GE Power & Water

Water & Process Technologies

ABMet Selenium Removal

Tim Pickett

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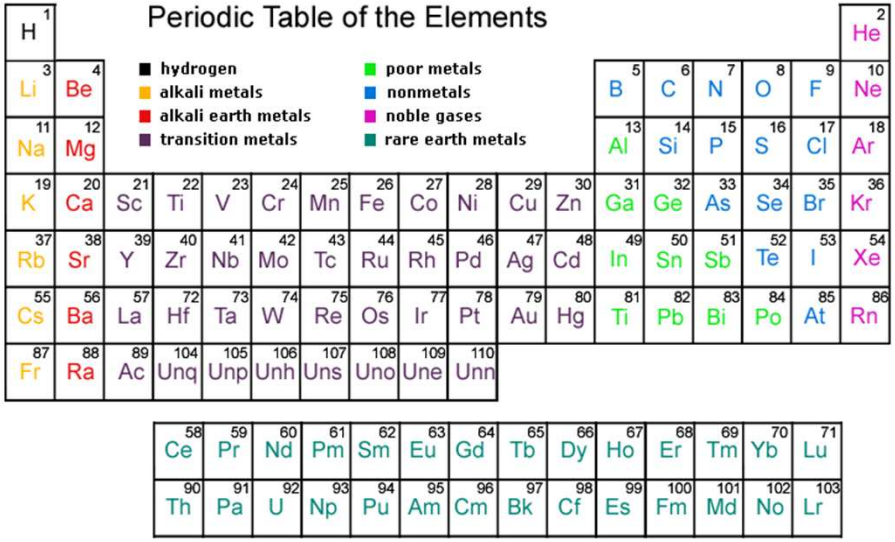
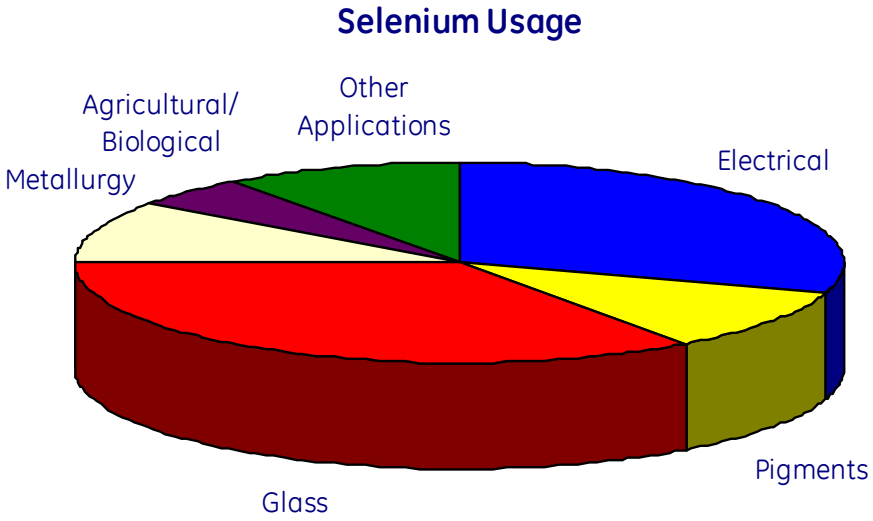
*ABMet is a registered trademark of General Electric Company.

What is Selenium?





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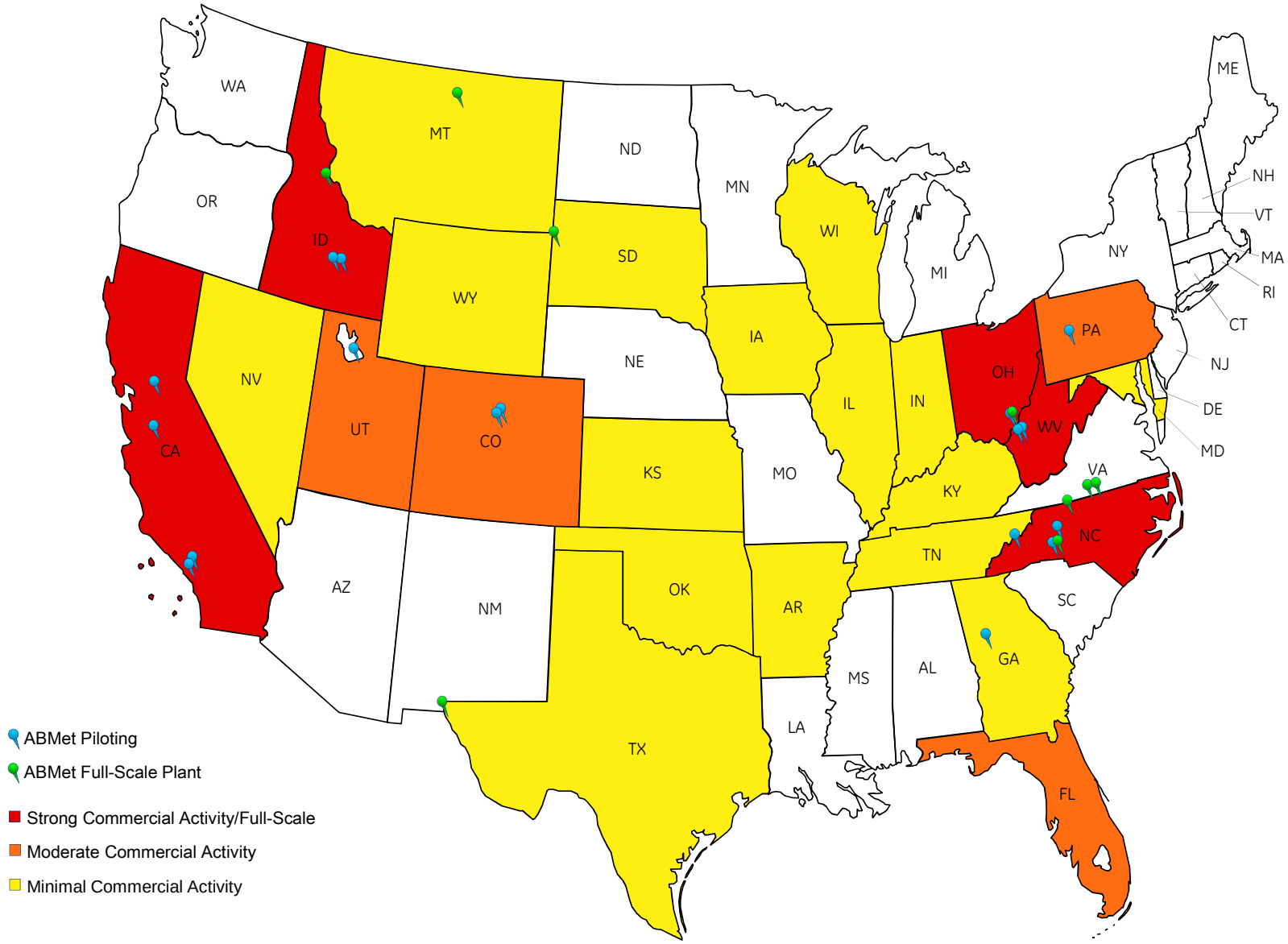

