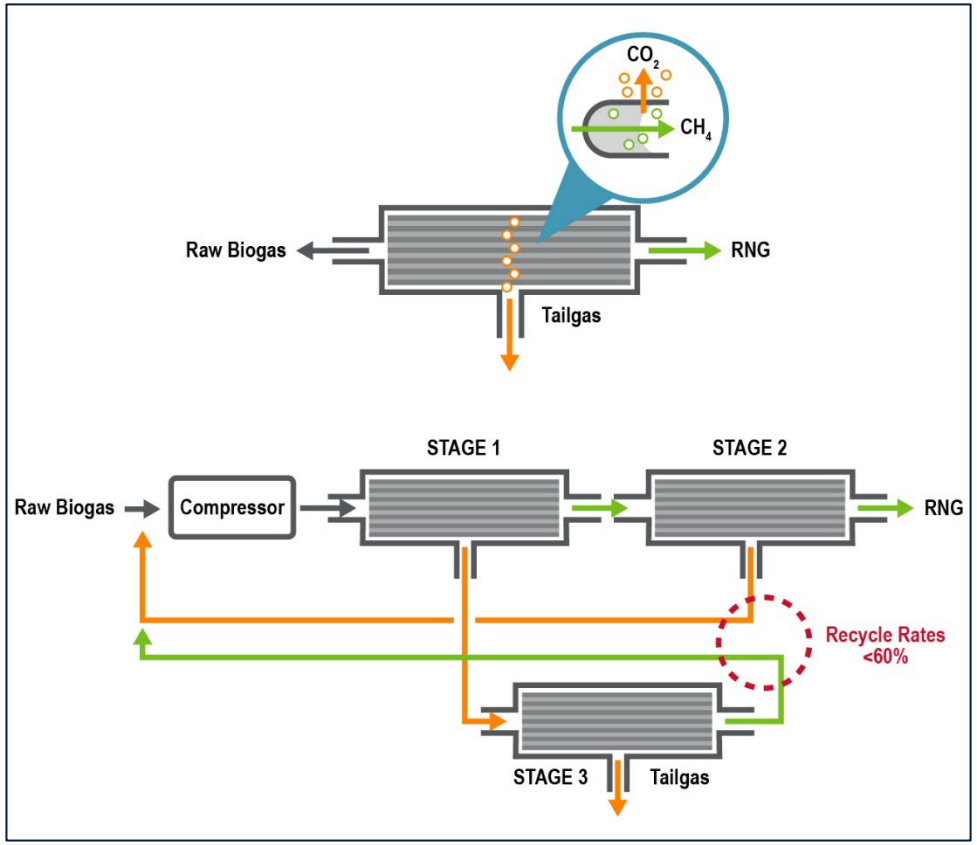
Non-Economic and Overall Scoring





Recommendation

- Proceed with upgrading biogas to renewable natural gas for use as vehicle fuel offsite
  - Lowest present worth cost
  - Highest non-economic score
  - Lowest onsite emissions
  - Lowest carbon footprint
- Provide Biosolids Advisory Panel executive summary of gas utilization report



Example membrane gas upgrading system

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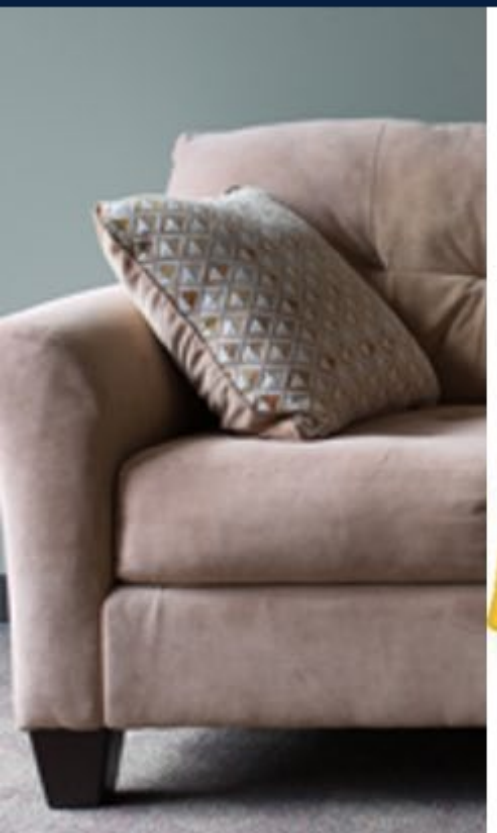
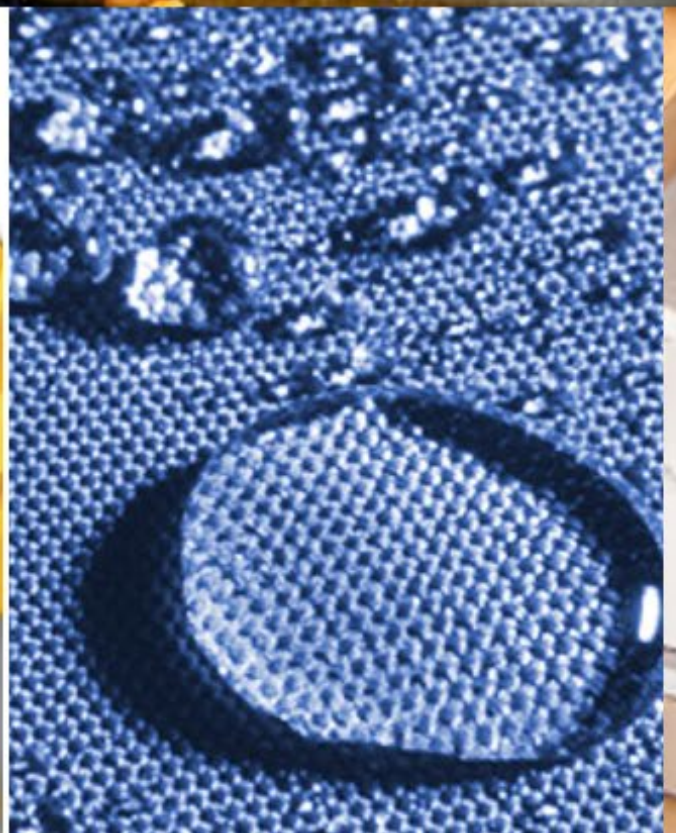
PFAS/Contaminants of Emerging Concern

What's the Big Deal?

