BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:	)	
	)	R 2020-019
STANDARDS FOR THE DISPOSAL OF	)	
COAL COMBUSTION RESIDUALS IN	)	(Rulemaking – Water)
SURFACE IMPOUNDMENTS:	)	
PROPOSED NEW 35 ILL. ADM.	)	
CODE 845	)	

NOTICE OF FILING

To: Service List

PLEASE TAKE NOTICE that I have today electronically filed with the Office of the Clerk of the Pollution Control Board Midwest Generation, LLC's First Post Hearing Comment, a copy of which is herewith served upon you.

Dated: October 1, 2020

MIDWEST GENERATION, LLC

By: ___/s/Kristen L. Gale ___________

Susan M. Franzetti
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CERTIFICATE OF SERVICE

The undersigned, an attorney, certifies that a true copy of the foregoing Notice of Filing, and Midwest Generation, LLC's First Post Hearing Comment was electronically filed on October 1, 2020 with the following:

Don Brown, Clerk of the Board
Illinois Pollution Control Board
James R. Thompson Center, Suite 11-500
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Chicago, IL 60601
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and that copies were sent via e-mail on October 1, 2020 to the parties on the service list.

Dated: October 1, 2020 /s/Kristen L. Gale ____________

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BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:	)	
	)	
STANDARDS FOR THE DISPOSAL OF COAL COMBUSTION RESIDUALS IN SURFACE IMPOUNDMENTS: PROPOSED NEW 35 ILL. ADM. CODE 845	))))	R 20-19 (Rulemaking – Land)
	)	

MIDWEST GENERATION LLC'S FIRST POST HEARING COMMENT

Midwest Generation L.L.C. ("MWG"), by and through its attorneys, Nijman Franzetti, LLP, submits supplemental responses to the questions posed by the Illinois EPA to David Nielson related to his conclusion that the Human and Ecological Risk Assessment of Coal Combustion Residuals, December 2014, Regulation Identifier Number: 2050-AE81 ("Risk Assessment") did not model coal combustion residual ("CCR") surface impoundments with leachate collection systems.

Risk Assessment Section 4.3.1 on p. 4-6 states:

> "Most surface impoundments are known to be periodically dredged. Since this dredging would remove any potential source postclosure, only the operational phase of a surface impoundment was modeled"

Risk Assessment Section "Surface Impoundment Leaching Duration" on p. 5-28 through 5-29 states:

> "EPA considered the potential impact of postclosure releases through a sensitivity analysis (see Appendix K). This sensitivity analysis modeled closed surface impoundments equivalent to closed landfills, with the full constituent mass still available to leach without replacement. The results of this comparison show that releases from surface impoundments drop dramatically after closure, even with waste in place. This is because the large hydraulic head present during operation forces leachate into the underlying soils at a faster rate, resulting in higher releases to ground water than can occur postclosure. Based on these findings, EPA concluded that the assumption of clean closure has a negligible effect on modeled risks."

Risk Assessment Section 2.2.1 on p. 2-3 states:

> "It is assumed that all waste is removed from most units prior to closure (i.e., clean closure). However, in some instances, waste is left in place and the unit is closed and capped. Closed surface impoundments are assumed to behave the same as a closed landfill."

Risk Assessment Section K.2.1 on p. K-1 states:

> "The removal of free liquids and capping during closure reduces the hydraulic head and the rate of contaminant migration. After closure is complete, infiltration through the impoundments is driven only by percolation of incident precipitation through the cap."

At the request of the Hearing Officer, copies of the pages 2-3, 4-6, 4-7, 5-28, 5-29, and K-1 are attached. [1] Also, MWG notes that there was an inadvertent omission in a citation in Mr. Nielson's Answer to Illinois EPA Question 14.g. The citation should be 40 CFR 257.103(k)**(1)**(i).

Respectfully submitted,

MIDWEST GENERATION, LLC
By: /s/ Kristen L. Gale
One of Its Attorneys

Dated: October 1, 2020

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[1] Page 4-7 is attached to fill the gap between page 4-6 and pages 4-8 and 4-9, which were attached as Exhibit 1 to MWG's Answers to Questions filed on September 24, 2020.

