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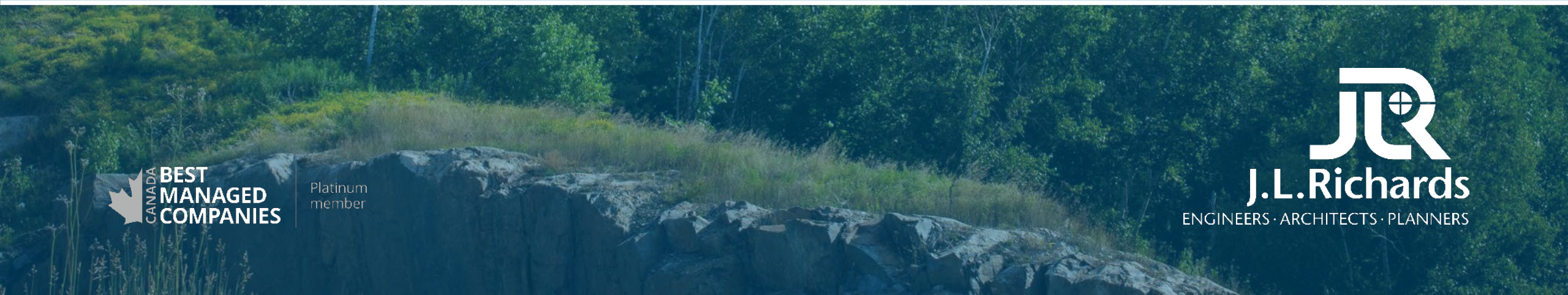
Your Vision on the Horizon



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Multidisciplinary **Services**

- Architecture
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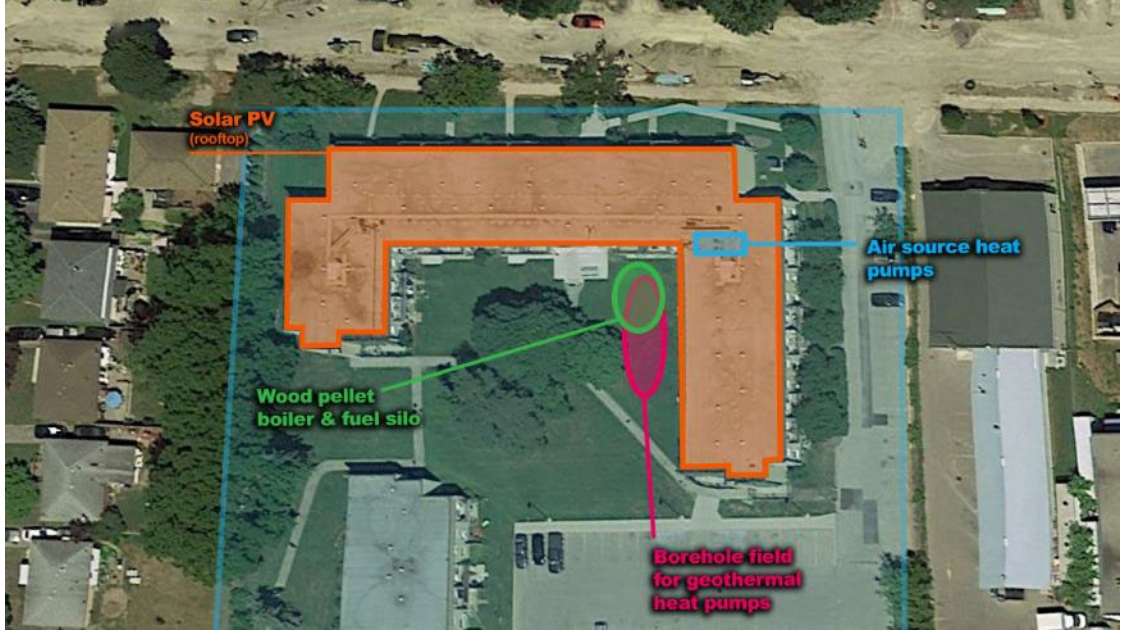
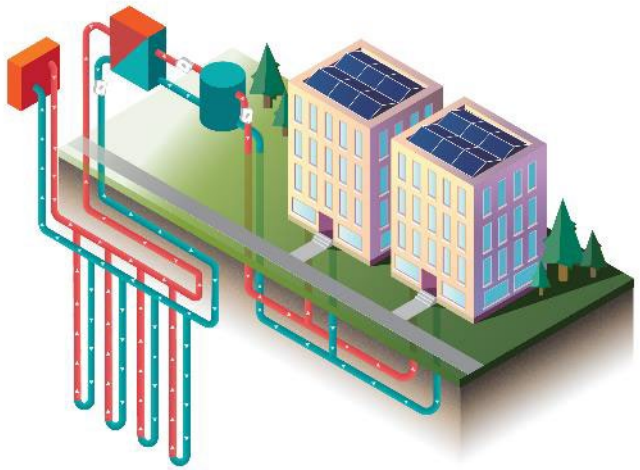
- Electrical
- Energy Systems
- Environmental
- Mechanical
- Planning
- Structural