- Effect on health
- Effect on the environment
- Some are still in use

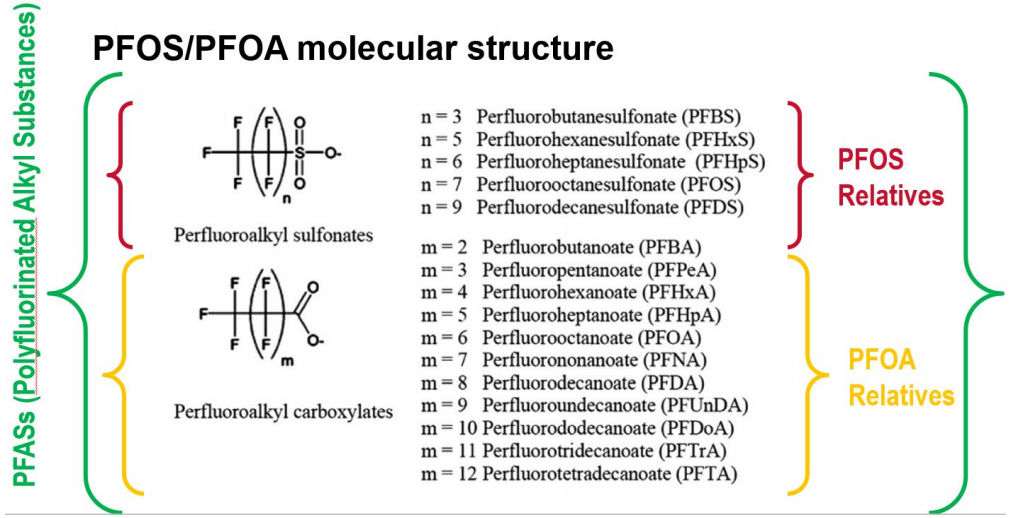
Where are PFAS found?



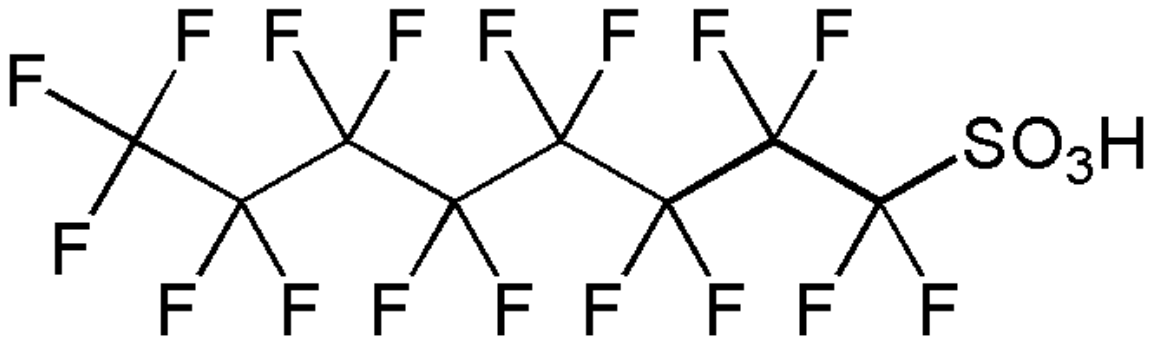


What are Per- and Poly-Fluoroalkyl Substances (PFAS)?

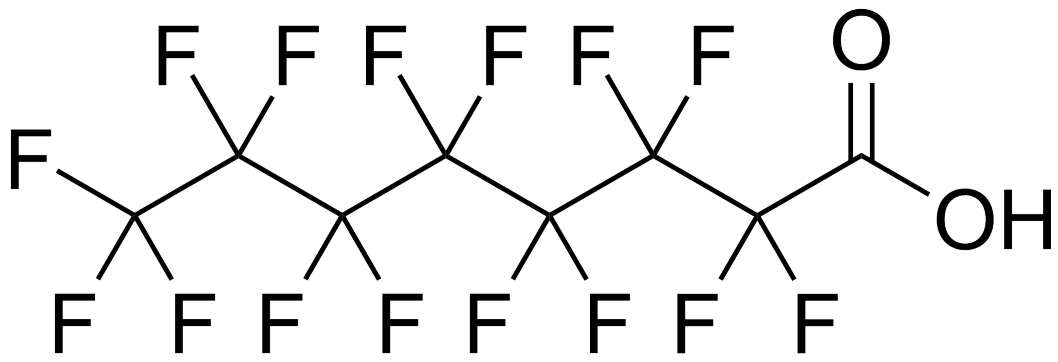
- Chemical Lightning Bolts with Fs!
  - Stable, nonreactive, and effective at low concentrations
  - Hydrophobic, hydrophilic, and lipophilic all in one → grab onto everything!
  - Highly soluble in water → The shorter the more soluble



