



eVOQUA

WATER TECHNOLOGIES

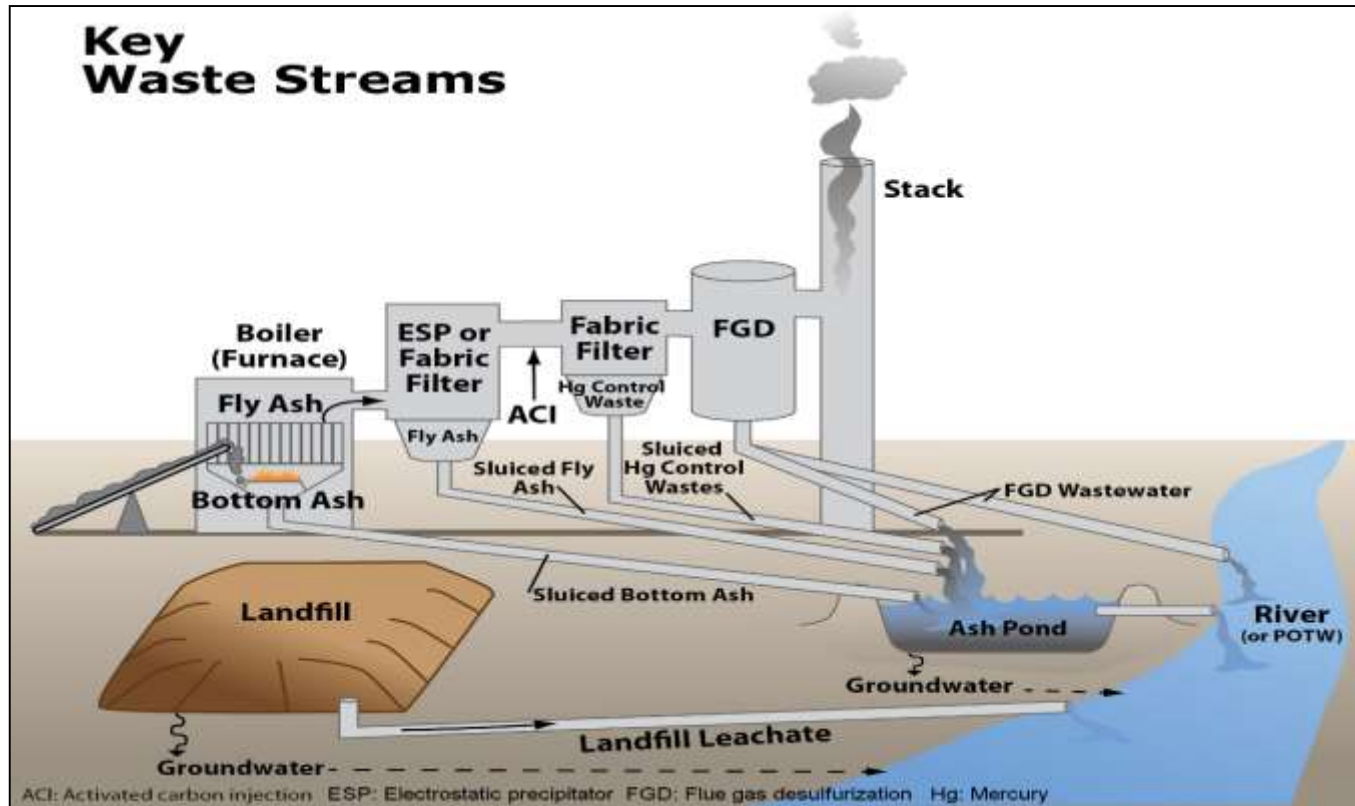
**Comparison of High and Low Residence Time
Biological Treatments for ELG Selenium
Compliance**

WPCA

Pittsburgh – Feb 19, 2020

TRANSFORMING WATER. ENRICHING LIFE.

Coal Power Plant Wastewater



LRTR vs HRTR

LRTR System. A biological treatment system that targets removal of selenium and nitrate/nitrite using fixed-film bioreactors in smaller, more compact reaction vessels than those used in the biological treatment system evaluated in the 2015 rule (referred to in this proposal as HRTR—high residence time biological reduction). The LRTR system is designed to operate with a shorter residence time (on the order of 1 to 4 hours, as compared to a residence time of 10-16 hours for HRTR), while still achieving significant removal of selenium and nitrate/nitrite.

Typical 300 GPM FGD Purge Stream

- 4 Hour HRT – 1.9M Gallons
- 12 Hour HRT – 5.7M Gallons
- Smaller Foot Print
- Reduced Installation Cost
- Simpler Operation

Traditional HRTS Biological System

- HRT of 12-16 hours
- Two Stage Down Flow Bio Reactors
- Common Wall Lined Concrete
- Installation Cost Factor