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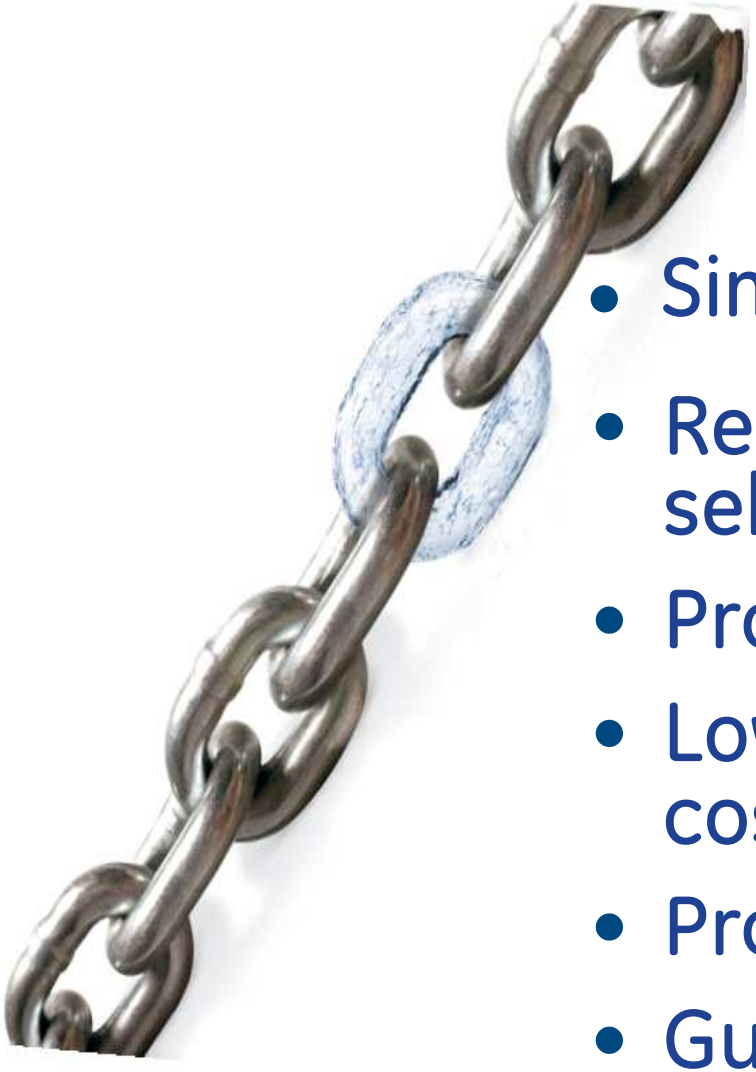
Why biological treatment for Se?



- Simple and efficient
- Removes both selenate and selenite
- Produces minimal sludge
- Low operating and maintenance costs
- Proven and reliable
- Guaranteed performance