Innovative Energy

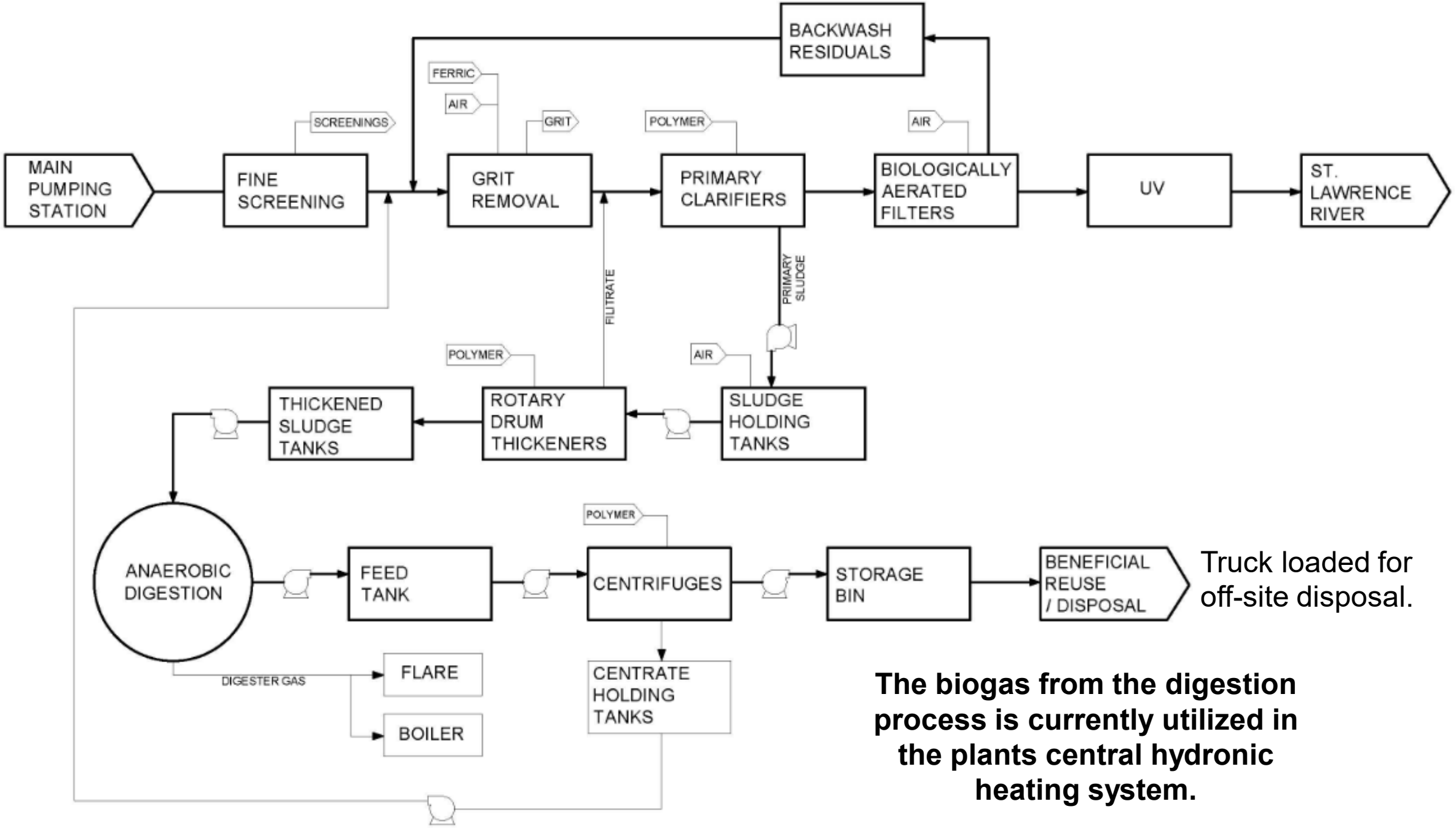




- Advisory Services - Energy Assets
- Energy & Carbon in Buildings
- Energy & Carbon in Environmental Infrastructure
- Energy & Carbon in Mining
- Energy & Carbon Strategy
- Renewable Energy Supply & Storage

Background
Cornwall WWTP

- The City of Cornwall is studying a co-digestion initiative to transition to a Waste Recovery Facility (WWRF).
- Intent is to see source separated organics being pre-treated and added to the existing digestion system **to increase biogas production**
- Collect digester gas and upgrade to Renewable Natural Gas to sell.
- Minimize on-site consumption of digester gas to maximize collection.
- Reduce GHG emissions



Truck loaded for off-site disposal.

The biogas from the digestion process is currently utilized in the plants central hydronic heating system.

Purpose
Feasibility Study

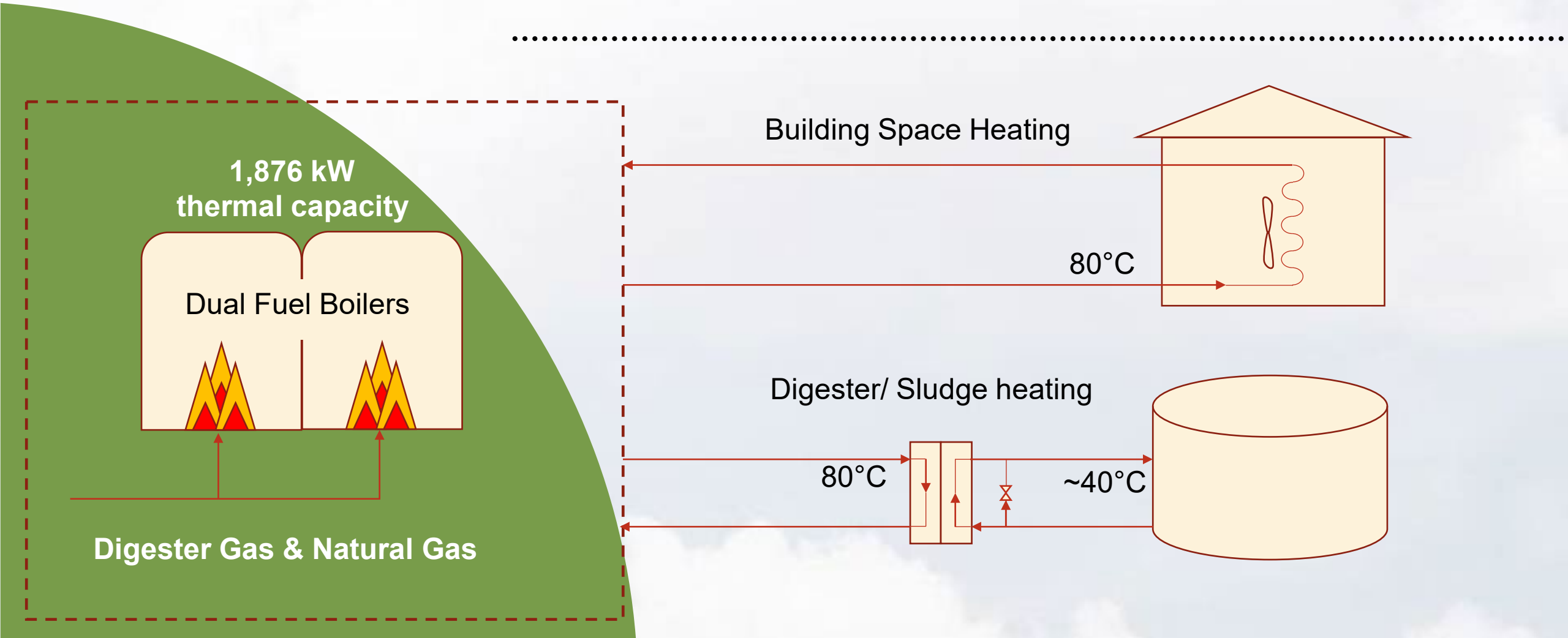
Can we *eliminate* on-site consumption of fuel (biogas & NG) using Wastewater heat recovery?

Procedure

- Review of Existing Systems
- Thermal Resource Assessment
- Technology Review
- Concept Design
- Financial Analysis
- Recommendations & Next Steps

