Kemper County Storage Complex

Proposed Injection Wells MPC 19-2 and MPC 32-1

Mississippi Power Company

Financial Responsibility

40 CFR 146.85

Facility Information

Facility Name: Kemper County Storage Complex

Facility Contact: Mississippi Power Company
Environmental Affairs
P.O. Box 4079
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Well Locations: Kemper County, Mississippi
MPC 19-2:
Latitude: 32.6130560, Longitude: -88.8061110
MPC 32-1:
Latitude: 32.5908015, Longitude: -88.7792582

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List of Acronyms/Abbreviations

AoR	Area of Review
CCUS	Carbon capture, utilization, and storage
CO_2	Carbon dioxide
CMG	Computer Modelling Group
DOE	Department of Energy
ECO_2S	Establishing An Early Carbon Dioxide Storage
EPA	Environmental Protection Agency
ERRP	Emergency and Remedial Response
ft	feet
mg/L	milligrams per liter
MMt	Millions of Metric tons
MPC	Mississippi Power Company
PCC	Porters Creek Clay
PISC	Post-Injection Site Care
psi	Pounds per square inch
psia	Pounds per square inch absolute
psig	Pounds per square inch gauge
RCA	Routine Core Analysis
SS	Sub- Sea
TMS	Tuscaloosa Marine Shale
Tonnes	Metric tons
TVD	True Vertical Depth
UIC	Underground Injection Control
USDW	Underground Source of Drinking Water

A. Demonstration of Financial Responsibility

The Environmental Protection Agency's (EPA) required demonstration of Financial Responsibility (FR) by the applicant of the Class VI permit (during the Class VI permitting process) is to prevent the general public from bearing the costs of uncompleted or abandoned Geologic Sequestration (GS) projects. The demonstration of FR in this section of the Class VI application shows that Mississippi Power Company (MPC) has the resources to carry out required GS activities related to: (1) closing and remediating the project and its Area of Review (AoR); (2) plugging the CO_2 injection wells at the planned or actual completion of CO_2 injection; (3) performing Post-Injection Site Care and Site Closure (PISC-SC). The FR requirements are also designed to demonstrate that MPC has the financial resources for proper and prompt emergency and remedial response to any CO_2 leakage or other problems.

The Kemper County Storage Complex is located in a geologically favorable setting, as described in the *Geological Site Characterization* document. The Kemper County Storage Complex contains a thick package of deep sedimentary formations with excellent reservoir properties and a series of seals, the formations have a low-angle of dip, and the storage interval does not contain any major faults. There are no wellbores within the AoR that extend into the CO_2 storage area confinement interval that were drilled prior to initial geologic characterization well drilling by the Kemper County Storage Complex.

As a result, the demonstration of FR and its estimated costs reflect the moderate size of the AoR, low project risks, and the relatively short timeframe for returning pre-injection pressures and for stabilization of the plume once CO_2 injection ends.

B. Cost Estimates of Financial Responsibility

The FR cost estimates are provided for four categories, as listed below:

- Corrective Action
- Injection Well Plugging
- Post-Injection Site Care and Site Closure

- Emergency and Remedial Response

The timeline for coverage begins prior to well construction and concludes after the authorization of site closure by the UIC Program Director. MPC has elected to utilize either third-party insurance or Letter of Credit as their financial instrument(s) as shown in Error! Reference source not found.. The cost estimates in Error! Reference source not found. represent the current best-estimates of costs for performing the required GS activities. Corrective action is not anticipated to be required as no wellbores outside of the scope of the project penetrate the confinement interval within the project AoR. Some of the costs (Injection Well Plugging and Post-Injection Site Care and Site Closure) are more certain and easily estimated. The FR cost estimates for the Emergency and Remedial Response are less easily defined in terms of when (or if) such an emergency would occur and how much remediation will be required.

Table 1. Cost Estimates for Financial Responsibility and the Associated Financial Instrument(s).