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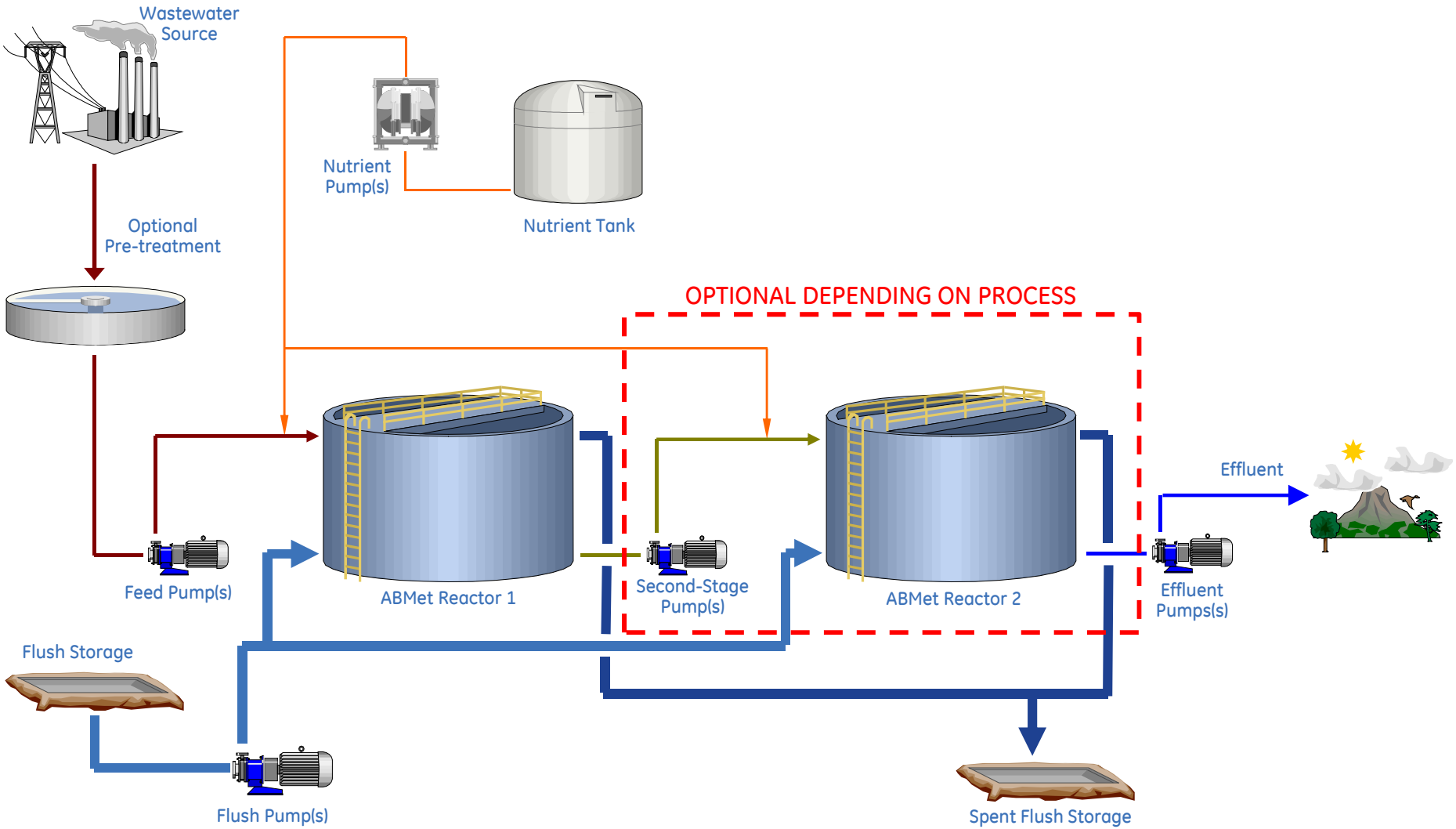
ABMet flow diagram



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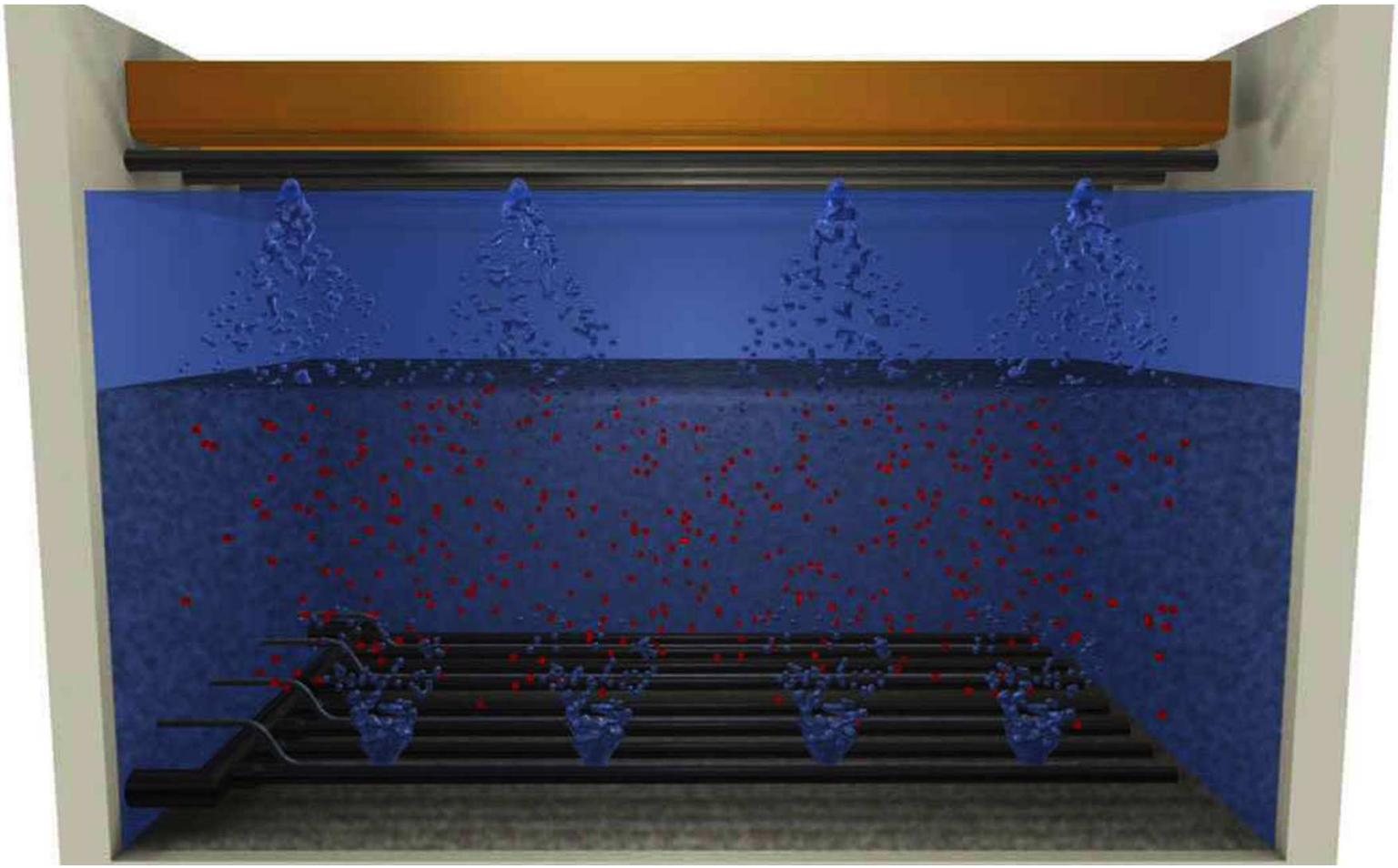