HRTS– Modular System

- HRT of 12-16 hours



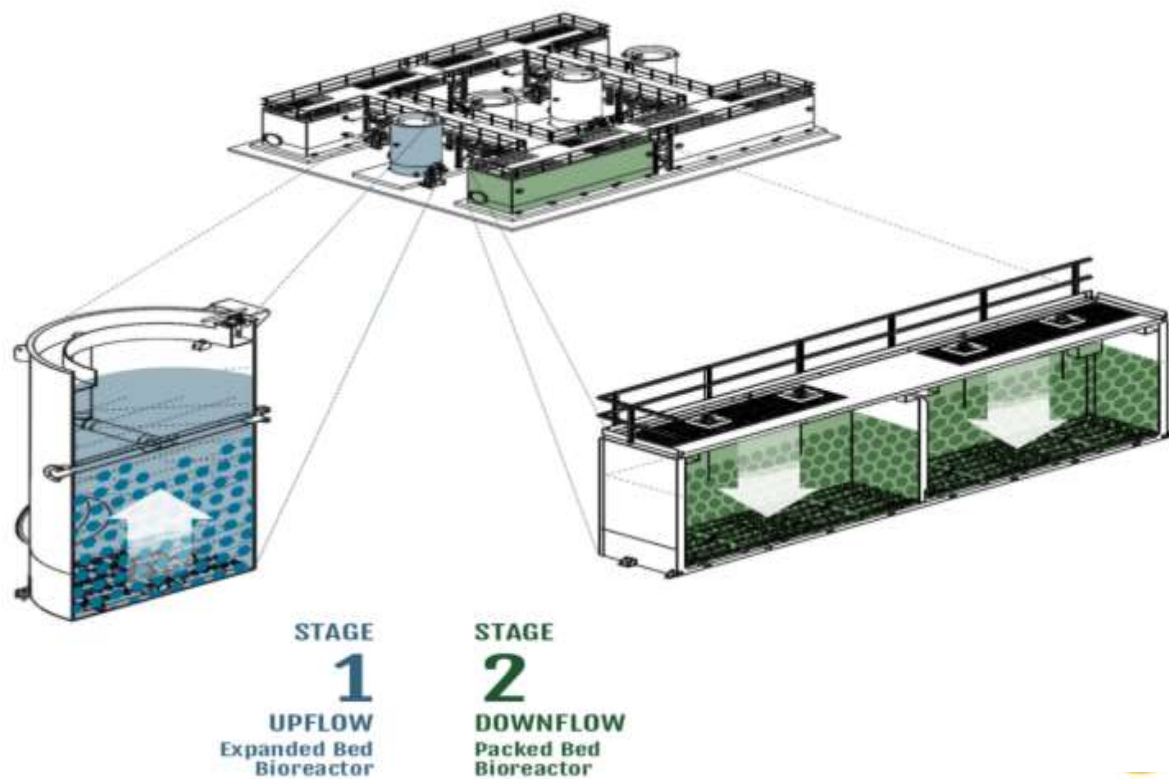
LRTS BIOREACTOR PROCESS



How the Process Works



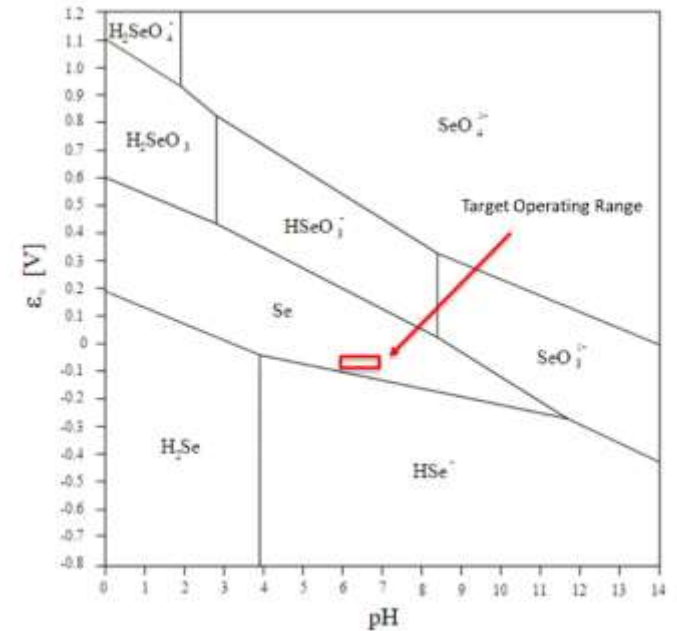
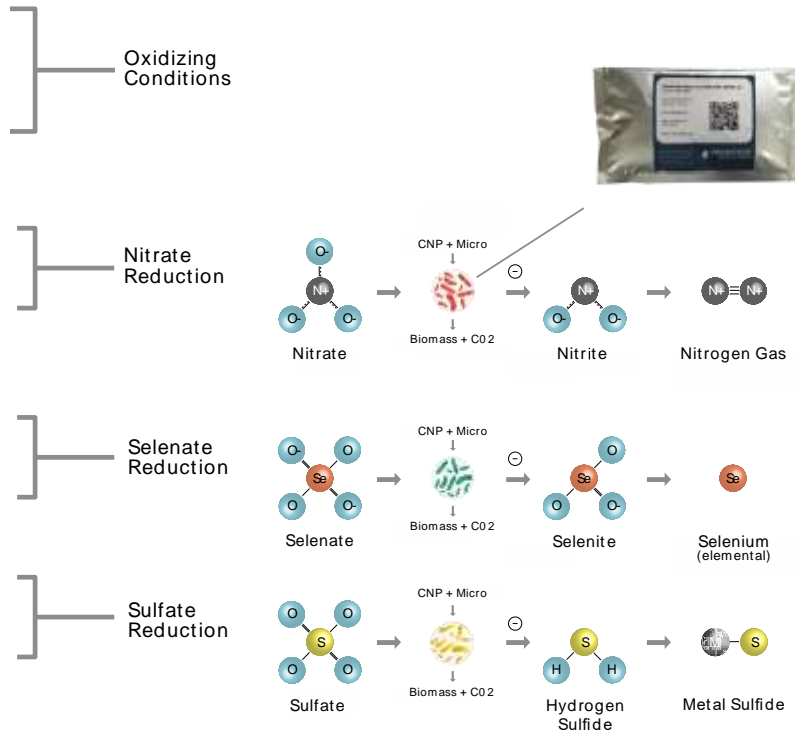
LRTS BIOREACTOR PROCESS