PFOS

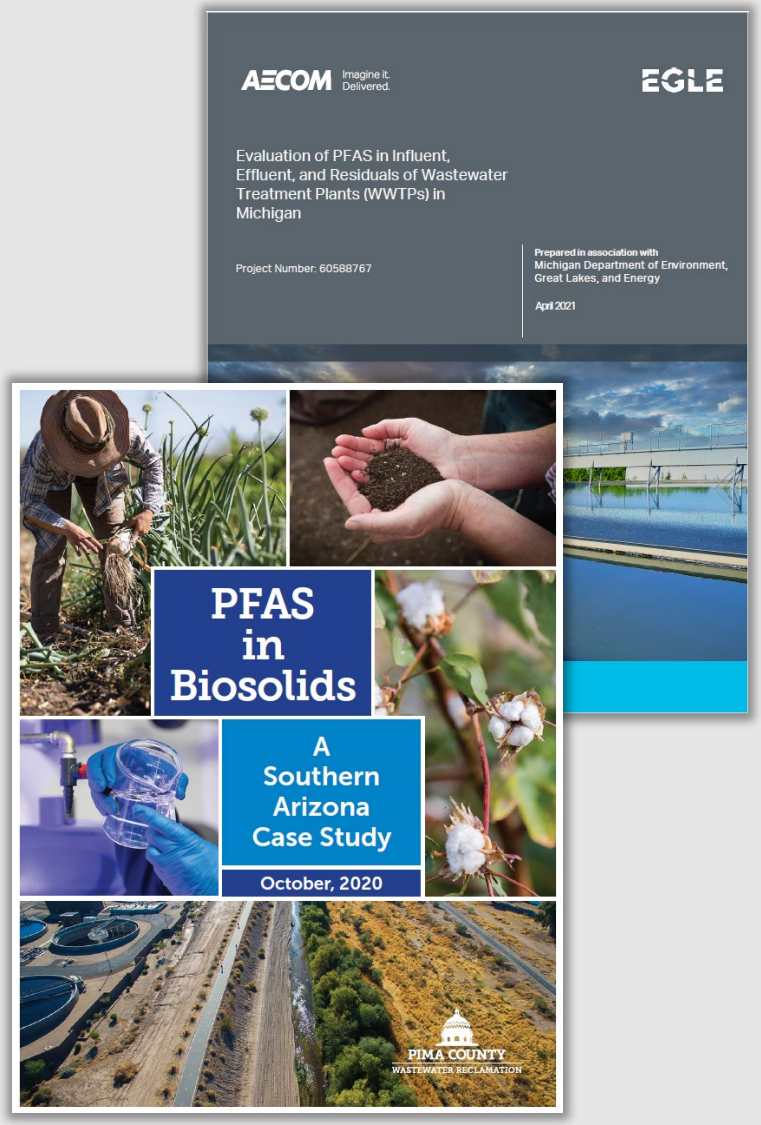


PFOA



PFAS and Biosolids – Ongoing Research

- Research of PFAS to date has been focused on drinking water and wastewater
- Studies are currently underway to determine the impact of PFAS in biosolids on:
  - Land application sites
  - Plant uptake rates
  - Groundwater impact
- Recent large published studies: Michigan EGLE and Pima County, AZ



Current Virginia Approach for PFAS

- Virginia Department of Health (VDH) is aware of PFAS regulations being developed in other states
- VDH has formed PFAS Workgroup to study occurrence of six specific PFAS compounds (PFOA, PFOS, PFBA, PFHpA, PFHxS, PFNA) and others as needed
- PFAS Workgroup may recommend maximum contaminant level (MCLs) for public water systems

Current Virginia Approach for PFAS

- Current Virginia PFAS sampling - groundwater systems, source water intakes and large waterworks
- Results summarized in PFAS Workgroup meeting minutes
  - PFAS detected in waterworks
  - No samples exceeded EPA's health advisory level of 70 ppt (PFOA + PFOS) or MCLs established by other states
- PFAS Workgroup links
  - Per- and Polyfluoroalkyl Substances (PFAS) in Drinking Water – Drinking Water (virginia.gov)
  - Meeting Minutes, September 2, 2021 (virginia.gov)

CECs/PFAS and Biosolids - Virginia

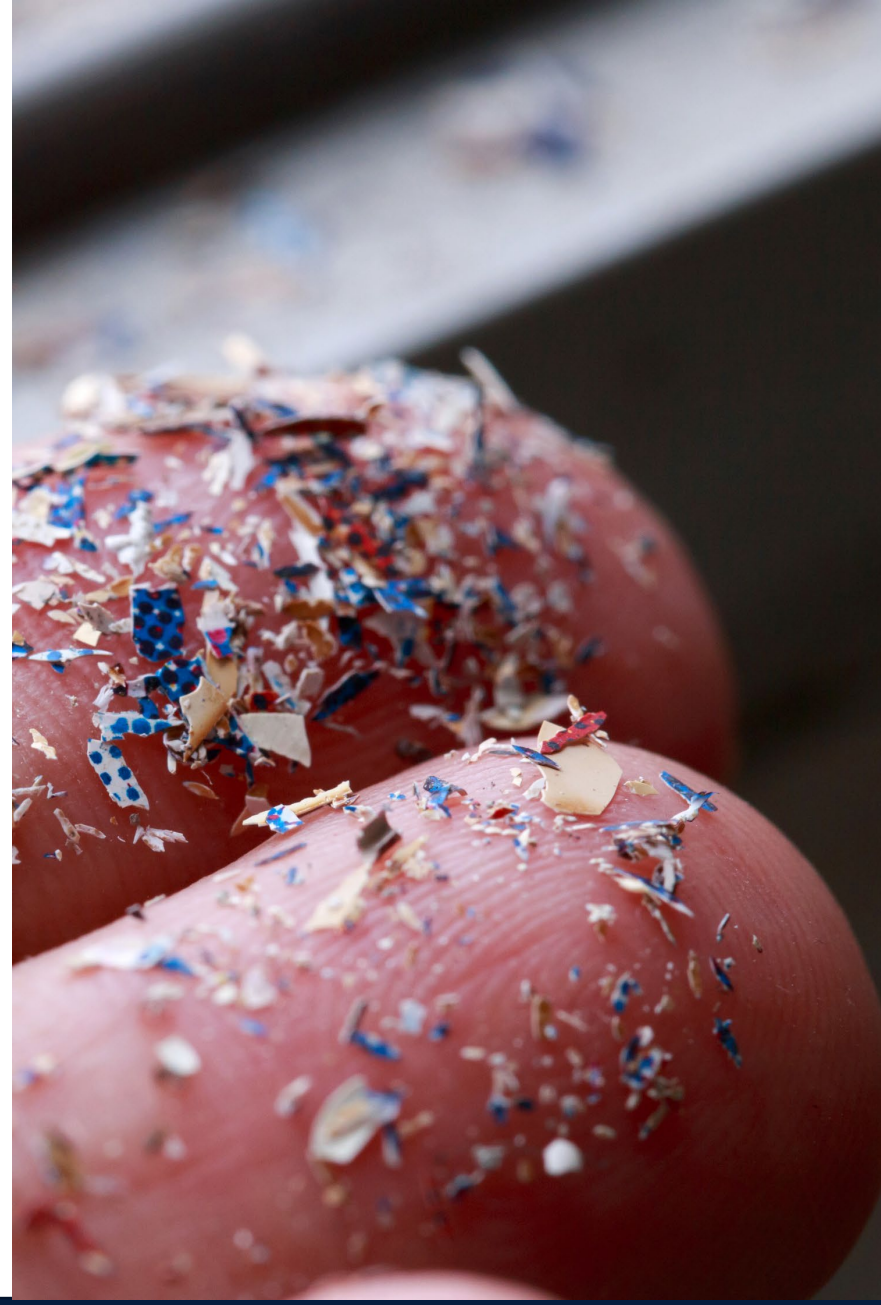
- Virginia Department of Environmental Quality and Department of Health are working on communications for PFAS in biosolids
- Based on recent research findings, forthcoming regulations on biosolids land application are not anticipated at this time
- Eventual PFAS drinking water standards may impact discharge limits on wastewater, recycled water and biosolids