Neither conceptual model includes direct, point source discharges to surface water. These types of releases are permitted under the National Pollutant Discharge Elimination System of the Clean Water Act and have been evaluated separately in the *Environmental Assessment for the Proposed Effluent Limitation Guidelines and Standards for the Steam Electric Power Generating Point Source Category* (U.S. EPA, 2013). The risk assessment for direct discharges was conducted in support of proposed effluent limitation guidelines (ELG) for the steam electric power generating point source category.[6] That assessment is under revision by EPA in response to the public comments received on the proposal and will be released in conjunction with the final ELG rule.

Surface water used as a source of potable water is not included in either conceptual model. Surface water is assumed to be routed through a municipal water treatment facility prior to consumption, reducing constituent levels present. Furthermore, neither conceptual model includes incidental ingestion of, inhalation of, or dermal contact with COPCs in surface water that may occur during swimming or other activities near a water body. For human receptors, it is assumed that these exposures are infrequent and small in comparison to similar exposures from ground water.

2.2.1 Surface Impoundment Conceptual Model

Surface impoundments are conceptualized as square units that are constructed anywhere from entirely above grade to entirely below ground surface. During operation, a surface impoundment receives waste sluiced from the facility. Over time, impoundment water may be lost to some combination of infiltration, evaporation, and controlled discharges to other impoundments and nearby water bodies, while the CCR solids either accumulate until the surface impoundment's capacity is reached or are periodically dredged for final disposition elsewhere. To reflect that the majority of impoundments are periodically dredged, the conceptual model assumes that dredging losses are balanced out by continued loading from the facility, resulting in a constant ponding depth over the operational life. It is assumed that all waste is removed from most units prior to closure (i.e., clean closure). However, in some instances, waste is left in place and the unit is closed and capped. Closed surface impoundments are assumed to behave the same as a closed landfill. **Figure 2-2** depicts a cross-section of the conceptual layout for operating impoundments.

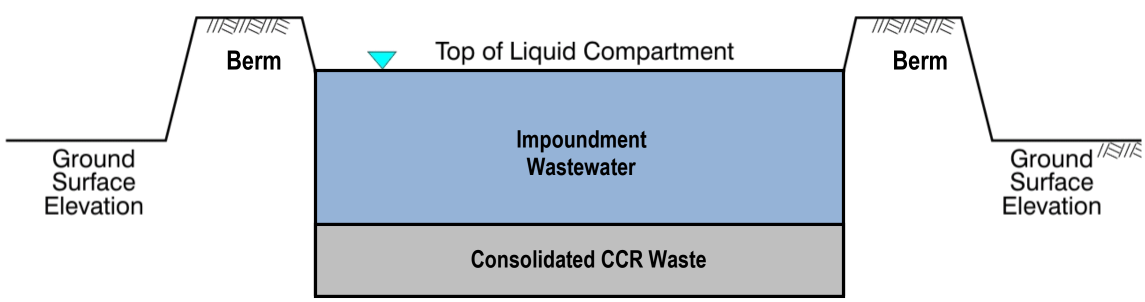

Figure 2-2. Cross-sectional view of generic surface impoundment site model.

Chemical constituents can be released from surface impoundments through the leaching of soluble constituents into the water that comes in contact with the CCRs and percolation of the resulting

[6] Available online in docket number EPA-HQ-OW-2009-0819 at: www.regulations.gov.

data preparation loop also assigned a specific waste sample to each landfill entry, with an equal probability assigned to each sample. During the calculation loop, the models probabilistically sampled the assigned pH distribution during each model iteration. This pH was used to identify the pH-specific leachate concentration measured with LEAF Method 1313. The modeled leachate concentration was calculated in one of two ways, based on the type of leaching behavior exhibited by the waste sample at that pH (discussed further in **Appendix I**):

- **Solubility-Controlled Leaching** occurs when the total COPC mass available to be released from the waste is greater than the maximum amount that can be dissolved in the mass of water present. Because the solubility limit is reached at the higher liquid-to-solid ratio (L/S ratio) of 10:1 used in Method 1313, it will also be reached at the lower L/S ratio of around 1:2 typical of landfills. Thus, the concentrations measured with Method 1313 accurately reflect solubility-controlled leaching from landfills and the measured concentration was used for the model iteration.
- **Washout-Controlled Leaching** occurs when the total COPC mass available to be released from the waste is less than or equal to the maximum amount that can be dissolved in the mass of water present. Because the solubility limit is not reached for the higher L/S ratio of 10:1 used in Method 1313, the water concentration will increase as the L/S ratio decreases until the solubility limit is reached. Thus, washout-controlled leaching from landfills will be higher than the concentrations measured with Method 1313. To account for the difference in L/S ratios between Method 1313 and landfills, the measured Method 1313 concentration was multiplied by a factor of 20. This calculated concentration was used for the model iteration.

