BEFORE THE ENVIRONMENTAL APPEALS BOARD
UNITES STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C.

In re:	)	
	)	
FutureGen Industrial Alliance, Inc.	)	UIC Appeal Nos.: 14-68, 14-69, 14-70 & 14-71
	)	
Permit Nos.: IL-137-6A-001	)	
IL-137-6A-002	)	
IL-137-6A-003	)	
IL-137-6A-004	)	
	)	

EPA REGION 5 CONSOLIDATED RESPONSE TO PETITIONS FOR REVIEW

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Region 5 is providing the Evaluation of AoR Delineation and Corrective Action. Please note that due to the voluminous nature of the modeling inputs and outputs in the associated files, Region 5 is only including a hard copy of specific modeling information related to the dissolved phase

plume modeling referenced on page 12 of *EPA Region 5's Consolidated Response to Petitions for Review*. This excerpt, below, shows the 165 files with data extracted from the (Subsurface Transport Over Multiple Phases, or STOMP) simulator output files, including 81 time-series files, 48 snapshot files, and 36 surface flux files that were provided to EPA. The list of snapshot files includes aqueous phase (dissolved) CO_2 outputs for multiple time steps during the injection and post-injection periods. Only this relevant excerpt is provided. The associated files in the administrative record include all aspects of all runs of the model and so encompass an enormous amount of data and file space. To the extent the Board would like copies of additional associated files, Region 5 can provide them, but it would need some time to do so due to the extraordinary volume of these files.

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Note that Region 5 has included a hard copy of only the Final Permit for Well 1. The permits are identical except for the permit number, the well name, the location, and minor differences in construction details that are reflected in the construction/plugging and abandonment plans. None of these differences are relevant to any matters raised in the Petitions for Review. All 4 permits are available online at http://www.epa.gov/r5water/uic/futuregen/

I. INTRODUCTION

The United States Environmental Protection Agency ("EPA"), Region 5 ("Region 5"), hereby responds to the consolidated Petitions for Review submitted by the Andrew H. Leinberger Family Trust and DJL Farm LLC, and William and Sharon Critchelow (collectively referred to as "Petitioners") in Appeal Nos. UIC 14-68; UIC 14-69; UIC 14-70 and UIC 14-71.

On August 29, 2014, Region 5 issued four related final Class VI Underground Injection Control ("UIC") permits to FutureGen Industrial Alliance, Inc. ("Permittee" or "FutureGen"). Pursuant to 40 C.F.R. §124.19, Petitioners seek review of those permits by the Environmental Appeals Board ("EAB"). The EAB consolidated the Petitions for Review on October 9, 2014, and the Petitions raise the same issues for each of the four permits.[1] Attached to this response are a certified index of the administrative record for the challenged permits, and the relevant portions of the administrative record.

For the reasons set forth below, the Petitioners have failed to meet their burden to obtain review by the EAB, and Region 5 requests that the EAB deny the Petitions for Review.

II. FACTUAL AND PROCEDURAL BACKGROUND

The Safe Drinking Water Act ("SDWA"), 42 U.S.C. §§300f-300j-26, directs EPA to promulgate regulations containing minimum requirements for state UIC programs to protect underground sources of drinking water ("USDWs"). 42 U.S.C. §300h. One of these requirements

[1] The relevant terms of the permits, Nos. IL-137-6A-0001, IL-137-6A-0002, IL-137-6A-0003, and IL-137-6A-0004, are identical.

is that a person who intends to operate an underground injection well must obtain a permit, unless the well is authorized by rule. 42 U.S.C. §300h-3; 40 C.F.R. §§144.11 and 144.31.[2]

On December 10, 2010, EPA promulgated federal UIC requirements for carbon dioxide geological sequestration wells, which are codified at 40 C.F.R. §§146.81-146.95. These requirements establish a new class of injection wells (Class VI) and set minimum federal technical criteria for Class VI injection wells for the purpose of protecting USDWs.

In states where EPA has not approved a UIC program, EPA directly implements its own UIC program and regulations. The State of Illinois has not been approved to administer the Class VI program. See 40 C.F.R. §§144.1(e); 147, Subpart O.

On March 15, 2013, FutureGen submitted permit applications for four carbon dioxide sequestration wells to be located in Morgan County, Illinois. It submitted revised applications on May 15, 2013. (Permit Applications, Administrative Record ("AR") #1 and 2.) FutureGen's four proposed injection wells would be drilled from a single location to a depth of about 4,000 feet below ground surface ("bgs"). The injection is limited to the Mount Simon and Eau Claire rock formations, located between 3,785 feet and 4,432 feet bgs. (Permits at 1 and Attachment G (AR #594).) The base of the lowest USDW near the wells, the St. Peter Sandstone formation, is 1,942 feet bgs. (AR #594, Attachment C at 38.) (For reference, the deepest underground municipal water supply wells in nearby Jacksonville are 95 feet bgs.) (FutureGen Fact Sheet, AR #16 at 5.) The injection zone is separated from the lowest USDW by 1,843 feet of rock, including an impermeable confining zone whose characteristics confine and trap fluids and prevent upward migration.

[2] Under 40 C.F.R. §144.6, injection wells fall into six classes depending primarily on the nature of the material being injected.

As Region 5 reviewed the permit applications, it requested, and FutureGen provided, supplemental information to assist its consideration. Given the magnitude and complexity of the project, numerous EPA scientists and engineers, and additional contractor personnel, contributed to Region 5's evaluation of the application. The broad scope of that review is evidenced by an administrative record index that includes almost 600 separate entries.

On March 30, 2014, Region 5 issued draft Class VI permits to inject carbon dioxide for the purpose of geologic sequestration (permit numbers IL-137-6A-0001, IL-137-6A-0002, IL-137-6A-0003, and IL-137-6A-0004) to FutureGen, and invited public comment. (AR #15-17.)

Twenty-nine parties submitted comments to Region 5, either in writing or during a public hearing held on May 7, 2014 (or both). (AR #478-510.) Written comments exceeded 300 pages, including 172 pages of comments from Petitioners. (AR #478-506.) Region 5 considered all comments received before deciding to issue final permits to FutureGen on August 29, 2014. As provided in 40 C.F.R. §124.17, Region 5 prepared a written response to comments ("RTC") which itself was more than 220 pages long. (AR #511.)

On October 1, 2014, Petitioners filed their Petitions for Review. The Petitions criticize the permits' delineation of the Area of Review ("AoR"), design of the site monitoring network, development of predicted plume dimensions, identification of wells within the AoR, development of cost estimates, use of a trust fund with a pay-in period to demonstrate financial assurance, and provisions for termination of that trust fund. As described in more detail below, while the Petitioners may not be fully satisfied with the provisions of the FutureGen permits, the permit terms are developed consistent with, and fully satisfy, the UIC permitting regulations, and as documented in the RTC, Region 5 fully responded to the issues Petitioners raised in their

comments. Region 5's decisions are supported by the extensive administrative record and do not require review by the EAB.

III. STANDARD OF REVIEW

In any appeal from a permit granted under 40 C.F.R. Part 124, the petitioner bears the burden of demonstrating that review is warranted. 40 C.F.R. §124.19; see *In re Pennsylvania Gen'l Energy Co., LLC*, UIC Appeal Nos. 14-63, 14-64, & 14-65, slip op. at 4, (EAB Aug. 21, 2014), 16 E.A.D. __; *In re City of Palmdale*, PSD Appeal No. 11-07, slip op. at 8, (EAB Sept. 17, 2012), 15 E.A.D. __; *In re Wash. Aqueduct Water Suppl Sys.*, 11 E.A.D. 565, 573 (EAB 2004); *In re Am. Soda, LLP*, 9 E.A.D. 280, 286 (EAB 2000). To obtain review, the Petitioners must show that the permit condition in question is based on a "clearly erroneous" finding of fact or conclusion of law, or involves an "exercise of discretion or an important policy consideration that the Environmental Appeals Board should, in its discretion, review." 40 C.F.R. §124.19(a)(4); See *In re Guam Waterworks Auth.*, NPDES Appeal Nos. 09-15 & 09-16, slip op. at 9 & n.7 (EAB Nov. 16, 2011), 15 E.A.D. __; *In re Environmental Disposal Sys., Inc.*, 12 E.A.D. 254, 263 (EAB 2005).