Existing Systems Review

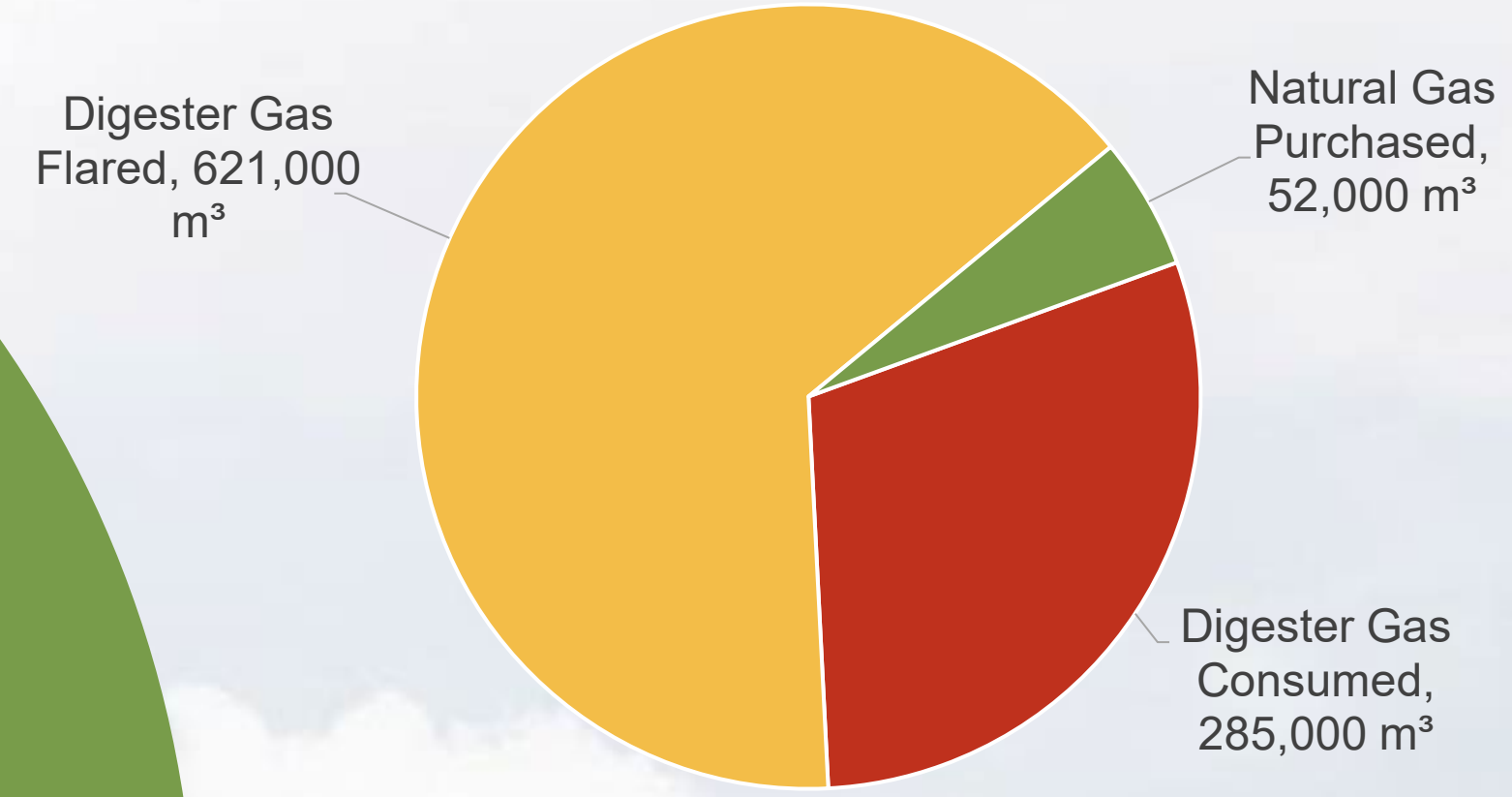
Cornwall WWTP
Existing Heating System



Cornwall WWTP

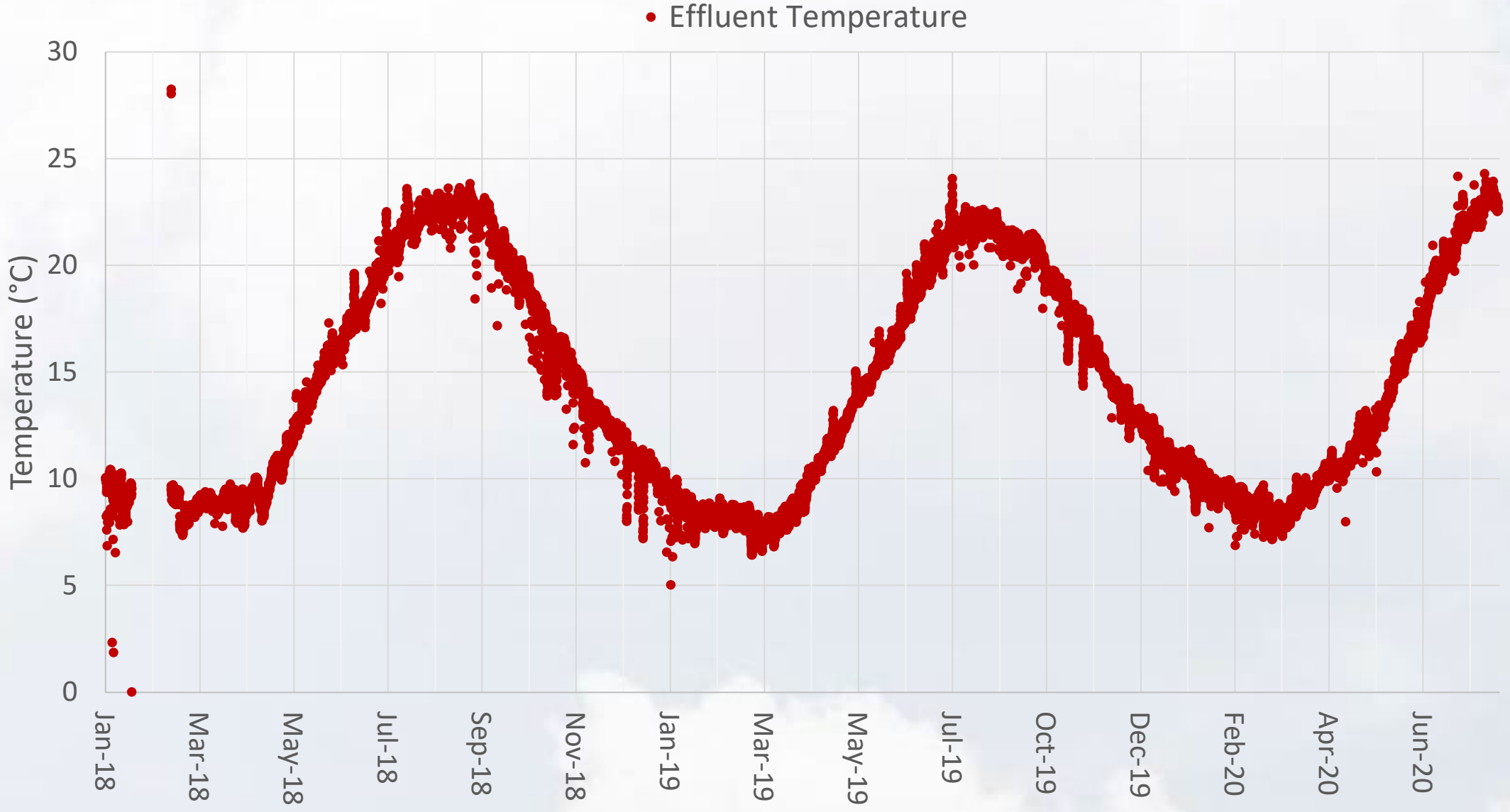
Gas production/ consumption

Annual heat demand
>3,000 MWh