CECs/PFAS and Biosolids - Virginia

- Biosolids from the Arlington WPCP are low risk for elevated PFAS levels, as there are no large industrial dischargers to the plant
- Biosolids management solutions at the Arlington WPCP are adaptable and can pivot to additional treatment or alternate uses should a future limitation on land application arise

Other CECs - Virginia

- Current focus is on PFAS, but research into other CECs is ongoing including:
  - Pharmaceuticals and Personal Care Products (PPCPs)
  - Microplastics
- Recent report from the Academic Advisory Committee (AAC) to the VDEQ:
  - Emerging Contaminants in the Waters of Virginia
  - Link to paper here.



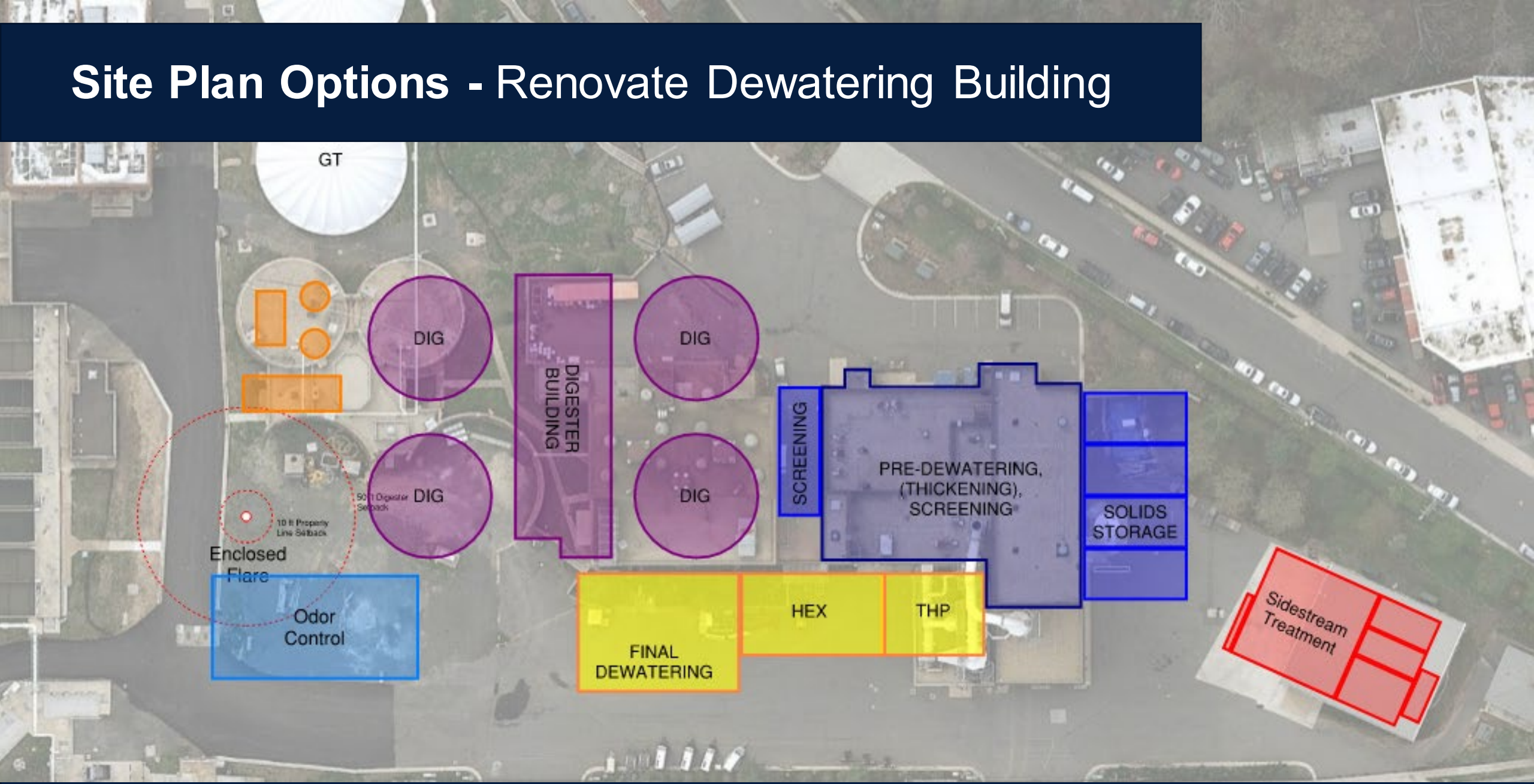
06

Site Layout

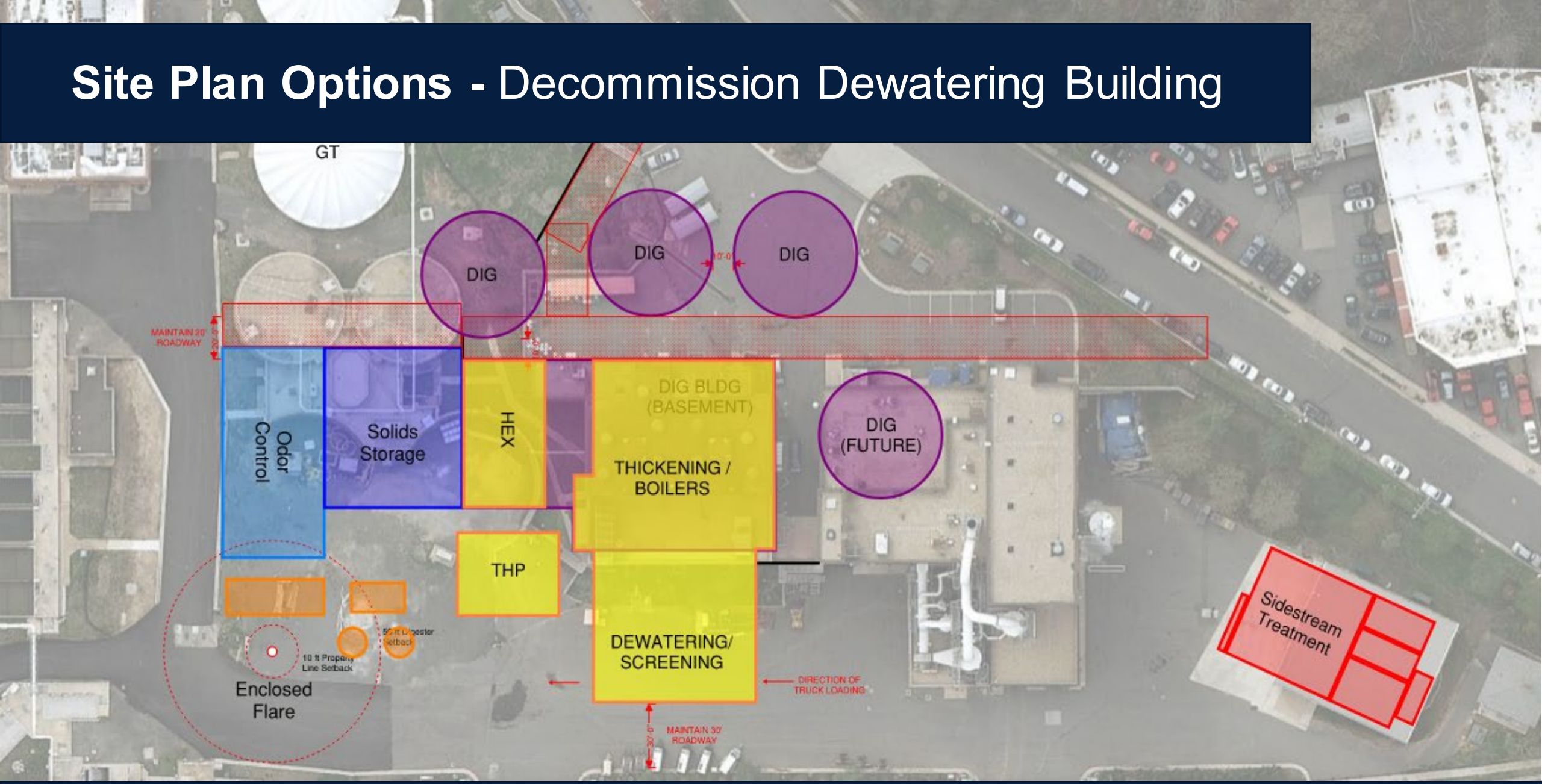
Evaluating Existing Facilities

Evaluating Existing Facilities

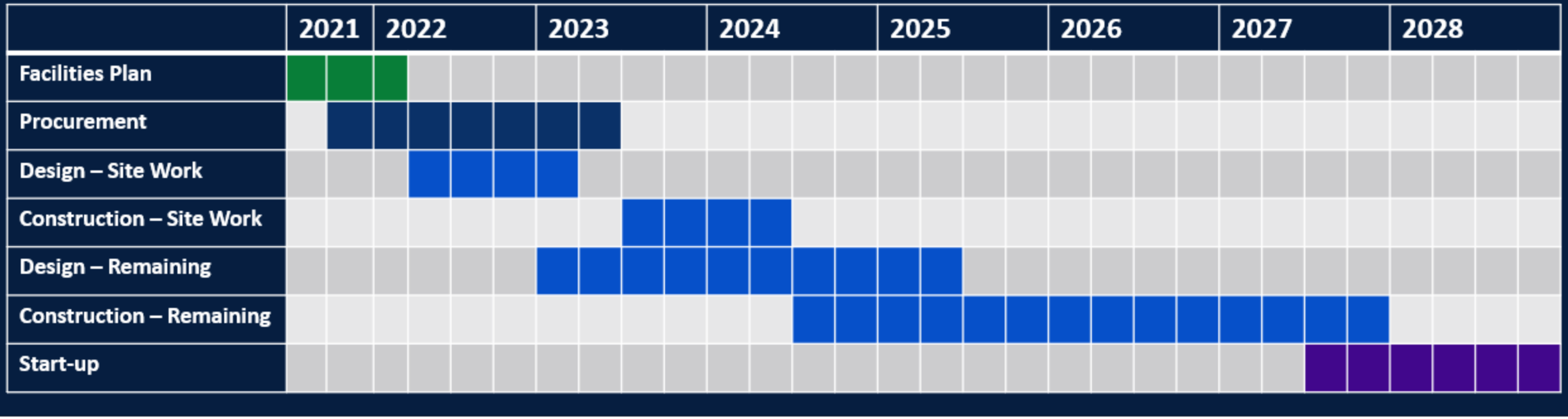
Site Plan Options - Renovate Dewatering Building