4.3 Leaching Duration

The following subsection summarizes the approach used to assign leaching durations to each WMU within the probabilistic framework. Leaching duration is the length of time that a WMU releases leachate into underlying soils. Because the aim of this probabilistic analysis is to provide an accurate estimate of peak concentrations, the leaching duration of interest for a WMU may not be the same as the total leaching duration. The duration of interest differs for surface impoundments and landfills because of the distinct leaching behavior of the two WMUs during operation and postclosure. Therefore, EPA used different data to characterize the leaching duration for surface impoundments (**Section 4.3.1**) and landfills (**Section 4.3.2**).

4.3.1 Surface Impoundments

Most surface impoundments are known to be periodically dredged. Since this dredging would remove any potential source postclosure, only the operational phase of a surface impoundment was modeled. The highest releases from surface impoundments are anticipated to occur during operational life due to the presence of a large hydraulic head that will drive infiltration rates. As a result, the length of the operating life was a key parameter for this analysis. Data on impoundment operating life were drawn from EPRI (1997a). A total of 86 of the 116 surveyed impoundments provided both an opening date and projected closure date, from which EPA calculated the expected operating life. No projected closure date was provided for the other 30 surface impoundments.

Figure 4-2 shows the distribution of the calculated operating lives, along with a separate bar representing units with no reported closure date.

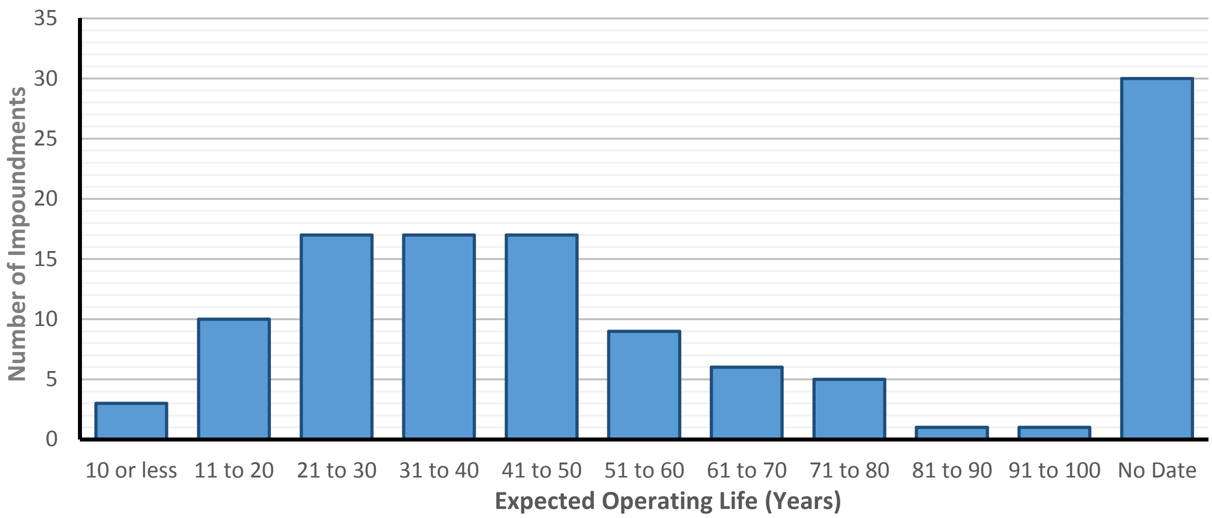

Figure 4-2. Distribution of operating life for surface impoundments from EPRI (1997a).

The calculated 50th percentile impoundment operating period was 40 years, while the 95th percentile value was 75 years. More recent information available in the CCR WMU database corroborates the distribution of expected operating life, and shows that many impoundments are currently approaching 40 years of age. At the same time, the EIA reported a large decrease in wet handling between 2009 and 2012 and many facilities have publicly announced plans to close surface impoundments.[12] Due to the uncertainty in operational lifetime for nearly a quarter of these units, and the potential for extended operational life through dredging, EPA selected a 95th percentile value of 75 years was assigned to all surface impoundments during the data preparation loop.