Category	Financial Instrument	Coverage Amount
Corrective Action	N/A	$ 0
Injection Well Plugging	Third-Party Insurance or Letter of Credit	$ 500,000
Post-Injection Site Care and Site Closure	Third-Party Insurance or Letter of Credit	$ 18,736,000
Emergency and Remedial Response	Third-Party Insurance or Letter of Credit	$ 7,750,000
TOTAL		**$ 26,986,000**

C. Financial Coverage Criteria

MPC has elected to utilize Third-Party Insurance or Letter of Credit as its financial instrument for all elements of FR. MPC has a strong relationship with reputable insurers and creditors shall elicit this position to secure sufficient coverage prior to the construction phase of the Class VI project.

D. Estimation of FR Costs

This section of the FR document provides more details on the cost estimates for each of the GS activities required by the FR. It also includes the methodology for arriving at the cost values for injection well plugging, for PISC, for PISC-SC and for emergency and remedial response. Error! Reference source not found. provides the site-specific i nformation utilized to estimate the various FR costs for Kemper County Storage Complex.

Table 2. Cost Estimation Inputs for Kemper County Storage Complex.

Input	Value	Unit
Planned Injection Total	87,000,000	Tonnes CO_2
Injection Phase	30	Years
Plume Area	10.0	Square miles
Area of Review	16.5	Square miles
Injection Wells	2	Count
In-zone Monitoring Wells	5	Count
Above-zone Monitoring Wells	2	Count
Deep USDW Monitoring Wells	7	Count
Shallow Groundwater Wells	7	Count
Well Pads	7	Count
PISC Phase	20	Years

D.1. Estimated Costs for Corrective Action

MPC does not anticipate any corrective action being necessary because no known wellbores penetrated the confinement and storage intervals prior to the drilling of the characterization wells for the Kemper County Storage Complex. The new wells drilled at the Kemper County Storage Complex have been completed according to Class VI standards. As such, no money is set aside for this element of FR. Any losses in

mechanical integrity or leaks of CO_2 or other fluids are addressed in the *Emergency and Remedial Response Plan in Section 1.3.4*.

D.2. Estimated Cost of Injection Well Plugging

Injection well plugging is detailed in the *Injection Well Plugging Plan* and assumes filling the entire wellbore with cement, which exceeds the standards required by Mississippi regulations. Information on the costs for plugging and abandonment of wells is readily available from industry sources. In addition, the period over which the injection wells will be plugged is short (weeks) relative to other required GS activities. Based on current estimates and the proposed injection well schematic detailed in the *Injection Well Construction* document, well plugging and abandonment costs are estimated at $250,000 per injection well for a total of $500,000 for two wells (in Year 2022 dollars).

D.3. Estimated Costs of Post-Injection Site Care and Site Closure (PISC)

MPC is proposing a timeframe of 20 years for PISC followed by site closure. For more details of the rationale for this determination, please refer to the *Post-Injection Site Care and Site Closure Plan*. Error! Reference source not found. tabulates the post-i njection site care and site closure costs including costs for well monitoring and well maintenance. Well monitoring follows the schedule described in the *Post-Injection Site Care and Site Closure Plan*. The total costs for 20 years of PISC and PISC-SC is $18,736,000 in 2022 dollars.

The FR rules state that the well sites must be returned to their original condition and the monitoring wells must be plugged and abandoned (P&A). MPC estimates that the total cost to P&A all the monitoring wells is $2,940,000 and site remediation will cost approximately $300,000 per well pad, for a total of $2,100,000.

Table 3. Estimated Costs for Post-Injection Site Care and Site Closure (in 2022 dollars).

