

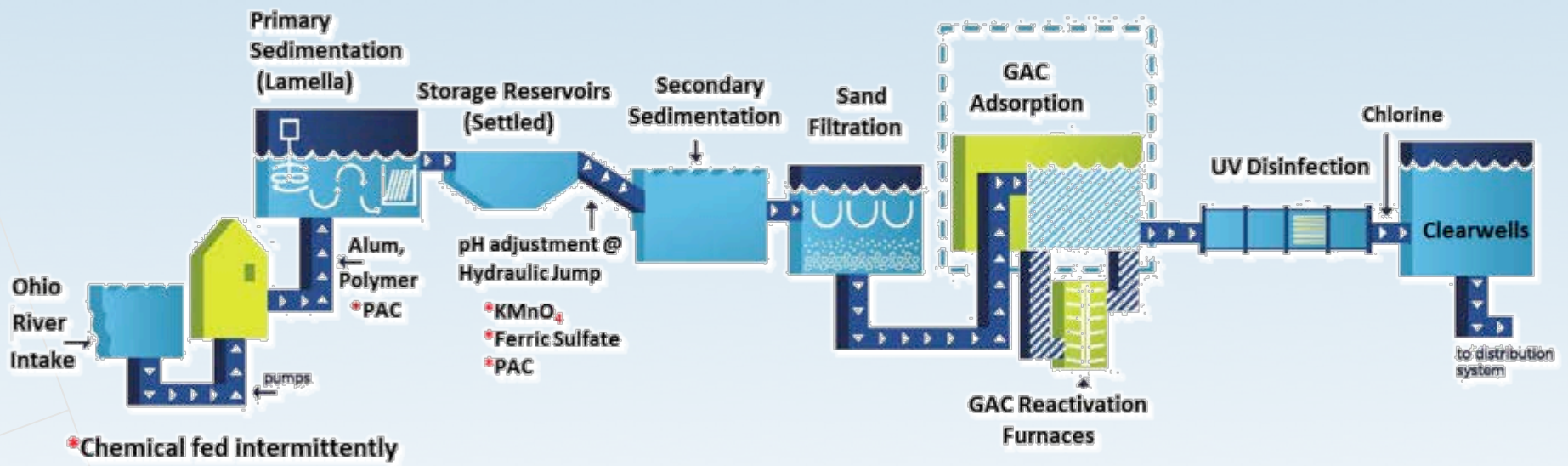
# Optimizing the Design and Operating Strategy for Cincinnati's New UV Disinfection Facility

Ramesh Kashinkunti, *GCWW*  
Christopher Schulz, *CDM Smith*  
Harold Wright, *Carollo Engineers*

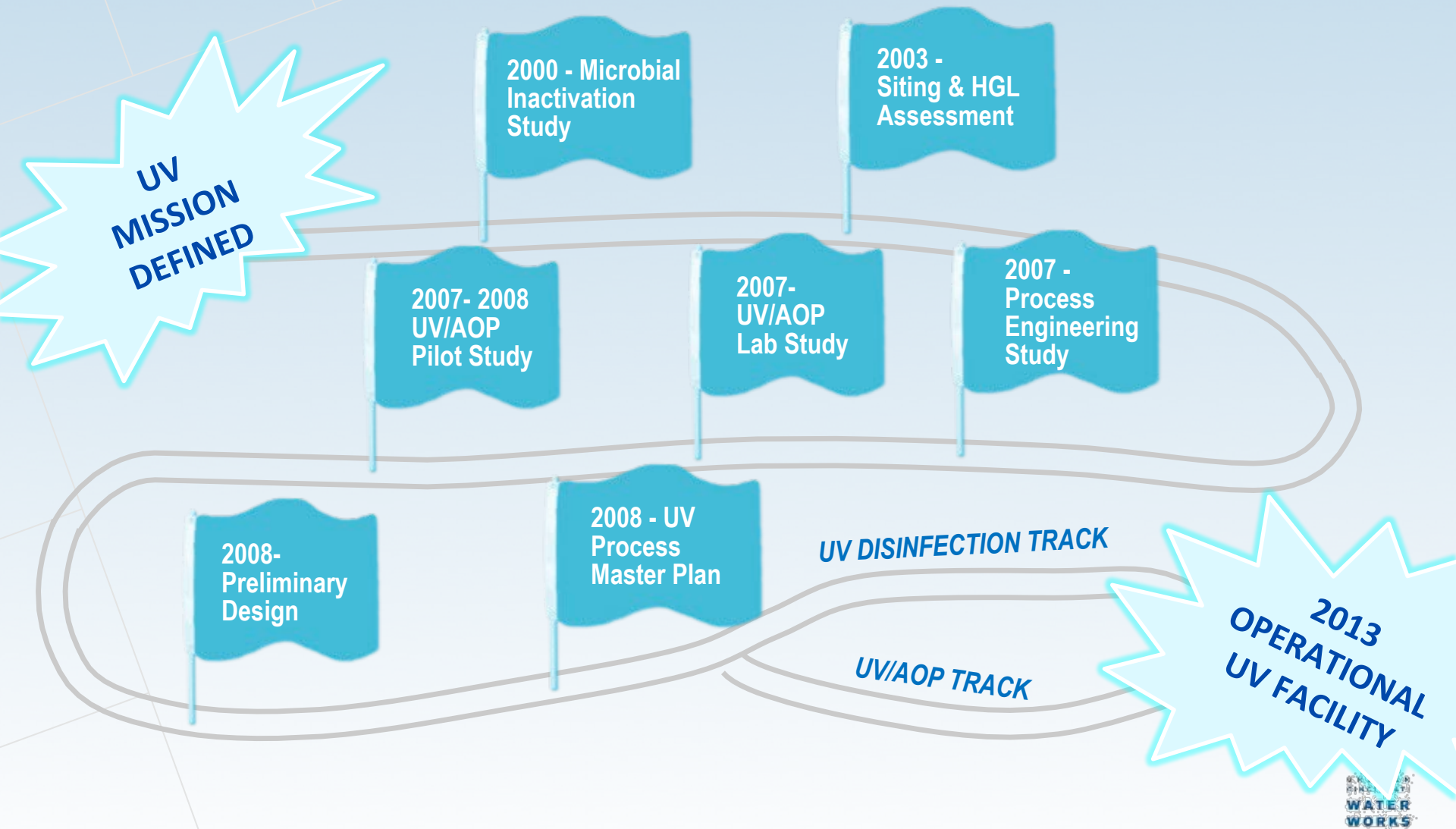
April 24, 2014



# GCWW Owns and Operates the 240-MGD Richard Miller Treatment Plant



# 13-Year Pathway to UV Implementation at RMTP



# Integrated GCWW Team Guided 5-Year UV Design Project from Start to Finish

- GCWW

*Jason Fleming (Engineering)*  
*Ramesh Kashinkunti (Water Quality)*  
*Verna Arnette (Operations)*  
*Larry Moster (Maintenance)*  
*Maureen Richards (Construction)*