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Biochemical reduction

Nitrates are converted to nitrogen gas

$$NO_3^- + \text{org. C} \rightarrow NO_2^- + \text{org. C}$$

$$\rightarrow N_2 + CO_2 + H_2O$$

Bacteria reduce oxidized forms of selenium to elemental selenium

$$SeO_4^{2-} + \text{org. C} \rightarrow SeO_3^{2-} + \text{org. C}$$

$$\rightarrow Se^0 + CO_2 + H_2O$$

Dissolved metals are converted to metal sulfides and are retained within the system

$$SO_4 + \text{org. C} \rightarrow HS^- + M^{+2} \rightarrow MS + 2H^+$$

(where M= Metal)

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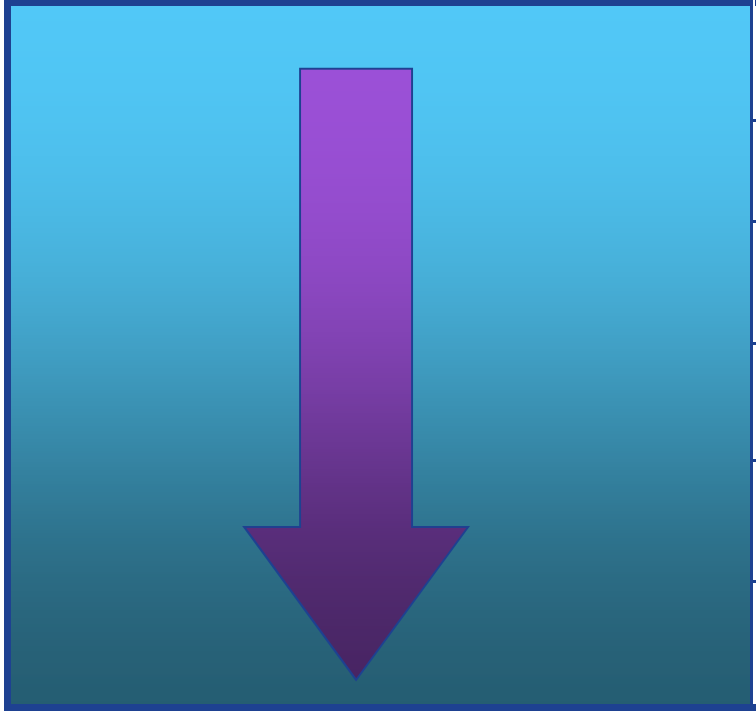
ABMet: respiration and reduction

ABMet Bioreactor	Respiration: Final e^- Acceptor	Approximate ORP
	Oxygen	>0 mV
	Nitrate	< 0 mV
	Nitrite	< -50 mV
	Selenate	< -100 mV
	Selenite	< -150 mV
	Sulfate	< -200 mV

