



Montrose Environmental – Global Water Practice Division
In Association with EPRI

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Flue Gas Desulfurization Effluent Management Using Innovative Sorption Treatment System

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Overview and Background

- Effluent Limitation Guidelines (ELGs) for selenium, arsenic, mercury, and nitrate
- Flue Gas Desulfurization (FGD) wastewater from a wet scrubber for controlling gas emission needs compliance with ELGs
- A number of technologies have been tested, but some still have challenges associated with the implementation (footprint, cost, waste management, etc.)
- Selenate (Se(VI)) is more difficult to remove than selenite (Se(IV)), but selenate is the dominant species found in FGD wastewater

Project Objectives

- Evaluate hybrid sorption process to effectively remove Se(VI) (FGD sites have Se(VI))
- Bench test various source waters including FGD, runoff water, mining water, groundwater, etc. with different types of media
- Field validate select media in a continuous pilot scale setting
- Develop cost estimate based on energy usage, media breakthrough, waste management, etc.

Media Pre-Screening with Multiple Source Waters

- Media candidates with different Se removal properties (difference in functionalities, capacities, and selectivities) and control samples
- Adsorption experiments for media pre-screening
 - 1:10 (media mass : water volume) ratio
 - 50-mL centrifuge tubes
 - Rotatory shaker at 60 RPM
- Evaluation criteria
 - Total selenium removal



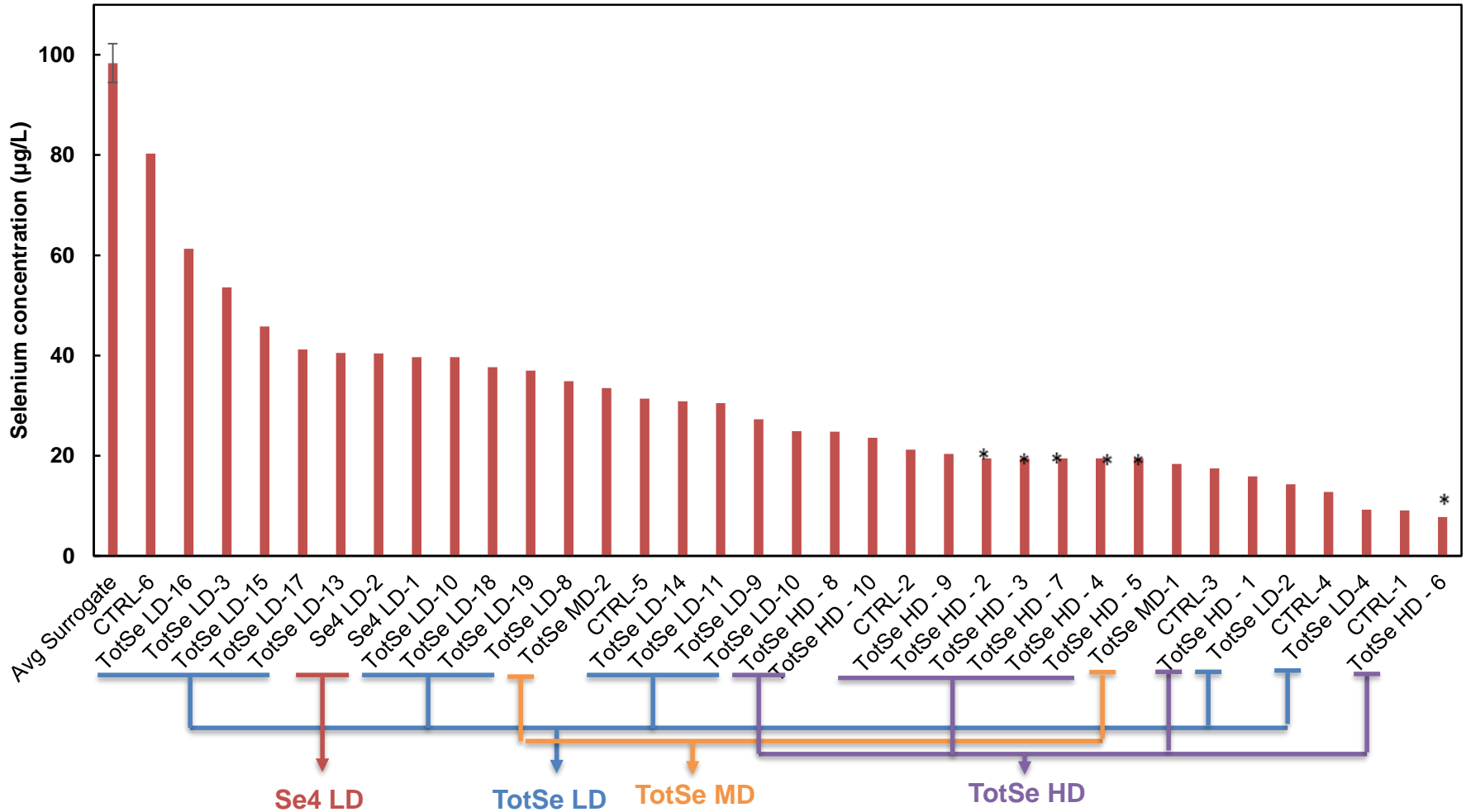
Water Quality for Source Waters Tested with Selenium