- CDM Smith

*Chris Schulz (Technical Director)*  
*David Opferman (Project Manager)*

- Carollo Engineers

*Harold Wright (Process Lead)*



# Top 3 UV Design/Operational Challenges

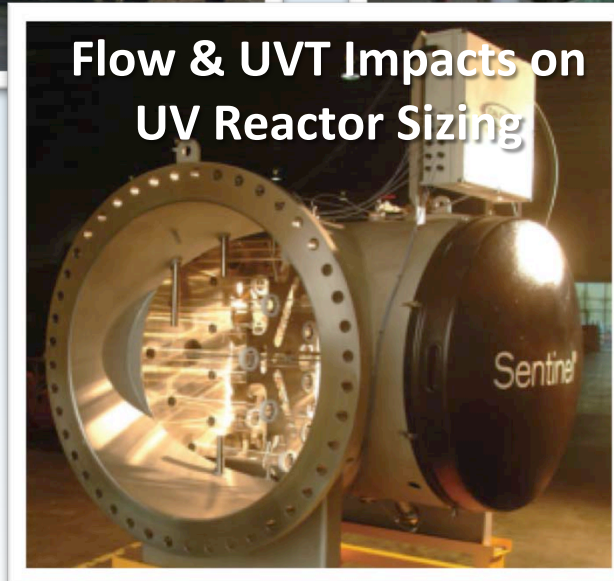
**Regulatory Compliance or Public Health Protection?**



**UV-AOP Capability Now or Later?**



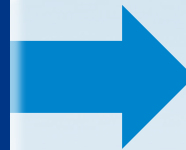
**Flow & UVT Impacts on UV Reactor Sizing**