4.3.2 Landfills

Leaching from landfills was assumed to start at closure when the unit is filled to capacity with CCR waste. This point was chosen because EPACMTP requires a fixed WMU size, and the size at closure represents the largest possible footprint. Postclosure landfills were modeled as a finite source because the buried waste is not replenished as it leaches. For all COPCs except arsenic, leaching was idealized as a single, constant source that continued until the total available mass of a COPC had been depleted. For these COPCs, the total available mass was estimated as the maximum mass released at any pH over the range of 2.8 and 12.8 measured with Method 1313. The exact leaching duration varied between model iterations based on the modeled leachate concentration, total available mass and the leaching rate.

[12] Wilson, Mark. 2009. "Coal ash disposal varies from company to company." Evansville Courier & Press. October 24. Available online at: www.courierpress.com/lifestyle/health-and-fitness/coal-ash-disposal-varies-from-company-to-company

Table 5-21. Likely Effect on Modeled Risk from Toxicity Benchmark Uncertainties

Uncertainty	Likely Effect on Risk		
	Uncertain	Low	High
Bioconcentration Factor	●		

5.1.7 WMU Source Term Models

Scaling of Washout Constituent Concentrations

Leaching profiles of washout phase constituents are characterized by an initial high-concentration pulse of 20 times the Method 1313 equilibrium concentration followed by a lower concentration pulse that continues until the leachable content is depleted. The use of a factor of 20 is supported by field data, as seen in U.S. EPA (2014b). However, in some cases, preferential flow or other considerations may result in concentrations only 10 times the Method 1313 equilibrium concentration. Therefore, this is unlikely to result in a significant uncertainty to the analysis.

Constant Leachate Concentrations

The nonlinear fate and transport solution used for inorganic constituents in the unsaturated zone module of EPACMTP requires constituent concentrations leached from the bottom of WMUs to remain constant for the entire duration of leaching (U.S. EPA, 2003b). However, empirical evidence reported in U.S. EPA (2009a) indicates that constituents can exhibit a leaching profile that changes over time. EPA conducted a sensitivity analysis to estimate the potential magnitude of error introduced by modeling a single, high-concentration pulse for washout constituents. This analysis, presented in **Appendix I**, found that there was a negligible (< 1 percent) difference in the peak time-averaged drinking water concentrations using a single, high-concentration pulse until depletion, or two pulses representing a high concentration followed by a low-concentration pulse until depletion. Although a leaching profile that changes over time may be more realistic, the simplified leaching profile used by the model provides very good approximations for peak ground water concentrations overall, and thus has a minimal effect on the risk results.

Surface Impoundment Leaching Duration

Leaching from surface impoundments was modeled based on the assumption that these units are periodically dredged during operation, resulting in a constant source that is continuously replenished. To reflect this assumption, the leachable mass was set equal to the total constituent mass in EPACMTP. This indirectly accounted for the constant source because an operating time of 75 years for impoundments is not enough to deplete the entire constituent mass present in CCR waste. After this timeframe, the model assumed clean closure of impoundments. EPA received public comments that indicated this approach is not consistent with the current practice of closing with wastes in place at some surface impoundments.

EPA considered the potential impact of postclosure releases through a sensitivity analysis (see **Appendix K**). This sensitivity analysis modeled closed surface impoundments equivalent to closed landfills, with the full constituent mass still available to leach without replacement. The results of this comparison show that releases from surface impoundments drop dramatically after closure, even with waste in place. This is because the large hydraulic head present during operation forces leachate into the underlying soils at a faster rate, resulting in higher releases to ground water than can occur postclosure. Based on these findings, EPA concluded that the assumption of clean closure has a negligible effect on modeled risks.

Landfill Leachable Content

It is likely that there may be some insoluble or otherwise unleachable constituent mass that remains bound within any waste. To account for the presence of this recalcitrant fraction, EPA used empirically derived estimates of the leachable mass of each constituent based on data collected using SW-846 Method 1313. However, long-term leachate studies have shown that short-term test methods may underestimate the total mass of constituents that can leach over longer periods of time (U.S. EPA, 2009a). For example, additional mass may become available as the physical matrix of the waste degrades over time.