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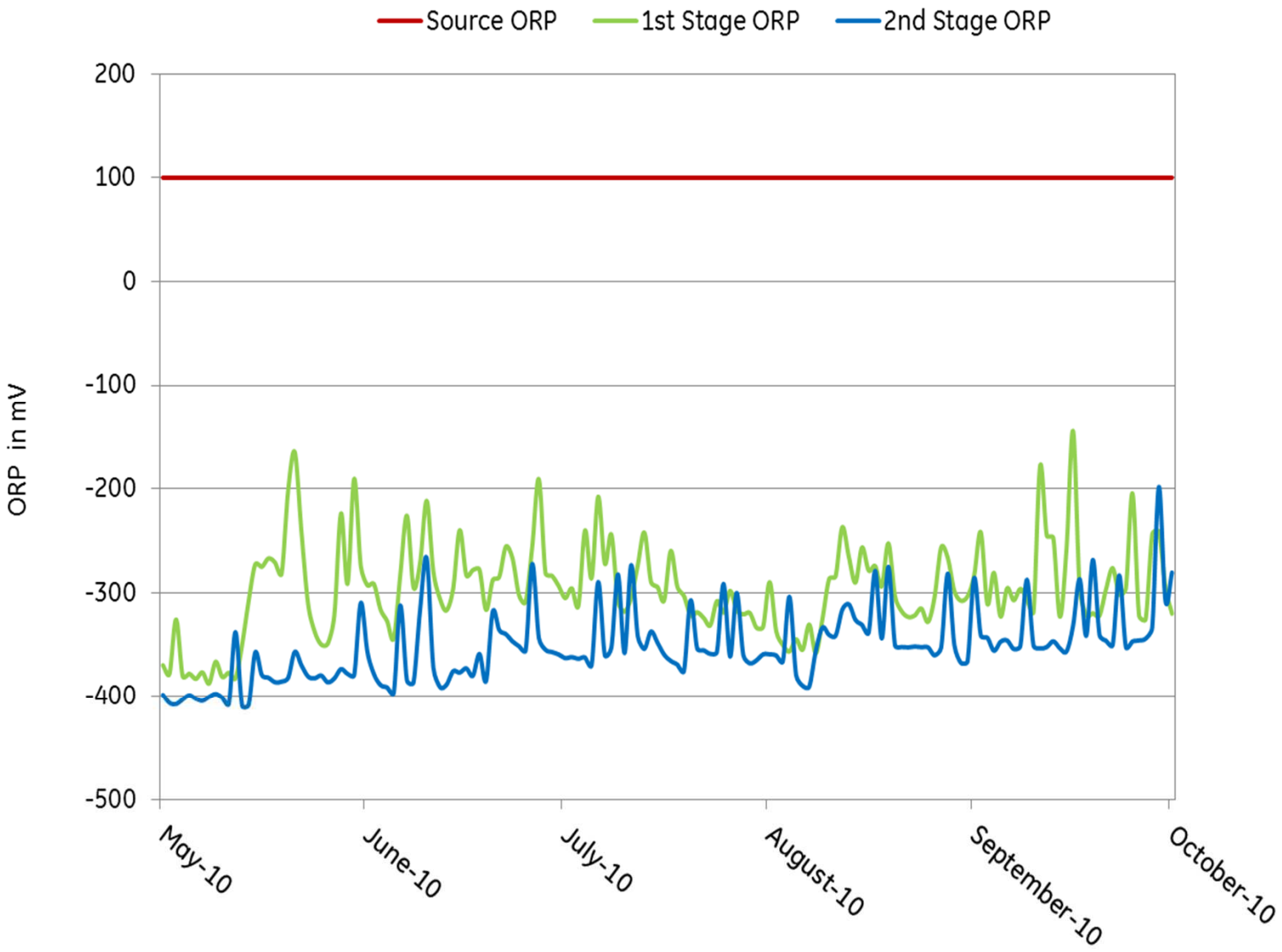