# Holistic Approach Defines UV System Operating Strategy

## Preliminary Design

- *UVCAT*
- *CFD Models*
- *USEPA Risk Model*



## Equipment Selection

- *Extended Validation*
- *Validation Control Sheet*

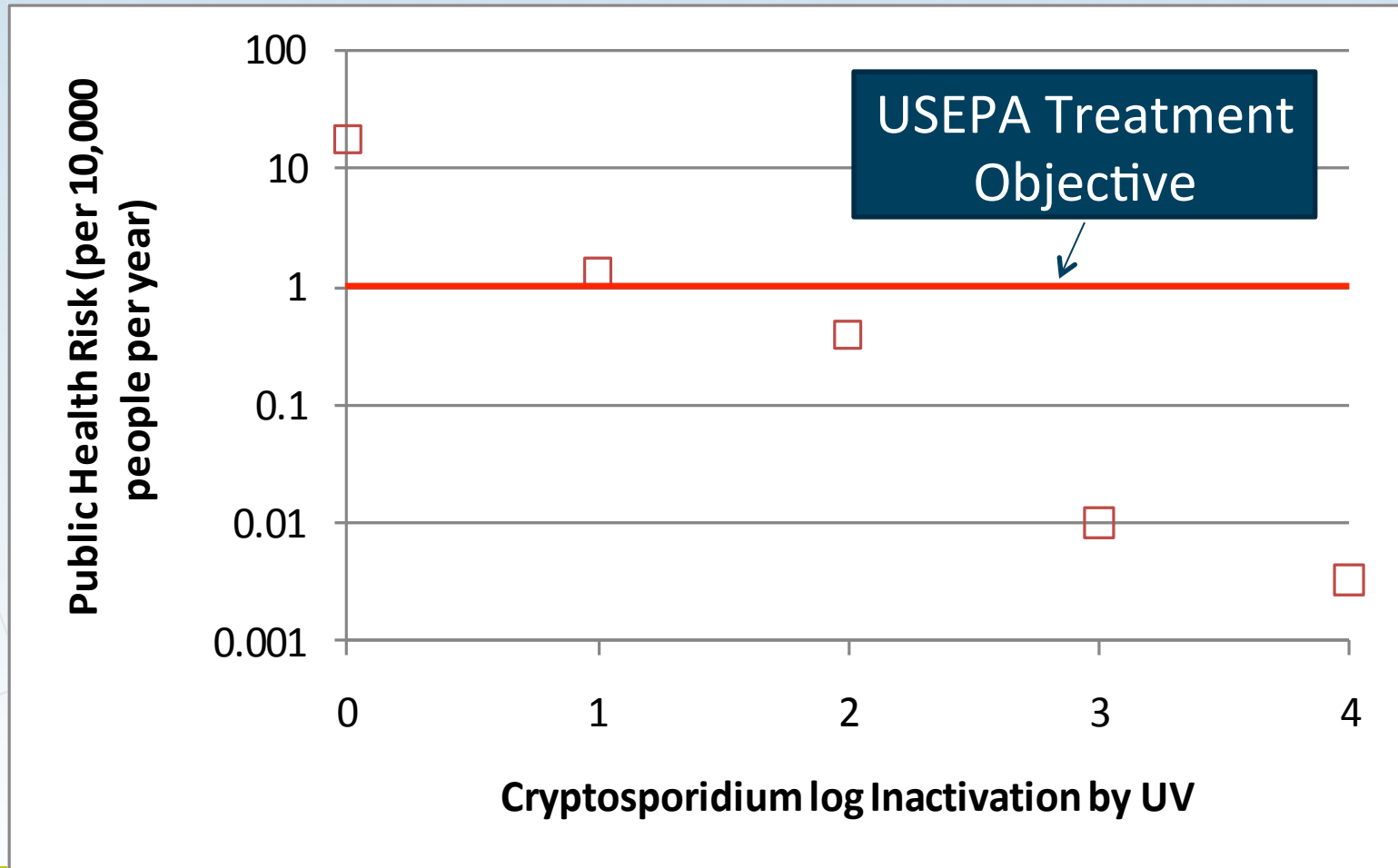


## Commissioning

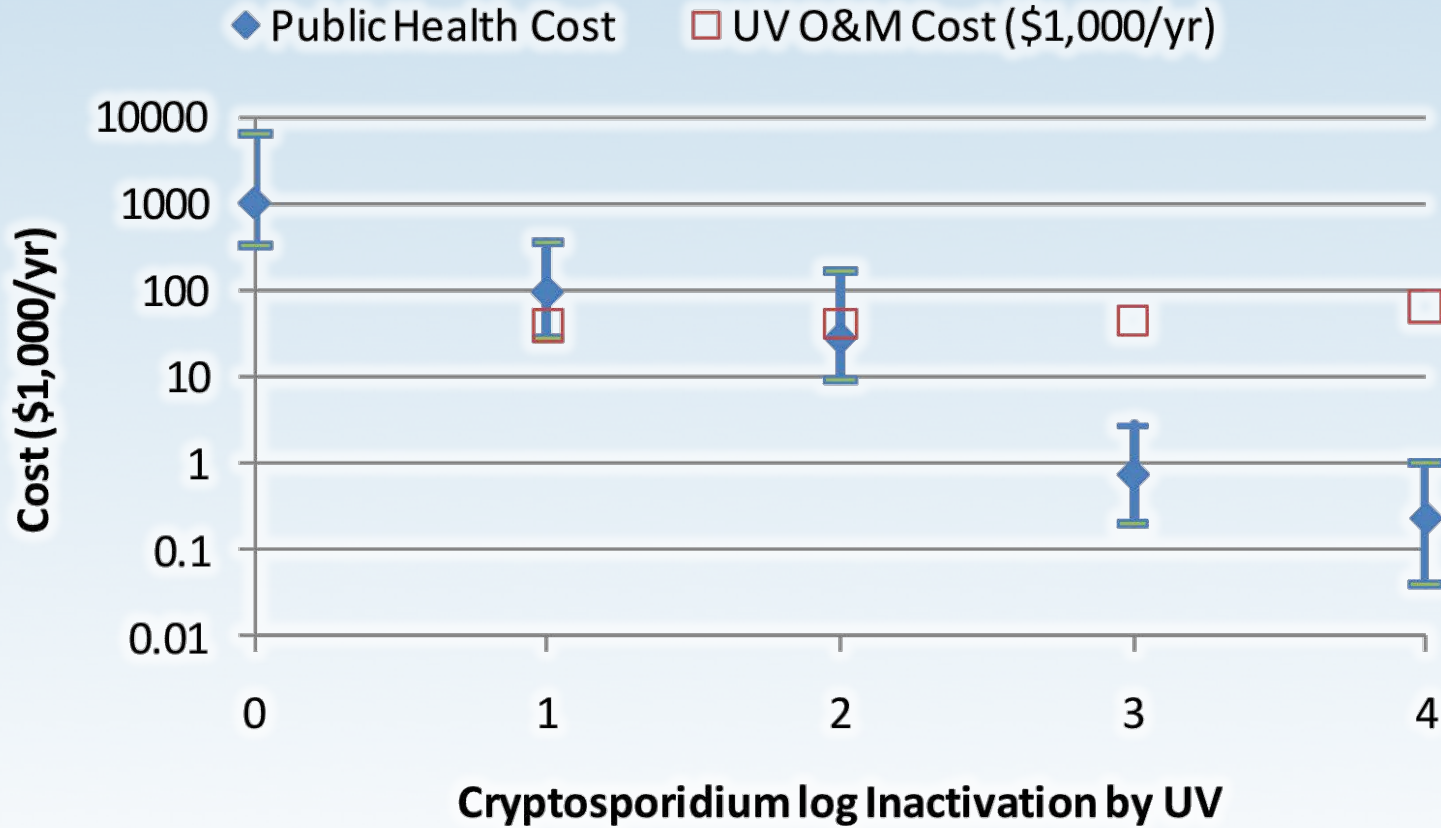
- *Factory Witness Testing*
- *Start-up Testing*



# USEPA Risk Model Showed Benefits of UV Disinfection

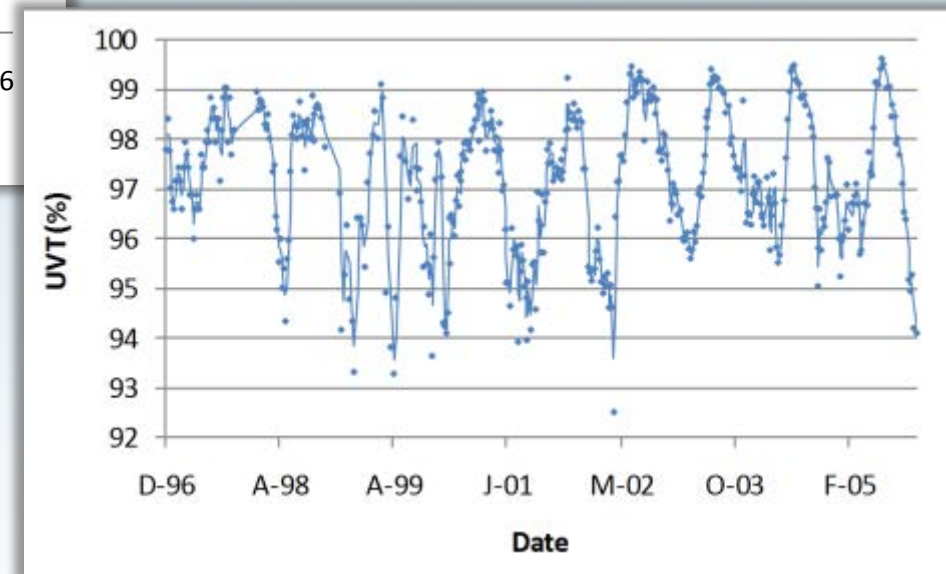
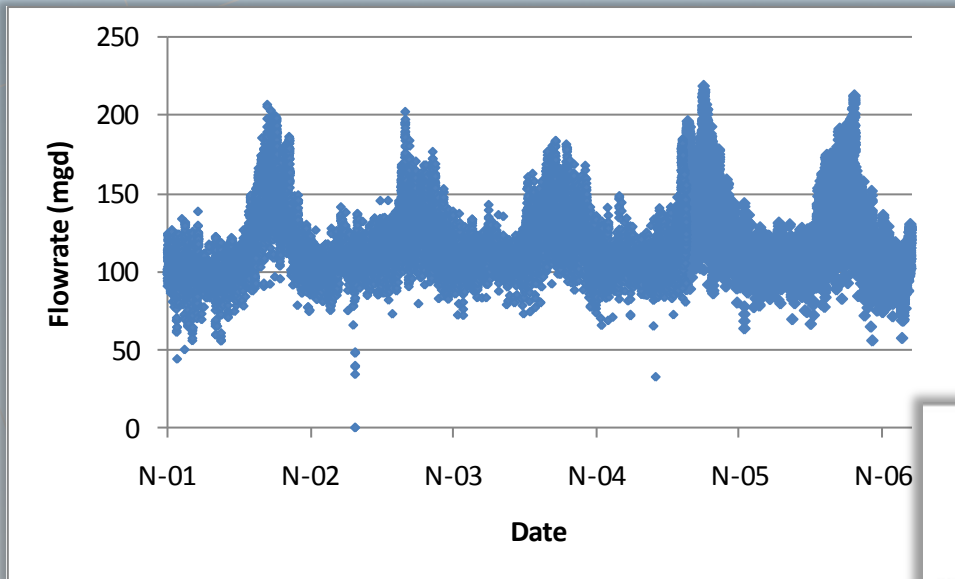