The preamble to 40 C.F.R. § 124.19 states that "this power of review should only be sparingly exercised," and that "most permit conditions should be finally determined [by the permitting authority]." 45 Fed. Reg. 33,290, 33,412 (May 19, 1980) (Consolidated Permit Regulations); See *In re City of Attleboro*, 14 E.A.D. 398, 405 (EAB 2009); *In re Environmental Disposal Sys., Inc.*, 12 E.A.D. 254, 263-64 (EAB 2005); *In re Scituate Wastewater Treatment Plant*, 12 E.A.D. 708, 717 (EAB 2006); *In re City of Moscow*, 10 E.A.D. 135, 140-41 (EAB 2001); *In re Jett Black, Inc.*, 8 E.A.D. 353, 358 (EAB 1999); *In re*

Maui Electric Co., 8 E.A.D. 1, 7 (EAB 1998). On matters that are fundamentally technical or scientific in nature, the Board will typically defer to a permit issuer's technical expertise and experience, as long as the permit issuer adequately explains its rationale and supports its reasoning in the administrative record. *In re City of Palmdale*, PSD Appeal No. 11-07, slip op. at 9, (EAB Sept. 17, 2012), 15 E.A.D. __; See also *In re Beeland Group, LLC,* 14 E.A.D. 189, 196 (EAB 2008); *In re Dominion Energy Brayton Point, LLC,* 12 E.A.D. 490, 510 (EAB 2006); *In re Russell City Energy Ctr.,* PSD Appeal Nos. 10-01 to 10-05, slip op. at 88 (EAB Nov. 18, 2010), 15 E.A.D. __, petition denied sub nom., *Chabot-Las Positas Cmty. Coll. Dist. v. EPA,* No. 10-73870 (9th Cir. May 4, 2012); *In re Peabody W. Coal Co.,* 12 E.A.D. 22, 41, 46, 51 (EAB 2005); *In re NE Hub Partners, L.P.,* 7 E.A.D. 561, 570-71 (EAB 1997).

Finally, the Board's authority to review a UIC permit does not extend beyond the goals of the UIC program to protect USDWs. See *In re Environmental Disposal Sys., Inc.,* 12 E.A.D. at 266; See also *In re Sunoco Partners Marketing & Terminals, LP,* UIC Appeal No. 05-01, slip op. at 10 (EAB June 1, 2006); *In re Envotech, L.P.,* 6 E.A.D. 260, 286 (EAB 1996) ("[T]he SDWA ... and the UIC regulations ... establish the *only* criteria that EPA may use in deciding whether to grant or deny an application for a UIC permit.") (emphasis in the original).

IV. ARGUMENT

The UIC regulations clearly identify the information that must be included in permit applications, the factors that EPA must consider in acting on the applications, and the conditions that must be in any issued permits. The record establishes that Region 5 met all of those

standards in issuing final permits to FutureGen. The Petitioners identified several areas where they seek to substitute their technical and financial preferences for Region 5's decisions and determinations, but they have not identified any clearly erroneous findings of fact or conclusions of law, or any exercises of discretion or policy judgment, that would require review.

A. The Permits' Delineation of the Area of Review Is Consistent With Regulatory Requirements, And Region 5 Adequately Responded to Public Comments

The Class VI regulations define the "Area of Review" as "the region surrounding the geologic sequestration project where USDWs may be endangered by the injection activity." 40 C.F.R. §§146.84(a) and 146.81(d). Under the regulations, as reflected in the permits, Region 5 and FutureGen will regularly monitor and reevaluate the AoR over the entire lifetime of the project to assure that USDWs are not endangered. See Permits Sections G, M.1 and M.8, and Attachments B and C (AR #594); 40 C.F.R. §146.84(b) and (e); 40 C.F.R. §146.90(g) and (j). AoR modeling and reevaluation are important components of the overall strategy to track the carbon dioxide ("CO_2") plume and pressure front through an iterative, multi-faceted process of site characterization, modeling, and monitoring at geologic sequestration ("GS") sites. This approach addresses the unique and complex movement of CO_2 at GS sites. 75 Fed. Reg. 77230, 77248 (Dec.10, 2010).

Defining the bounds of the AoR requires complex computational modeling "that accounts for the physical and chemical properties of all phases of the injected carbon dioxide stream and is based on available site characterization, monitoring, and operational data." 40 C.F.R. §146.84(a). AoR modeling must predict -- using existing site characterization, monitoring and operational data -- the projected lateral and vertical migration of the carbon dioxide plume and the pressure front to be created by the injection activities. 40 C.F.R. §146.84(c)(1).

Because of the inherent uncertainty associated with the computational modeling of plume and pressure front boundaries, the Class VI regulations set forth an iterative framework throughout the lifetime of a GS project to ensure that model uncertainty is reduced over multiple stages/phases of a project as more data becomes available (including even prior to initial authorization to inject). See 40 C.F.R. §§146.82(c), 146.84(b) and (e), 146.90 and 146.93. As the regulation states, the modeling of plume and pressure front boundaries is merely a prediction. 40 C.F.R. §146.84(c)(1). EPA's Geologic Sequestration of Carbon Dioxide: Underground Injection Control (UIC) Program Class VI Well Area of Review and Corrective Action Guidance, EPA 816-R-13-005 (May 2013) ("AoR Guidance") (AR #439) also explains that numerical/computational models are an approximate representation of highly complex real systems, and so exhibit some degree of uncertainty. Petitioners seek an unrealistic degree of precision for the initial projection of where the CO_2 may extend in 20 years[3], especially at this stage of the project, where injection has not begun. Indeed, Region 5 will review the AoR again prior to granting approval to begin operation/injection, in light of site-specific data collected during pre-injection testing required under 40 C.F.R. §146.87 and submitted in compliance with 40 C.F.R. §146.82(c) and Permits Parts J and Q.4 (AR #594). Region 5 will then continue to review FutureGen's required AoR reevaluation submittals to refine and calibrate the AoR modeling as injection begins and is monitored. 40 C.F.R. §146.84(b) and (e); Permits Part G and Attachment B (AR #594).

As documented in its permit applications (AR #1 and #2, Section 3.0), FutureGen delineated the AoR using a computational tool called "Subsurface Transport Over Multiple Phases" ("STOMP"), which is one of the methods recognized in EPA's AoR Guidance at 28. (AR #439.)

[3] The maximum extent of the plume is modeled/predicted to be at 22 years from the start of injection. (AR #296.)

Petitioners and their expert[4] do not appear to object to the use of STOMP, but only to elements of its application. Petitions for Review at 10-11.

Petitioners criticize the AoR delineation[5] based on FutureGen's estimation of the CO_2 plume boundary. Petitions for Review at 11-13. This critique, however, ignores the fact that for the FutureGen permits the AoR will necessarily be defined by the pressure front,[6] which fully encompasses the CO_2 plume boundary.

The pressure front extends approximately 25 miles in each direction from the wells, which dwarfs the estimated plume boundary radius of approximately 1.5 miles. (AR #1, #2, #156, #296 and #594.) As a result, the pressure-front based AoR is certain to include and to account for the separate-phase (supercritical) and dissolved phase CO_2 plume, potential variations in plume size observed in sensitivity analyses, and inherent plume modeling uncertainties. Petitioners' technical quibbles around the margins of the modeled plume could not conceivably affect the

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[4] The Petitions for Review attach as "Exhibit 1" a 15-page "Supplemental Expert Report of Gregory Schnaar, Ph.D." Exhibit 1 expands on arguments and assertions presented in the Petitions for Review. Indeed, page 11 of the Petitions for Review confirms that "Dr. Schnaar's Supplemental Expert Report is attached as Exhibit 1 *and incorporated by reference.*" (emphasis added) As such, Exhibit 1 and its contents are an attempt to circumvent the page limitation established by the EAB's rules at 40 C.F.R. §124.19(d)(3), and so should be excluded.

[5] For issues pertaining to the AoR that were addressed in the RTCs, Petitioners fail to provide the required citation to the RTC and fail to explain why that response was clearly erroneous or otherwise warrants review, as required by 40 C.F.R. §124.19(a)(4)(ii). Petitioners have therefore failed to comply with the threshold requirement for appealing the issues raised in Petitioners' Issue I (modeling of AoR), and that portion of their Petitions should be denied review under the EAB's rules.

Page 12 of the Petitions for Review generally references the RTCs on pages 59, 61, 62, 64, 76, 77 and 83, but Petitioners fail to address Region 5's substantive responses to their comments. Instead, Petitioners reduce Region 5's substantive responses to the statement, "USEPA repeatedly states that FutureGen will obtain additional site information during the pre-operation phase, and revisions to the Permit will be considered." In its extraneous "Supplemental Expert Report," Petitioners' consultant references only RTC Section 3, Nos. 9 and 38, and Section 7, No. 20 regarding the AoR (and RTC Section 3, No. 52 regarding well identification) (AR #511).

As described in Region 5's response, the RTCs and the administrative record fully address Petitioners' concerns about AoR delineation. However, under 40 C.F.R. §124.19(a)(4)(ii), those matters are not properly before the EAB for review.

[6] The pressure front is the extent of pressure increase of sufficient magnitude to force fluids from the injection zone into the formation matrix of a USDW. AoR Guidance at 38. (AR #439.) Because the injection zone for the FutureGen project is over-pressurized relative to the USDW, the pressure front extends a significant distance from the wells, far beyond the separate and dissolved phase CO_2 plumes. See Figure 15 of the Permits Attachment B for a map of the permitted AoR. (AR #594.)

AoR.[7] As the AoR Guidance (AR #439) explains at page 38, the AoR is based on the maximum extent of the plume and the pressure front:

> The boundaries of the AoR are based on simulated predictions of the extent of the separate-phase (i.e., supercritical, liquid, or gaseous) plume and pressure front. As such, *EPA recommends that the AoR encompass the maximum extent of the separate-phase plume or pressure front over the lifetime of the project* and entire timeframe of the model simulations." (emphasis added)

See also AoR Guidance (AR #439) at 46 ("The AoR is delineated by drawing the contour line that encompasses the maximum extent of the separate-phase plume or pressure front…").