Site Plan Options - Decommission Dewatering Building



Next Biosolids Advisory Panel meeting: January or February 2022



07

Next Steps

Next Steps

- Next meeting in early 2022
- Provide opportunity for Advisory Panel to comment on Gas Utilization Executive Summary
- Provide update on overall Facilities Plan
- Provide update on Delivery Approach
- Review site plan and project site renderings

Project Contact

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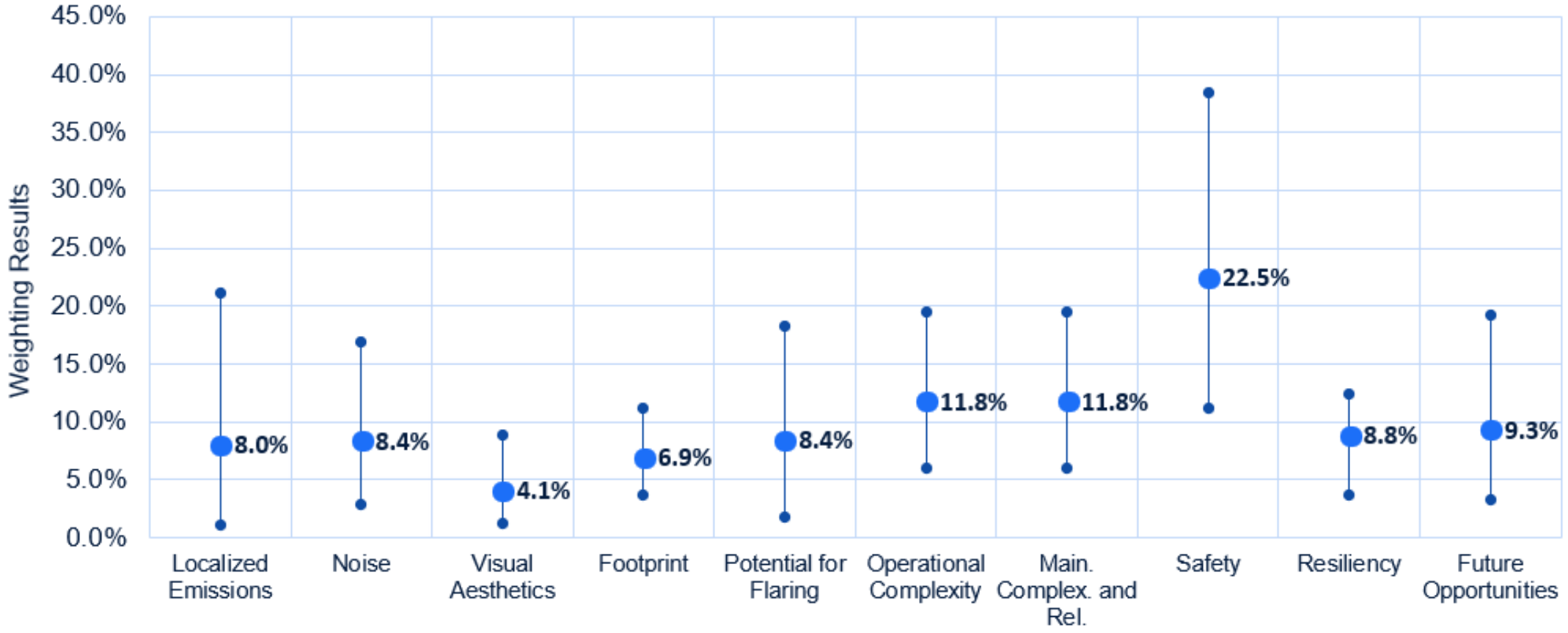
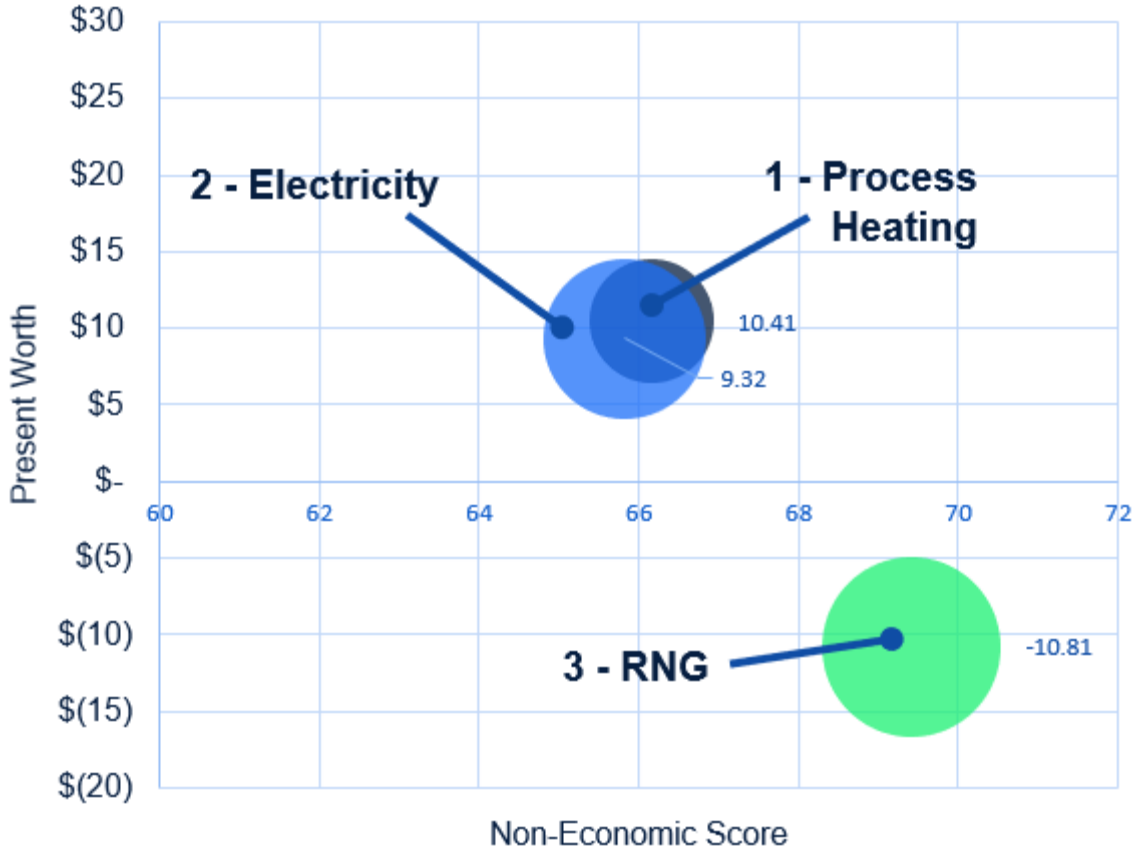
County Weighting of Non-Economic Criteria