# USEPA Risk Model Showed Benefits of UV Disinfection

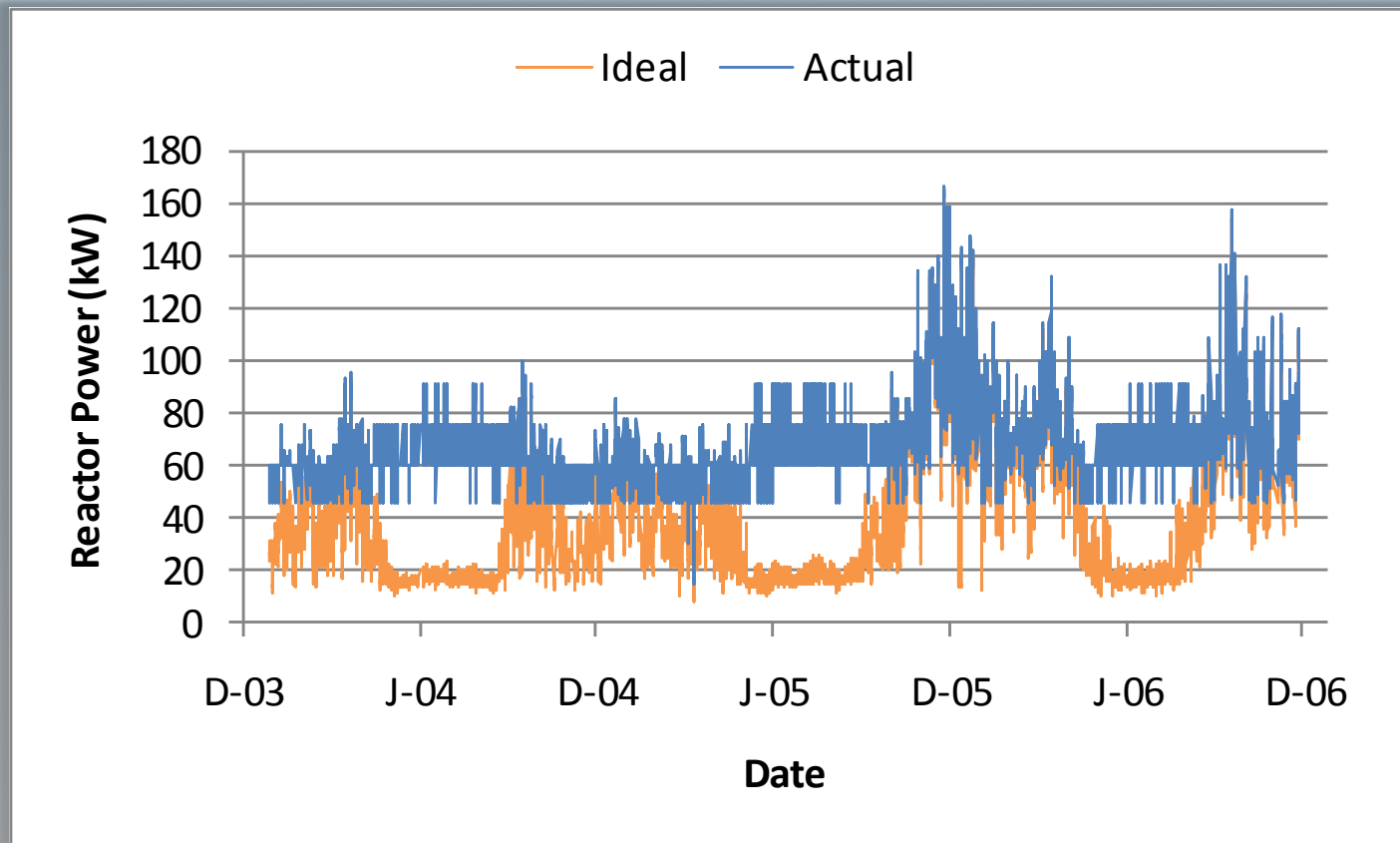




# RMTP Flow and UVT Varies Seasonally



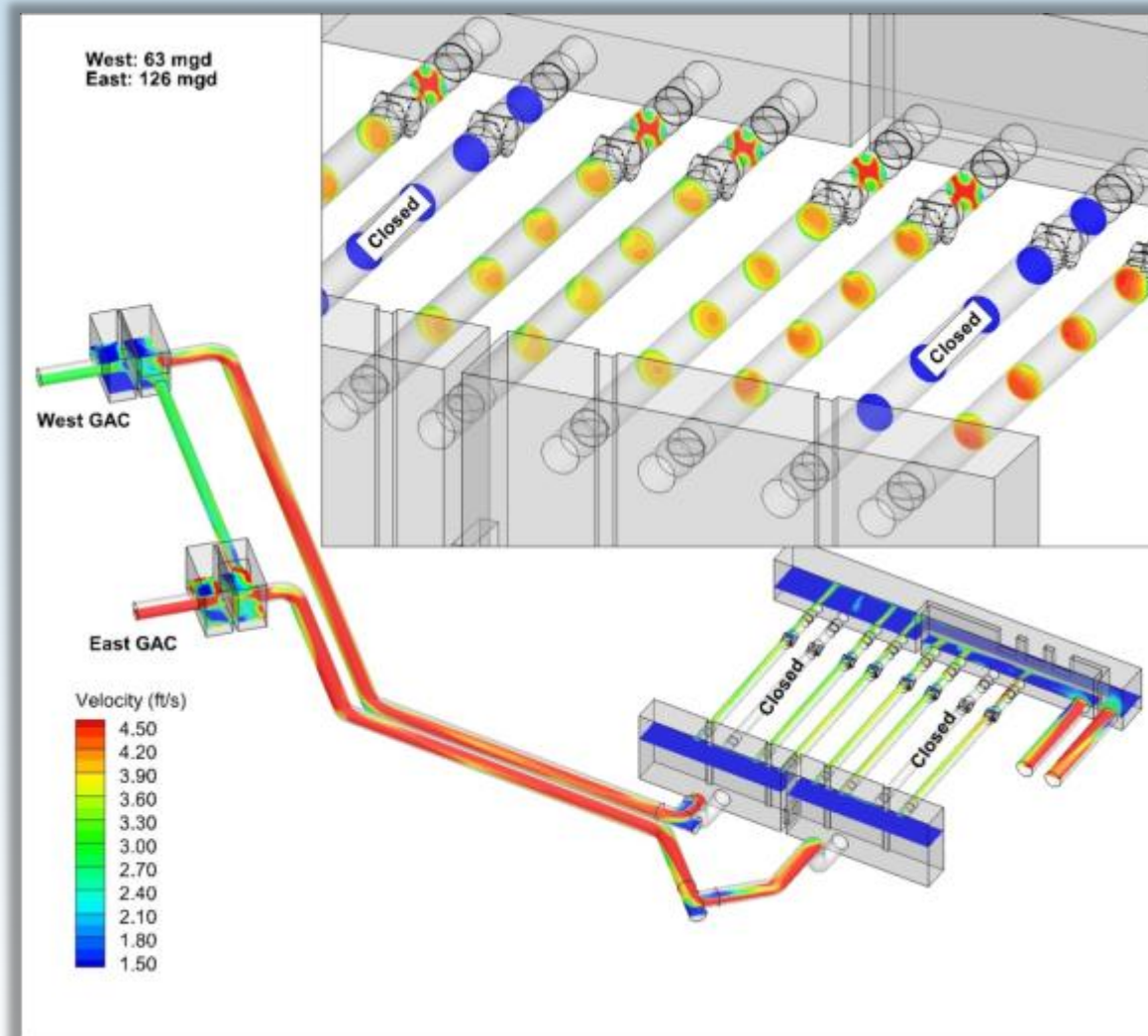