Petitioners did not raise any objections or concerns about the pressure front delineation. The uncontested pressure front calculation fully meets the purpose of the AoR regulations as described by Petitioners -- to "ensure that the areas potentially impacted by the proposed operation are delineated." Petitions for Review at 12. Region 5 took a very conservative approach to the delineation of this AoR in order to address risks for all phases of the CO_2 and the area of elevated pressure as well as to address the associated uncertainty inherent in this stage (pre-construction) of any GS project. This information is documented throughout the Administrative Record. (See, e.g., AR #118-121, #124-125, #140-141, #232, #234-238 and #296.)

Much of the Petitioners' objection focuses on Region 5's alleged failure to conduct an independent AoR modeling effort. See Petitions for Review at 10, 13. The regulations do not contemplate, much less require, that Region 5 initiate an independent AoR modeling effort. EPA's AoR Guidance suggests only that Region 5 may evaluate the AoR delineation results and,

[7] Petitioners assert that the Natural Resources Defense Council, Clean Air Task Force and Sierra Club also questioned the plume projection in their comments on the draft permits (Petitions for Review at 11). These parties did not seek review of the final permits, which implies they were satisfied with the explanation provided in the Response to Comments (RTC, Section 3, No. 13 (AR #511)).

as appropriate, replicate the computational modeling exercise to verify the appropriateness of the permit applicant's modeling effort. (AR #439 at 38.) That is precisely what Region 5 did concerning the plume delineation. Region 5 collected the information and conducted the analyses necessary to understand and evaluate all model inputs, assumptions, construction, and results, to review the appropriateness of FutureGen's AoR delineation approach and its proposed AoR. This effort is summarized in Region 5's Evaluation of AoR Delineation and Corrective Action. (AR #296.)

Region 5's model evaluation process compared FutureGen's model inputs and assumptions with the site characterization data (e.g., geology, hydrogeology, formation characteristics) and the proposed operational information, to determine or confirm the consistency of the model with those data. Region 5 identified and evaluated all input data and assumptions individually during the process of developing the base case model, and compared model input information to the submitted site characterization information or other relevant information.

Following the evaluation of FutureGen's approach and confirmation that it is suitable for the proposed site, Region 5 conducted additional evaluations of the predicted system behavior to confirm: that the upward migration of CO_2 is not predicted to endanger USDWs; predicted induced pressures are below the observed fracture pressures for the injection and, particularly, the confining zones; the estimates of the predicted effect of trapping mechanisms (that may be used in alternative Post Injection Site Care timeframe demonstrations or non-endangerment demonstrations under 40 C.F.R. §146.93) are supported; and the applicant's proposed approach for the non-endangerment demonstration at site closure will be sufficiently supported by the adopted modeling approach. (AR #296.) See also, AoR Guidance (AR #439.)

Region 5 also conducted some sensitivity analyses for the parameters with high uncertainty and expected effect on the plume and induced pressures. The purpose of these analyses is to ensure that the delineated AoR sufficiently covers any potential variation in model predictions of the CO_2 plume (dissolved or separate phase) and pressures due to uncertainty associated with site-specific information. Through the evaluation of the quality and appropriateness of inputs and assumptions and a confirmation of their site-suitability, Region 5's approach facilitates an understanding of how representative of the actual site and system the applicant's approach is. For the FutureGen project, Region 5 followed the process above and determined that the AoR size and position were appropriate. *Id.*

Moreover, with respect to the pressure front delineation that defines the AoR, Region 5 affirmatively expanded on FutureGen's analytical approach, independently evaluating and determining the allowable pressure increase to be used in AoR delineation for the over-pressurized case,[8] as contemplated in the AoR Guidance (AR #439) at 42. Indeed, Region 5's analysis and input led to a significant expansion of the AoR beyond what FutureGen proposed. (Compare AR #2, Section 3.1.8 and AR #296.)

FutureGen's permit applications originally proposed a "plume-based" AoR, (AR #1 and AR #2), which did not account for the pressure front anticipated to be created by the project. FutureGen applied a simplified analytical approach for evaluating potential leakage into USDWs based on predicted pressures, and concluded that the predicted pressures would not cause significant leakage into USDWs, so that the "plume-based AoR" (in their initial permit

[8] In an over-pressurized case, fluids in the injection zone may already be at a higher pressure than fluids in the potential USDW even before injection begins. In this situation, fluid leakage could occur from the injection zone to the USDW through a conduit between both zones even prior to commencing injection. Additional pressure increase within the injection zone owing to the injection associated with the GS project may initiate or increase fluid leakage rates if the confining zone is breached. Therefore modeling of the pressure front in the injection zone becomes more significant and has a larger impact on the AoR size. See AoR Guidance (AR #439) at 42.

application, AR #1 and #2) was appropriate for the project. However, FutureGen applied non-conservative assumptions, including "thief zones" (an assumption of leakage attenuation so that fluids would not reach USDWs). (See AR #2, Section 3.) Region 5 determined this approach for pressure front delineation did not comply with the requirements at 40 C.F.R. §146.86(a)(1) which require that all Class VI wells are constructed and completed to "prevent the movement of fluids into or between USDWs or into any unauthorized zones." In response, Region 5 engaged in a series of conversations with FutureGen to discuss the significance and importance of accounting for the area of elevated pressure associated with the project in a more conservative manner. (See, e.g., AR #118-121, #124-125, #140-141, #232, #234-238 and #296.)

Even though the Petitioners' concerns about the CO_2 plume boundary projection are irrelevant to the AoR delineation, there is no indication that the boundary estimate is inappropriate or erroneous as they allege. Petitioners arguments that the plume mapping may be understated by 1% and that sensitivity analyses looking at the theoretical impact of using different inputs might expand the estimate plume size by up to 25% (Petitions for Review at 10-13) do not establish any flaws in the plume model.

As described in the record, Region 5's technical evaluation and FutureGen's additional output files indicated no significant changes in the plume size when the plume is defined as 99% or 100% of the total separate-phase CO_2 mass. See Evaluation of AoR Delineation and Corrective Action and associated files (AR #296), and AR #565.

Moreover, Region 5's sensitivity analyses of the model inputs and assumptions, as described above, identified parameters that may have a relatively larger effect on model predictions, and ensured that the results of those analyses informed the delineation of the permitted AoR (Figure 15 of Attachment B of AR #594) by confirming that it encompasses any

potential variations in plume size as predicted and the extent of dissolved CO_2. See Evaluation of AoR Delineation and Corrective Action and associated files (AR #296). Although the Petitioners would prefer that the modeled CO_2 plume be a depiction of the most conservative scenario, this approach is inconsistent with the purpose of the modeling the plume. The modeled CO_2 plume delineation should provide the most accurate estimation (not necessarily the most conservative). Once injection begins, direct and indirect monitoring results will be compared with the model predictions, as required by regulation and as outlined in the Testing and Monitoring Plan. (AR # 594, Attachment C at C1, C2, C19 and C28.) This helps the Permittee and Region 5 determine if the model is accurately predicting the location of the CO_2 in the subsurface or if the model needs to be revised to more closely match observations.

Region 5 explained and supported its rationale for the AoR delineation in the RTC (RTC Section 3, Nos. 9-12, 32-39 and 45 (AR #511)) and the administrative record. After thorough consideration, Region 5 determined that the AoR is defined by the (uncontested) pressure front boundary estimate, and that the pressure front and plume modeling "accounts for the physical and chemical properties of all phases of the injected carbon dioxide stream and is based on available site characterization, monitoring, and operational data." 40 C.F.R. §146.84(a). The AoR, which establishes an expansive area to be regularly monitored, evaluated, and provided corrective action as needed under the Permits (AR #594, Part G and Attachment B), reflects a reasonable and appropriate determination based on Region 5's expertise.

B. The Permits' Monitoring Network Is Reasonable And Consistent With Regulatory Requirements, And Region 5 Adequately Responded to Public Comments

EPA's regulations provide that the "owner or operator of a Class VI well must prepare, maintain, and comply with a testing and monitoring plan to verify that the geologic sequestration project is operating as permitted and is not endangering USDWs." 40 C.F.R §146.90. The

regulations do not outline specific technologies, applications, placements, or frequencies of monitoring to be used by a permit applicant, stating only that a monitoring program must include:

> (d) Periodic monitoring of the ground water quality and geochemical changes above the confining zone(s) that may be a result of carbon dioxide movement through the confining zone(s) or additional identified zones including:
> (1) The location and number of monitoring wells based on specific information about the geologic sequestration project, including injection rate and volume, geology, the presence of artificial penetrations, and other factors; and
> (2) The monitoring frequency and spatial distribution of monitoring wells based on baseline geochemical data that has been collected under §146.82(a)(6) and on any modeling results in the area of review evaluation required by §146.84(c).
>
> ***
>
> (g) Testing and monitoring to track the extent of the carbon dioxide plume and the presence or absence of elevated pressure (e.g., the pressure front) by using:
> (1) Direct methods in the injection zone(s); and,
> (2) Indirect methods (e.g., seismic, electrical, gravity, or electromagnetic surveys and/or down-hole carbon dioxide detection tools), unless the Director[9] determines, based on site-specific geology, that such methods are not appropriate;

The regulations establish considerable discretion for the permitting authority in reviewing the Testing and Monitoring Plan. The regulatory preamble to the Class VI regulations, "acknowledges the importance of flexibility" and explains that the rule "maintains a testing and monitoring plan requirement that will allow for site specificity and selection of the most appropriate monitoring technologies." 75 Fed. Reg. 77230, 77261 (Dec.10, 2010). "The number, placement, and depth of monitoring wells will be site-specific and will be based on information collected during baseline site characterization." *Id.* at 77262. Petitioners assert (without any legal support) that because GS is a new technology, methods for monitoring the location of the plume are largely untested and thus should be strictly reviewed. (Petitions for Review at 14.) However,

[9] In EPA's regulations, "Director" refers to the delegated permitting authority; in this case the Director of Region 5's Water Division. See 40 C.F.R. §146.3; AR #594 at 1.

as described in Section III, above, Region 5's technical evaluations are entitled to considerable deference and are subject to a "clearly erroneous" standard of review.