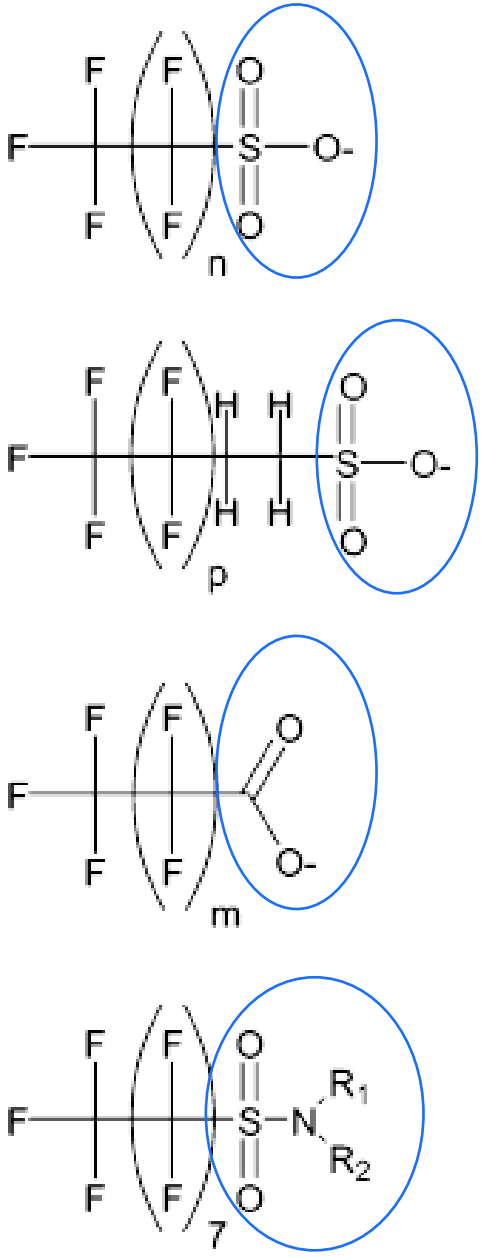
Scenarios and Probability Models

- Modeled for different electricity and value of environmental attributes (Renewable Identification Numbers)
- Performed statistical analysis for sensitivity analysis
  - Alternative 3 had lower financial and environmental cost for 97% of scenarios
  - In 80% of scenarios, there was a negative cost (revenue generation) to Arlington County



What are PFAS?

- Refers to a group of manufactured chemicals (per- and polyfluoroalkyl substances) used in several industries and found in a range of items (e.g., nonstick cookware, firefighting foam, paint, raincoats, food packaging, cleaning products, etc.)
- PFAS are persistent in the environment and can accumulate over time
- Public concern regarding PFAS presence in drinking water and wastewater