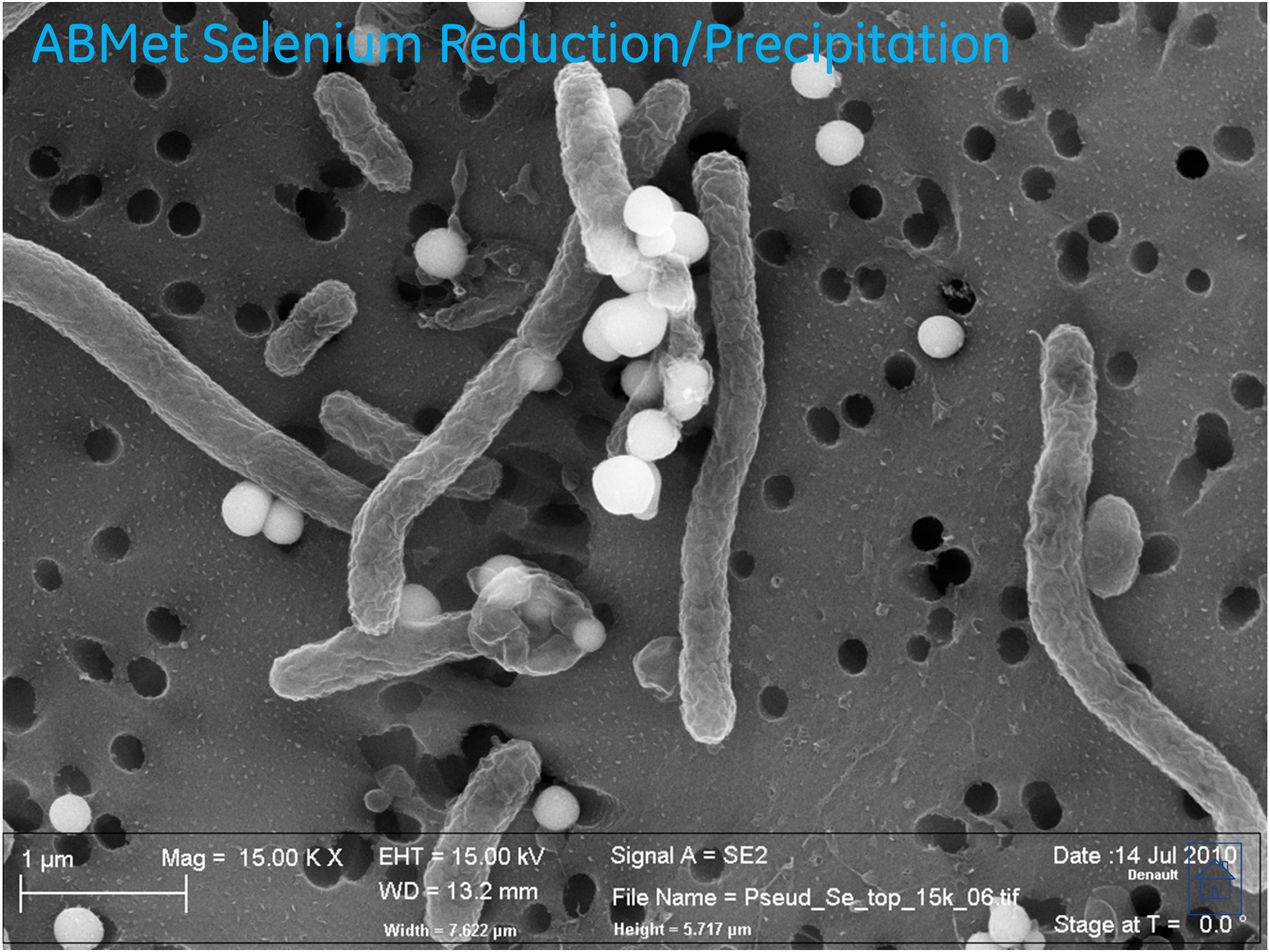
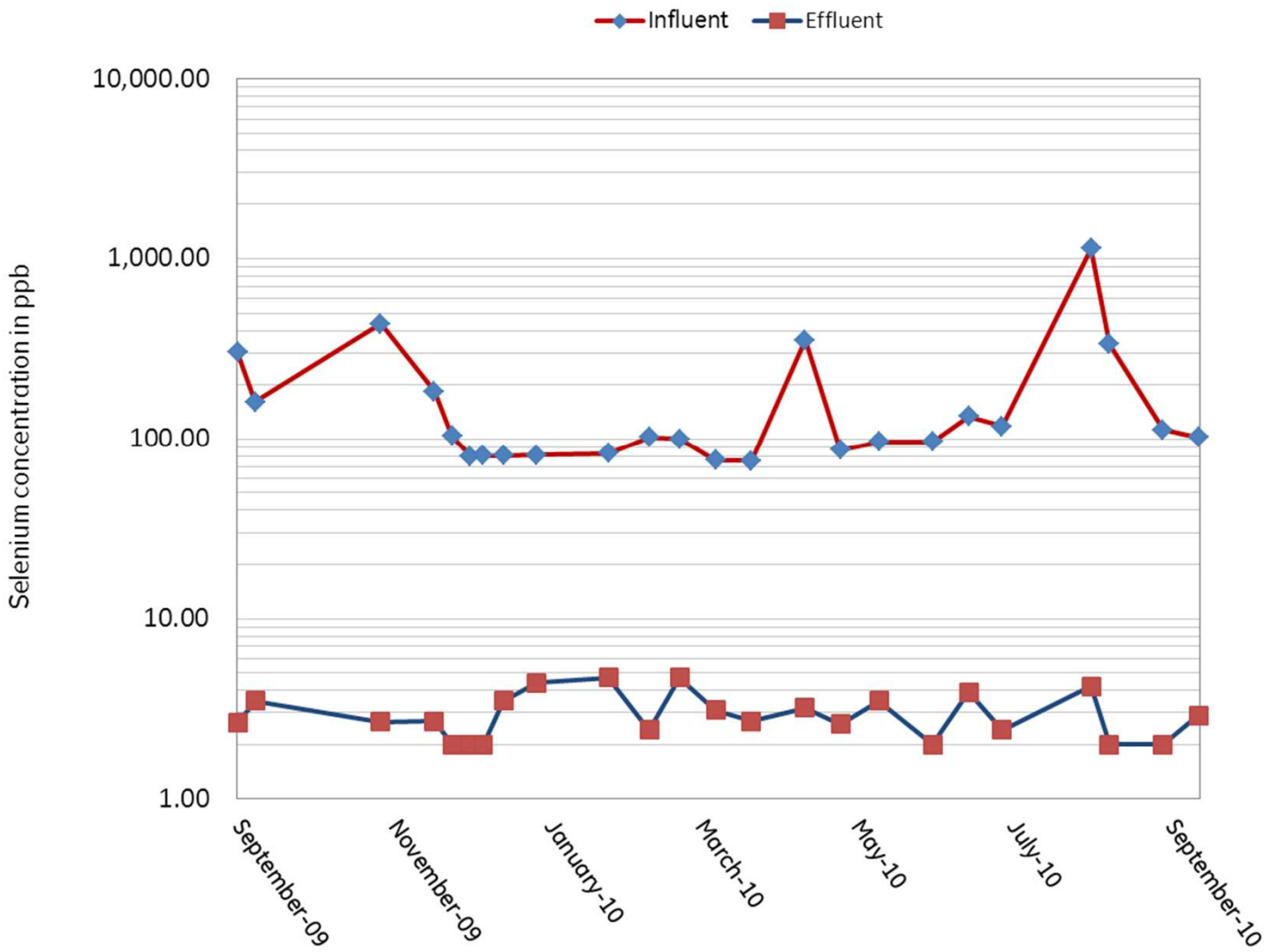
Full-scale ORP Data



ABMet Selenium Reduction/Precipitation

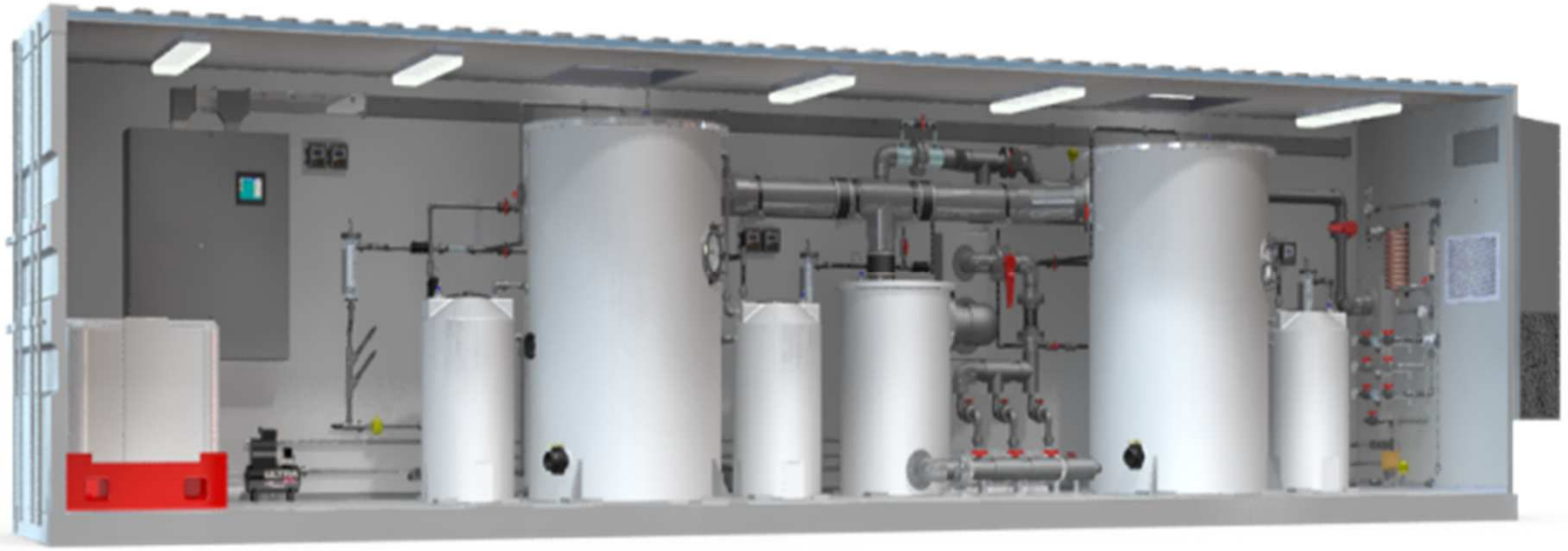


Full-scale Selenium Removal



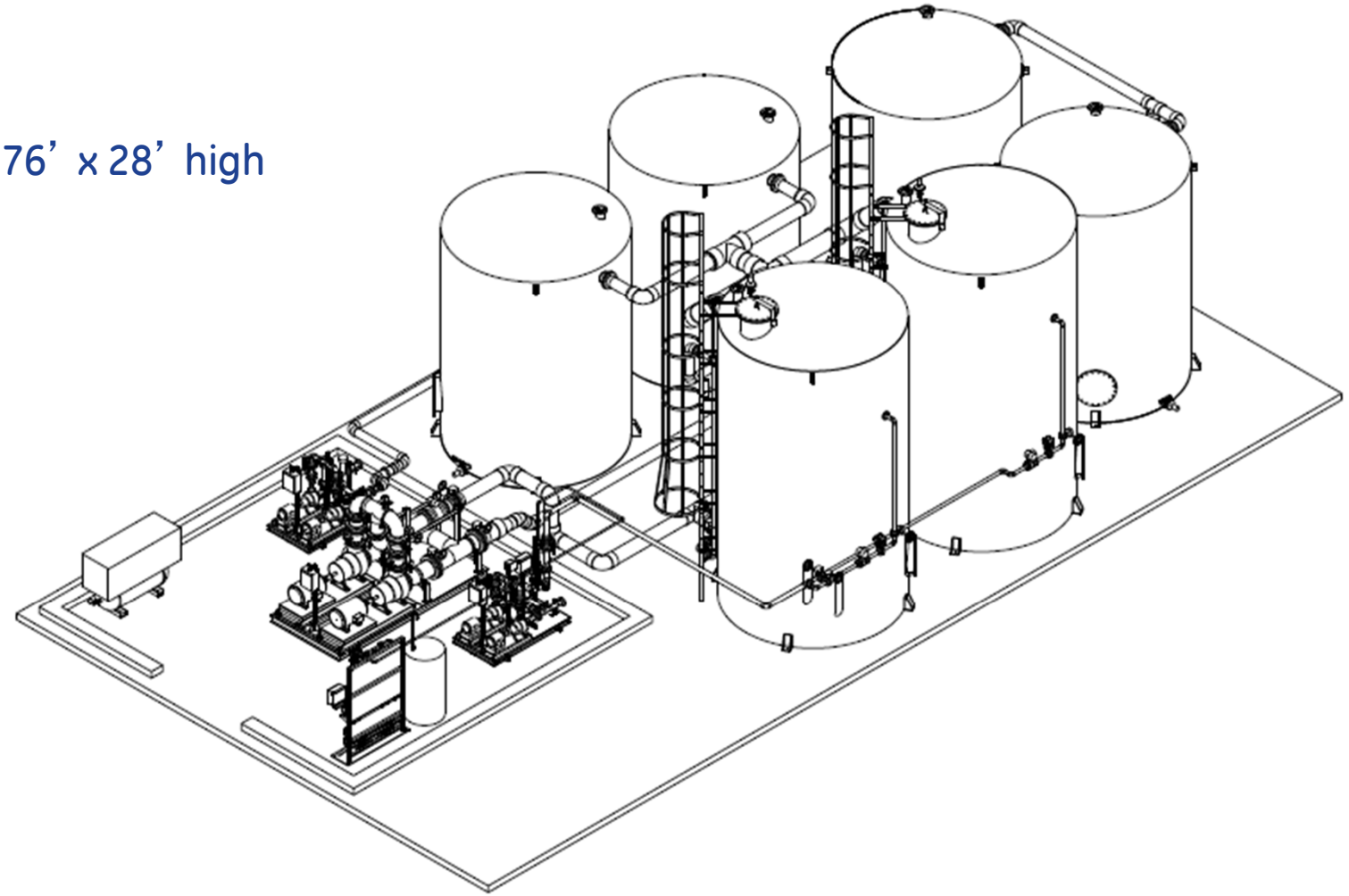
Design Considerations

- Water Chemistry
- Retention time (EBCT) – experienced based, pilot based
- Configuration – one or two stage
- Waste Disposal
- Secondary Limits
- Pre or Post-treatment