Effluent Thermal Resource

Effluent Temperature



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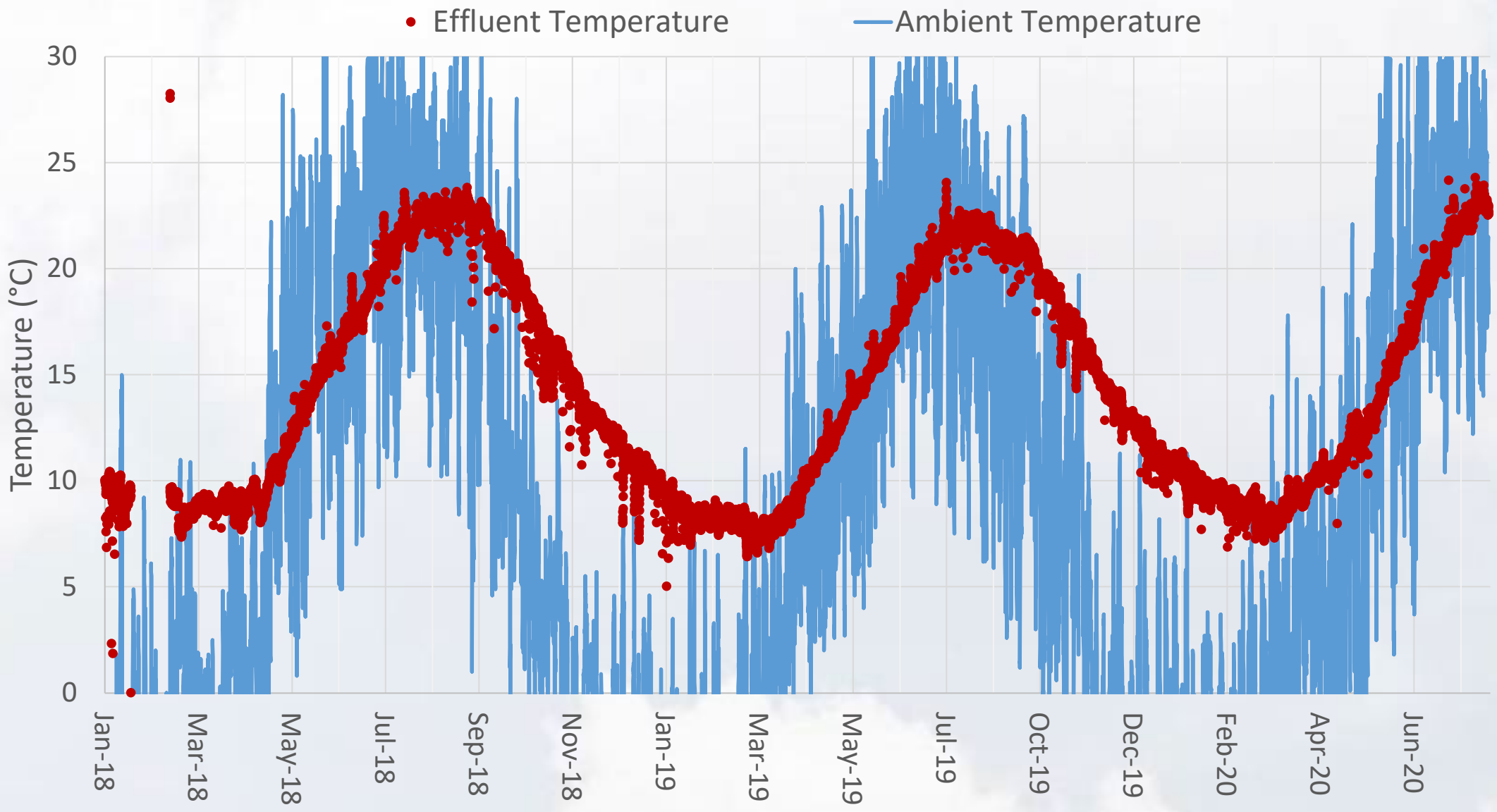
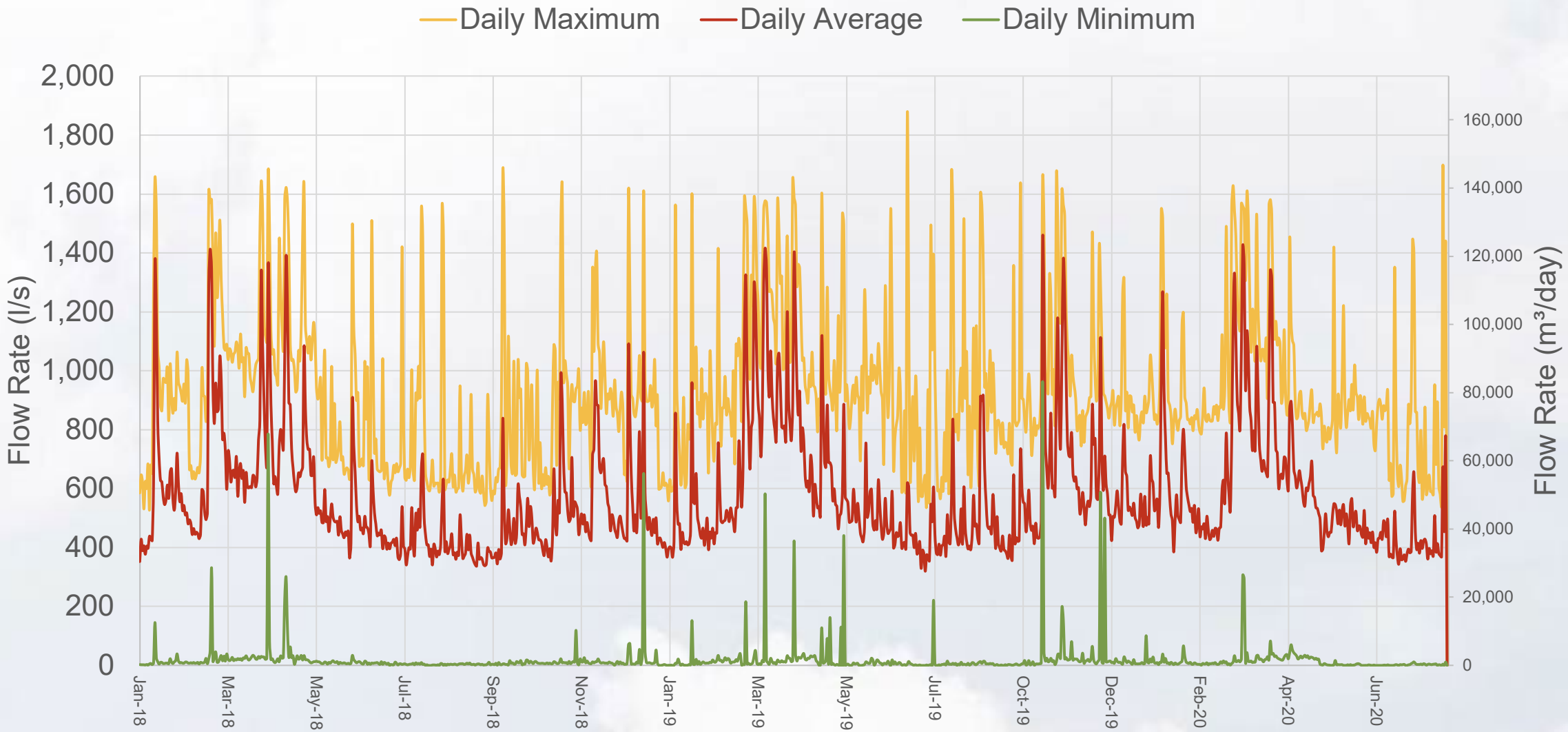
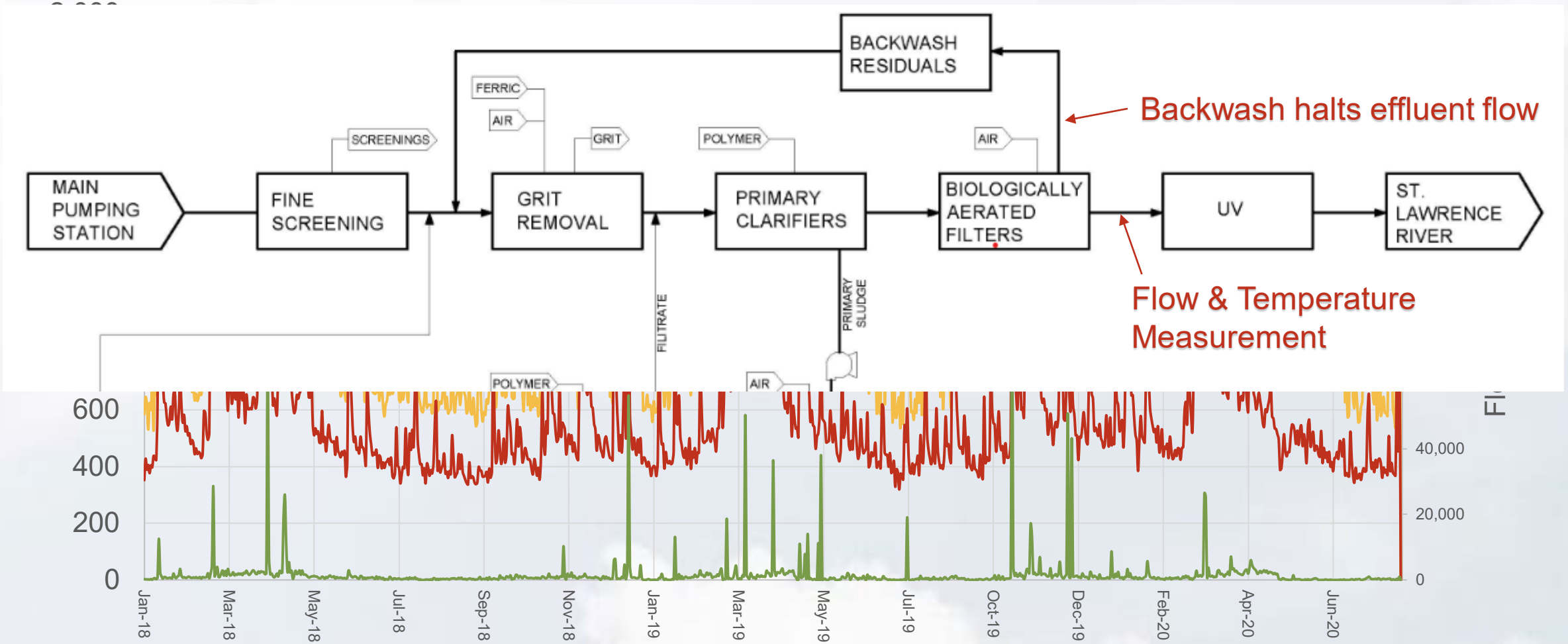