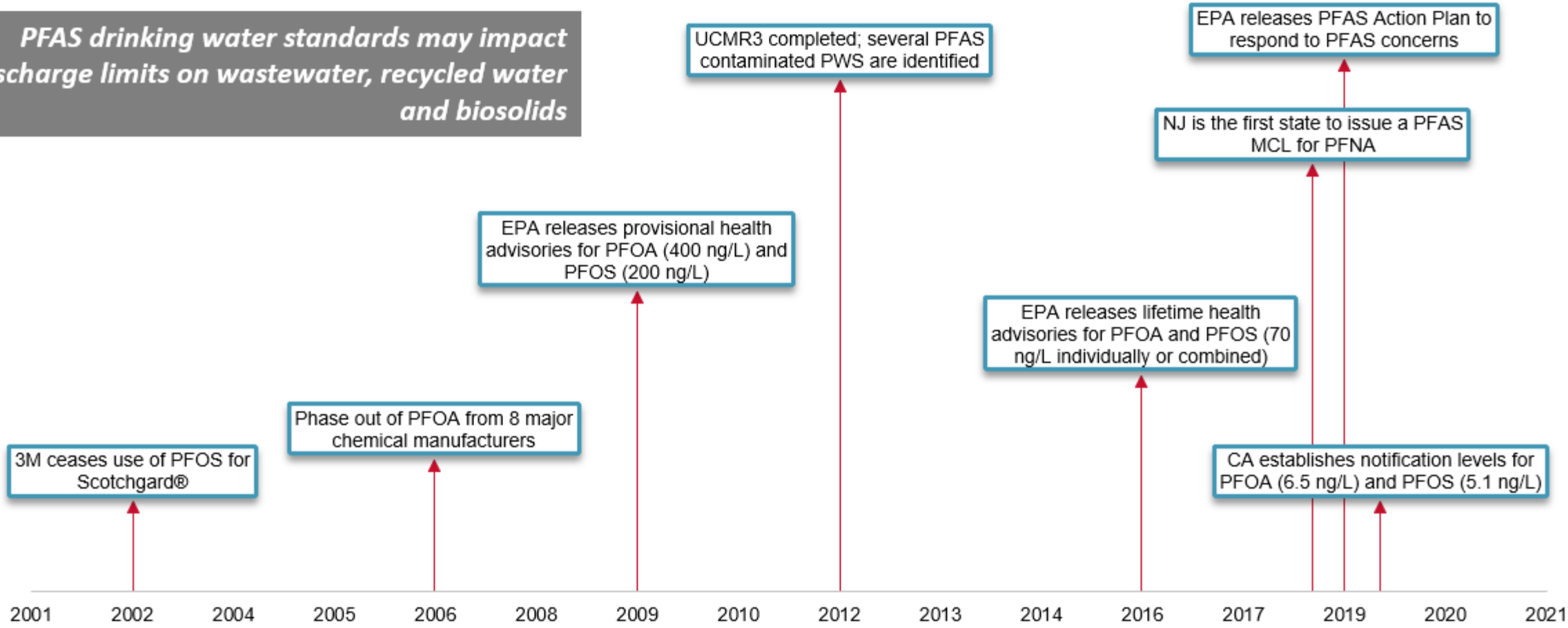


PFAS, PFOS, PFOA – What are all these terms?

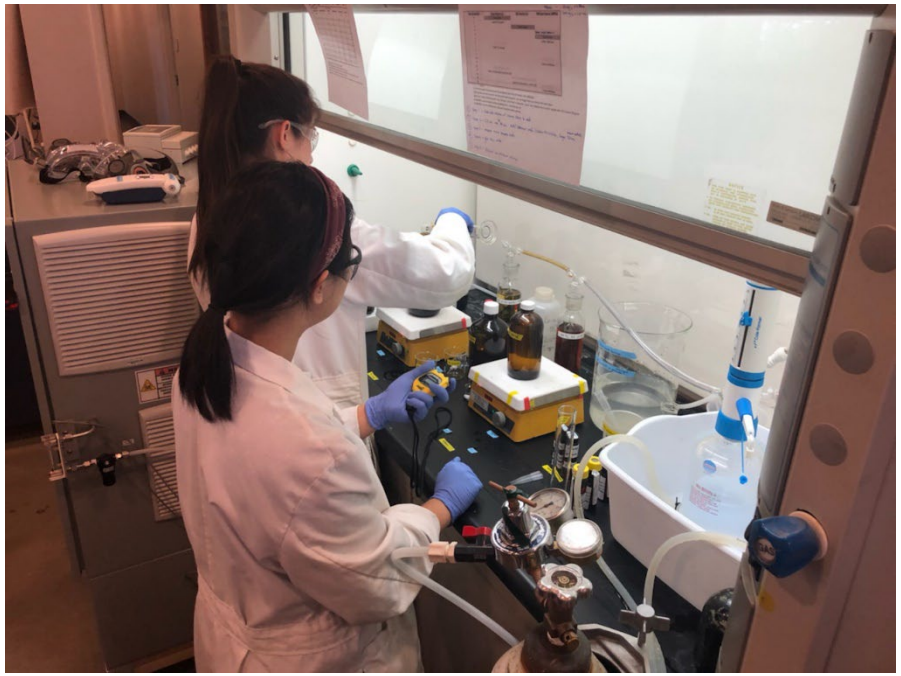
- PFCs → All of it
- PFAS → Group that holds PFOS and PFOA
- PFAAs = PFCAs + PFSAs
  - **Shorter chain PFASs bioaccumulate plants**
  - **Longer chain PFOSs bioaccumulate in humans**
  - Short Chain = more soluble
  - Long chain = immobile

PFAS Timeline

PFAS drinking water standards may impact discharge limits on wastewater, recycled water and biosolids



Industry-wide Research and Development



- High throughput toxicity screening
- Cancer risk quantification
- Analytical method development
- Destructive end treatment technologies
- Cost implications – who is responsible?
- Who will regulate and how will PFAS be regulated?
- Research!

Industry guidance is developing at a rapid pace to help drive policy decision for managing PFAS

PFOA/PFAS in Biosolids Vs. PFOA/PFAS in Other Media

Biosolids & Residuals	**PFOA (ppb)**	**PFOS (ppb)**	
Regulatory standards	**none**	**none**	
Sampling of U. S. biosolids, 2001 (Venkatasen and Halden, 2013)	**34**	**403**	
A northern New England biosolids compost, 2017	**8.3**		
NH land applied solids, 2017, n=20, non-detects included at detection limit	**2.3**	**5.3**	Mean (includes 17 wastewater biosolids, 2 paper mill residuals, & 1 water treatment residual)
Northeast paper mill residuals	**1.6**	**25**	
Other media			
Household organic waste compost	**6** (median) **3.4 – 35** (range)		all PFAS combined
Dust in U.S. daycare centers, median values (Strynar and Lindstrom, 2008)	**142**	**201**	
Human blood, U. S. population 1999 average (CDC NHANES)	**5**	**30**	
Human blood, U. S. population 2012 average (CDC NHANES)	**2**	**6**	

Keeping Things into Perspective

CECs/PFAS and Biosolids Resources and References

- June 2020 Rebuttal of the November 2018 EPA Office of Inspector General (OIG Report by the US Dept. of Agriculture Multistate Research Committee: Response to USEPA OIG Report No. 19-P-0002
- October 2020 Report on the Pima County, AZ PFAS Study, one of the largest studies completed to date: PFAS in Biosolids, A Southern Arizona Case Study
- Michigan Department of Environment, Great Lakes, and Energy (EGLE): Biosolids information and links
  - April 2021 Evaluation of PFAS in Influent, Effluent and Residuals of WWTPs in Michigan
  - April 2021 Statewide Wastewater Treatment Plant and Biosolids PFAS Study – Field Reports Summary