The record is clear that Region 5 reviewed and evaluated FutureGen's proposed monitoring program, and indeed required FutureGen to add wells prior to accepting the Testing and Monitoring Plan. Information in the record shows that the monitoring well locations were chosen to protect USDWs by demonstrating that the injectate is safely confined in the target rock formation and detecting any deviations from the predicted project performance. See Geologic Sequestration of Carbon Dioxide: Underground Injection Control (UIC) Program Class VI Well Testing and Monitoring Guidance, EPA 816-R-13-001 (March 2013), AR #441 ("T&MP Guidance") at 54.

FutureGen's Testing and Monitoring Plan (Attachment C of the Permits (AR #594)) ("T&MP") went through several iterations, based on multiple communications between Region 5 and FutureGen that are documented in the record. (See, e.g., AR #1, #2, # 3, #5, #6, #7, #10, #14, #67, #75, #102, #105, #108, #109, #110, #112, #113, #116, #127, #133, #139, #159, #170, #175, #179, #180, #191, #192, #205, #208, #210, #211, #213, #215, #216, #217, #218 and #285.) The T&MP and the conversation records document and explain the nature of and rationale for the monitoring network.

In its initial permit application, FutureGen proposed a monitoring network to include three monitoring wells in the injection zone, one monitoring well above the confining zone, and one groundwater monitoring well in the St. Peter Formation (the lowest USDW). (AR #1.) The approved program includes nine monitoring wells: six in the injection zone, two above the confining zone, and one in the lowest USDW. (AR #594, Attachment C.) The wells will be used along with other indirect monitoring techniques to determine if the project is operating safely and

to help evaluate the accuracy of the model predictions of CO_2 movement and pressure effects. (AR #1 at 5.1 and 5.23; AR #594, at C2, C19, and C28.) In addition to the nine monitoring wells, the program requires FutureGen to sample nine existing private water wells in the project's vicinity. (AR #594 at C9 to C11.) This sampling will develop current baseline data on water chemistry in the shallow USDWs. (AR #594 at C10.)

Petitioners assert that the site monitoring network is not adequately explained or justified in the record (Petitions for Review at 13-15), but the record provides sufficient support and explanation to show that the monitoring program meets the flexible requirements of the regulations and is appropriate for this specific site. Region 5 provided FutureGen with detailed tables describing parameters and expectations for monitoring above the confining zone, for the plume, and for the pressure front in compliance with requirements at 40 C.F.R. §146.90. Among other things, Region 5 requested further information on locations of monitoring wells, depths of sampling, target parameters, monitoring methods, response plans for observed anomalies, and the indirect monitoring methods they will employ to comply with 40 C.F.R. §146.90(g)(2). (AR #116.) FutureGen provided the requested details and submitted a revised and expanded T&MP. (AR #133, AR #216.)

The finalized T&MP begins with an explanation of the monitoring well placement and perforation strategies, based on site characteristics and computational modeling, describing its methods for verifying that the injectate is safely confined in the target formation and detecting deviations from the predicted project performance. (AR #594 at C1-C3.) The T&MP and the record provide further explanation and support for each element of the monitoring well network:

Plume Monitoring. FutureGen's T&MP explains that the three CO_2 plume monitoring well locations in the injection zone will be "distributed across three different azimuthal directions,

providing CO_2 arrival information for three of the four predicted lobes of the CO_2 plume," with locations "selected to provide information about CO_2 arrival at different distances from the injection wells and at multiple lobes of the CO_2 plume." The distances are based on the predicted 1-, 2- and 4-year CO_2 plumes. (AR #594 at C1, C47.)

Pressure Front Monitoring. FutureGen's T&MP includes Single-Level in-Reservoir ("SLR") wells "completed across the planned injection interval … to continuously and directly measure for pressure, temperature, and specific conductance." (AR #594 at C1.) As a result of discussions with Region 5, FutureGen revised its T&MP to add an additional (third) SLR well to be installed within 5 years after injection starts, based in large part on actual pressure front monitoring results. Compare AR #1 at 5.8 and AR #594, Attachment C, Table 6. See AR #286.

Above Confining Zone. The two Above Confining Zone ("ACZ") wells are located above the same lobe, with one well located close to the injection well site where the injection zone would be most highly pressurized during the life of the project. (AR #594 at C33.) The second ACZ well in the same lobe would facilitate calibration of the model. (AR #594 at C2.) See also T&MP Guidance (AR#441) and AoR Guidance (AR #439) at 23. "These selected ACZ locations focus early-detection monitoring within the region of elevated pressure and are proximal to six of nine project-related caprock penetrations (four injection wells, two reservoir wells, and three reservoir access tubes [RATs])." (AR #594 at C33.)

USDW Well. FutureGen's T&MP explains that the USDW monitoring well "will be instrumented to monitor continuously for, [Pressure, Temperature, and Specific Conductance] and periodically samples will be collected for characterizing aqueous chemistry. This USDW well is co-located with the ACZ well located closest to the injection well site." (AR # 594 at C2.) This area of higher pressurization is also where USDW impacts would be most likely to occur,

especially during the early years of the project. (AR #2 at Section 5.8, AR #594 at C37.) See T&MP Guidance (AR#441) at 56-57.

The goal of the monitoring plan regulations is to establish a monitoring network with a sufficient number of monitoring wells that are strategically located to provide site monitoring that meets the requirements at 40 C.F.R. §146.90(d)(1) and (2). T&MP Guidance at 56 (AR #441). At the same time, it is very important that in establishing the monitoring network, Region 5 and FutureGen avoid unnecessarily increasing the number of artificial penetrations in the AoR that could serve as conduits for fluid movement. *Id.* As described above and in the record, the permits accomplish both of these goals for the initial monitoring network for the FutureGen facility.

Region 5 explained and supported its rationale for approving the monitoring network in the RTC (RTC Section 7, Nos. 17-18, 20-23, 25, 31, 35 and 42 (AR #511))[10] and the administrative record. The permit provisions represent a reasonable monitoring program reflecting Region 5's application of its technical expertise, are adequately supported by the record, and are not clearly erroneous.

Finally, Petitioners have not identified any specific flaws in the monitoring network, other than the general statement that additional deep and shallow monitoring wells are needed. The only specific relief that the Petitioners ask for is to revise the permits to provide for additional monitoring wells as necessary. Petitions for Review at 30.

[10] On page 14 of the Petitions for Review, Petitioners cite only to RTC Section 7, No. 20 (AR #511), and note that Region 5 stated, "EPA considered the AoR modeling and geologic data in evaluating the special distribution and frequency of sampling at the monitoring wells." This ignores other RTCs that addressed questions about monitoring wells and articulated Region 5's rationale.

The permits already provide the relief that Petitioners request. Under Part M.1 and Attachment C of the permits, the monitoring program will be regularly revisited as additional data are developed. See also 40 C.F.R. §146.90(j). The approved T&MP adopts an iterative approach which "...will involve continually evaluating monitoring results and making adjustments to the monitoring program as needed, including the option to install additional wells in outyears to verify CO_2 plume and pressure front evolution..." (AR # 594 at C2.)

C. The Identification of Wells Located Within The AoR Is Consistent With Regulatory Requirements, And Region 5 Adequately Responded to Public Comments

40 C.F.R. §146.84(c) requires Class VI facilities to identify all wells within the AoR that may provide a conduit for CO_2 to escape from the injection zone and so may require corrective action. Specifically, 40 C.F.R. §146.84(c)(2) requires the facility to "[u]sing methods approved by the Director, identify all penetrations, including active and abandoned wells and underground mines, in the area of review that may penetrate the confining zone(s)."

The AoR and Corrective Action Plan (AR #594, Attachment B) and the administrative record show that all penetrations that may reach the confining zone have been identified to the Director's satisfaction. Petitioners contend, however, that Region 5 did not require or conduct an extensive enough search. Petitioners again assert without any citation that the regulations set a "strict standard" to locate and identify wells. (Petitions for Review at 4.) On their face, however, the regulations establish considerable discretion for the permitting authority in accepting the identification of potential conduits within the AoR for fluid movement out of the injection zone, in order to support a permit's corrective action program. See also 40 C.F.R. §146.84(c)(1)(iii). As described in Section III, above, those technical evaluations are entitled to considerable deference and are subject to a "clearly erroneous" standard of review. As shown below, the

documented well identification efforts were extensive, were calculated to identify any relevant wells, and were not clearly erroneous.