- Surrogate Sample Spiked with 50 µg/L of Se(IV)
- Raw power plant wastewater with mostly Se(VI)

Analyte	Unit	Surrogate Water	Power Plant Wastewater
pH	S.U.	6.64	6.54
Total Suspended Solids	mg/L	5.7	ND
Turbidity	NTU	3.8	0.72
Total Se	µg/L	98.4	172.3
Se (IV)	µg/L	53.7	4.43
Se (VI)	µg/L	41.1	147
Dissolved Oxygen	mg/L	7.9	9.2
Sulfate	mg/L	3,640	981
Total Phosphate as P	mg/L	0.148	0.011
Total Phosphate as PO ₄	mg/L	0.454	0.034
Arsenic	µg/L		6.96
Mercury	µg/L		4.97
Nitrate, as N	mg/L		8.32

Bench Batch Test Selenium (Se(VI)) Removal Results

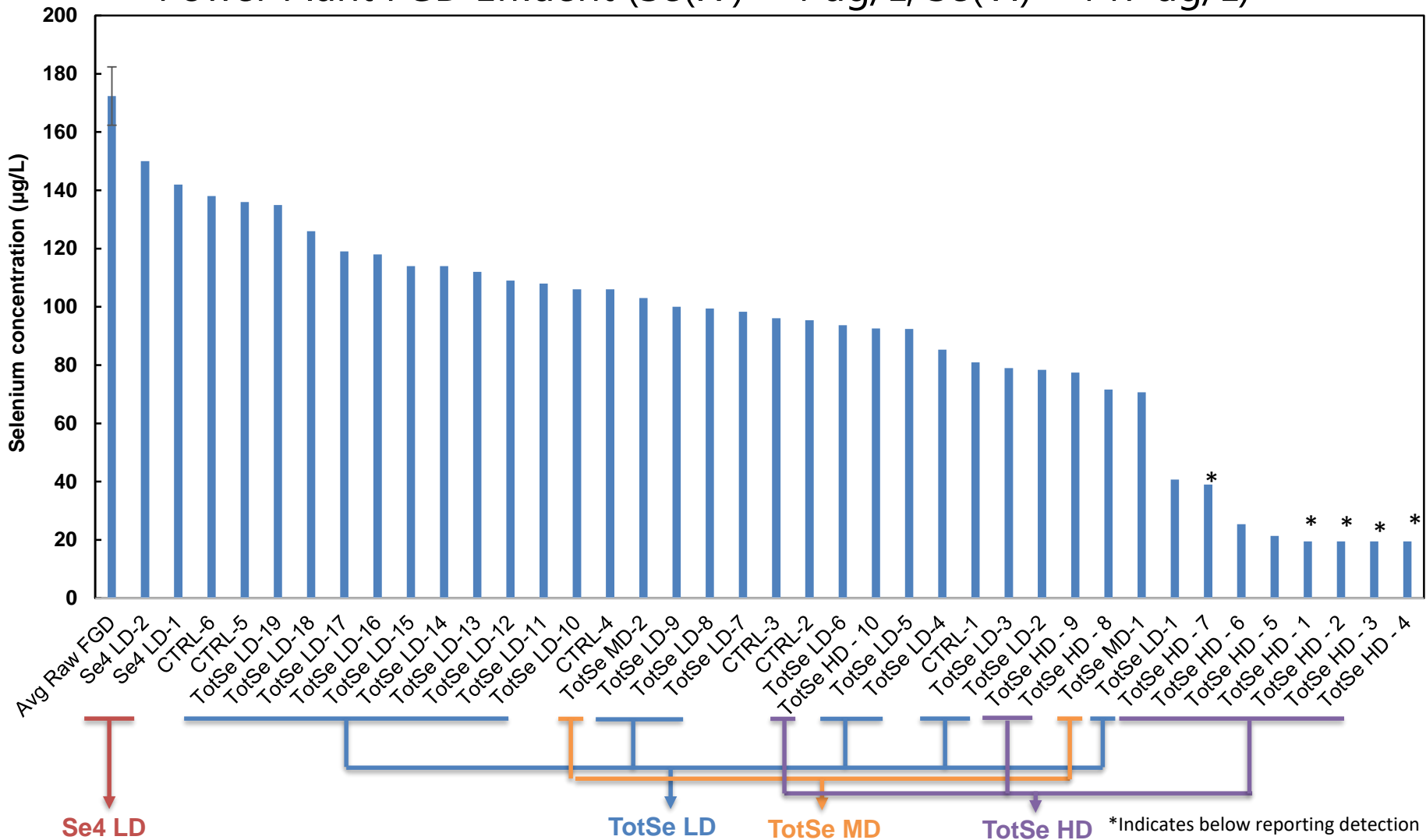
- Surrogate Water (Se(IV) – 54 ug/L, Se(VI) – 41 ug/L)