200 GPM (45 M^3/h , 1-stage, 2-train, 4 h

42’ x 76’ x 28’ high



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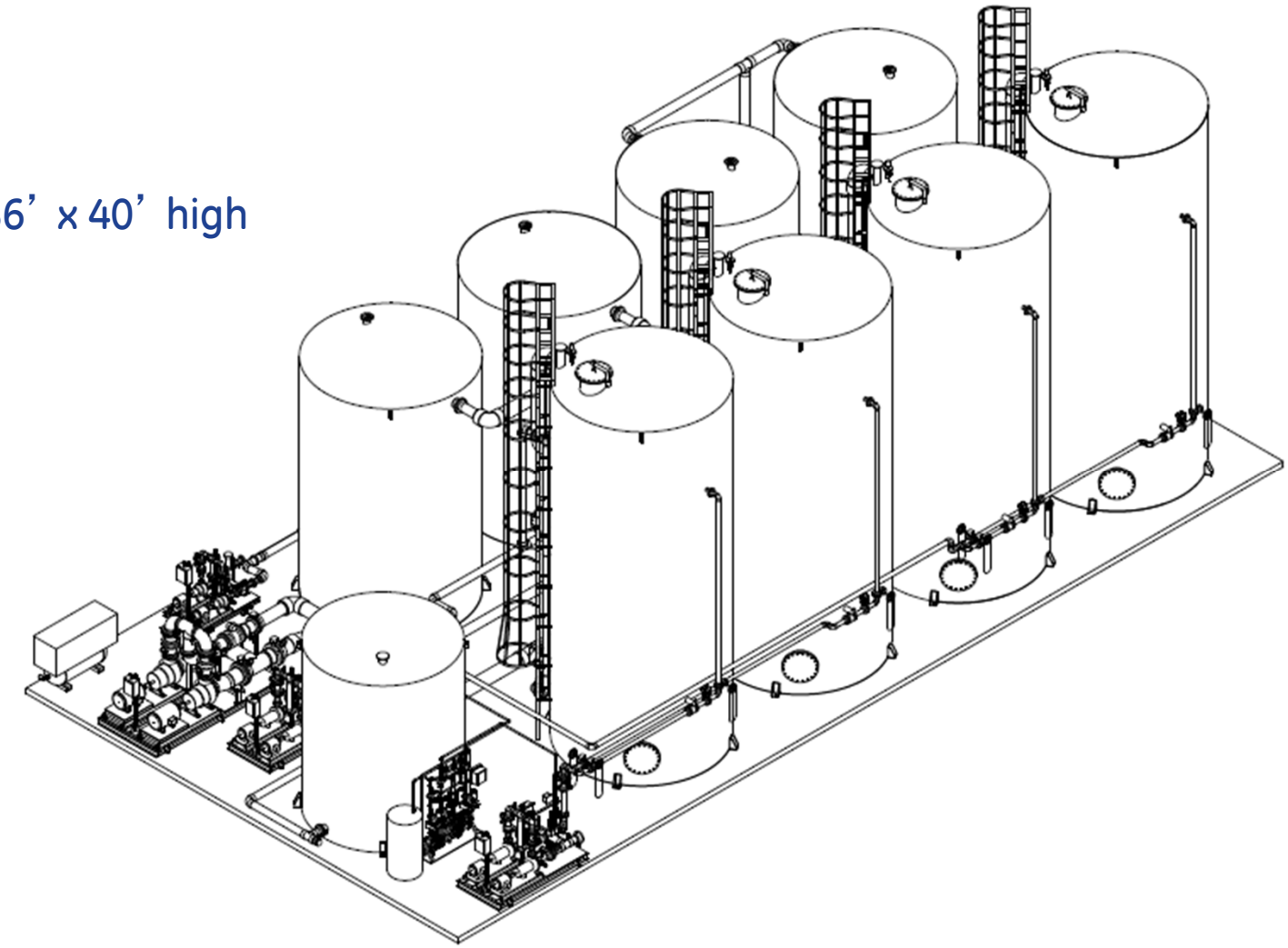
400 GPM (96 M^3/h) 2-stage, 2-train, 4 h

45’ x 86’ x 40’ high



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ABMet costs

Diverse Configurations

Power

- Complex, custom systems
- High-end components (corrosion)
- High redundancy
- High Se loading

Estimated installed cost:

- 1400 gpm (318 M^3/h)- $24MM

Operational cost:

- < $200 K / Year

Mining

- Modular systems
- Robust, proven components
- Remote operation
- Low to moderate Se loading

Estimated installed cost:

- 100 gpm (23 M^3/h) = $4MM
- 400 gpm (96 M^3/h) = $8MM

Operational cost:

- $65K/ year (400 gpm)

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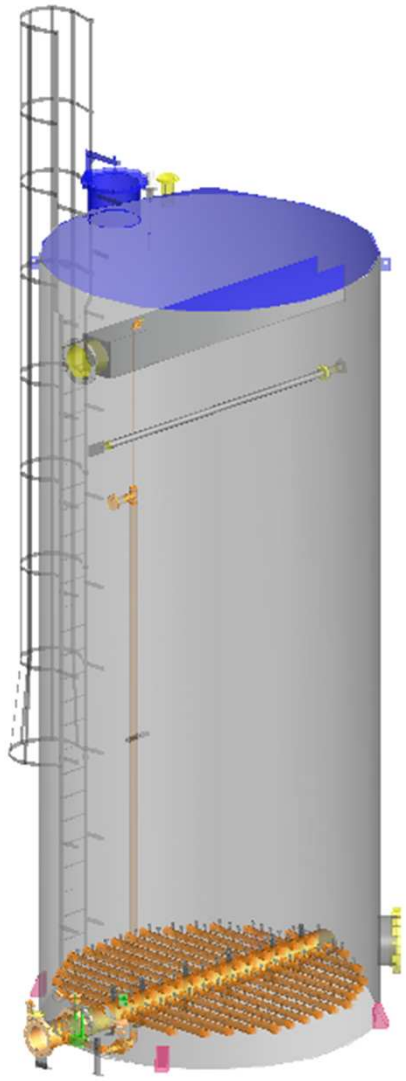
What is next?

- Smaller
- Faster
- Lower Cost
- Enhanced performance



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Thank You!

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http://www.gewater.com/ABMet.jsp