The Rising Demand for Lined Landfills: Impacts to Both the Power and Solid Waste Industries from Increased Coal Combustion Product Landfilling

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ABSTRACT

Since October 9th, 1993, the effective date of the Resource Conservation and Recovery Act (RCRA) Subtitle D regulations, municipal solid waste has been required to be landfilled in a facility that includes a flexible membrane (geomembrane) overlaying a minimum of two feet of compacted clay soil lining the bottom and sides of the landfill to protect groundwater and the underlying soil from potential leachate releases. Under rules currently being considered by the Environmental Protection Agency (EPA), coal combustion products (CCPs) will likely be required to be deposited within a facility that also meets RCRA Subtitle D regulations. These proposed regulatory changes are already causing major changes in how utilities conduct current operations, and the planning for future operations.

If the rules being considered by the EPA pertaining to landfiling of CCPs are put into place, power utilities will have to convert from the sluicing of coal ash to dry storage landfills. The resulting increase in location, design, and construction of lined landfill facilities will affect the way business is conducted for both the power industry and the public and private solid waste industry throughout the United States.

As regulations and restrictions are increased within the power industry, the demand for construction of new lined landfill space will rise, resulting in changes in the landscape of the landfill marketplace. This paper discusses and presents how utilities are reacting and addressing these new impending requirements, and the potential social, economic, environmental, and regulatory impacts to both the power and solid waste industries.
INTRODUCTION

On May 4, 2010, the EPA announced plans to regulate Coal Combustion Residuals (CCRs), also referred to as Coal Combustion Products (CCPs), for the first time under the Resource Conservation and Recovery Act (RCRA). Rather than release a specific regulation, the EPA proposed two possible options for the future regulation of CCRs.

One option would regulate CCPs under the hazardous waste provisions of the RCRA. CCPs are currently considered exempt waste under an amendment to RCRA. The other option would regulate CCPs under RCRA's nonhazardous waste provisions, with individual states responsible for the regulatory programs. These actions are the latest in a series of responses from the EPA in the aftermath of the failure of a coal ash impoundment facility in Kingston, TN in December 2008. A final coal ash rule from the EPA is expected in June 2013.

Since the Kingston event, power plant and electric utility owners and operators have faced a series of inquiries and site assessments of impoundments and ponds. The EPA has evaluated conditions across the country as well as its options to more tightly regulate CCPs, as well as the structures and facilities related to their handling and management.

All this activity combined with an uncertain regulatory future has left power plants and electric utilities without a clear path forward to provide responsible yet cost effective management of CCPs. Pending EPA Rules will likely require CCP deposition in a Subtitle C or Subtitle D lined landfill facility under RCRA. These proposed regulatory changes are already causing major changes in how utilities conduct current operations, and the planning for future operations. Power utilities are beginning to make plans for converting from the sluicing of CCP into ponds to the dry storage of CCP in landfills.

Given that both regulatory paths (Subtitle C or Subtitle D) lead to classifications that are the norm in the Municipal Solid Waste (MSW) / Waste-To-Energy (WTE) industry, forming a strategic direction toward safe and cost-effective CCP management similar to the MSW industry makes good business sense.

In addition to increased regulation of CCP handling, more stringent air quality emissions limits for power plant flue gases have and will continue to result in decreased quality of CCP for beneficial use in traditional markets. Until new markets for beneficial use of poorer quality CCPs are developed, increasing quantities of CCPs will need to be disposed of in landfills.

The “Coal Ash Recycling and Oversight Act of 2012” [1] was filed in the U.S. Senate on August 2, 2012. The bill has earned the support of state regulators, ash recyclers, the utility industry, and the business community. The base bill passed the House of Representatives with broad bipartisan support. The bill ensures the safe regulation of
coal ash in a cost-effective manner, while protecting public health, the environment, and jobs.

The bill was introduced and then referred to the Senate Environment and Public Works Committee, where it remains and it is unclear whether or not the bill will move past the Committee stage for a vote. The bill proposes to amend Subtitle D of the Solid Waste Disposal Act under RCRA to facilitate recovery and beneficial use, and provide for the proper management and disposal, of materials generated by the combustion of coal and other fossil fuels. The bill further proposes strong state oversight for storage and management of CCPs via permitting programs that must be based on federal RCRA standards. The bill also seeks to prevent the EPA from regulating coal ash as a hazardous waste under RCRA.

While EPA regulation and legislative action is pending, utilities must continue to provide services while preparing for future operational changes in handling, disposal, and beneficial use of CCPs. As regulations and restrictions are increased within the power industry, the demand for construction of new lined landfill space will rise.

POTENTIAL SOCIAL IMPACTS

Increasing numbers of CCP landfill facilities will likely result in increased opposition and NIMBY (Not In My Back Yard) activities for all types of landfills, including CCP and MSW landfills. RCRA Subtitle D regulations for MSW landfills require an extensive public involvement process for the planning, location, and permitting of new MSW landfills. If the RCRA Subtitle D regulatory framework is applied to CCP landfills, the public will have the opportunity to participate in the process of applying proven methods of handling and disposal of MSW to the handling and disposal of CCPs.

Locating and permitting new landfill facilities is a difficult and lengthy process. Regulatory requirements for public involvement, environmental protection of groundwater and surface water, considerations for seismic activity, and other factors make suitable locations difficult to find and permit. As the demand for new CCP landfills increases, and as new CCP landfills are permitted, there will be a resulting decrease in land availability for future landfills of all types. This will make locating and permitting any type of landfill more difficult in the future.

Beneficial use of CCPs has largely been an untold success story, with a 14.8% increase in recycling rate from 2000 to 2008 [2]. However in recent years, since the Kingston event in December of 2008, CCPs have been perceived more as a waste and not as a resource.

According to the latest “Production and Use Survey” from the American Coal Ash Association (ACAA) [2], regulatory uncertainty concerning the disposal of CCPs has kept beneficial use levels below those reported in 2008 for a third consecutive year.
The increase in CCP landfill siting and permitting activities will focus more social attention to either viewing CCP as resource for beneficial use, or viewing it as a waste to be deposited in a landfill. The social attention will result in an increase of research for ways to beneficially use CCPs, and an increase in efforts to decrease the use of coal for energy production. This leads to potential economic impacts.

POTENTIAL ECONOMIC IMPACTS

The proposed regulatory changes are already causing major changes in how utilities conduct current operations, and the planning for future operations. Potential economic impacts to the landfiling of CCPs are numerous. A few of the potential economic impacts are presented below:

- Increased costs for production of power due to costs of CCP landfilling
- Increased lawsuits which could add to increased power production costs
- Increased costs for property purchase for both CCP and MSW landfills as a result of the increased demand for properties suitable for landfills
- Increased landfill permitting costs
- Increased private industry CCP landfill operation and management opportunities
- Increased CCP landfill operation and management job opportunities for experienced personnel
- Increased competition within the waste hauling and landfilling industry (which could result in decreased CCP landfilling costs over time)
- Increased emphasis on research and opportunities for beneficial use of CCPs

Many of these potential impacts could result in decreased costs overall, especially if MSW and CCP landfill facilities are co-located. This concept is discussed further in the next section.

POTENTIAL ENVIRONMENTAL IMPACTS

As a greater volume of CCPs is deposited into landfills instead of being beneficially used, there are both potentially negative and potentially positive environmental impacts.

Potentially negative environmental impacts include less open space and greater use of natural resources due to CCP landfill construction. Greenhouse gas emissions will be impacted from CCP landfill construction equipment and CCP landfill operational equipment activities. With increased CCP landfill construction and subsequent deposition of CCP within the newly constructed landfills, the perception of CCP as a resource will likely decrease, resulting in a decrease of beneficial CCP use and recycling.

Potentially positive environmental impacts include greater protection of groundwater and surface water resources through the construction of lined CCP landfills. CCP landfill closures under RCRA rules would be beneficial to the environment through
decreasing the potential for leachate generation and impact to groundwater and surface water resources.

With the down-turn in the United States economy since 2008, MSW generation rates have decreased [3]. Coupled with the rise in the deposition of CCP in landfills [4], there is a synergistic opportunity to co-locate MSW and CCP landfills in separate cells on the same site. In this manner, facilities, equipment, operations, and maintenance are combined for the two landfill streams, realizing efficiencies, decreasing operational costs, and leading to potential environmental benefits by reducing the number of separate landfill facilities.

The addition of the CCP volume would help to replace the lost MSW volume from the recent economic downturn in the United States, thereby increasing revenues, all while providing an environmentally sound location for deposition of both landfill streams. By placing the CCP and MSW in separate cells, the opportunity for mining for beneficial use / resource recovery in the future is protected, rather than co-mingling the two streams.

Test cells could be constructed where MSW and CCP are co-mingled, or where CCP is used as daily cover material for MSW. The effects of co-mingling and / or daily cover use could be studied to determine the practicality, limitations, and potential benefits.

Similar systems are needed for proper operations at both MSW landfills and CCP landfills. Potential economy of scale benefits from co-location of MSW landfills and CCP landfills could include shared:

- Landfill operation facilities, equipment, and personnel
- Hauling, handling, and placement of CCP / MSW
- Collection, transport, and treatment of landfill leachate
- Storm water and fugitive dust control
- Groundwater and surface water monitoring
- Regulatory compliance checks and corrective actions
- Closure and Post Closure Care planning

Opportunities for beneficial use of bottom ash for daily cover and internal haul road construction instead of using borrow soil within co-located MSW / CCP landfills could be explored. Opportunities for future mining of CCP landfills for beneficial use of CCPs that are not currently recyclable due to lack of market demand or due to poor material quality could also be explored in the future. These ideas and others can be explored for potential benefits to the environment as a result of the increase in the number of CCP landfills.
POTENTIAL REGULATORY IMPACTS

Since October 9th, 1993, the effective date of the Resource Conservation and Recovery Act (RCRA) Subtitle D regulations, MSW has been required to be landfilled in a facility that includes a flexible membrane (geomembrane) overlaying a minimum of two feet of compacted clay soil lining the bottom and sides of the landfill to protect groundwater and the underlying soil from potential leachate releases. Under rules currently being considered by the Environmental Protection Agency (EPA), coal combustion products (CCPs) will likely be required to be deposited within a facility that also meets RCRA Subtitle D regulations.

The RCRA Subtitle D regulatory framework will result in an increase in regulatory scrutiny on CCP handling and operations as compared to current operational requirements. New CCP landfill permits, as well as closures of existing CCP landfills, dry fly-ash stacks, gypsum stacks, and combined CCP stacks would be subject to RCRA regulations. In turn, there will be an increased burden on state and federal regulators for processing of landfill permits that could extend the processing time for landfill permits, landfill permit modifications, and closure permits for both CCP and MSW landfills.

If the regulatory permit process for new landfills and landfill closures becomes a bottleneck, there will likely be increased legislative and political involvement to move the regulatory promulgation process forward.

CONCLUSIONS

If the rules being considered by the EPA pertaining to landfilling of CCPs are put into place, power utilities will have to convert from the sluicing of coal ash to dry storage landfills. The resulting increase in location, design, and construction of lined landfill facilities will affect the way business is conducted for both the power industry and the public and private solid waste industry throughout the United States.

As regulations and restrictions are increased within the power industry, the demand for construction of new lined landfill space is rising, resulting in changes in the landscape of the landfill marketplace. This paper discussed these new impending requirements, and the potential social, economic, environmental, and regulatory impacts to both the power and solid waste industries.

Given that both regulatory paths (Subtitle C or Subtitle D) lead to classifications that are the norm in the MSW / WTE industry, forming a strategic direction toward safe and cost-effective CCP management similar to the MSW industry makes good social, economic, environmental, and regulatory sense.

In addition to increased regulation of CCP handling, more stringent air quality emissions limits for power plant flue gases have and will continue to result in decreased quality of
CCP for beneficial use in traditional markets. Until new markets for beneficial use of poorer quality CCPs are developed, increasing quantities of CCPs will need to be disposed of in landfills.

While EPA regulation and legislative action is pending, utilities must continue to provide services while preparing for future operational changes in handling, disposal, and beneficial use of CCPs. As regulations and restrictions are increased within the power industry, the demand for construction of new lined landfill space is already rising.

The resulting need for and increase in location, design, and construction of lined landfill facilities will affect the way business is conducted for both the power industry and the public and private solid waste industry throughout the United States. Increased CCP landfilling will impact the social, economic, and regulatory framework of both the power and solid waste industries, resulting in continued protection of the environment, and increased focus and research to beneficially use CCPs now and in the future.

REFERENCES

The Rising Demand for Lined Landfills

Impacts to both the Power and Solid Waste Industries from Increased Coal Combustion Product Landfilling
Introduction

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Discussion Outline
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- CCP / Solid Waste Connection
- MSW Supply vs. CCP Demand
- Potential Impacts
- Potential Solutions
- CCP Connections
- Conclusions
CCP / Solid Waste Connection
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- What are Coal Combustion Products (CCPs)?
  - Bottom Ash – heavier materials remaining after coal combustion
  - Fly Ash – lighter materials remaining after coal combustion
  - Gypsum – product from emissions control systems
  - Pyrites – rock, iron, & other materials remaining after coal pulverization prior to combustion
CCP / Solid Waste Connection

○ What is the Connection to Solid Waste?
  ○ Monday, December 22\textsuperscript{nd}, 2008
  Kingston, Tennessee  Ash Spill

Then

Now
CCP / Solid Waste Connection

- Pending EPA Rules in Response to the Ash Spill
  - Hazardous or Non-Hazardous?
    - Subtitle C or Subtitle D Liner Requirements?

- Result: A Rise in Demand for Lined Landfill Space
CCP / Solid Waste Connection

As reported by the ACAA Washington News Alert on April 20th, 2013:

- EPA Signals Shift Away From “Hazardous Waste” Designation in New Proposed Rules for Coal-Fueled Power Plants

- The U.S. Environmental Protection Agency announced Friday, April 19, 2013, that it will propose “a range of options” for regulating water discharges from steam electric power plants. Contained in EPA’s proposal was this statement about the related Coal Combustion Residuals rulemaking that has been under way since 2010:
“Although a final risk assessment for the CCR rule has not yet been completed, reliance on the data and analyses discussed above may have the potential to lower the CCR rule risk assessment results by as much as an order of magnitude. If this proves to be the case, EPA’s current thinking is that, the revised risks, coupled with the ELG requirements that the Agency may promulgate, and the increased Federal oversight such requirements could achieve, could provide strong support for a conclusion that regulation of CCR disposal under RCRA Subtitle D would be adequate.”
MSW Supply vs. CCP Demand
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- Effects of the “Great Recession”
- Less Consumption of Goods and Purchase of Products = Less Waste
MSW Supply vs. CCP Demand

- Municipal Solid Waste Tonnage Supply Decrease + CCP Landfill Space Demand Increase = Business Opportunity

MSW Industry Example:
Waste Management, Inc.
Advertisement in recent ACAA “Ash at Work” Magazine
MSW Supply vs. CCP Demand

- Another Business Opportunity Example

**Landfill Industry:**
EnviroSolutions, Inc.

- Big Run is located in appropriately named Ashland, KY
- Copper Ridge is located in Caples, WV
Potential Impacts
Potential Impacts

- Social
  - Increased Opposition – NIMBY
  - Decreased land availability for future landfills
  - Increased difficulties in locating and permitting landfills in general
  - Increased perception that CCP is a waste not a resource
Potential Impacts

- Economic
  - Landfill job opportunities
  - Private O&M opportunities
  - Property purchase prices
  - Lawsuits
  - Permitting Costs
  - Utility Costs
  - Competition
Potential Impacts

- Environmental
  - Impacts to open space
  - Use of natural resources
  - Aversion to beneficial use and recycling
  - Greenhouse gas emissions
  - Groundwater and surface water protection
Potential Impacts

- Regulatory
  - Permitting Burden
  - Permit Processing Time
  - Regulatory Scrutiny
  - Political Involvement
Potential Solutions
Potential Solutions

- Co-location* of MSW and CCP Landfills to realize economies of scale with similar systems needed for:
  - Landfill O&M (facilities, equipment, personnel)
  - Hauling, Handling, and Placement
  - Leachate Collection, Transport, & Treatment
  - Stormwater Control
  - Groundwater Monitoring
  - Regulatory and Permitting Activities

* In separate landfill cells; not co-mingled
Potential Solutions

- Beneficial use of CCP (coarse bottom-ash) within MSW Landfills for daily cover and road construction instead of using borrow soil material
- MSE Wall construction
- Increase Beneficial Use of CCPs
- Future mining opportunities
Potential Solutions

The Rising Demand for Lined Landfills
CCP Connections
CCP Connections

- Recent Examples of where HDR is making CCP Connections
  - TVA CCP Wastewater Treatment Studies
  - Charah, Inc. – CCP MSE Wall Design for LG&E & Big Rivers Sebree Fossil Plant, KY
  - Luminant – OE services on CCP monofill sites in TX
  - GDF Suez – Exposed Geomembrane Solar cap for CCP monofill site in Chile
CCP Connections

CCR MANAGEMENT LIFECYCLE

Power House | CCR Handling | Impoundment Pond | Dredging | Interim Storage | Truck | CCR Recovery and Landfill Containment

CCR Handling and Pond Impoundment | Pond Dredging and Remediation | Dry Stack Storage and Recovery | Transport | Remanufacturing

HDR SERVICES SPAN THE PROJECT LIFE-CYCLE

STRATEGIC CONSULTING | REGULATORY COMPLIANCE | NATURAL RESOURCES | ENGINEERING | CONSTRUCTION MANAGEMENT | ALTERNATIVE DELIVERY

| The Rising Demand for Lined Landfills |
Conclusions
Conclusions

- Increased demand for CCP Landfills is significantly impacting both the Power and Solid Waste industries
- Co-location of MSW & CCP Landfills has significant potential benefits
- Making Connections at WOCA 2013 facilitates CCP use solutions
- Providing CCP use solutions = reduced power costs, increased business opportunities, and WOCA 2015!
Questions?

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