40 C.F.R. §146.82(a)(2) requires a Class VI permit applicant to "within the area of review … show the number or name, and location of all injection wells, producing wells, abandoned wells, plugged wells or dry holes, deep stratigraphic boreholes, State- or EPA-approved subsurface cleanup sites, surface bodies of water, springs, mines (surface and subsurface), quarries, water wells, other pertinent surface features…. *Only information of public record is required to be included on this map.*" (emphasis added) FutureGen submitted a map showing wells within the survey area covering the area originally proposed as the AoR, which also encompasses the estimated range of the CO_2 plume. See AR #2 and AR #15, Attachment B.

When Region 5 determined that the AoR would be much more expansive based on the estimated extent of the pressure front, it undertook its own well review. Specifically, Region 5 identified and tabulated 6,110 wells in the AoR. (AR #538.) FutureGen also subsequently submitted revised maps showing the wells it had identified within the expanded AoR. (AR #278.) Of these wells identified by Region 5 and FutureGen, only two (not including FutureGen's own stratigraphic test well) were identified as penetrating the top of the confining zone: Whitlock #7-15 and Criswell #1-16.[11] (AR #15 and 538.)

The small number of wells penetrating the confining zone is not surprising, as the injection zone is more than 3,785 feet deep, the confining zone isolating the injection zone from any potential USDW is located between 3,425 feet and 3,764 feet bgs, and the base of the deepest potential USDW is 1,942 feet bgs. Because the deepest USDW currently in use is considerably

[11] One well (API #120170011000) does not have a depth reported in the ISGS dataset; however, the well's record in the ISGS ILWATER database (AR #392) denotes that this is a private water well. (See AR #538 at 4.) Private water wells are very shallow in the area and the lowermost USDW is at 1,942 feet deep; thus, a private water well would not penetrate the primary confining zone at 3,425 feet.

shallower than the confining and injection zones, drinking water wells throughout the AoR would not come anywhere close to the depths of those formations. Drinking water wells constitute the large majority of surface penetrations in the AoR. See AR #2, #15 and #538.

Petitioners emphasize the disclaimer accompanying the Illinois State Water Survey ("ISWS") information (AR # 514), indicating that the State database may be incomplete. (Petitions for Review at 16.) Region 5 relied on data from the Illinois State Geological Survey (AR #519, #391, #392) for its well records review,[12] in addition to data from the ISWS (AR #512, #514), to gather the most complete picture possible from publicly available records.

EPA's AoR Guidance acknowledges that any well database may be imperfect, but recognizes that any data gaps are relevant only to the extent that they may omit deep wells. AoR Guidance at 51 (AR #439). The extensive records in the well databases did not identify any oil well within the AoR extending deeper than 1,845 feet bgs or any gas well extending deeper than 1,124 feet bgs. The deepest wells on record in the AoR (other than the Whitlock, Criswell and FutureGen wells described above) are two private wells associated with the gas storage operation in Waverly, Illinois (almost 20 miles away) that extend approximately 3,600 feet deep. Those wells do not penetrate through the confining zone. After that, the next deepest recorded private water well extends only 1,056 feet bgs. (See AR #538, AR #519.) Petitioners base their criticism of the well identification efforts on recommendations in EPA's AoR Guidance. However, as the guidance states at the outset, it is merely advisory, does not add any requirements beyond those contained in the regulations, and may not be applicable to every situation. AoR Guidance at i (AR #439).

[12] The ISGS is an official repository for records of wells drilled in the state of Illinois. Paper records are archived for over 700,000 wells. Some of these records go back as far as the late 1800s. (AR #392.)

In discussing options for the well identification process, the AoR Guidance confirms what Region 5 observed in its site-specific review:

> Most deep wells that may penetrate the primary confining zone of a proposed GS project site are related to oil and gas exploration and production. Deep well drilling for oil and gas exploration dates back to the 1870s. State and local databases of well exploration may include locations of abandoned wells, and EPA recommends conducting a records review as the first step in abandoned well identification within the delineated AoR for a proposed Class VI injection well. In addition, state and local records will provide information on the time period and types of exploration that have been conducted in an area, and they may also provide information on typical completion and abandonment methods in a given field. This records search will provide a list of known abandoned wells, and it may inform additional stages of abandoned well identification.

AoR Guidance at 52 (AR #439).

Because the depths of the injection zone and the confining zone far exceed the depths of typical recorded historic drilling activities in the AoR, Region 5 reasonably concluded that further measures described in the AoR Guidance such as additional site reconnaissance, aerial surveys or geophysical surveys were unlikely to be productive uses of Region 5's or FutureGen's resources. However, if subsequent remodeling of the AoR results in an expanded AoR (laterally and/or vertically), the Permits and the regulations require re-evaluating the AoR for potential leakage pathways. See Permits Section G and Attachment B (AR #594); 40 C.F.R. §146.84(b) - (e).

Petitioners also contend that Region 5's error in failing to properly identify wells is underscored as it relates to wells on Petitioner Leinberger's Property. (Petitions for Review at 20-21.) Petitioners commented (and submitted an affidavit) that there are two non-producing natural gas wells located on the Leinberger Property that are not reflected in the draft permit or in the ISGS database. However, the Petitioners have not provided well depths or American Petroleum Institute numbers, or asserted that these wells could even potentially extend to the confining layer. (AR #497.) Absent this information, Region 5 has no reason to believe the wells

present an issue for corrective action; indeed it cannot evaluate such wells, or even verify their existence.

Ironically, Petitioners also criticize Region 5's review because it identified and corrected factual errors in FutureGen's application concerning the status and history of the two deep wells located within the AoR.[13] Region 5's review of all available information relating to potential conduits for migration of fluids into USDWs is exactly the kind of careful evaluation of the permit application and the underlying facts contemplated by the regulations and the guidance.[14]

Finally, Petitioners contend that the drilling of FutureGen's stratigraphic well approximately two miles away somehow led to contamination of the Critchelows' well. (The stratigraphic well drilling, which took place more than three years ago, did not occur under the UIC program.[15]) Region 5's and FutureGen's well investigations identified six water wells located within the modeled plume around the proposed site for the FutureGen injection wells, including one drinking water well located near the Critchelow property with a depth of 25 feet. Five of the six water wells are at depths between 25 and 127 feet bgs. One well is 1,056 feet deep. (AR #538.)

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[13] 40 C.F.R. §146.84(c)(2) and (3) requires FutureGen to provide details on the deep wells' "type, construction, date drilled, location, depth, record of plugging and/or completion," and to confirm whether those wells "have been plugged in a manner that prevents the movement of carbon dioxide or other fluids that may endanger USDWs."

[14] The errors that Region 5 identified were not material and did not raise any concerns about the need for potential corrective action. Region 5's investigation confirms FutureGen's conclusion that corrective action is not needed. The Criswell well #1-16 was noted as an observation well at the time of FutureGen's application in 2013 (AR #1 and #2),and also when Region 5 first inquired with the ISGS in June 2014 (AR #571 and #572). Through further conversations with ISGS (AR #524 and #576) and a Panhandle Gas Storage representative (AR #566), Region 5 learned that Criswell well #1-16 was plugged in June 2014 as part of a routine operation to plug and abandon 33 wells. The Petitioners' claim that Region 5 made the decision to plug Criswell #1-16 is incorrect.

The deepest perforations at the Whitlock well #7-15 reach 3,155 feet bgs (AR #572, #576), and the well is plugged back with 180 feet of cement at the bottom. Region 5 contacted Panhandle Gas Storage to confirm that the construction is adequate to prevent the well from acting as a potential conduit for fluid movement up the well. (AR #566 and #567.) Additionally, the Whitlock well is monitored by the Panhandle Gas Storage operation as an active observation well (IDNR permit #051720), and was last inspected by the Illinois Department of Natural Resources on March 12, 2014. (AR #526.)

[15] Petitioners mischaracterize this stratigraphic test well as an injection well. (Petitions for Review at 20.) It is not, and so is not within EPA's jurisdiction. (See AR #2 at 1.4; RTC Section 2, No. 11 (AR #511).)

Three water wells are located closer to the stratigraphic well location than the Critchelows' drinking water well. (AR #278.)

None of the well owners, including the Critchelows, raised any complaints of fouling or overflowing of water wells to any government agency or to FutureGen during or after FutureGen's drilling in late 2011. In 2014, Mr. Critchelow provided a one-page declaration expressing his conclusion that the drilling of FutureGen's stratigraphic well impacted his water well, with no further information or support. Mr. Critchelow has not disclosed the actual well location, depth, or other identifying information to Region 5. (AR #497.) Because it is a water well, Region 5 reasonably assumes it would not extend anywhere near the confining layer or present a possible pathway for injection fluid migration. Region 5 therefore concluded that the Critchelows' well issues were independent of the activities at FutureGen.

Nonetheless, to help assure the Critchelows that their well is not linked to FutureGen activities, Region 5 expressed its willingness to require FutureGen to provide advance notice to the Critchelows of well construction to help assure the Critchelows that there is no linkage. (RTC Section 2, No. 11 and Section 3, No. 52 (AR #511).) The Petitioners assert that Region 5 has no authority to ask FutureGen to do so. (Petitions for Review at 21.) If Petitioners wish Region 5 to withdraw its offer, it will do so. To the extent the Critchelows seek their own permit provision requiring FutureGen to monitor their wells, the impact on the Critchelows is so speculative and so unlikely, that there is no basis to do so. In the unlikely event that impacts are identified in the future, the well would be subject to corrective action. (Permits, Part G.2 and Attachment B (AR #594); 40 C.F.R. §146.84(c) – (e).)

Petitioners state that Region 5 cannot rely on a corrective action plan in lieu of identifying all water wells, citing to *In re Bear Lakes Properties, LLC,* UIC Appeal No. 11-03 (EAB June

28, 2012), 15 E.A.D. __. (Petitions for Review at 18.) That is simply not the case for these permits, however. Region 5 has met the standard described by the EAB in that case – to account for and consider appropriate and accurate site-specific information in reviewing the permits. *Id.* at 7, 11.[16] Region 5 merely pointed to the fact that Class VI permits and regulations provide additional assurance through requirements that identification of wells in the AoR is regularly revisited. 40 C.F.R. §146.84(e); Permits Part G.2 and Attachment B (AR #594).

Region 5 explained and supported its approach to confirming that all wells in the AoR that may penetrate the confining zone were identified and evaluated, in the RTC (RTC Section 2, No. 21; Section 3, Nos. 14, 35, 48-52, 54-55; Section 7, Nos. 20-21 (AR #511))[17] and in the administrative record. Region 5's determination reflects a reasonable and appropriate decision based on Region 5's expertise, and is not clearly erroneous.

D. The Permits' Cost Estimate For Emergency And Remedial Response Is Consistent With Regulatory Requirements, And Region 5 Adequately Responded to Public Comments

The Class VI regulations establish specific requirements to help "ensure that adequate and continuous financial responsibility mechanisms are in place throughout the life of each GS project and that the cost associated with operation of GS projects is not passed along to the public." 75 Fed. Reg. 77230, 77270 (Dec.10, 2010). Those requirements allow a permittee to choose among several different options, or combinations of options, including: trust funds; surety

[16] In *Bear Lake*, the permitting region could not articulate what data it relied on in making its determination about water wells in the AoR, because the record was confusing and contradictory. *Id.* at 11-12. In that same case, the EAB did not require anything beyond a review and analysis of public records to establish a sufficient record identifying and accounting for gas wells in the AoR. *Id* at 16-18.

[17] On page 14 of the Petitions for Review, Petitioners cite only to RTC Section 7, No. 20 (AR #511), and note that Region 5 stated, "EPA considered the AoR modeling and geologic data in evaluating the special distribution and frequency of sampling at the monitoring wells." This ignores other RTCs that addressed questions about monitoring wells and articulated Region 5's rationale.

bonds; letters of credit; insurance; self-insurance (*i.e.*, financial test and corporate guarantee); and escrow accounts. 40 C.F.R. §§146.85(a)(1) and (a)(6).

Financial responsibility instruments must be sufficient to cover the cost of those matters regulated by the Class VI permit program -- corrective action; injection well plugging; post injection site care and site closure; and emergency and remedial response. 40 C.F.R. §146.85(a)(2). The amount of the financial responsibility provided must be based on a detailed written estimate, in current dollars, developed for each phase separately. 40 C.F.R. §146.85(c).

The qualifying financial responsibility instrument(s) must also comprise protective conditions of coverage; i.e., they must include cancellation, renewal, and continuation provisions, specifications on when the provider becomes liable following a notice of cancellation, and requirements for the provider to meet a financial strength standard. 40 C.F.R. §146.85(a)(4). The Director "shall consider and approve the financial responsibility demonstration for all the phases of the geologic sequestration project prior to issu[ing] a Class VI permit." 40 C.F.R. §146.85(a)(5)(i).

Petitioners object to the cost estimate, and to use of the trust fund mechanism, approved by Region 5 solely as it concerns emergency and remedial response ("E&RR"). (See Petitions for Review at 22-26.) In reviewing the permit, Region 5 approved a $26.7 million cost estimate for E&RR, and approved FutureGen's proposal to provide a trust fund to cover that entire cost estimate. See AR #307; AR #316 and AR #594, Attachment H.

Petitioners do not provide any legal basis that authorizes (much less requires) Region 5 to reject a financial responsibility mechanism that is specifically allowed by the regulations, is sufficient to cover the cost of E&RR, and provides the required protective conditions of coverage. If the Permittee's financial responsibility proposal meets regulatory requirements, the

regulations do not authorize Region 5 to dictate that FutureGen instead provide financial assurance through an insurance policy because the Petitioners might prefer it.

FutureGen's application included a detailed written estimate for the injection and post-injection emergency and remedial response costs. (Appendix C of the Permit Application, prepared by Patrick Engineering (AR #2).) FutureGen's permit application provided a detailed list of possible E&RR scenarios, and based its E&RR cost estimate on the costliest possible scenario -- migration of CO_2 from the injection zone through failure of the confining zone (loss of containment through catastrophic failure of the caprock). (AR #2, Section 8.1.) Responding to such a failure was estimated to cost $6.1 million. (AR #2, Appendix C.) FutureGen also proposed to use an insurance policy to provide financial responsibility for E&RR. (AR #2, Section 9.)

Region 5's review identified shortcomings with both the cost estimate and the financial responsibility mechanism, which were corrected as documented in the record. Outlining the review process for the E&RR cost estimate and financial mechanism illustrates the reasonableness of Region 5's decision to approve the financial responsibility demonstration under 40 C.F.R. §146.85(a)(5).

1. E&RR Cost Estimate Development

While Region 5 evaluated FutureGen's estimate and determined that $6.1 million was an acceptable starting point, it also determined that a complete cost estimate over the entire life of the project must consider a range of events that could require E&RR.[18] Region 5 then used its

[18] Section 8.1 of the Permit applications identifies other items that could cause additional E&RR costs such as loss of mechanical integrity (monitoring wells); migration of CO_2 from injection zone through faults and fractures or undocumented wells; monitoring equipment failure or malfunction; movement of brine from injection zone; and earthquake damage. (AR #1 and #2; see also AR #594, Attachment F.)

Cost Estimation Tool for Class VI Financial Responsibility Demonstrations ("Cost Tool") to further evaluate the cost estimate. Summary of Financial Responsibility Estimates for FutureGen Based on Cost Tool Outputs (AR #320 at 9, Appendix B and C).

Specifically, Region 5 generated independent cost estimates for each of the covered activities using the Cost Tool. To develop these estimates, Region 5 extracted relevant information about the project from FutureGen's permit application which served as the inputs/assumptions to the Cost Tool. Inputs included: maximum extent of the CO_2 plume, amount of CO_2 injected, duration of post-injection site care period, presence of USDWs in the AoR, the depths and diameters of the injection and monitoring wells in the AoR, and the characteristics of any deficient wells in the AoR requiring corrective action. Additional information on the assumptions used in developing the unit costs is provided in Appendix A of AR #320.

The Cost Tool generated low-, medium-, and high-end estimates of the costs to respond to an event that includes remediating ground water based on site-specific information in FutureGen's permit applications. *Id.*, Appendix B. As Appendix A of AR #320 explains, the Cost Tool generates a range of costs for financial responsibility activities based on assumptions about the project (as provided by the permit applicant) and the costs for third parties to perform these activities (which are based in part on the cost estimation model EPA developed to estimate the costs of implementing the Class VI Rule as part of the rulemaking process).

The Cost Tool applies conservative assumptions to develop a cost estimate sufficient to cover the entire life of the project. Although only a small fraction of GS sites are expected to require any E&RR, all sites need to be financially capable of facing an emergency. As such, the Cost Tool will overestimate the actual E&RR costs incurred by most sites, but not the funds required for E&RR financial responsibility. *Id.*, Appendix A. The Cost Tool assumes that all CO_2 injected

could leak into the USDW and that it will be necessary to stop injection at, establish a hydraulic barrier for, and chemically seal, all four wells (which would not necessarily be required). *Id.* at 9, Exhibit B-2.

In the Cost Tool estimate, costs for creating a hydraulic barrier add almost $13 million in potential E&RR costs (based on EPA studies of Superfund groundwater remediation data). In addition, FutureGen estimated that pump and treat activities would occur for only 2 years, whereas the Cost Tool estimates that pump and treat activities may continue for anywhere between 2 and 30 years. (Region 5 adopted the middle range of the cost estimate, which assumes that pump and treat activities would continue for 18 years[19] at a cost of $14.4 million.) [20] *Id.*

Based on the Cost Tool results, Region 5 and FutureGen discussed and agreed upon revising the E&RR cost estimate to $26.7 million (AR #307),[21] although FutureGen still asserts that the cost estimate is too conservative (RTC Section 4, No. 8 (AR #511)). This revised figure was based on the middle range cost estimate calculated using the Cost Tool (see AR #320, Exhibit B-2).