*Indicates below reporting detection limit

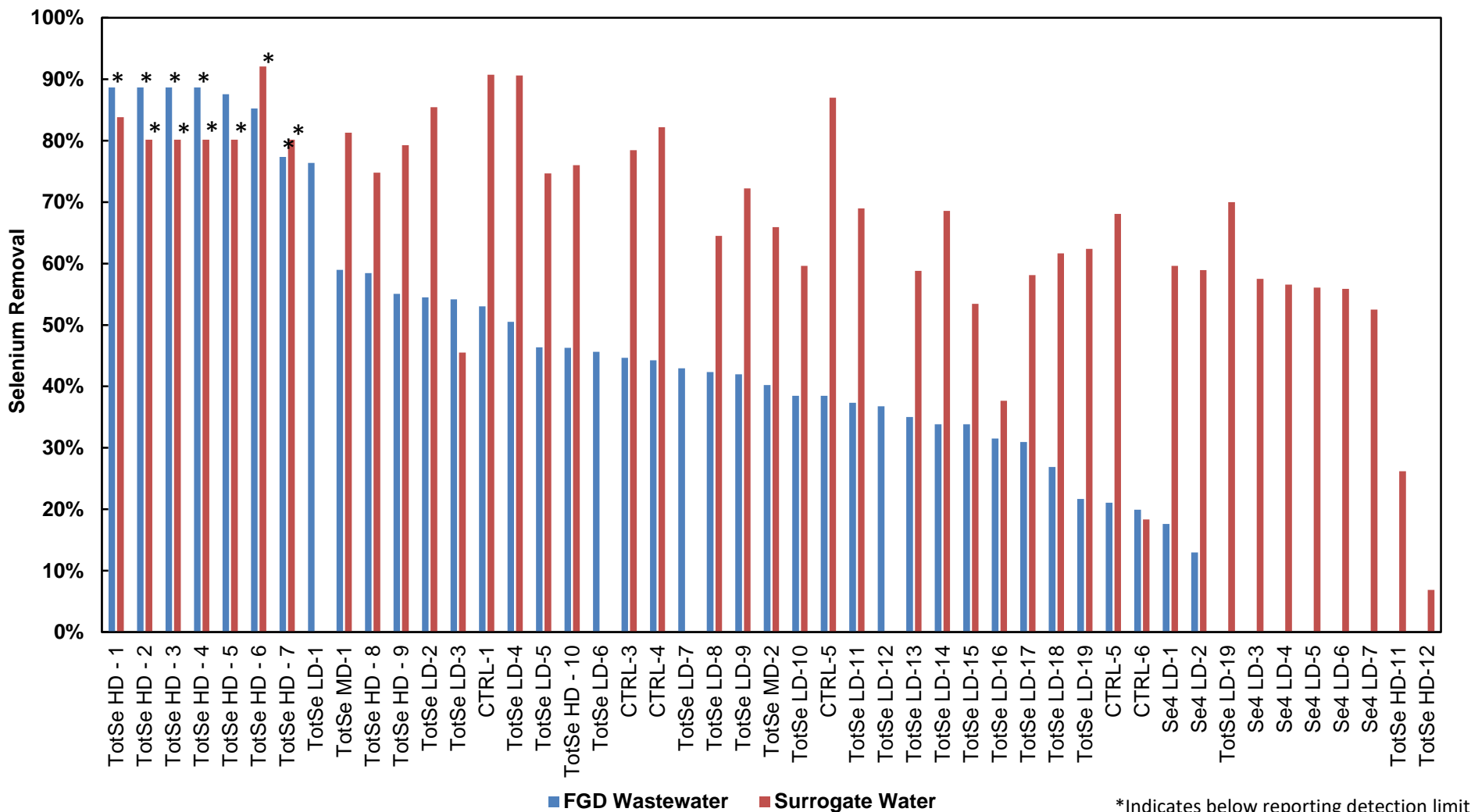
Bench Batch Test Selenium (Se(VI)) Removal Results

- Power Plant FGD Effluent (Se(IV) – 4 ug/L, Se(VI) – 147 ug/L)



Bench Batch Test Selenium Removal Results

- FGD Effluent (mostly Se(VI)) and Surrogate Water (both Se(IV) Se(VI))



*Indicates below reporting detection limit

Selenium Treatment Results Summary

- Various types/groups of sorbents were tested in the pre-screening experiments
- TotSe HD showed good overall Se removal performance for different source waters, compared with other types of media
- Specific formulations within the media type affect performance
- TotSe HD showed highest capacity
- Continued analysis of adsorption data is needed for various source water matrix and different types of selenium species
- Column testing is being conducted to validate the capacity / runtime for each source water

Current Work and Next Steps – On Site Validation

- Column test on-going in lab scale with select media
- A pilot will be deployed to Plant Bowen in Georgia and operated for 6 months for selenium and other contaminants removal using select media
- Project is scheduled to complete by the end of 2021