LRTS BIOREACTOR PROCESS

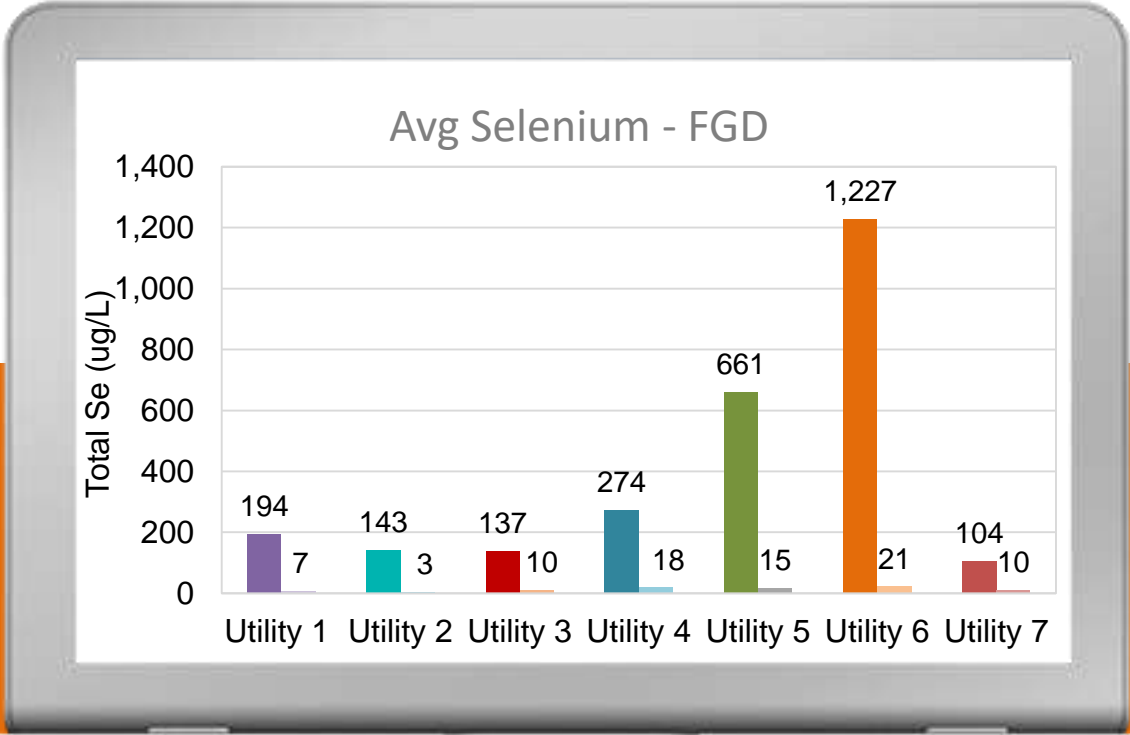


Oxidation Reduction Potential (ORP)



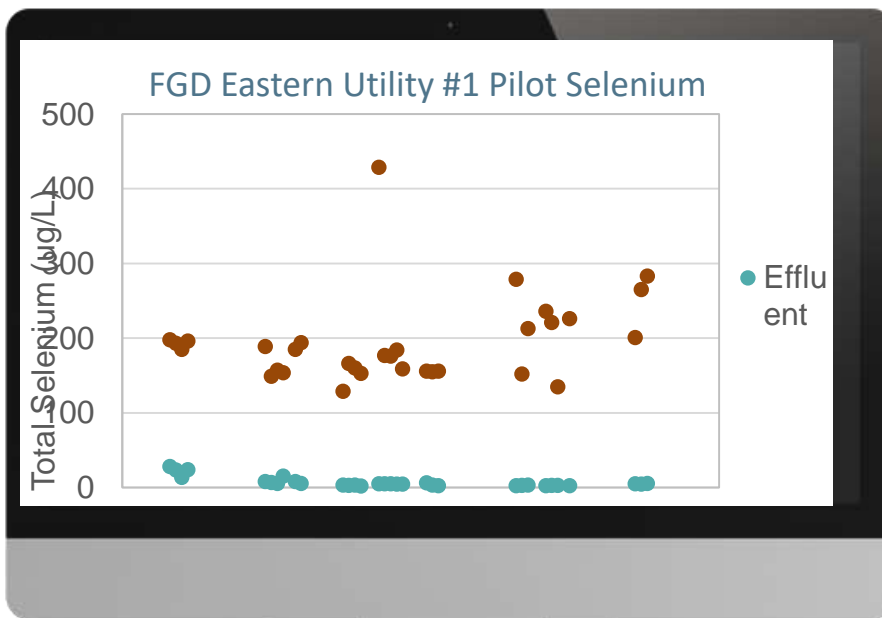
... Manipulation of the ORP curve for maximum removal of constituents

