Alternatives to Discharge for High Metal Bearing Water from Coal Ash Ponds

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BACKGROUND

Coal Ash Ponds have various concentrations of a number of metals. Although they may not be at levels to qualify them as hazardous by State or EPA definition, metals such as mercury, arsenic, and selenium present issues regarding discharge to waterways. Other than the way that coal ash is defined and regulated, the management of water in coal ash ponds is one of the most important environmental issues involved in coal ash management.

One aspect of the coal ash business is the safe, cost effective, and environmentally compliant management of water in facilities that have ponds. Power plants have options to manage these waters from discharge to POTWs, on-site treatment to off-site disposal. There is no set solution for every plant and every situation. Rather than prescribe specific solutions, facilities would benefit by a general review of the factors involved in decision making including cost, time, on-site investment, regulatory compliance, and public perception. The intention is to provide a review of options and a general discussion of benefits and general limitations.

WATER MANAGEMENT CHALLENGES

Coal Ash Pond management present a complex set of challenges. These challenges come from the size and risk of managing large volumes of water. The size of the ponds will have an impact on options to best manage water that would not be factors if the pond volumes were not so large. The risks associated with management of ponds are very significant. The risks generally fall into two categories. One is regulatory compliance. The other is financial. The risk associated with regulatory compliance is important as it may have operational implications. Some of the operational impacts could include limits to size of ponds and limits to the rate of water generation. The financial risk is related to environmental performance in terms of penalties of non-compliance, responsibility for any impact on the environment. This includes harm to third parties and future liability.
WATER MANAGEMENT OPTIONS

Management Strategies for coal ash ponds can be viewed in terms of whether they are routine or events. Routine management strategies would be based on normal and projected volumes, water quality, and effluent standards. Event management covers planned reductions in water volume. Event management also includes contingency plans for reductions in water volume on an emergency basis.

The options for managing coal ash water are either on-site or off-site. On-site options can include re-use, pretreatment or on-site solidification. Off-site options can include landfill, and deepwell disposal. The choice of a particular solution is a function of the factors that are present at each site.

The factors which can impact the choice of technology include cost, risk, volume of water and rate of treatment, regulatory requirements such as discharge conditions, volumes, and concentration limits, time, public perception, and proximity to offsite disposal options. Public interest and perception is a factor which is difficult to quantify. It is important to understand and manage this factor as it can change the choice of management technology outside more conventional and objective analysis. A review and summary of the benefits and limitations of available options is valuable for an effective coal ash water management program.

On site options can include re-use, pretreatment and discharge to a (Publically Owned Treatment Works (POTW), pretreatment and discharge by means of a State Pollution Discharge Elimination System permit or on-site underground injection wells.

COMPARISON OF WATER MANAGEMENT ALTERNATIVES

The re-use option is attractive because of the cost and water conservation aspects of re-use of any resource. The re-use option may be limited by the special requirements of the process and equipment. There is a potential for the concentrations of metals to increase with significant re-use.

Discharge and pretreatment options have many benefits for the power plant with coal ash ponds. It is cost effective versus other solutions. The level of pretreatment is governed by the discharge permit limitations. This option is well suited for relatively stable volumes and levels of contaminants.

On-site options can also include metals precipitation or ion exchange systems. If an ion exchange system is appropriate for the volume and metal concentrations, it may be easier to run than a unit to precipitate all the metals. The limitations are the ability to manage large fluctuations in flow as the unit capacity is limited by flow, metal concentration, and time to exhaust the bed. Ion exchange systems may be designed in
conjunction with other technologies to remove specific metals. Precipitation may involve purchase of chemical neutralization agents and the processes and equipment to separate solids which are subject to disposal. Any option involving ultimate discharge to a POTW or to a river has operational and financial risks associated with the ability to remain in compliance with the permit. Any time a permit is required, there is some risk that it may be challenged or impose restrictive conditions. There are compliance and testing costs associated with compliance with any permit. Discharge options may not be effective for large upsets or volumes required on an emergent basis.

An on-site deepwell injection well may be an effective alternative especially if there are pretreatment discharge issues. If applicable, a Class 1 Hazardous injection well would be permitted for injection without further treatment. The benefits are that there would be no discharges to waterways and no numerical discharge limits. This could be very effective for water that contains constituents that are difficult to treat or have very low discharge requirements. The cost of building an injection well would be generally competitive with on-site options. The limitations are the permit process and the very rigorous geological requirements which dictate whether a well could be permitted or not. The geologic requirements would likely limit this option to a small percentage of power plants with coal ponds. The permit may take a year or more. If a Class 1 Hazardous injection well is required by the water and the geology supports a well, the corresponding Federal EPA No Migration Exemption required for Class 1 Hazardous wells could take over 3 years.

Off-site options are generally not considered unless there are issues which limit on-site treatment or pre-treatment cost and efficiency. Off-site options are highly dependent on proximity to the plant as transportation costs are significant.

Landfills may have limits to the amount of liquids which can be solidified or stabilized. Chemical treatment plants may be able to treat the liquids, but are limited by the same type of ultimate discharge as the power plants themselves.

Commercial Hazardous and Non Hazardous deepwell injection wells have large capacities. They can manage waters with various concentrations of metals without the requirement for pre-treatment as they do not discharge to waterways. These facilities, although but are likely to serve plants where the cost of transportation could be justified. Access to rail or barge may be beneficial in reducing unit transportation costs.

SUMMARY

The management of water from coal ash ponds is a significant issue for power plants with wet coal ash. It is important to manage water in a way that is environmentally and economically sustainable. There are a number of ways to achieve these results. It will
be useful to look at all the options to come up with plans for operations and contingencies.