# UVCAT Simulated Operation of 12 Candidate UV Systems



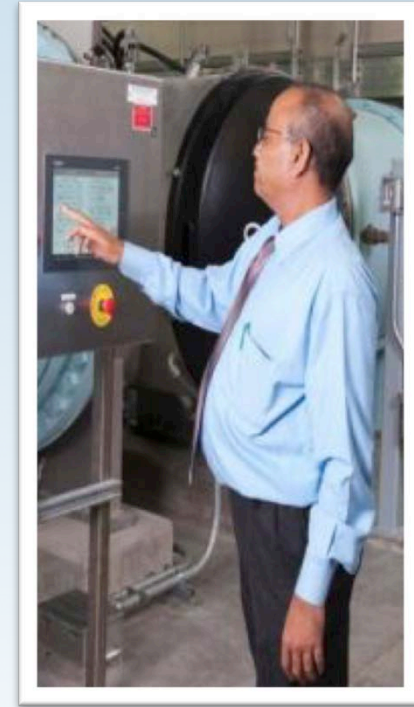
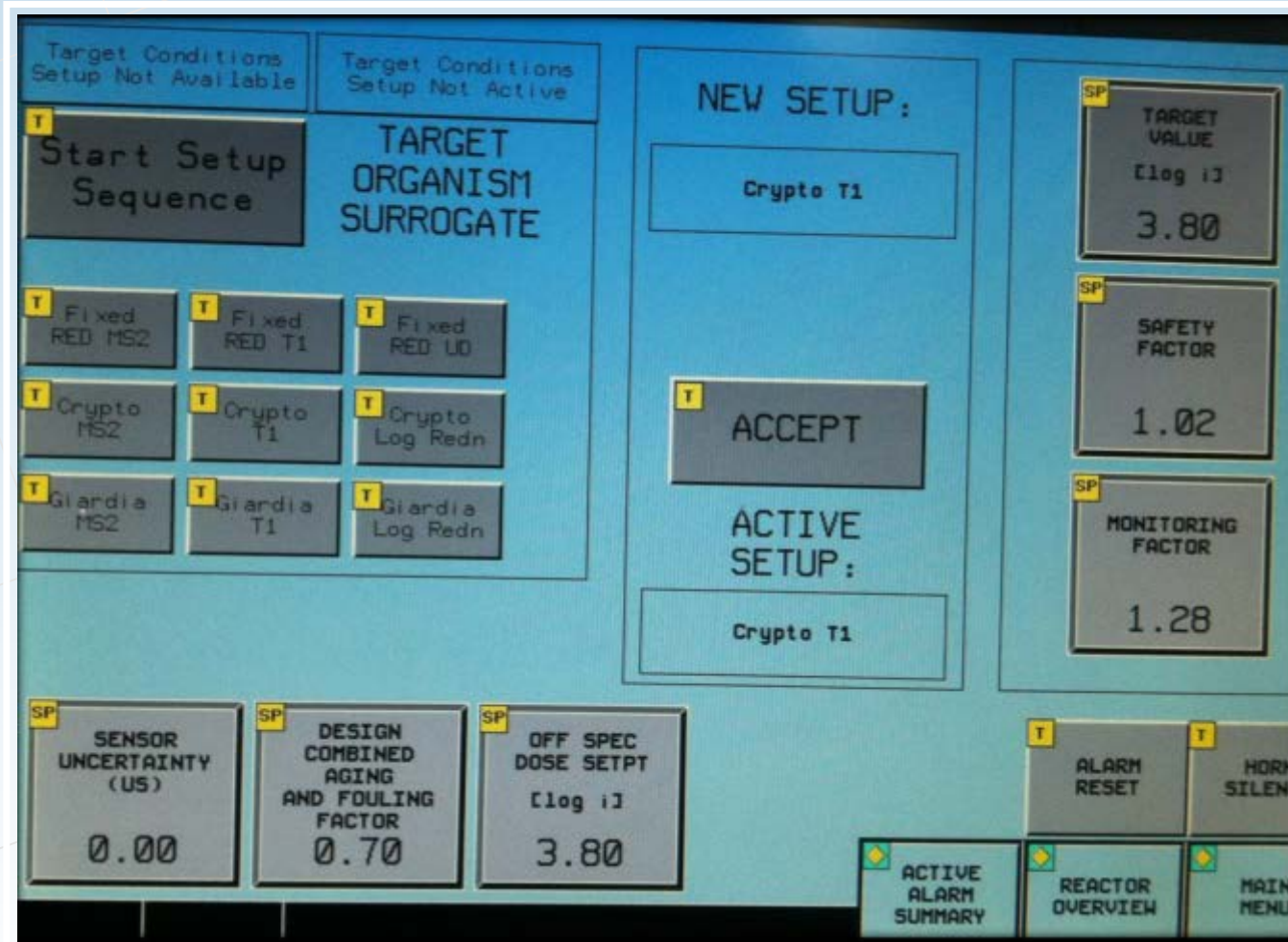
***Recommendation:*** Allow Large Scale UV Systems to Provide Efficient Dose Delivery