Effluent Flow



Effluent Temperature



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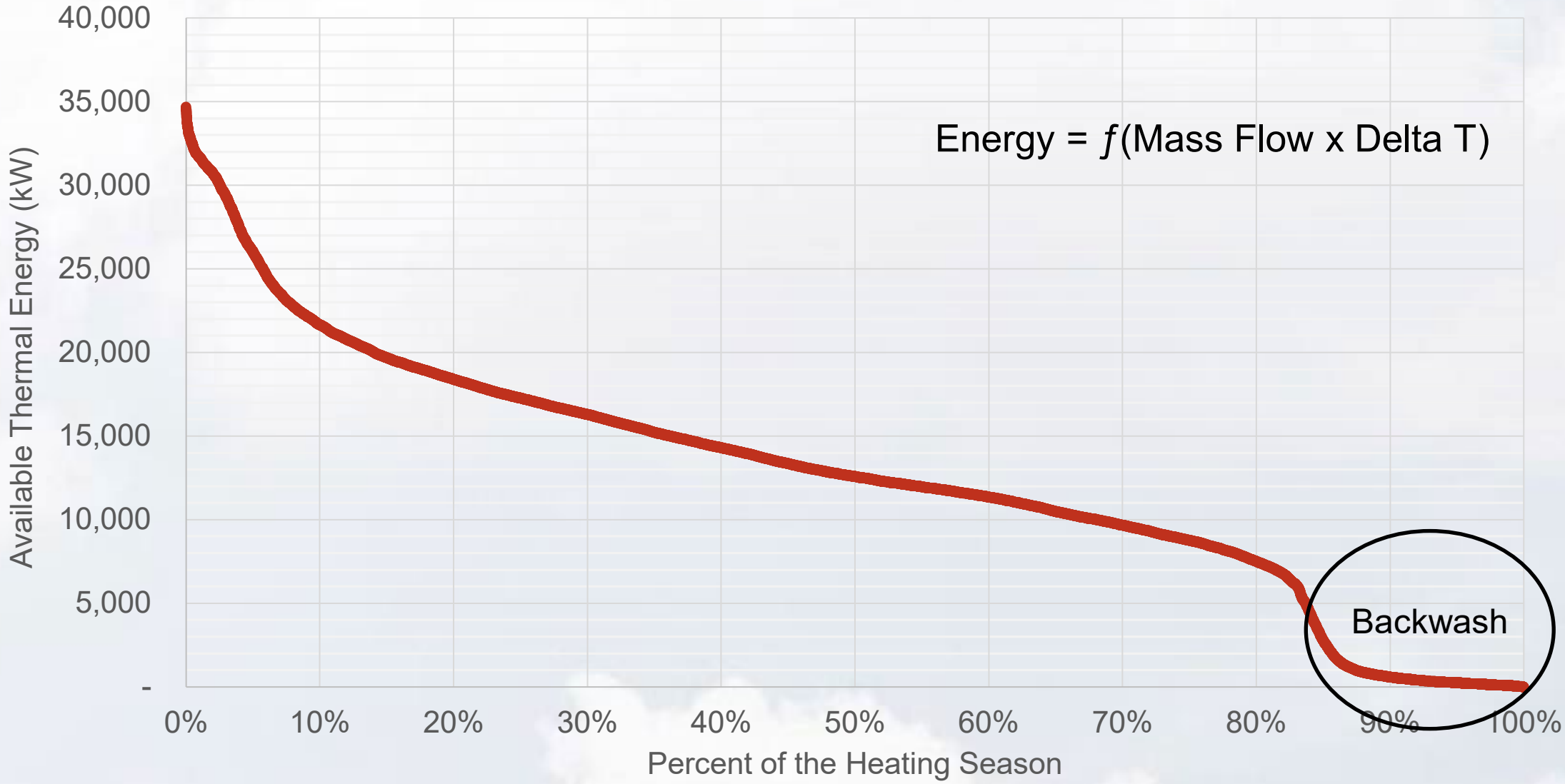
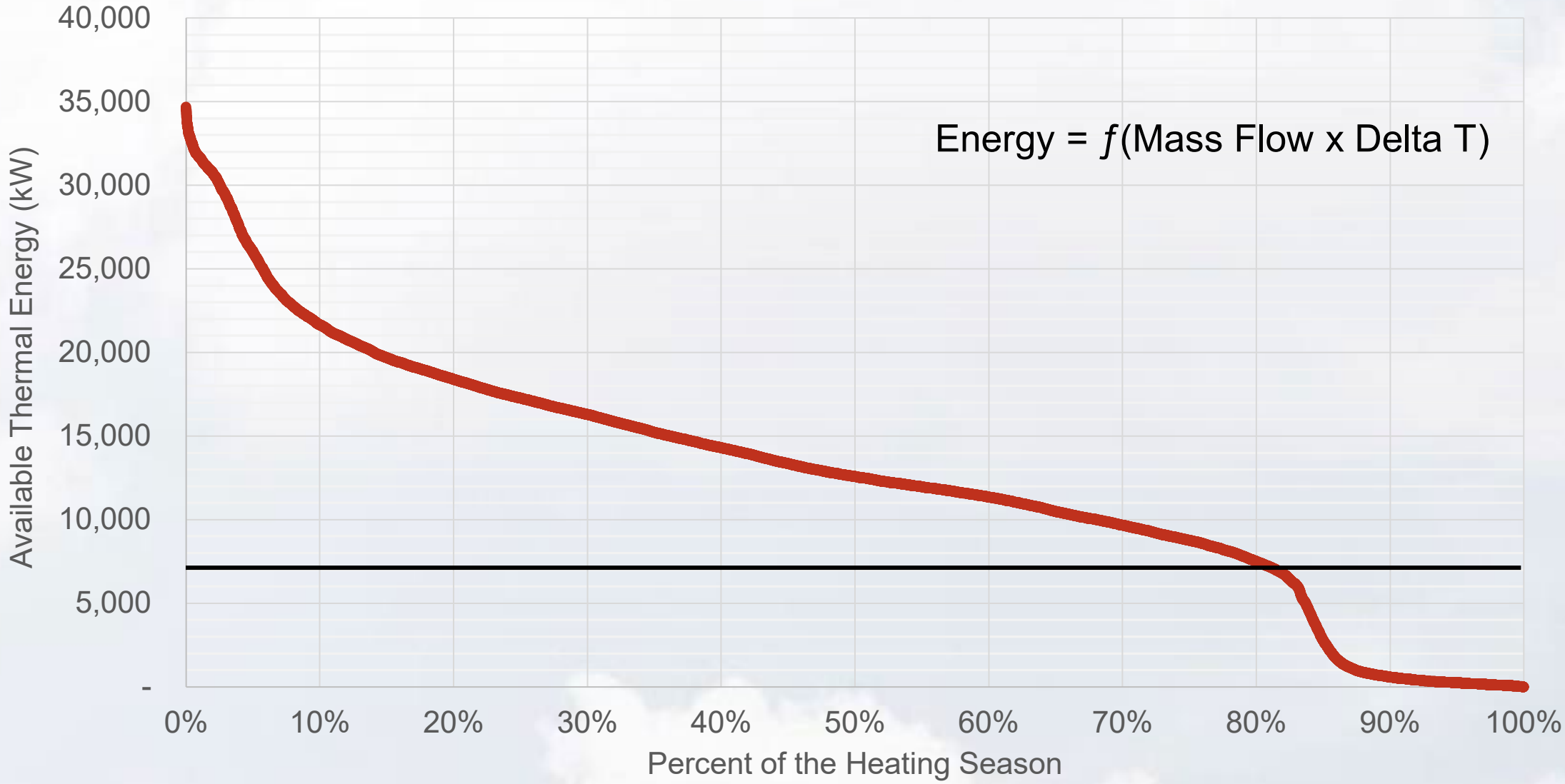
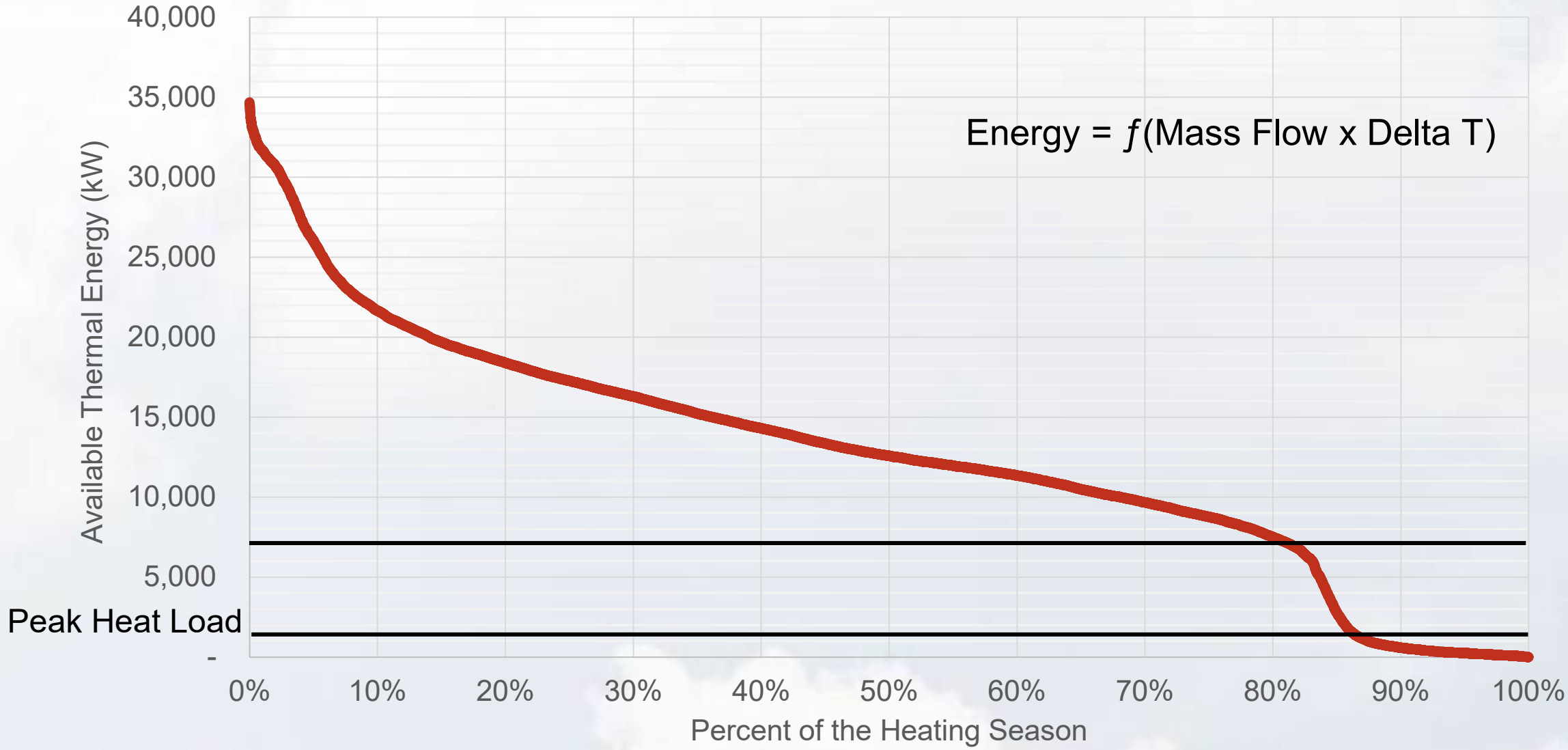


Effluent Thermal Resource

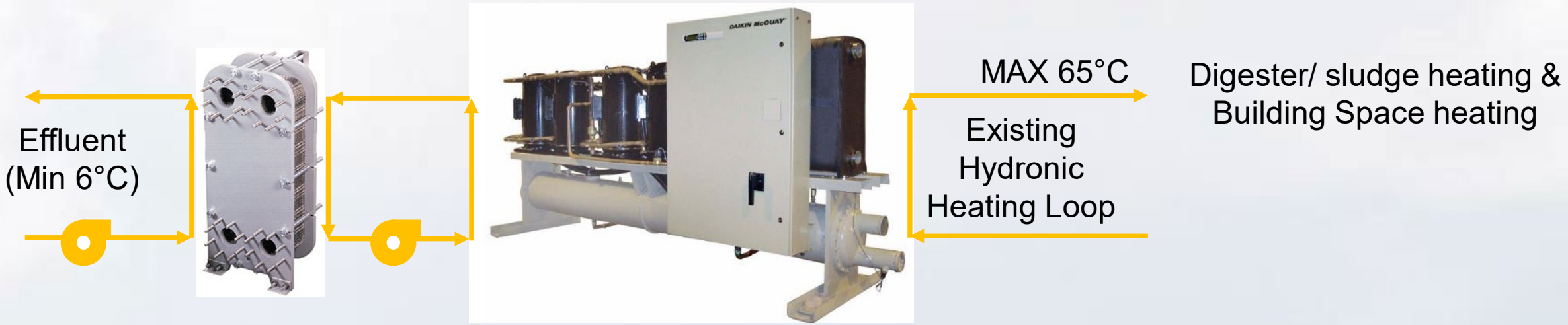


Effluent Thermal Resource

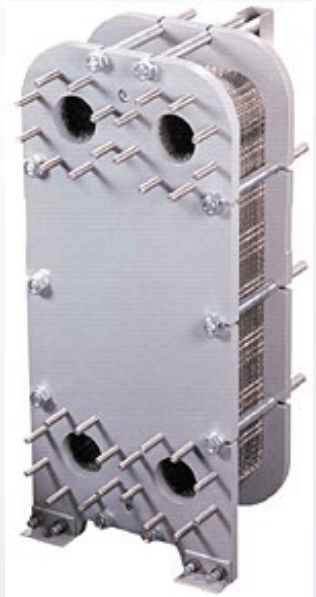


Technology Review & Concept Design

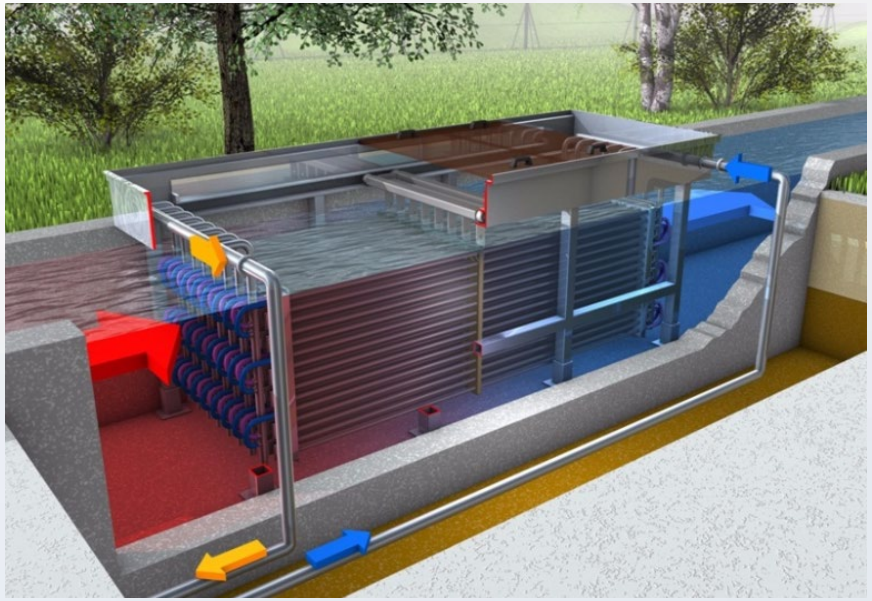
Basic Concept Design
Heat Pump



Heat Exchanger
Sample Products



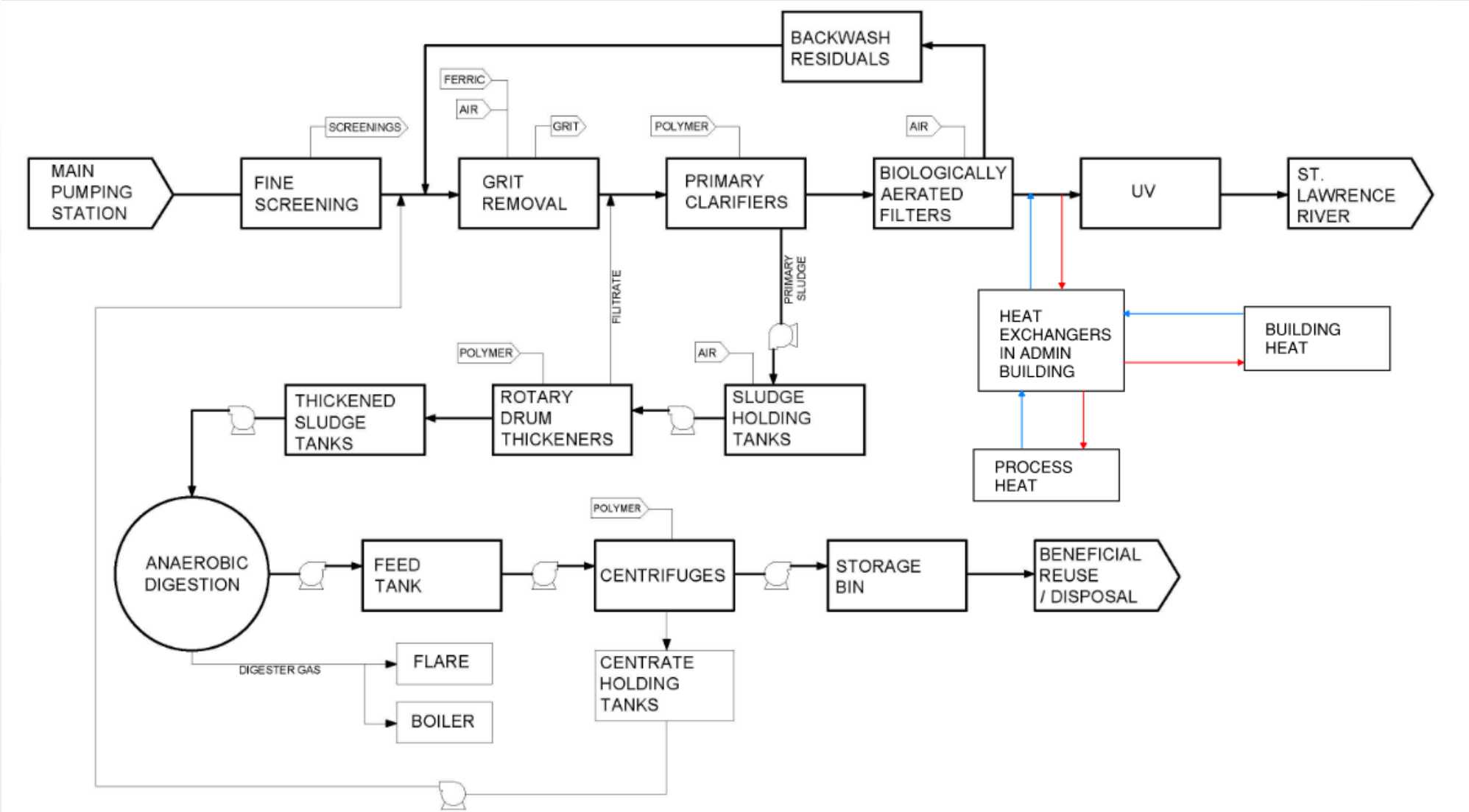
Conventional Flat Plate



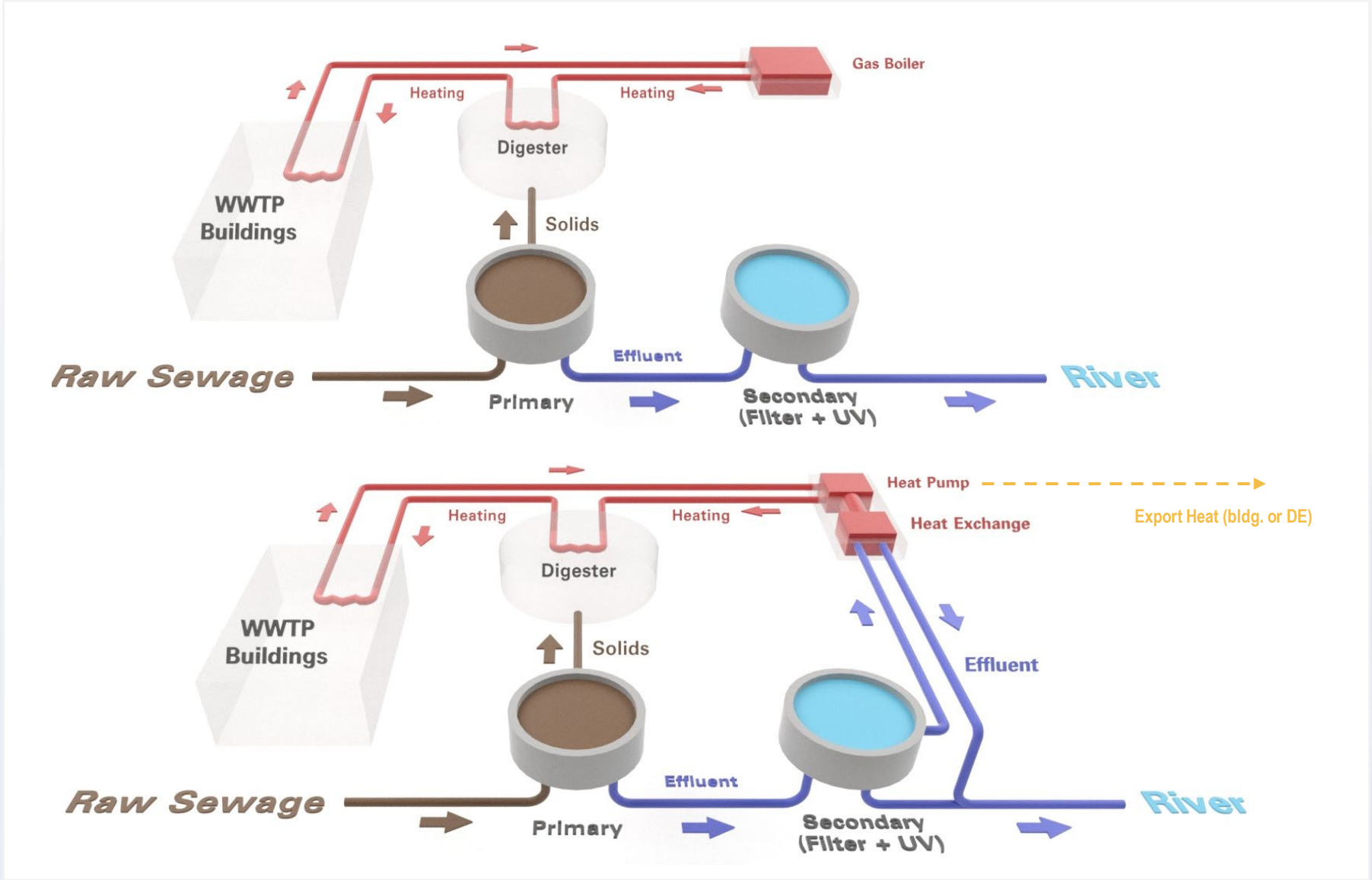
HUBER RoWin Heat Exchanger
Self cleaning & Designed for wastewater and sludge.

Lakos Self Cleaning Pump Intake Screen

Effluent Intake/ HX location



Concept Design



Financial Analysis & GHG Savings

Heat Recovery Opinion of Probable Cost

Description	Cost	Comments
Equipment (installed)	$1,250,000	Includes heat exchanger, heat pumps, BAF effluent pumps, glycol pumps, glycol make up system and expansion tank, replacement of existing unit heaters (where required), and primary feed pumps.
Piping	$350,000	Piping to/from the BAF feeding the heat exchanger in the Work Shop, piping within the work shop connecting the heat pumps and the heat exchanger, tie to the existing piping network, New secondary piping connecting the BAF hydronic loop to the upgraded pipe distribution network.
Demolition	$30,000	Removal of unit heaters. Removal of piping around the existing boilers made obsolete with proposed design.
Electrical & I/C	$ 350,000	Power and controls to install the heat pumps and associated accessories.
Commissioning	$20,000	Commissioning of the entire heating system.
Total OPC	**$2,000,000**	

Heat Recovery GHG and Cost Savings

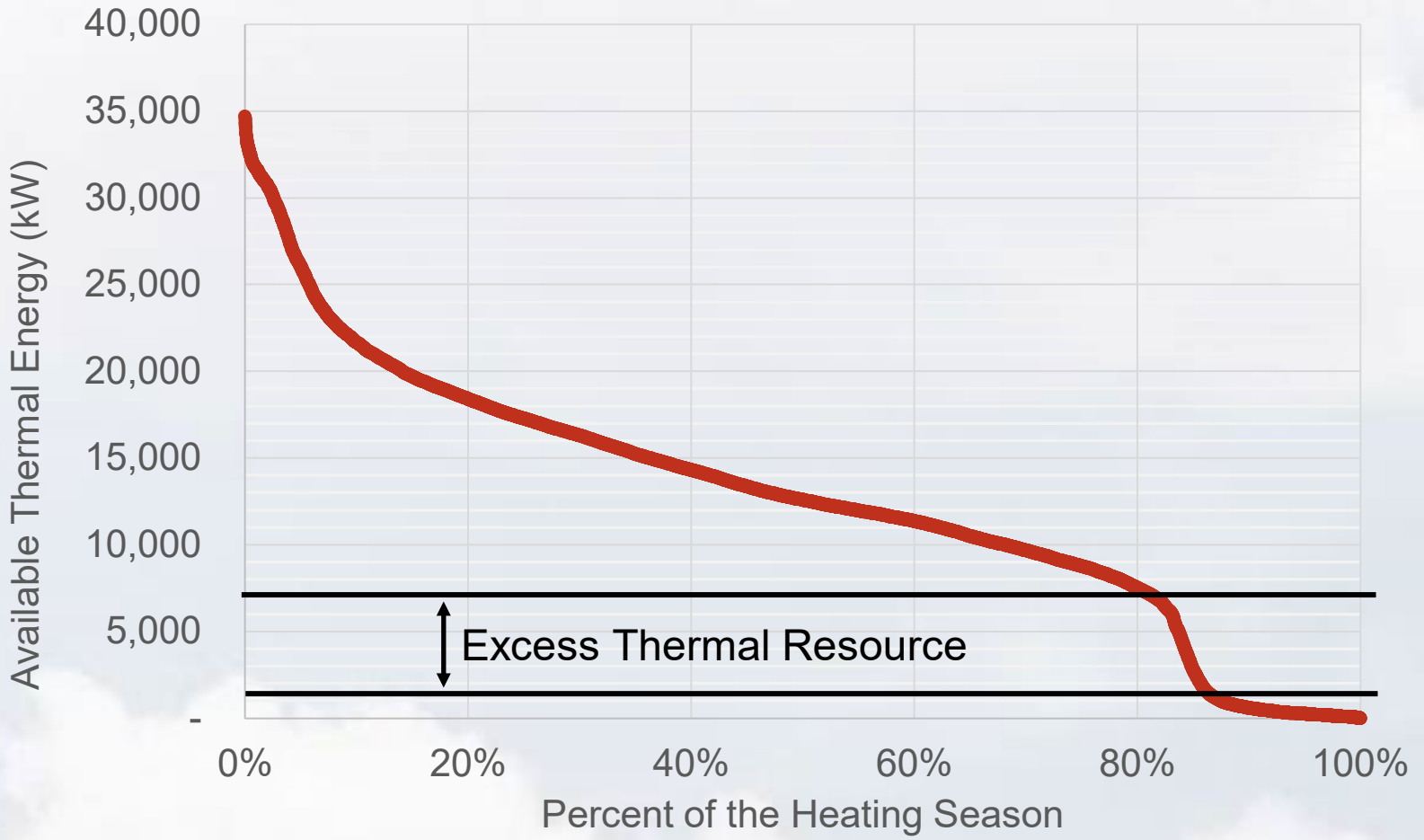
Reference Scenario:	NG (Current Rate)	NG (170$/t Carbon Tax)	RNG Conservative Case	RNG Optimistic Case
System Electricity Consumption	830 MWh			
Avoided NG/ RNG Consumption (*)	(3,105 MWh)			
GHG Reduction	550 tCO_{2e}			
GHG percent Reduction	**99.8%**			
NG/ RNG Rate	0.03 $/kWh	0.06 $/kWh	0.072 $/kWh	0.09 $/kWh
System Electricity Costs (Annual)	$83,000	$83,000	$83,000	$83,000
Avoided NG/ RNG Annual Costs (Annual)	($93,000)	($174,000)	($206,000)	($254,000)
Annual Cost Savings	$10,000	$91,000	$140,000	$197,000
OPC	$2,000,000	$2,000,000	$2,000,000	$2,000,000
Simple Payback (Years)	**NA**	**22**	**16**	**12**

Next Steps

Recommendations

Design & Cost Optimization

- Smaller heat pump/ heat exchanger?
  - Meet a base load, supplement with “peaking” boiler, or
  - Digester heating only
- High temperature or cascading heat pumps?
- Sell heating (and cooling) to neighbors?



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Thank You!

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