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[19] One set of inputs used by the Cost Tool to estimate treatment costs is the duration of extraction well operation and extraction well O&M, which is based on 10th, 50th and 90th percentiles of corresponding data from pump-and-treat groundwater remediation at Superfund sites. 18 years of groundwater remediation corresponds to the 50th percentile of pump-and-treat duration from EPA. See AR #320, Appendix A; U.S. Environmental Protection Agency (EPA), Office of Solid Waste and Emergency Response. 2001. Groundwater Pump and Treat Systems: Summary of Selected Cost and Performance Information at Superfund-financed Sites. Washington, DC. Office of Solid Waste and Emergency Response. EPA 542-R-01-021b. http://www.epa.gov/tio/download/remed/542r01021b.pdf.

[20] Cost associated with E&RR activities (e.g., costs to drill and run extraction wells to treat contaminated water from a USDW) derive from EPA studies of Superfund groundwater remediation. While a Class VI well failure is not expected to produce the same kinds of toxic contamination as found in a Superfund site, the Superfund estimates are the best available source for costs of pump-and treat operations. Because E&RR at GS sites will likely require less complex treatment, the Cost Tool likely overestimates the costs that would be needed to treat contaminated water from USDWs. (AR #320 at 8, Appendix A.)

[21] FutureGen's final E&RR cost estimate was revised upward by approximately $700,000 after that agreement was reached. The trust agreement funding remains sufficient, especially because the cost estimates and financial responsibility mechanisms will be regularly revisited over the life of the project under Part H.2-3 of the Permits (AR #594) and 40 C.F.R. §146.85(c)(2). See AR #320 at 9.

Petitioners contend, without any applicable legal citation,[22] that Region 5 should have adopted the high end cost estimate for E&RR from the Cost Tool (Petitions for Review at 24-25), also asserting that the record does not include a detailed cost estimate. As explained above, the cost estimates in the record are well explained and justified.

The E&RR cost estimate is fully explained and is inherently conservative. The most significant difference in assumptions (and costs) between the middle cost estimate and the worst case value is the length of groundwater pump and treat operations. (AR #320 at 9, Appendix B.) As the Cost Tool report indicates, the groundwater treatment cost estimates are likely overestimated because they are based on Superfund groundwater remediation. (*Id.* at 8, Appendix A.) Moreover, since the cost estimate is regularly revisited over the life of the project under Part H.2-3 of the Permits (AR #594) and 40 C.F.R. §146.85(c)(2), the cost estimate would be adjusted well before any longer term groundwater treatment costs would be incurred. After considering all of these relevant factors, Region 5 determined that the middle cost estimate was reasonable for this project.

The cost estimate data provided by FutureGen's submittal and by EPA's Cost Tool evaluation provide a clear and detailed explanation of the E&RR cost estimate, just as they do for the other uncontested elements of the total cost estimate for the project.

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[22] In arguing that the trust funding allocated for E&RR is insufficient, the Petitioners cite *In re Pennsylvania Gen'l Energy Co., LLC*, UIC Appeal Nos. 14-63, 14-64, & 14-65, slip op. at 2 (August 21. 2014), 16 E.A.D. __, for the proposition that "[w]ithout sufficient funding to remedy drinking water contamination, the purpose of the SDWA is disregarded." (Petitions for Review at 24.) There is no support for, or reference to, Petitioners' assertion anywhere in the *Pennsylvania Gen'l.* decision. In *Pennsylvania Gen'l*, the EAB found that Region 3 had addressed petitioners' concerns about financial responsibility for well plugging and abandonment in its response to comments, and that "the petition fails to indicate why the Region's response was clearly erroneous or otherwise warrants Board review." *Id.* at 17-18.

2. E&RR Financial Mechanism Development

FutureGen's initial permit applications proposed to use an insurance policy to show financial responsibility for E&RR. Specifically, they recommended a Pollution Legal Liability ("PLL") insurance policy with a value of $10 million during the drilling phase, increasing to $100 million once injection begins, with a term of 3 to 5 years for E&RR, along with various other insurance policies including Control of Well and General Liability insurance and Umbrella/Excess coverage. (AR #2, Section 9.) As Region 5 began asking for details about the insurance policy, however, three potential flaws came to light.

First, because the PLL policy would cover potential legal and liability costs and damages (such as personal injury and property damage) unrelated to E&RR costs, and would include standard incident and aggregate limits, it was not clear what amount of the overall coverage would ultimately be available to address E&RR costs, and whether that coverage would match or exceed the cost estimate.[23] (See AR # 305, #249.) 40 C.F.R. §146.85(a)(2)(iv) requires that "The qualifying instrument(s) must be sufficient to cover the costs of … Emergency and Remedial Response." Without an insurance policy clearly delineating the liability amount dedicated to providing financial responsibility for E&RR, Region 5 could not be certain that the insurance policy provided the protective conditions of coverage required by 40 C.F.R. §146.85(a)(4)(i).

Second, although FutureGen proposed to phase in the amount of insurance coverage, it was unable to provide a commitment for coverage extending beyond the drilling and well construction phase of the project. (AR #249, #250, #267, #269, #271, #295.) Because the coverage did not yet include the anticipated $100 million policy earmarked for the injection and

[23] It was also not clear to what extent E&RR claims under the policy might be subject to delays in payment or might not be covered to the extent the policy limit was reached if claims were paid first for other covered matters. (See AR #267, #305, #249.)

post-injection phases, it called into question whether the insurance proposal provided a financial responsibility demonstration for all the phases of the geologic sequestration project prior to issuing a Class VI permit, as required by 40 C.F.R. §146.85(a)(4)(i).

Third, FutureGen was not able to provide a proposed PLL policy that satisfied all requirements for protective conditions of coverage. For example, the specimen policies provided by FutureGen allowed for broader cancellation rights and shorter notice provisions than those outlined in 40 C.F.R. §146.85(a)(4)(i)(A), and did not include the automatic renewal provisions outlined in 40 C.F.R. §146.85(a)(4)(i)(B). (AR #249, #250, #267, #269, #271, #295.)

For these reasons, FutureGen concluded that it could not provide an insurance policy as a financial assurance mechanism that met regulatory requirements, at least at that time. As a result, FutureGen proposed to provide financial responsibility of $26.7 million for the estimated E&RR costs by adding that amount to the trust fund established to cover its other financial responsibility obligations under the permits. (AR #305; #594, Attachment H.)

Because the trust fund option met all regulatory requirements, Region 5 approved it and included it in the permits. Indeed, it might have been clear error for Region 5 not to approve a compliant financial responsibility mechanism proposed by the Permittee. In addition, the regulations specifically provide that the cost estimate will be re-evaluated on an annual basis, and that financial responsibility will be increased to the extent the cost estimates increase. Therefore, in the event E&RR is actually triggered, FutureGen would be required to (1) implement its E&RR plan under the permits (regardless of funding source) (Permits Part P (AR #594)); and (2) adjust its cost estimates and financial assurance value accordingly. 40 C.F.R. §§146.85(c)(2) and (c)(4); Permits Part H.2 and H.4 (AR #594).

Petitioners point out that EPA's Geological Sequestration of Carbon Dioxide: Underground Injection Control (UIC) Class VI Program: Financial Responsibility Guidance, EPA 816-R-11-005 (July 2011), AR #438 ("FR Guidance") at 22, indicates a preference for insurance as an assurance mechanism for E&RR.[24] (Petitions for Review at 23.) However, an insurance mechanism must still meet all regulatory requirements before the Director can approve it for a permit. Both FutureGen and Region 5 agreed that the proposed insurance mechanism did *not* meet all of the requisite regulatory requirements.

The Petitioners may prefer insurance coverage in part because the coverage extends beyond the potential corrective actions that may be needed to address USDWs as required by the Class VI regulations.[25] However, the insurance coverage that FutureGen was exploring did not meet the protective conditions of coverage and did not assure that the necessary financial assurance would be available for the E&RR.

Finally, the financial assurance requirements exist in addition to the permit provisions (AR #594, Part P and Attachment F) requiring FutureGen to implement all necessary E&RR provisions regardless of whatever financial assurance is in place. FutureGen consists of several large organizations with significant financial resources (AR #2 at 1.1) that have a duty to implement E&RR under the permits under any circumstances. (AR #594, Part F.1.)

Region 5 explained and supported its approval of the E&RR cost estimate and financial responsibility mechanism in the RTC (RTC Section 4, Nos. 8-13, 15-18 (AR #511)) and in the administrative record. The permit provisions represent a reasonable cost estimate and financial

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[24] Of course, guidance is not binding but rather provides recommendations that may not apply in a particular situation. *Nat'l Mining Ass'n v. McCarthy*, 758 F.3d 243 (DC Cir. 2014).

[25] The financial responsibility requirements are limited to assuring protection of USDWs and of human health *as it relates to USDWs*; Region 5's decisionmaking is not and cannot be based on a broader scope than that. See *In re NE Hub Partners, L.P.*, 7 E.A.D. at 567.

assurance mechanism reflecting Region 5's application of its technical expertise, are adequately supported by the record, and are not clearly erroneous.

E. The Permits' Trust Fund Provisions To Provide Financial Responsibility For Emergency And Remedial Response Are Consistent With Regulatory Requirements, And Region 5 Adequately Responded to Public Comments

Petitioners raise concerns with two matters related to the terms of the trust fund. First, they assert that the pay-in period provided for the E&RR cost estimate is inappropriate. (Petitions for Review at 28.) Second, they contend that the permits must include a provision requiring FutureGen to maintain the trust fund through the entire duration of the GS project. (Petitions for Review at 27.) In both cases, the permits provide the flexibility specifically contemplated by the financial responsibility regulations and are not clearly erroneous.

1. Pay-In Period

40 C.F.R. §146.85(f) specifically authorizes Region 5 to approve the use and length of pay-in-periods for trust funds or escrow accounts established to provide financial responsibility. As the regulatory preamble states: "EPA understands that in some cases a short pay-in period (*e.g.*, three-years or less) will provide some financial flexibility for owners or operators while balancing financial risk." 75 Fed. Reg. 77230, 77271 (Dec.10, 2010).

The pay-in provisions in FutureGen's permits provide such flexibility, which is appropriate because the trust fund is intended to cover the entire life of the project, where many potential financial responsibility triggering events will not occur for years, if at all. Pay-in terms in Attachment H of the permits are consistent with EPA's FR Guidance, and in fact take a more conservative approach than the FR Guidance outlines. (See AR #594, Attachment H, Schedule C; FR Guidance, AR #438 at 26.)

Specifically, the permits require payment of $8.823 million into the trust fund within 7 days of final permit issuance to cover pre-injection activities. The payment figure includes $6.1 million earmarked for potential E&RR costs and represents more than 17% of the total trust fund value. Petitioners contend that Region 5 should not use the $6.1 million E&RR value here because it is based on a $6.1 million estimate from FutureGen that Region 5 determined did not fully address potential E&RR costs for the entire life of the project. (Petitions for Review at 26, 29.) It is, however, extremely conservative to address solely pre-injection activities, where any catastrophic failure is highly unlikely. EPA's Cost Tool also verified that $6.1 million is a reasonable low-end estimate for any E&RR event that could occur before injection begins. (AR #320 at B-1.) More than half of that estimate represents collection and treatment of contamination caused by injection activities, which would not come into play during well construction and testing. (*Id.*) Given the limited scope of pre-injection activity, the initial pay-in amount is reasonable, explained in the record, and not clearly erroneous.

FutureGen must then place an additional $22.435 million in the trust fund within one year of final permit issuance,[26] or at least 7 days prior to injection, whichever comes first. At this point, $31.258 of the $57.1 million[27] trust fund (55%) would be in place. Even though none of the second installment is earmarked for E&RR, under Section 4 of the trust fund agreement, all funds would be available for E&RR use if needed. (AR #594, Attachment H, Section 4.)

FutureGen's last installment payment of $20.6 million is due within 2 years of final permit issuance, regardless of whether injection has actually started. This pay-in plan is more

[26] The final permit issued on August 29, 2014, so this payment is due no later than August 29, 2015. (AR #594 at 1.)

[27] The trust will initially be funded to a total of $57.1 million, which covers the cost estimates for corrective action, injection well plugging, and post injection site care and site closure, in addition to E&RR. AR #594, Attachment H.

conservative than the recommended approach described in the FR Guidance. That document suggests a three year pay-in period (FR Guidance, AR #438 at 26), where the FutureGen permits establish a two year period, and provide further that at least 55% of the total funding would be in place before any injection began.[28]

Finally, there is no need to add an affirmative statement that the Director must approve the pay-in-period (see Petitions for Review at 30), as the inclusion of the pay-in period in the final permits necessarily reflects the Director's approval of that period, as provided by 40 C.F.R. §146.85(f). (See RTC, Section 4, No. 5 (AR #511).)

2. Trust Fund Termination

Petitioners assert that the permits fail to contain a provision requiring FutureGen to maintain financial assurance through the duration of the project, because the trust agreement states that it "shall continue until terminated by the Grantor and Trustee, with the concurrence of USEPA Water Division Director." Petitioners interpret that clause as allowing FutureGen to terminate its financial responsibility obligations before site closure is completed, in violation of 40 C.F.R. §146.85(b)(1). (Petitions for Review at 27.)

This argument ignores the clear language of Part H.1 of the permits (AR #594):

> **Financial Responsibility** – The permittee shall maintain financial responsibility and resources to meet the requirements of 40 CFR 146.85 and the conditions of this permit. Financial responsibility shall be maintained through all phases of the project. The approved financial assurance mechanisms are found in Attachment H and in the administrative record of this permit.

The flexibility in the language cited by Petitioners is to account for the flexibility built into the regulations for the permittee to request a substitute mechanism to demonstrate financial responsibility. The cited language comes from the model trust agreement form included as

[28] To the extent the actual effective date of the permit is delayed by this appeal, it is even possible that injection may not begin until after the final payment is due on August 29, 2016.

Appendix B.1 to the FR Guidance (AR #438), and is consistent with, and necessary to implement, the language of 40 C.F.R. §146.85(b)(2):

> The owner or operator may be released from a financial instrument in the following circumstances:
>
> ***
>
> (ii) The owner or operator has submitted a replacement financial instrument and received written approval from the Director accepting the new financial instrument and releasing the owner or operator from the previous financial instrument.

Were FutureGen to terminate the trust fund without substituting alternative mechanisms necessary to cover the full remaining cost estimate, it would be out of compliance with the permit. The trust agreement provision cited by Petitioners does not somehow create a loophole in that obligation. In addition, 40 C.F.R. §146.85(b) creates an independent obligation to maintain financial assurance.[29]

Region 5 explained and supported its approval of the trust fund terms and pay-in provisions in the RTC (RTC Section 4, Nos. 5-7 and 14 (AR #511)) and in the administrative record. The pay-in provisions and trust agreement terms reflect Region 5's reasonable application of its technical expertise, are adequately supported by the record, and are not clearly erroneous.

V. CONCLUSION

In issuing the FutureGen permits, Region 5 reviewed the application and developed permit terms, consistent with regulatory standards. The record establishes that Petitioners have not identified any clearly erroneous decisions by Region 5 or any policy decisions requiring review by this Board. Region 5 therefore respectfully requests that the Petitions for Review be denied.

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[29] Ironically, if Region 5 were to remove the language cited by Petitioners from the trust agreement to make it impossible to replace and terminate, it would likely deter or even preclude FutureGen from later substituting an insurance mechanism to cover E&RR as Petitioners would prefer – an approach that FutureGen has indicated it may wish to pursue in the future. (See RTC, Section 4, No. 13 (AR #511).)

VI. STATEMENT CONCERNING ORAL ARGUMENT

As explained in detail above, Petitioners have not satisfied their substantial burden to demonstrate that any issues require review by this Board. All of Petitioners' contentions fall far short of proving any clearly erroneous finding of fact or conclusion of law, or of showing any exercise of discretion or important policy consideration requiring review. Therefore, oral argument is not necessary or appropriate.

VII. STATEMENT OF COMPLIANCE WITH WORD LIMITATION

Pursuant to 40 C.F.R §124.19(d)(3), Region 5 states that this Response to Petitions for Review contains approximately 12,521 words, which does not exceed the 14,000 word limit set by the EAB.

Respectfully submitted,

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Dated: October 31, 2014

BEFORE THE ENVIRONMENTAL APPEALS BOARD
UNITES STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C.

In re:		)	
		)	
FutureGen Industrial Alliance, Inc.		)	UIC Appeal Nos.: 14-68, 14-69, 14-70 & 14-71
		)	
Permit Nos.:	IL-137-6A-001	)	
	IL-137-6A-002	)	
	IL-137-6A-003	)	
	IL-137-6A-004	)	
		)	

CERTIFICATE OF SERVICE

I hereby certify that the original of this Consolidated Response to Petitions for Review in the matter of FutureGen Industrial Alliance, Inc. of Jacksonville, Illinois, Permit Nos. IL-137-6A-001 through IL-137-6A-004, UIC Appeal Nos. 14-68 through 14-71, and all associated attachments, were filed electronically, via the EAB eFiling System, with the Board. In addition, I certify that one identical paper copy of all of the attachments to the Consolidated Response were sent to the Board, via United Parcel Service overnight delivery, to the following address:

Clerk of the Board
U.S. Environmental Protection Agency
Environmental Appeals Board
1201 Constitution Avenue, NW
WJC East Building, Room 3334
Washington, DC 20004

Further, I certify that one copy of the Consolidated Response to Petitions for Review in the matter of FutureGen Industrial Alliance, Inc. of Jacksonville, Illinois, Permit Nos. IL-137-6A-001 through IL-137-6A-004, UIC Appeal Nos. 14-68 through 14-71, excluding the associated attachments, was sent to the Petitioner and Permit Applicant:

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By agreement of the parties, as provided in 40 C.F.R. §124.19(i)(3), service to the Petitioner and Permit Applicant of the attachments to the Consolidated Response to Petitions for Review in the matter of FutureGen Industrial Alliance, Inc. of Jacksonville, Illinois, Permit Nos. IL-137-6A-001 through IL-137-6A-004, UIC Appeal Nos. 14-68 through 14-71, was made electronically, via the EAB eFiling System.

Dated: October 31, 2014