

REPORT SUMMARY

Constructed wetland treatment systems can offer significant cost savings over chemical treatment alternatives for wastewater discharges from fly ash disposal sites. This report provides an analysis comparing capital, operational and maintenance costs of a constructed wetland treatment system to the estimated costs to employ four commonly-used chemical treatment alternatives on the same site.

Background

Coal-burning electric power generation facilities may encounter compliance difficulties with metal-contaminated wastewater discharges during the mining, handling, processing, and storage of coal, and the land disposal of coal combustion by-products. These discharges must comply with National Pollution Discharge Elimination System (NPDES) effluent limitations by reducing concentrations of metals and other contaminants. At the Springdale fly ash disposal facility, owned by Allegheny Power in western Pennsylvania, a constructed wetland treatment system has been shown to be highly effective for removing regulated parameters from fly ash leachate. A detailed cost analysis has been prepared to compare this system to the cost of owning and operating alternative chemical treatment systems designed and constructed to provide a similar level of compliance.

Objectives

To provide an overview of the costs associated with treatment of wastewater by both constructed wetlands and conventional chemical methods, and to demonstrate the superior cost performance of a constructed wetland by direct cost comparison to available chemical treatment alternatives for the same site.

Approach

The principal investigators documented actual unit costs during construction of the Springdale wetland treatment system to allow estimation of construction costs for equivalent components of chemical treatment systems. Two years of system monitoring provided data to make initial projections of long-term chemical loading and wetland system cost performance. Construction cost estimates were prepared for four common chemical treatment alternatives using conceptual designs sized to provide equivalent compliance at the Springdale site. Capital replacement costs, operational costs and maintenance costs were estimated for the wetland system and the chemical treatment alternatives for a period of 50 years. The present values of these future costs were calculated to allow direct comparison of economic performance between the systems.

Results

By this analysis, the Springdale constructed wetland treatment system provides a 50 year present value savings of over \$1,270,000 compared to the least expensive chemical treatment alternative. Capital construction costs for the wetland system and chemical treatment alternatives are approximately the same; however, operational and maintenance costs are considerably lower for the wetland system. Similar economic performance is expected for other constructed wetland treatment systems for fly ash leachate or other metal-contaminated wastewaters.

EPRI Perspective

Constructed wetland treatment systems are an emerging technology within the electric utility industry for the treatment of point and non-point source discharges. EPRI is conducting a constructed wetland research program dedicated to developing these systems as a cost-effective technology for the treatment of these discharges. EPRI is collecting field data from systems built by EPRI, with utility tailored collaboration support (WO 9065-01 and 9138-01), and others, and by conducting laboratory experiments to more fully understand system functions and the factors affecting these functions (WO 4163-01 and 8204-01). EPRI will use this information to develop and deliver design criteria and a model for the effective use of these systems to reduce or eliminate the risk that electric utilities will not meet regulatory-imposed effluent discharge limits under the National Pollution Discharge Elimination System (NPDES).

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Keywords

Wastewater Treatment

Constructed Wetlands

Economics