PISC Period (20 Years)	Well(s) Count	Units	Cost/Unit	Total
1. In-Zone Pressure and Plume Monitoring Well	5	20	$307,500	**$6,150,000**
2. Above-Zone Monitoring Well	2	20	$123,000	**$2,460,000**
3. USDW Monitoring Well	7	20	$119,000	**$2,380,000**
4. Shallow Groundwater Monitoring Well	7	20	$38,500	**$770,000**
5. Corrosion Monitoring	14	80	$300	**$336,000**
6. Reservoir Modeling	-	4	$100,000	**$400,000**
7. Well Plugging	21	21	Varies	**$2,940,000**
8. Reporting (Annual)	-	20	$50,000	**$1,000,000**
9. Reporting (Site Closure)	-	2	$100,000	**$200,000**
10. Site Remediation and Closure	-	7	$300,000	**$2,100,000**
TOTAL				**$18,736,000**

D.4. Estimated Costs of Emergency and Remedial Response

The nature of an emergency is inherently unknown. As such, the strategy in the FR document has been to plan for the most likely emergency situations, including costs that would cover a wide range of leakage scenarios. The usage of third-party insurance as the financial tool for coverage is particularly strong for this element of FR due to the uncertainty of emergencies.

The emergency and remedial response costs set forth in this section assume a CO_2 leak outside of the CO_2 storage injection zone. The emergency assumes the loss of mechanical integrity in an injection well and the costs assure of a rapid remedial response to fix the problem. For the reasons articulated in the *Geological Site Characterization*, the

Kemper County Storage Complex is a favorable target for a geologic sequestration project. Given the quality of the seal, there exists an extremely low risk of a leak above the confinement interval. Additionally, all wells within the AoR will have been completed to Class VI standards. Nonetheless, these would be different leakage scenarios including a loss of mechanical integrity in the wellbore or a loss of geologic containment in the confining zone.

If a leak is detected above the confinement interval, the first step will be cessation of CO_2 injection. Next, the above zone monitoring well or wells most proximal to the detected leak area will be converted into water injection well(s) to provide a pressure barrier between the detected leak interval and USDWs. In addition, a portion of the brine in the storage interval may be produced to lower the pressure in the storage interval. This methodology is recognized by industry as best-practice for CO_2 storage projects[1].

The costs required to remediate emergency leakage scenarios is set forth in **Table 4** below. Cost items are generalized to account for the inherent variability of emergency and remedial response scenarios and are estimated at $7,750,000 million in 2022 dollars. **Table 5** illustrates the itemized cost breakdown for remediation response activities on an operational basis. For more information on the specific response to emergency scenarios, please refer to the *Emergency and Remedial Response Plan*.

Table 4. Costs for Emergency and Remedial Response.

Cost Item	2022 Dollars
Field Equipment and Labor for Rapid Response	$250,000
Supply of Water	$1,000,000
Cement Squeeze to Restore Mechanical Integrity	$1,500,000
Convert and Operate Well(s) to Create Pressure Barrier	$5,000,000
Total	**$7,750,000**

[1] Kuuskraa, V. A. and Godec, M. L. (2007). Remediation of Leakage from CO_2 Storage Reservoirs: IEA Greenhouse Gas R&D Programme (IEA GHG).

Table 5. Detailed Monitoring Cost Breakdown

Monitoring Costs Breakdown	Cost (2022 dollars)
Corrosion Monitoring	$300/quarter/well
In-Zone CO_2 Pressure/Plume Monitoring	
Operation & Maintenance including pressure monitoring, MITs, and USIT	$2,000/month/well
PNC Logging	$25,000/run
Fluid Sampling & Analysis	$25,000/sample
Above-Zone Monitoring	
Operation & Maintenance	$2,000/month/well
PNC Logging	$25,000/run
Fluid Sampling & Analysis	$25,000/sample
USDW Monitoring Wells	
Operation & Maintenance	$1,000/month/well
Fluid Sampling & Analysis	$5,000/sample
Shallow Groundwater Monitoring Wells	
Operation & Maintenance	$2,000/year/well
Fluid Sampling & Analysis	$3,500/sample