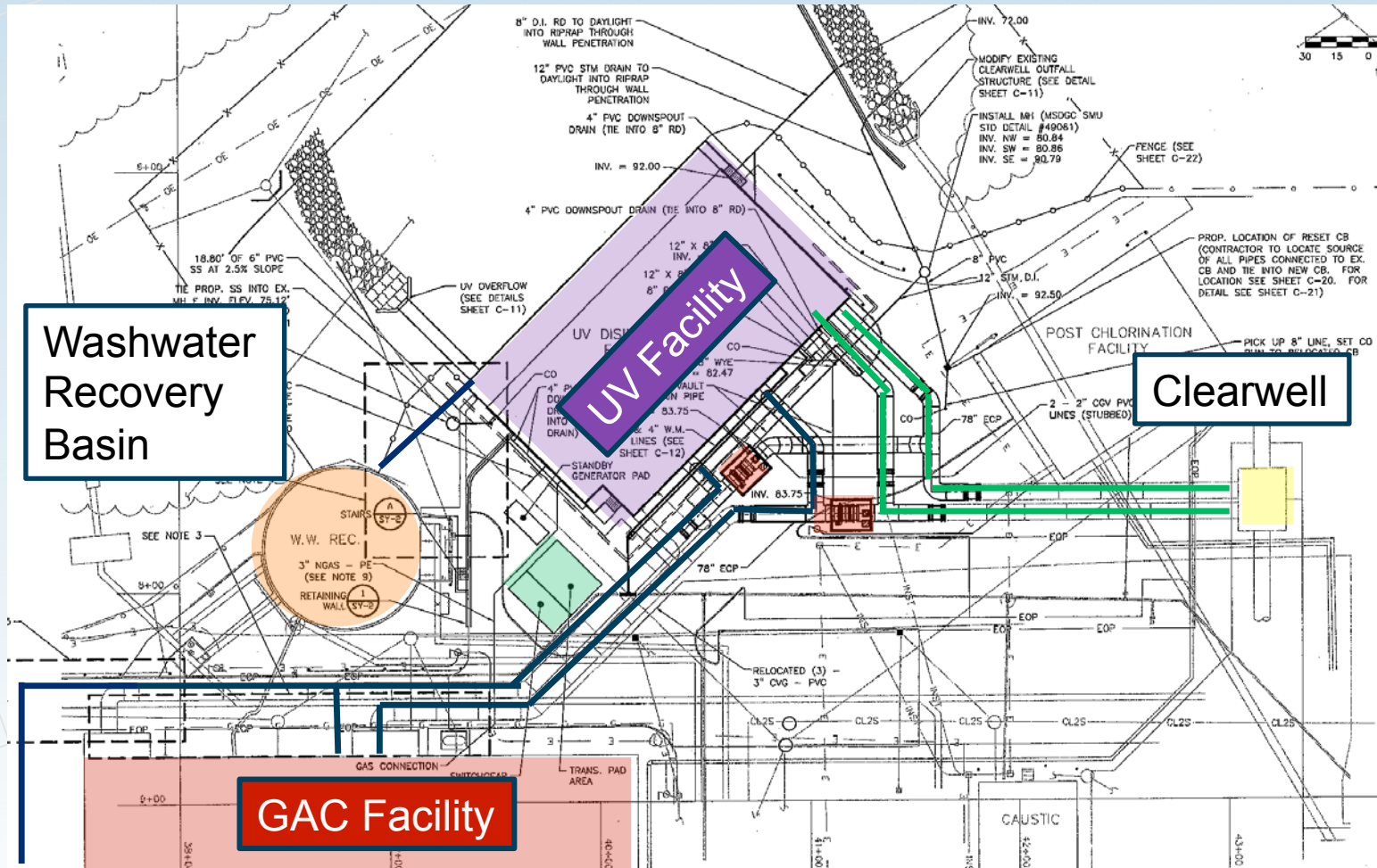
# CFD-Based Models Extended Control Algorithm for High UV Dose Advanced Oxidation



