

## Metrics for Successful Supercritical Water Oxidation System Operation at the Blue Grass Chemical Agent Destruction Pilot Plant

The Blue Grass Army Depot is one of the last two sites in the United States with a stockpile of chemical munitions. This stockpile consists of rockets, projectiles, and mortars that contain the nerve agents GB (sarin) and VX as well as the blister agent mustard. Under the direction of the Program Executive Office for Assembled Chemical Weapons Alternatives (PEO ACWA), the Blue Grass Chemical Agent Destruction Pilot Plant (BGCAPP) is expected to begin operations in Fall 2019. BGCAPP will neutralize the nerve agents through a chemical hydrolysis process, followed by super critical water oxidation (SCWO). The SCWO system is designed to destroy the organic compounds in the neutralized agent to meet the requirements of the Chemical Weapons Convention treaty that the United States signed in 1993.

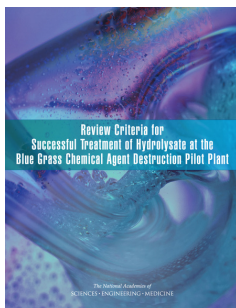
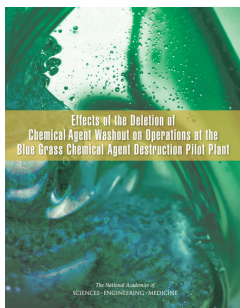


Based on a 2015 report (listed on the next page), PEO ACWA asked the National Academies of Sciences, Engineering, and Medicine to propose metrics that could be used to judge whether the SCWO system at BGCAPP is meeting its performance goals. PEO ACWA will decide on the final metrics to be used. The committee focused primarily on technical aspects of the SCWO system. Key points from the report include:

- Like previous committees, this committee believes that the SCWO technology is likely to work.
- The BGCAPP SCWO system is still a first-of-a-kind unit. Due to the aggressive environment within the reactor and in the feed lines just before the reactor, it is possible that component failure and associated maintenance issues could slow down processing rates.
- The SCWO units will not produce a lot of numerical information during operation from which metrics can be derived. The bottom line for overall SCWO performance is availability, the amount of time the system is available for operations. Another useful metric is the total organic carbon (TOC) concentration of the SCWO product water, which indicates whether all organic compounds have been fully destroyed. Finally, the corrosion rate will be critical to successful operations. In the case of high levels of corrosion, the system might need additional maintenance and down time, slowing down but not halting the process.
- The ability to operate safely is key to successful SCWO operations. Problems that increase maintenance will also increase the risk to worker safety.
- Time and funding are not unlimited, and thus there are levels of underperformance below which continued operation of the SCWO may no longer be tenable. An objective of this report is to provide more quantitative measures and objective bases for evaluation of SCWO performance to aid PEO ACWA in making these decisions should they prove necessary.
- The committee recommends measuring as many of these metrics as possible during pre-operational testing.

## LEARN MORE BY DOWNLOADING THESE NATIONAL ACADEMIES' REPORTS:

- Effects of the Deletion of Chemical Agent Washout on Operations at the Blue Grass Chemical Agent Destruction Pilot Plant (2016) - [nap.edu/21884](http://nap.edu/21884)
- Review Criteria for Successful Treatment of Hydrolysate at the Blue Grass Chemical Agent Destruction Pilot Plant (2015) - [nap.edu/21771](http://nap.edu/21771)
- Assessment of Supercritical Water Oxidation System Testing for the Blue Grass Chemical Agent Destruction Pilot Plant (2013) - [nap.edu/18363](http://nap.edu/18363)



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