LTRS FGD SELENIUM PERFORMANCE

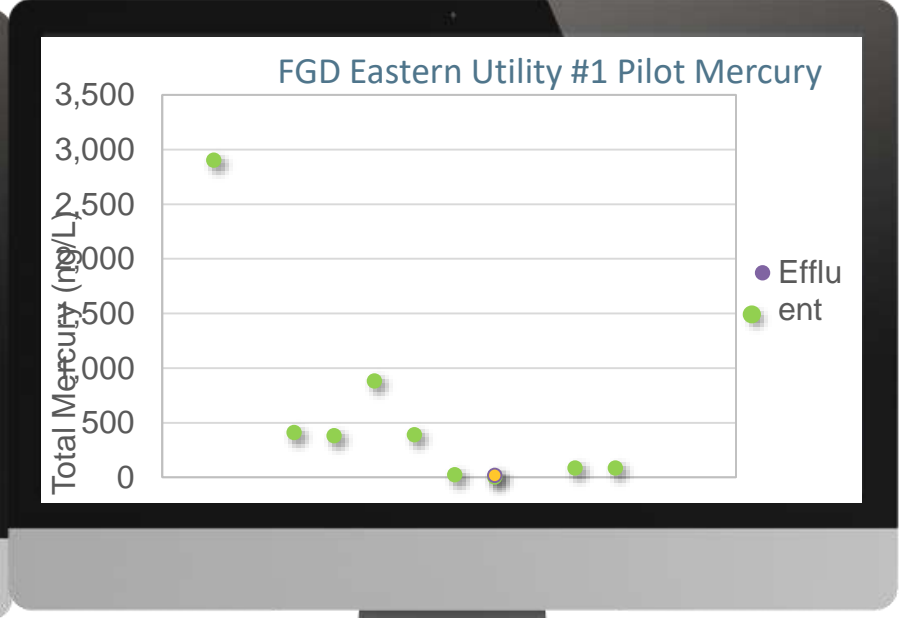


Consistent removal of Se

LRTS FGD SELENIUM & MERCURY PERFORMANCE



Point	Selenium (ug/L)
Avg Influent	194
Avg Effluent	6.96



Point	Mercury (ng/L)
Avg Influent	574
Avg Effluent	3.37

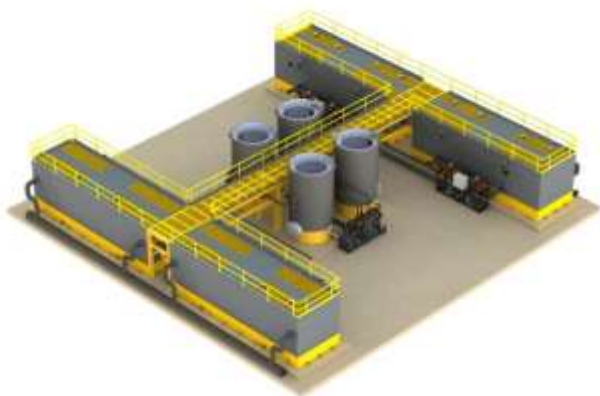
SOLUTIONS FOR THE POWER INDUSTRY



Reliable Compliance: Integrated solutions to meet stringent selenium, nitrate, arsenic, and mercury levels; identified by US EPA as best available technology (BAT).

Ease of Design & Construction: Compressed project schedule through simplified design, construction, and commissioning. Pre-built process skids reduce construction/project costs.

Flexibility: Multiple trains provides for both redundancy and turndown capability to meet the dynamic needs of power producers.



LRTS FGD EXPERIENCE

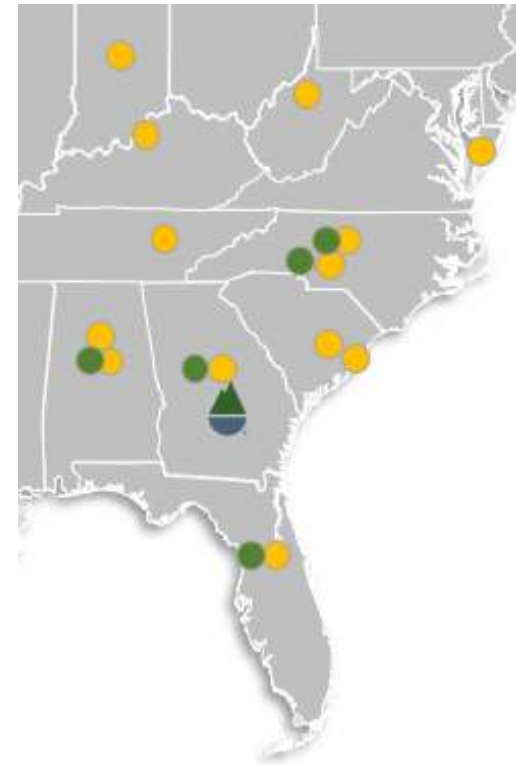


Full Scale Projects:

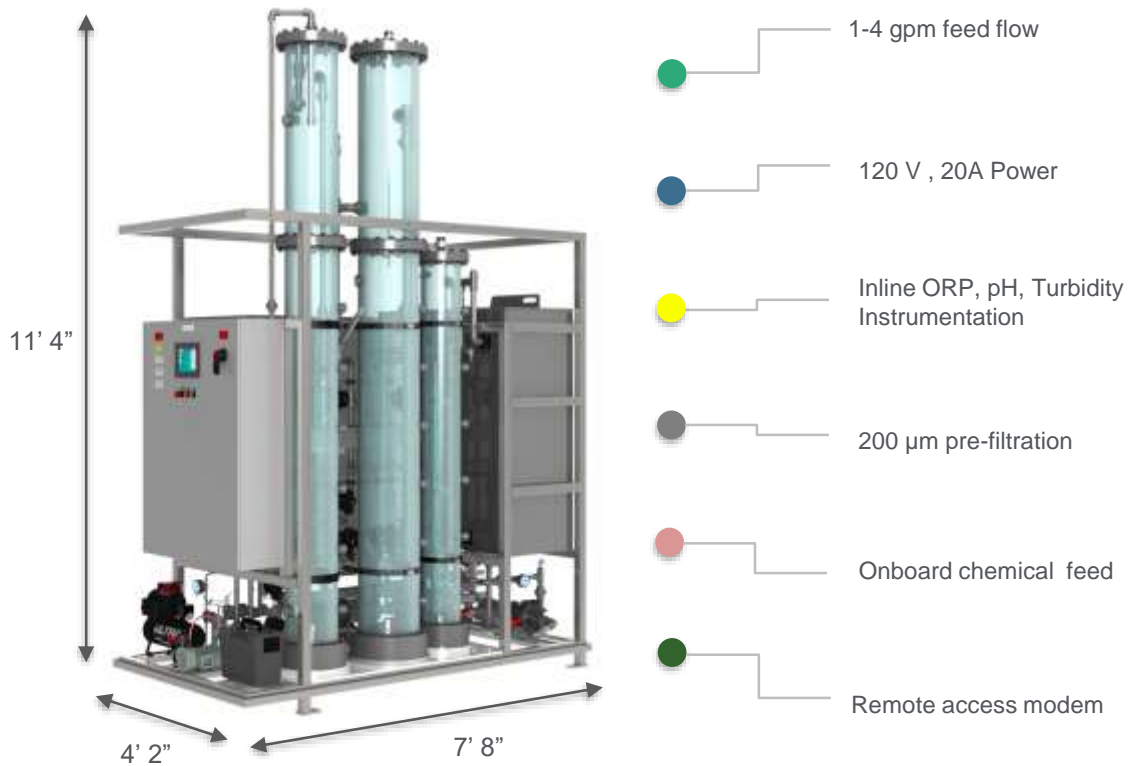
- Confidential Client – Florida – 300 gpm FGD WWT plant
- Confidential Client – North Carolina – 550 gpm FGD WWT plant
- Confidential Client – Georgia – 50 gpm FGD demonstration unit
- Confidential Client – Alabama – 2x300 gpm (600 gpm) FGD WWT plant
- Confidential Client – North Carolina – 200 gpm FGD WWT plant Startup 2020

Pilot Projects:

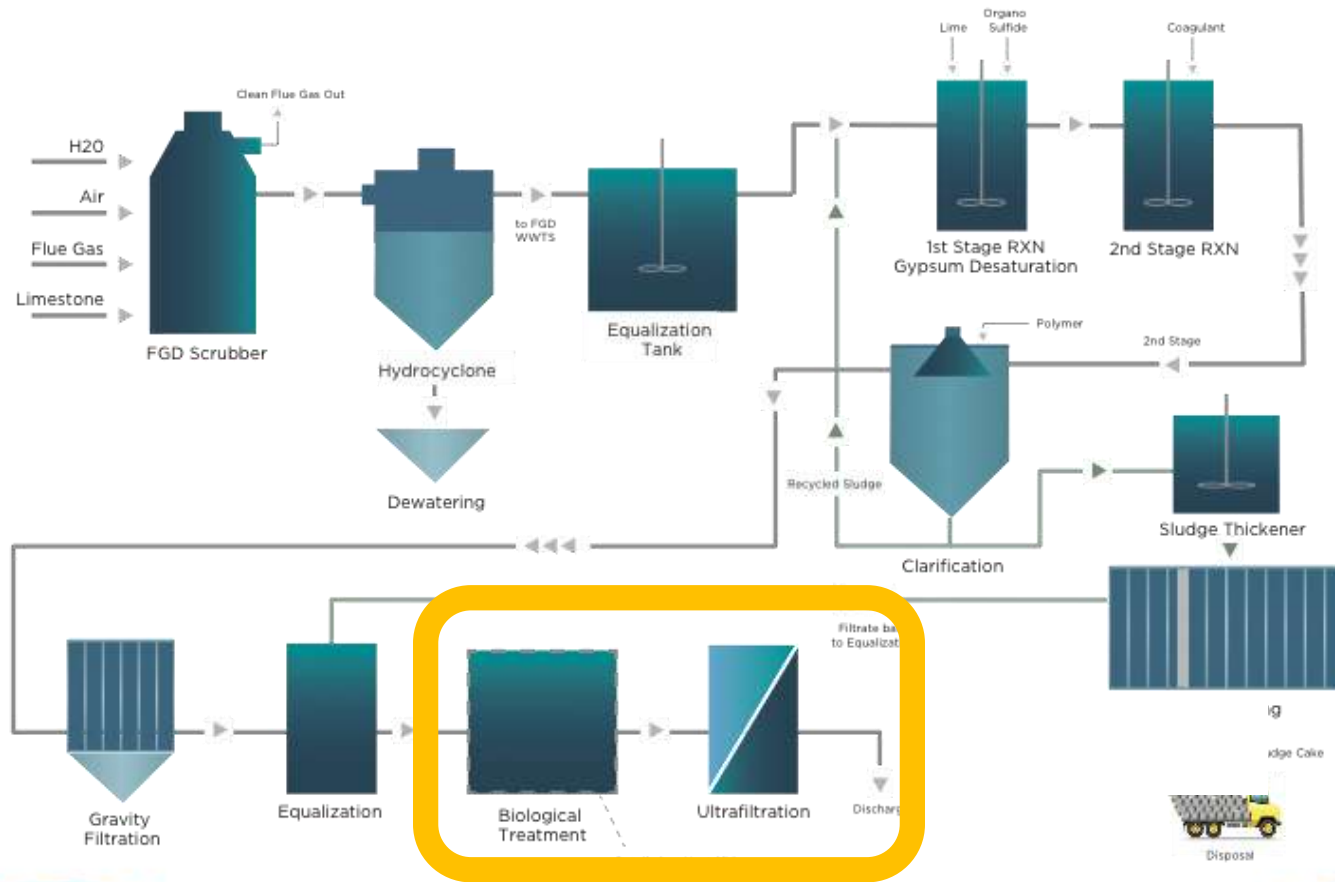
- Confidential Client – North Carolina – Oct. 2013 to Mar. 2014
- Confidential Client – Florida – Jun. 2014 to Jan. 2015
- Confidential Client – North Carolina – Jun. 2015 to Oct. 2015
- Confidential Client – Georgia – Jul. 2014 to Sep. 2015
- Confidential Client – West Virginia – Dec. 2015 to May 2016
- Confidential Client – Tennessee – Jun. 2016 to Oct. 2016
- Confidential Client – South Carolina – Aug. 2016 to Feb. 2017
- Confidential Client – Indiana – Dec. 2016 to Apr. 2017
- Confidential Client – South Carolina – Feb. 2017 to Apr. 2017
- Confidential Client – Kentucky – Apr. 2017 to Jan. 2018
- Confidential Client – Alabama – Jul. 2017 to Jan. 2018
- Confidential Client – Virginia – Nov. 2017 to Mar. 2018
- Confidential Client – Alabama- Active (as of Nov. 2018)



LRTS PILOT PROGRAM



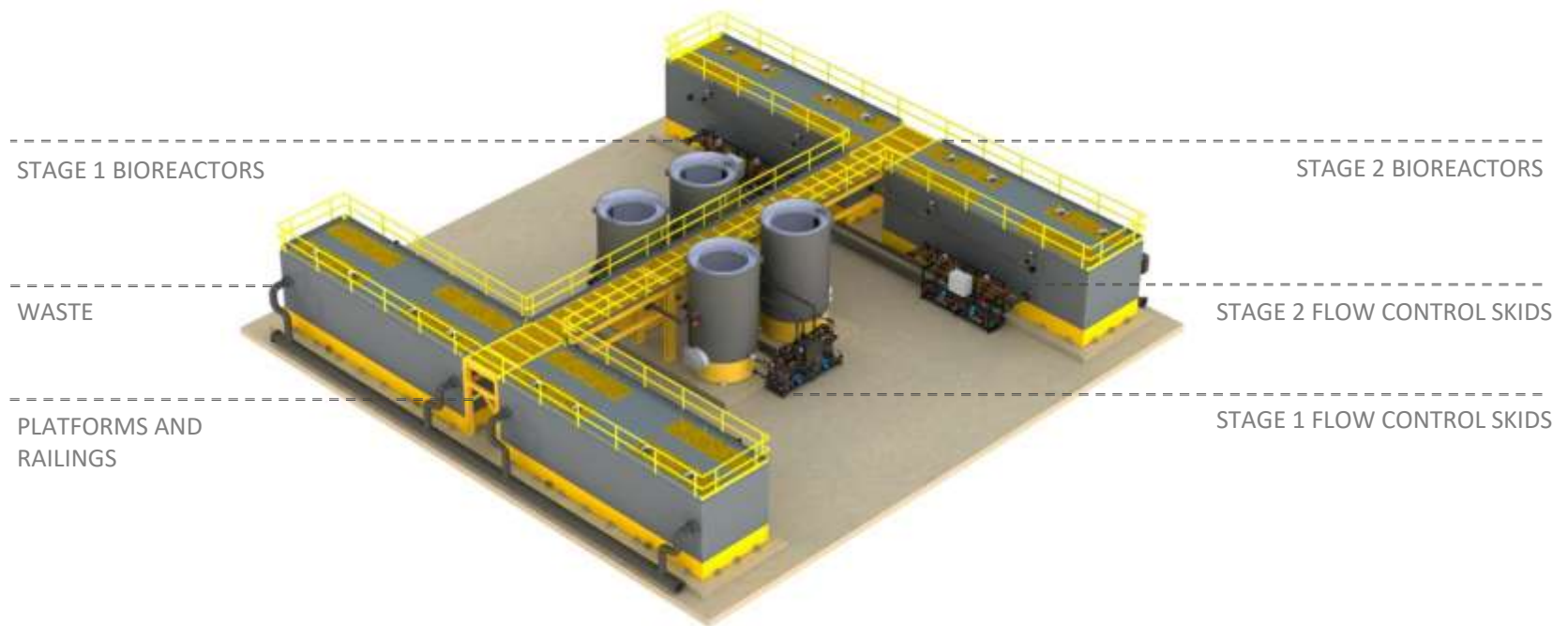
ADVANCED TREATMENT FGD WASTEWATER PROCESS FLOW



FGD ULTRAFILTRATION POST BIOREACTORS

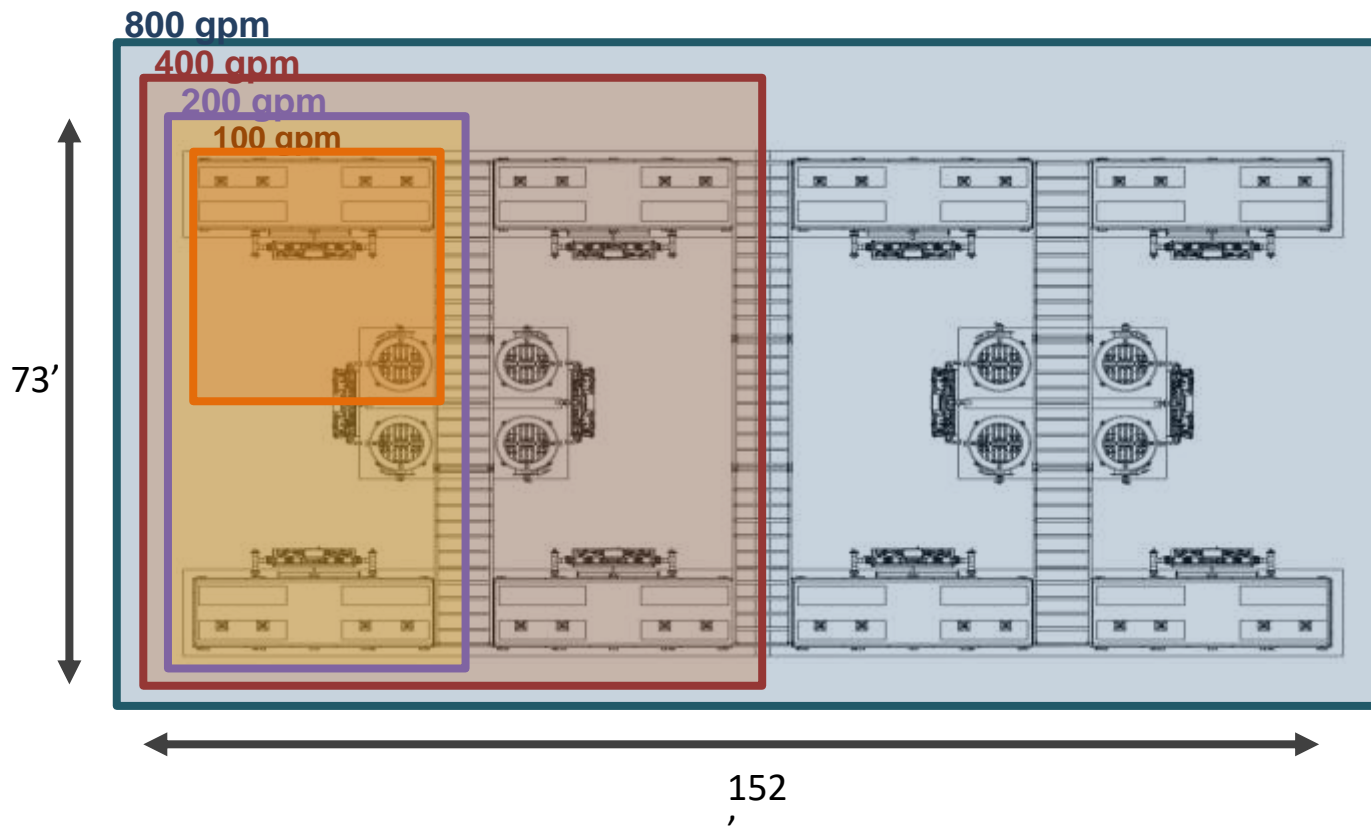


LRTS FGD BIOREACTOR CONFIGURATION



... Compact robust modular design that simplifies design and construction

LRTS FGD SCALABILITY

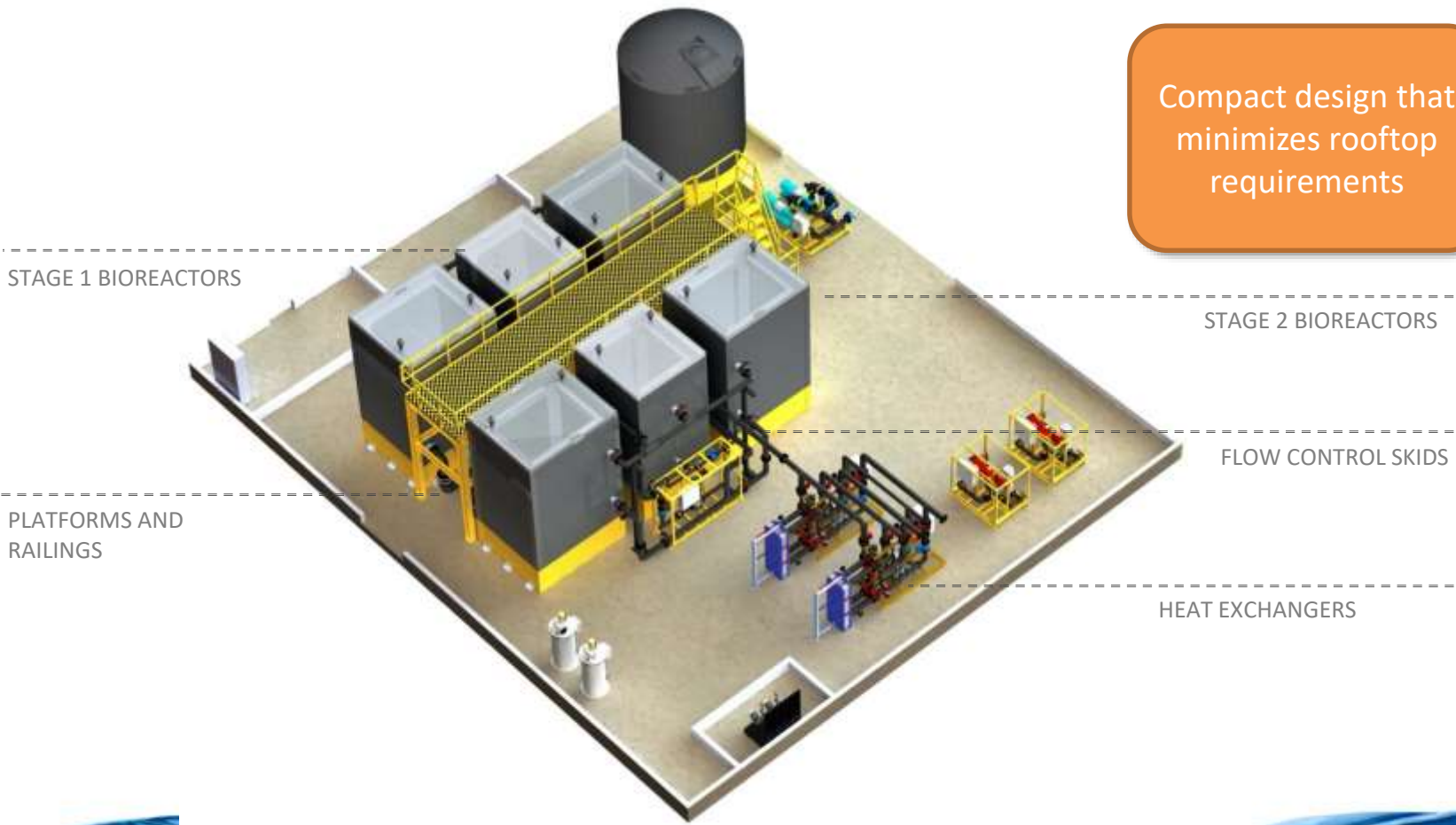


Scalable design capable of meeting a wide range of flow ranges

LRTS FGD BIOREACTOR CONFIGURATION (INDOOR)



Compact design that minimizes rooftop requirements



LRTS MOBILE OPTION



LRTS FGD INSTALLATION, FLORIDA, 2019



LRTS FGD INSTALLATION, NC, 2019



LRTS FGD INSTALLATION, ALABAMA, 2019



LRTS Designated as BAT

This document is a prepublication version, signed by Administrator Andrew Wheeler on 11/4/2019. We have taken steps to ensure the accuracy of this version, but it is not the official version.

TABLE VII-1. Main Regulatory Options

Wastestream	Subcategory	Technology basis for the BAT/PSES regulatory Options			
		1	2	3	4
FGD Wastewater	N/A	Chemical precipitation	Chemical precipitation + low hydraulic residence time biological treatment	Chemical precipitation + low hydraulic residence time biological treatment	Membrane filtration
	High FGD flow facilities	NS	Chemical precipitation	Chemical precipitation	Chemical precipitation
	Low utilization boilers	NS	Chemical precipitation	NS	NS
	Boilers retiring by 2028	Surface impoundments	Surface impoundments	Surface impoundments	Surface impoundments
FGD Wastewater Incentives Program (Direct Dischargers Only)	Voluntary	Membrane filtration	Membrane filtration	Membrane filtration	N/A
BA Transport Water	N/A	Dry handling or High recycle rate systems	Dry handling or High recycle rate systems	Dry handling or High recycle rate systems	Dry handling or High recycle rate systems
	Low utilization boilers	NS	Surface impoundments +BMP plan	NS	NS
	Boilers retiring by 2028	Surface impoundments	Surface impoundments	Surface impoundments	Surface impoundments

NS = Not Subcategorized

Note: The table above does not present existing subcategories included in the 2015 rule as the EPA is not proposing any changes to the existing subcategorization of oil-fired units or units with a nameplate

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