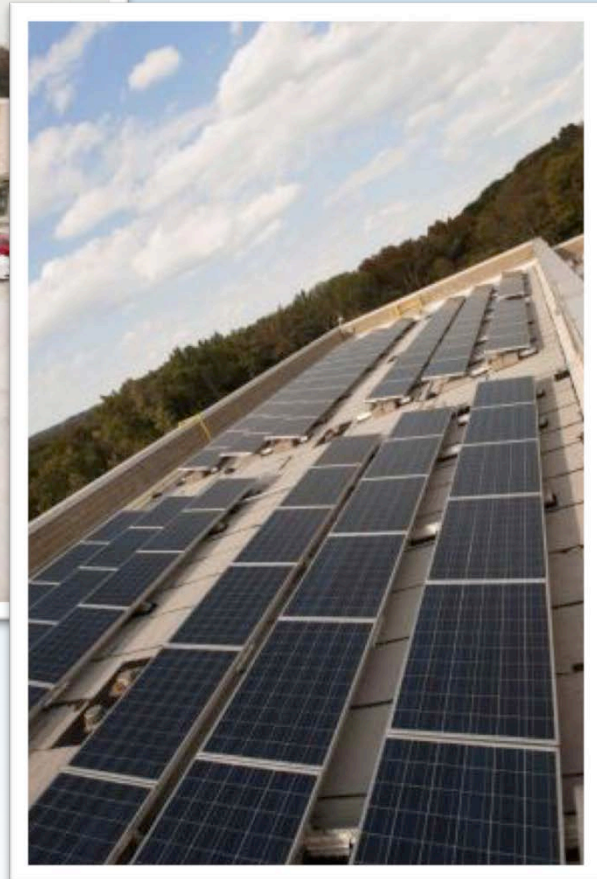
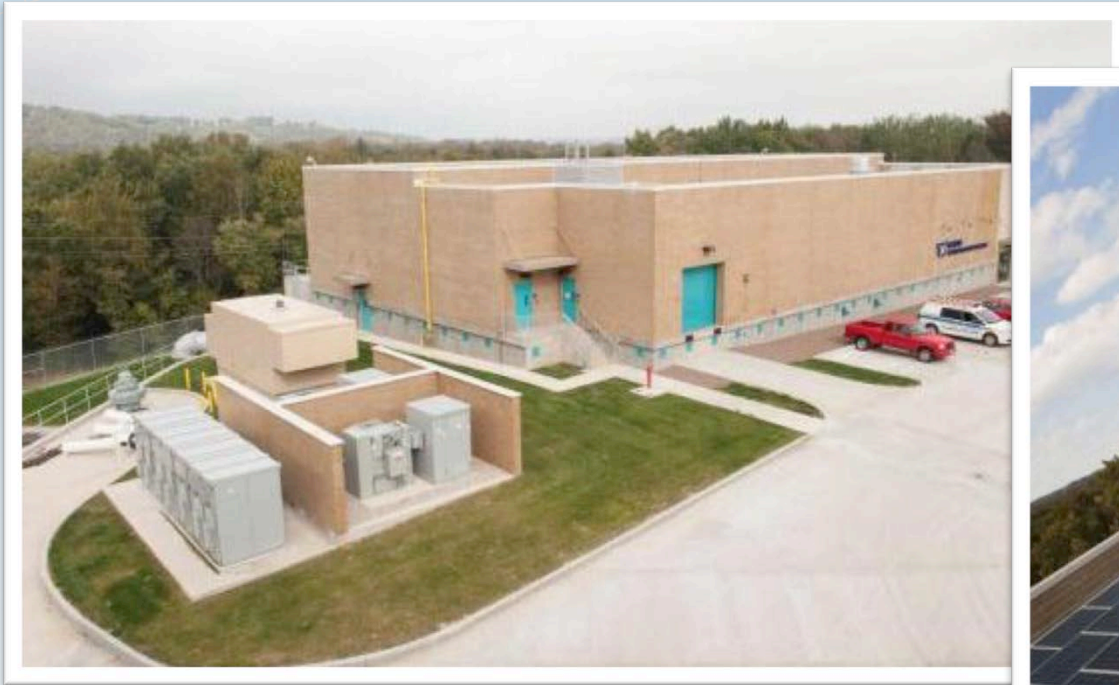
# UV Control System Allows for Multiple Disinfection and AOP Treatment Strategies



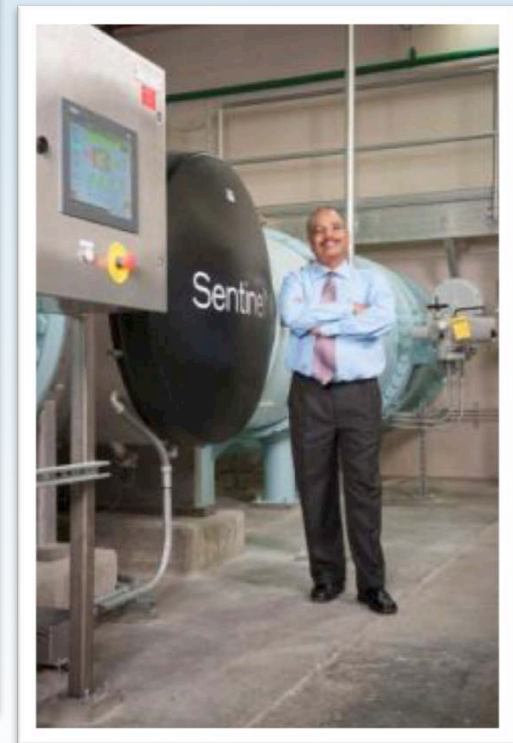
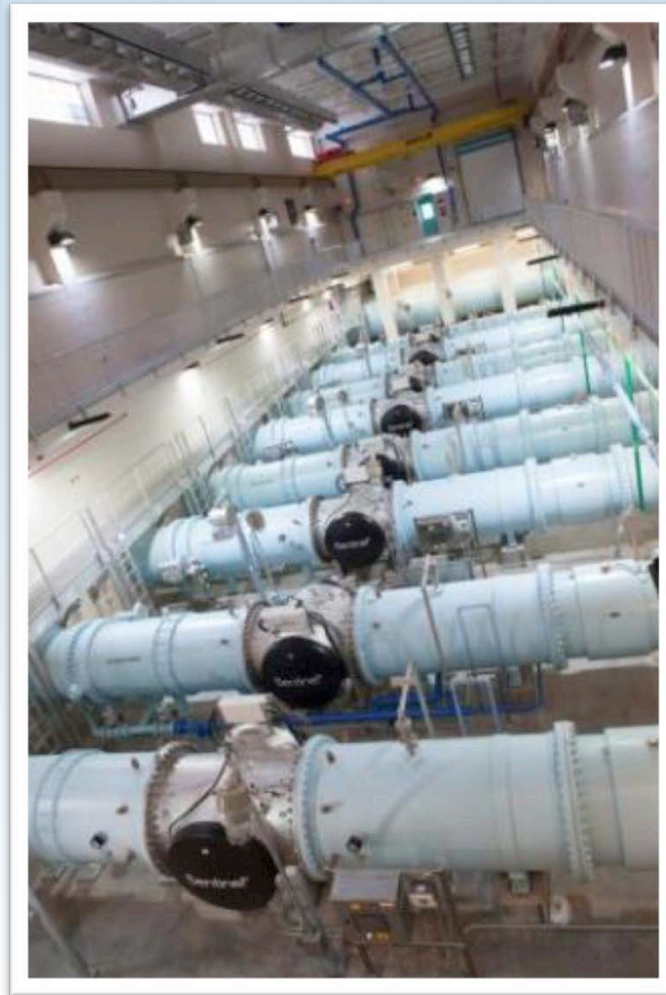
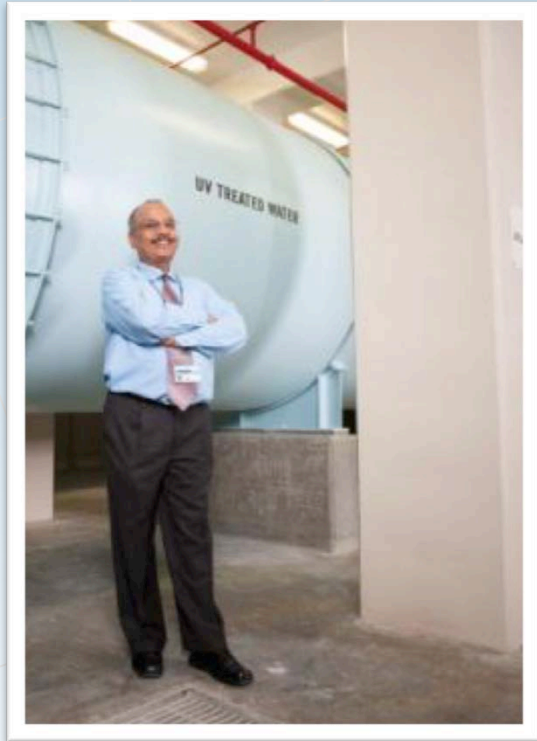
# UV Facility Site Piping Improves Unit Process Operational Flexibility



