

# **An Innovative System for the Efficient and Effective Treatment of Non-traditional Waters for Reuse in Thermoelectric Power Generation**

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This project is seeking opportunities for improving water quality associated with coal-fired power generation including the use of non-traditional waters for cooling, innovative technology for recovering and reusing water from power plants, novel approaches for the removal of trace inorganic compounds from ash pond effluents, and new approaches for removing biocides from cooling tower blowdown. This research is evaluating specifically designed pilot-scale constructed wetland systems for treatment of targeted constituents in non-traditional waters for reuse in thermoelectric power generation and other purposes. The overall objective of this project is to decrease targeted constituents in non-traditional waters to achieve reuse criteria or discharge limitations established by the National Pollutant Discharge Elimination System (NPDES) and Clean Water Act (CWA). The four non-traditional waters investigated are ash basin water, cooling water, flue gas desulfurization (FGD) water, and produced water. To date, we have identified targeted constituents for treatment in the four non-traditional water sources, determined reuse or discharge criteria for treatment, and designed constructed wetland treatment systems for these non-traditional waters. The contaminants of concern identified in ash basin waters are arsenic, chromium, copper, mercury, selenium, and zinc. Contaminants of concern in cooling waters include free oxidants (chlorine, bromide, and peroxides), copper, nitrogen, phosphorus, pH, and total dissolved solids. FGD waters contain contaminants of concern including arsenic, boron, chlorides, selenium, mercury, chemical oxygen demand (COD), and zinc. Similar to FGD waters, produced waters contain contaminants of concern that are predominantly inorganic (arsenic, cadmium, chlorides, chromium, copper, lead, mercury, nickel, sulfide, zinc, total dissolved solids), but also contain some organics (benzene, PAHs, toluene, total organic carbon, total suspended solids, and oil and grease). NPDES limits are used to establish treatment goals for this research along with toxicity values for *Ceriodaphnia dubia*, water quality criteria established by the US EPA, and irrigation standards established by the USDA as well as corrosion, biofouling, and scaling potential. Constructed wetland treatment systems were designed for each non-traditional water source based on published literature reviews regarding remediation of the constituents of concern, biogeochemistry of the specific contaminants, and previous performance evaluations.