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# **Coal Combustion Residual Landfill Closure Plan**

**Basin Electric Power Cooperative  
Laramie River Station**

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## Purpose

The purpose of this document is to demonstrate compliance with 40 CFR §257.102 (Criteria for conducting the closure or retrofit of CCR units) which requires the owner or operator of a Coal Combustion Residual (CCR) unit to prepare a written closure plan that describes the steps necessary to close the CCR unit at any point during the active life of the unit consistent with recognized and generally accepted good engineering practices.

## Introduction

Laramie River Station (LRS) is owned by Missouri Basin Power Project (MBPP) and operated by Basin Electric Power Cooperative (Basin Electric). LRS consists of three 570 megawatt (MW) units located approximately five miles northeast of Wheatland in Platte County, Wyoming. CCRs from LRS are disposed at the plant-site landfill. The LRS landfill is authorized by a Solid Waste Chapter 3 (Industrial Waste) permit issued by the Wyoming Department of Environmental Quality (WYDEQ). The WYDEQ permit designation is Solid and Hazardous Waste Division (SHWD) File #20.066.

The landfill was placed into operation in April 1980 and has been in continuous service since its initial construction. The landfill has been constructed in several phases, including cells 1 through 9, encompassing approximately 172.31 acres. Cells 1, 2, and 3 were constructed with a PVC bottom liner. It was later determined that a bottom liner was not necessary based on a number of site-specific factors, including depth to groundwater, CCR's ability to absorb and retain water, HELP model simulations, and climatic conditions in southeastern Wyoming (evapotranspiration far outweighs precipitation). Partial sequential closure of the landfill has been conducted as areas of the landfill are filled to final grade. To date, approximately 77.15 acres of the 187.81 acre CCR landfill footprint have been closed using a cover system approved by WYDEQ (24 inches of soil overlain by six inches of topsoil, for a total of 30 inches).

## Closure Narrative

Once CCRs have reached final elevation in the landfill, an 18-inch thick soil barrier layer will be constructed over the waste to minimize infiltration potential. Materials suitable for use as a low

permeability barrier layer may need to be imported from off-site. The barrier layer would be moisture-conditioned and compacted to achieve permeabilities of  $1 \times 10^{-5}$  cm/sec or less. Construction Quality Assurance/Quality Control (QA/QC) methodologies consistent the industry guidelines would be utilized so that the final cover is constructed to meet the requirements set forth in the CCR Rule. After the barrier layer has been constructed, an additional six inches of cover material will be placed over filled areas, followed by a six inches of topsoil. Closed areas will be seeded with a climatically adapted seed mix of shallow-rooted native vegetation. Final cover slopes of about one percent are present at the crest of the filled area while 10 to 20 percent slopes are present on the landfill flanks to help promote run-off. A terrace will be constructed about half way up the slope to prevent excessive erosion. The closed landfill will not be used for cultivated crops, heavy grazing or any other use which might disturb the protective vegetative and soil cover.

## Final Cover System Design and Performance

The cover system will be constructed, from bottom to top, of a barrier layer consisting of a minimum of 18 inches of compacted clay-rich soil with a hydraulic conductivity of  $1 \times 10^{-5}$  cm/second or less overlain by a minimum of 6 inches of uncompacted material to serve as a rooting zone. The uppermost layer consists of six inches of suitable plant growth material (SPGM). Total thickness of the cover system will be a minimum of 30 inches. In addition to the basic description of the final cover system, the CCR Rule requires the closure plan to address both performance and design standards for closure of the CCR unit.

CCR Rule design standards require a low permeability barrier layer (infiltration layer) with a permeability less than or equal to the bottom liner system or natural subsoils present, or a permeability of no greater than  $1 \times 10^{-5}$  cm/sec, whichever is less. The design standards also require that the infiltration layer have a minimum thickness of 18 inches and the infiltration layer be overlain by an erosion layer capable of sustaining native plant growth with a minimum thickness of six inches.

Soils present at the site are of colluvial (sand, gravel, etc.) or loessal (silty or clayey fine sand, silt, etc.) origin, with permeabilities ranging from approximately  $1 \times 10^{-5}$  to  $1 \times 10^{-3}$  cm/sec. The landfill base was constructed using these in-situ soils. The permeability of the cover system barrier (infiltration) layer is no greater than  $1 \times 10^{-5}$  cm/sec, which is less than or equal to the

permeability of the natural subsoils underlying the CCRs. Accordingly, the cover system meets the design criteria for permeability.

The final cover system is designed with an infiltration layer thickness of 18 inches which meets the minimum requirement of 18 inches. The erosion layer has a minimum thickness of 12 inches, greater than the minimum required thickness of six inches. As such, the cover system meets the minimum thickness design criteria for both the infiltration layer and for the erosion layer.

Performance standards include ensuring the CCR unit closure system controls, minimizes or eliminates, to the maximum extent feasible, post-closure infiltration of liquids into the waste; precludes the probability of impoundment of water, sediment, or slurry; addresses slope stability; minimizes the need for further maintenance; and that closure be completed in a time consistent with recognized and generally accepted good engineering practices.

The various components of the cover system work synergistically to meet CCR Rule performance standards. Infiltration is minimized by using a combination of slope to promote run-off, shallow-rooted native vegetation to enhance evapotranspiration, and a low permeability barrier layer to further limit infiltration. The closed landfill will be sloped to promote run-off thus limiting the probability of impounding liquids, slurry or sediment. The side slopes limited to approximately 20 percent contribute to structural stability and shallow-rooted native vegetation on the cover system helps minimize the need for future maintenance. The pozzolanic properties of the CCRs also promote structural stability and reduce the likelihood of settling and subsidence. Consistent with generally accepted good engineering practices, the cover system will be constructed in phases as areas are filled and brought up to grade (partial sequential closure).

## CCR Inventory and Maximum Closure Are Estimates

The maximum inventory or CCR ever on-site (design capacity) during the active life of the CCR unit is estimated to be 18,499,190 cubic yards. The largest area of the CCR unit ever requiring final cover at any time during the CCR unit's life is estimated to be 110.66 acres, reflecting current conditions at the site.

## Closure Schedule

As of October of 2016, the CCR unit has a remaining volume of approximately 6,527,922 cubic yards, which equates to 21.8 years of remaining capacity. The remaining life of the facility (summer 2038) may vary depending on factors such as ash content of coal, diversion of CCRs for beneficial use, and electrical generation rates, among others. Since sequential partial closure is periodically completed on the CCR unit, it is anticipated that the final area requiring final cover would be 20 acres or less. This relatively small area would easily be closed in one construction season. In any case, final closure would not take longer than 180 days.

## Recordkeeping and Reporting

A copy of this document will be placed into the facility's operating record in accordance with 40 CFR §257.105 (Recordkeeping Requirements) and will be posted to Basin Electric Power Cooperative's CCR Web site in accordance with 40 CFR §257.107 (Publicly accessible internet site requirements). Notification will be sent to the relevant State Director in accordance with 40 CFR §257.106 (Notification Requirements).

## Certification Statement

I certify that the design of the final cover system meets the requirements of 40 CFR §257.102 as specified in the *Standards of Coal Combustion Residuals in Landfills and Impoundments*.



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