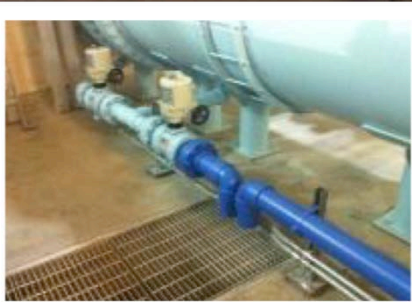
# Dual Power Feeders, Back-up Generator and Solar Panels Improve UV System Reliability



# UV Reactor Room Layout Provides Direct Access to 8 UV Trains



# OIT Screens, Drain Piping and Encased Conduit for Each UV Train Facilitates UV System Operations





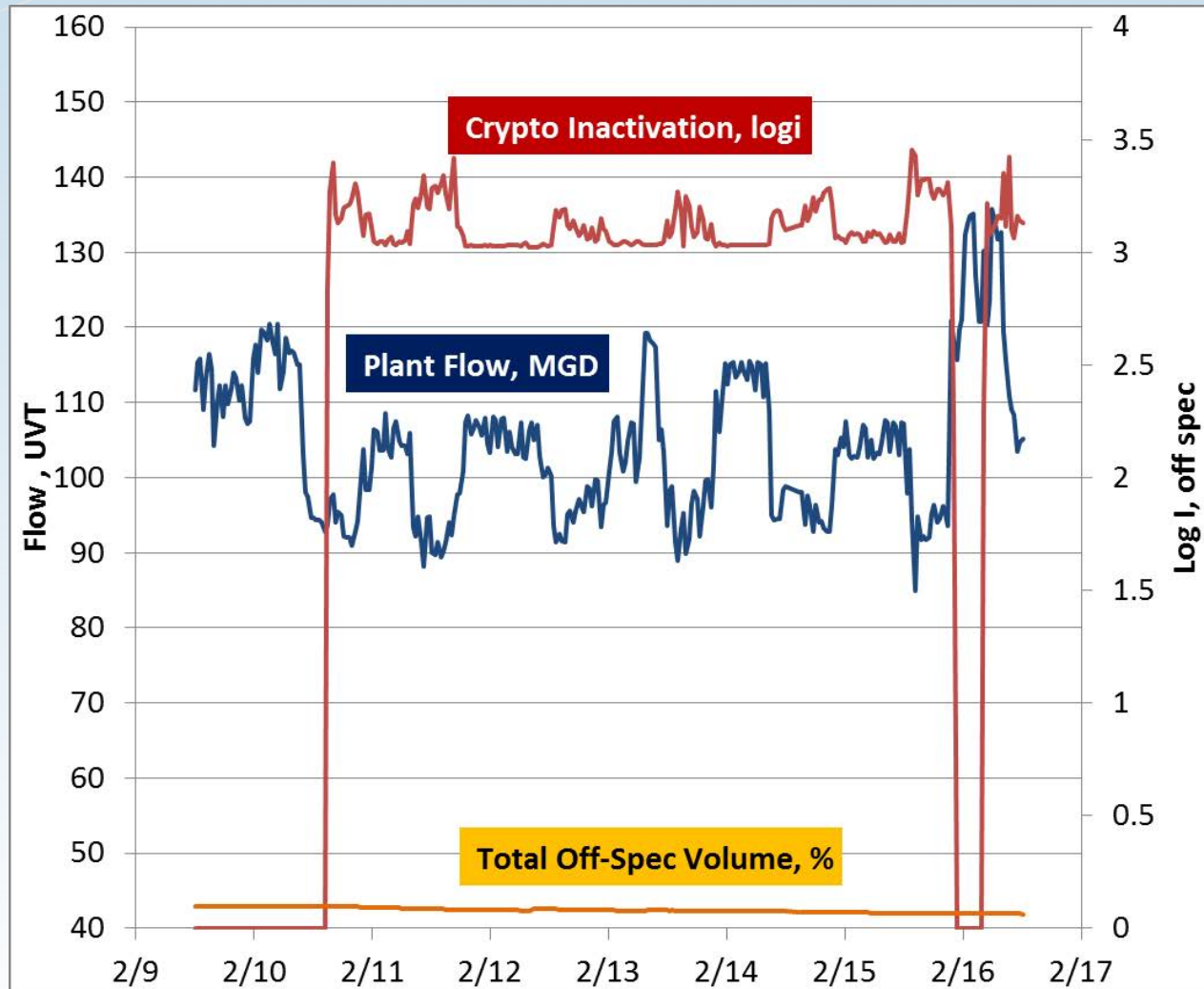
# Upper Level Electrical Room Houses MCCs and UV Master and Local Control Panels



# UVT, Chlorine Injection, and Demo Train Systems Enhance UV System Operations Now and in Future



# UV Control Logic Verified in Remote-Auto Mode for 30-day Acceptance Test



# Proactive, Integrated Design Team Implements Successful UV Project for Cincinnati

- UV planning models for cost-effective design and operation
  - *UVCAT, CFD, USEPA Risk Model*
- Large scale reactors for reduced footprint and operating cost
- Advanced UV dose control logic for multiple disinfection/AOP treatment strategies



*Construction Cost: \$30 million*  
*Customer Rate Impact: \$0.30/mo*

# QUESTIONS