EPA conducted a sensitivity analysis to provide a bound on the effects that the availability of this additional mass could have on modeled risks. In this sensitivity analysis, the Agency reran EPACMTP for landfills the same as in the full probabilistic analysis, except with the total constituent mass used in place of the leachable mass. This was done for 62 out of 69 CCR wastes sampled with Method 1313 for which data on total constituent mass were available. Since it was the only constituent to exceed any risk criteria in other sensitivity analyses conducted for landfills, arsenic (both III and V) was modeled for this analysis.

The use of total constituent mass resulted in an increase in arsenic III by a factor of less than 2, and an increase in arsenic V by a factor of 3 or less. These increases are not sufficient to push the modeled probabilistic risks above either cancer or noncancer criteria for either species. Furthermore, even if the total mass present in CCR waste were available to leach, it is unlikely that this mass would be released as a continuous pulse or at the same rate as early releases. Therefore, given that this conservative bound on releases modeled with total mass did not appreciably increase risks, the impact of this uncertainty on the modeled risks is negligible.

Closed Landfill Source Term

Landfills were only modeled postclosure because the nonlinear sorption isotherms used by EPACMTP require the infiltration rate to be held constant. The landfill source model assumes that the full footprint of the landfill is filled to capacity at the start of modeling, and that a cap no less permeable than the soil or liner underlying the WMU is present to avoid accumulation of water within the landfill. However, during operation, only a portion of the landfill will actively receive CCR wastes at any given time. The active portion of a landfill would be exposed directly to the elements. While the cap modeled on the closed landfill will limit infiltration, the filled capacity will overestimate the initial loadings into ground water. Because these uncertainties affect the results in opposite directions, the ultimate effect on risks is uncertain.

CCR Compaction

The landfill source model does not consider further compaction of CCR waste that may occur over time as a result of anthropogenic activities, gravity or infiltrating water. This decrease in space

K.1 Introduction

To confirm the results of the probabilistic analysis and to better understand whether any particular subset of disposal practices drives the risks identified, the U.S. Environmental Protection Agency (EPA or the Agency) retained each of the exposure pathways from the probabilistic analyses for additional uncertainty analyses. This appendix details the methodology used for some of the uncertainty analyses summarized in **Section 5** the document.

- **Attachment K-1** provides graphs of the times to peak concentration for select constituents.

K.2 Surface Impoundment Preclosure and Postclosure Releases

This section presents the approach used to evaluate uncertainties associated with the modeling of preclosure and postclosure releases for surface impoundments. EPA used the results of this analysis to draw conclusions, summarized in **Section 5**, about the potential for this uncertainty to affect the risk results of the probabilistic analysis.

K.2.1 Technical Approach

The lifetime of a surface impoundment is conceptualized in two phases: a 75-year operational period, during which a constant amount of wastewater is maintained, and a postclosure period, when all free liquid remaining in the impoundment is removed, leaving behind coal combustion residual (CCR) sludges and sediments that are capped with an appropriate final cover. The forces driving leaching from surface impoundments during operation and postclosure are different. During operation, free liquids that are ponded in the impoundment create a strong hydraulic head that acts to increase infiltration through the base of the impoundment. The removal of free liquids and capping during closure reduces the hydraulic head and the rate of contaminant migration. After closure is complete, infiltration through the impoundments is driven only by percolation of incident precipitation through the cap.

In the 2010 Risk Assessment, the postclosure period was not modeled because the hydraulic head reduction between the operational and postclosure periods is so great that the peak ground water exposures used in the HEI risk assessment are unlikely to be affected. However, based on a number of public and peer-review comments received, the revised risk assessment estimated the risks associated with postclosure to determine if any significant risks to ground water had been overlooked. The operational phase of an impoundment is modeled using the standard impoundment source term in EPA's Composite Model for Leachate Migration with Transformation Products (EPACMTP). Liquid wastes in the impoundment are assumed to be replenished over the operational life to maintain a constant level of liquid in the unit with constant constituent concentrations. At the end of the 75-year operational life, no additional contaminant mass is introduced into the system. Modeling the postclosure portion of the surface impoundment required a second run of EPACMTP where the surface impoundment was re-conceptualized as a closed landfill. This run was conducted using the database of impoundment and site characteristics supplemented with the additional inputs necessary to define the landfill source term as follows: