MOXA CARBON STORAGE, LLC

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BLM Rock Springs Field Office
Attn: Maura Bradshaw
280 US Highway 191
Rock Springs, WY 82901
Submitted through BLM National NEPA Register

RE: Environmental Assessment for the Southwest Wyoming Carbon Dioxide Sequestration Project, DOI-BLM-WY-D090-2023-0010-EA

As the applicant for the pore space right-of-way in Lincoln, Uinta, and Sweetwater counties in southwestern Wyoming, Moxa Carbon Storage, LLC ("Moxa Carbon Storage")—a wholly-owned subsidiary of Tallgrass Energy Partners, LP—appreciates this opportunity to provide comment and additional context for Moxa Carbon Storage's proposed Southwest (SW) Wyoming carbon dioxide (CO_2) Sequestration Project that is currently the subject of BLM's National Environmental Policy Act (NEPA) review.

The acquisition of a right-of-way (ROW) for federal pore space is an important step in any geologic sequestration project that includes federal lands. It lays the groundwork for the significant economic and operational investment in subsequent project steps, such as drilling one or more stratigraphic well(s) to obtain crucial information about the subsurface geology that will be needed to prepare the applications for Class VI underground injection control (UIC) well permits.

As explained in BLM's Environmental Assessment for the Southwest Wyoming CO_2 Sequestration project (SW Wyoming Sequestration EA), a grant holder for a pore space ROW must first obtain a notice to proceed (NTP) from BLM before injecting CO_2 into BLM-administered federal pore space.[1] And BLM will only issue a NTP after a ROW holder has first obtained a Class VI permit from the Wyoming Department of Environmental Quality (WDEQ) and (where necessary) a unitization order from the Wyoming Oil and Gas Conservation Commission (WOGCC).[2] The WDEQ Class VI permitting program includes a robust public comment process while the WOGCC unitization process includes a public hearing before the Commission prior to issuing a unitization order. Thus, while a BLM ROW is an indispensable step in the regulatory approval process required for a geologic sequestration project, a ROW grant does not authorize the actual injection and long-term storage of CO_2 on federal lands.

[1] SW Wyoming Sequestration EA, at 5.

[2] *Id*.

Because WDEQ has the primary regulatory authority for geologic sequestration projects in Wyoming, BLM will necessarily rely upon WDEQ's expertise and regulatory process before providing authorization to inject CO_2 into federal pore space for long-term storage. Moxa Carbon Storage provides a summary of WDEQ's Class VI permitting process below as additional background for why BLM (and the public) will have a comprehensive understanding of the site-specific impacts of long-term geologic sequestration for the Southwest Wyoming CO_2 Sequestration Project before BLM authorizes any injection of CO_2 into BLM-administered federal pore space.

Moxa Carbon Storage offers the following comments for BLM's consideration. First, we provide a high-level summary of why the requested pore space appears promising for long-term sequestration of CO_2. Second, we provide an overview of WDEQ's extensive Class VI well regulatory process to highlight why that process ensures the safety and effectiveness of geologic sequestration projects throughout the project's lifecycle. Third, we summarize why the SW Wyoming Sequestration Project has the promise to materially advance the administration's policy objective of significantly reducing GHG emissions through commercial-scale CO_2 sequestration on public lands. And fourth, we suggest specific revisions to BLM's proposed stipulations to increase the likelihood that these stipulations will satisfy their objectives (including the protection of other BLM-managed resources) without frustrating Moxa Carbon Storage's ability to develop a CO_2 sequestration project on BLM-administered lands.

Summary of Area Geology

The extent and plunging anticline structure of the Moxa Arch make it a feasible location for CO_2 sequestration, providing a structural trapping mechanism to prevent plume migration outside of the injection zone. A preliminary geologic feasibility assessment indicates the ability to inject significant volumes of CO_2 into the subsurface pore space that will remain permanently trapped by a thick sequences of caprocks that prevent vertical migration of fluids and gases outside the injection zone(s).

During its feasibility evaluation, Moxa Carbon Storage licensed and interpreted more than 200 miles of 2D seismic data to confirm structure and de-risk potential injection locations within the proposed area of review (AOR). Well log data with petrophysical interpretation of porosity was incorporated to determine lithology and porosity of respective confining and injection zones.

Based on a preliminary geologic assessment of the proposed injection zones—the Jurassic Nugget Sandstone and Mississippian Madison Limestone—the porosity and permeability within each zone is adequate for injection. Similarly, the existing formation water is too saline to be considered an underground source of drinking water (USDW). The preliminary geologic assessment of the proposed confining zones—the Gypsum Spring/Twin Creek and Phosphoria/Park City formations—shows the porosity and permeability is considered "tight", with permeability values well below the threshold required to permanently prevent vertical migration of CO_2 into overlying porous formations.

Moxa Carbon Storage's commitment to reduction of project risk requires the drilling of a stratigraphic test well to acquire core samples that will allow us to better understand rock

properties (porosity, permeability, relative permeability, petrography, and rock chemistry), formation fluid properties, geochemical interactions between rock, formation fluid, and injectate, injection response, and geomechanical stress/strain of respective rock formations. Based on an in-depth analysis of the petrophysically and seismically derived datasets integrated into subsurface geology model, available data suggests geologic feasibility of the proposed SW Wyoming Sequestration Project's AOR for permanent subsurface CO_2 sequestration. Further data will be incorporated into the geologic model after the construction of a stratigraphic test well and subsequent laboratory analysis of core samples. Moxa Carbon Storage will need this additional data in order to prepare its Class VI well applications.

Summary of WDEQ's Class VI Permitting Process

Following a formal delegation from the Environmental Protection Agency (EPA), the WDEQ has primacy to regulate Class VI underground injection control (UIC) wells in Wyoming.[3] WDEQ has promulgated detailed regulations, which incorporate and build upon EPA's threshold requirements, governing the entire lifecycle of Class VI UIC wells.[4] All stakeholders and the public at large are invited to review each Class VI application and participate in WDEQ's thorough public comment process.

Prior to constructing or operating a Class VI well, a party must first obtain a well-specific permit from the WDEQ.[5] To obtain a Class VI permit, an applicant must submit a detailed application to the WDEQ Water Quality Division (WQD). The WDQ must then determine whether the application is complete or whether the applicant needs to provide additional information to the agency. Once an application is deemed complete, the WQD prepares a draft permit and fact sheet for public notice and comment.[6] As part of the 60-day public notice and comment period, WQD may hold a public hearing to allow interested parties to make oral testimony on the proposed permit.[7]

After the conclusion of the public comment period, WDEQ will decide whether to issue the proposed Class VI permit. The issuance of a Class VI permit authorizes an applicant to construct a Class VI injection well. The DEQ has the opportunity to review the results of the well construction (including an inspection of the well) before authorizing an applicant to inject CO_2 in the subsurface pore space. Likewise, the BLM will have the opportunity to review the permits for each Class VI well before issuing a notice to proceed (NTP) that authorizes the permittee to inject CO_2 into BLM-managed pore space. This robust administrative process ensures a careful review of the proposed CO_2 sequestration project by the WDEQ and a thorough vetting by the stakeholders and the public.

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[3] EPA final rule, Wyoming Underground Injection Control Program; Class VI Primacy, 85 Fed. Reg. 64053-56 (Oct. 9, 2020).

[4] WDEQ Water Quality Rules, Ch. 24: Class VI Injection Wells and Facilities Underground Injection Control Program; 020.0011.24.10052021.

[5] *Id*., Ch. 24, § 11(a).

[6] *Id.* at § 27(a)(i).

[7] *Id.* at § 27(e)(ii) & (iii).

WDEQ's Class VI regulations provide numerous substantive requirements to ensure that geologic CO_2 sequestration takes place in a safe and effective manner. Among the key requirements of the Class VI permit are the following:

- Delineation of Area of Review and Protection of Underground Drinking Water. An applicant for a Class VI UIC permit is required to designate the area of review (AOR) for each well.[8] The AOR is defined as "the subsurface three-dimensional extent of the carbon dioxide plume, associated pressure front, and displaced fluid, as well as the overlying formations, and surface area above the delineated region."[9] Moreover, the owner or operator of a Class VI well is required to prepare, maintain, and comply with a plan to delineate the area of review for a proposed geologic sequestration project, re-evaluate the delineation, and perform corrective action that meets WDEQ's regulatory requirements and is approved by the Administrator.[10]

  The AOR is initially delineated based on computational modelling that accounts for the physical and chemical properties of all phases of the injected CO_2 stream. Once CO_2 injections are initiated, the AOR is regularly re-evaluated (at least every 2 years) and refined through monitoring and operational data. Because the AOR serves as a tool to identify to protect underground sources of drinking water (USDW), WDEQ's regulations require that the AOR "shall never be less than the area of potentially affected groundwater."[11] When necessary, Class VI operators are required to perform corrective action to ensure that any wells within the AOR do not serve as conduits for the movement of fluids into geologic formations (including those containing USDWs) other than those specifically authorized by the permit.[12]

- Description of Geology and Site Characterization. WDEQ's regulations require an applicant to demonstrate that the proposed sequestration site is suitable for the long-term storage of CO_2.[13] The applicant must provide detailed information on the geologic structure and reservoir properties of the proposed storage site and overlying formations, including Isopach maps of the proposed injection and confining zones, a structural contour map aligned with the top of the proposed injection zone, and at least two geologic cross-sections of the area of review.[14] The applicant must also show the location of any known or suspected faults and fractures that may transect the confining zones in the AOR and show that such fractures will not allow fluid movements. Through a review of any seismic events in the area, the applicant

[8] *Id*. at § 10(b)(ix) & (x).

[9] *Id*. at § 2(c).

[10] *Id*. at § 13(a).

[11] *Id*. at § 13(a).

[12] *Id*. at §§ 2(q), 13(b)(v).

[13] *Id*. at § 12(a).

[14] *Id*. at § 10(b)(xi).

must show that seismicity will not allow fluid movement out of the injection zone (the formation(s) into which CO_2 will be injected).[15]

As part of the site characterization, the applicant must provide sufficient data to demonstrate the effectiveness of the injection zone and the confining zone (the geologic formations that confine the CO_2 within the injection zone). This includes detailed data on the depth, areal extent, thickness of the confining zones within the AOR as well as geomechanical information on fractures, stress, ductility, rock strength and in situ fluid pressures within the confining zones.[16]

- Protection of Underground Sources of Drinking Water. As part of its Class VI application, the applicant must provide maps and stratigraphic cross-sections indicating the general vertical and lateral limits of all USDWs within the AOR, identify the location of water wells and springs, and indicate the proposed CO_2 injection zones relative to all USDWs, water wells and springs.[17] The applicant must also provide baseline (i.e., pre-injection) data on subsurface formations, including all USDWs, in the AOR. Each Class VI permit ensures the protection of water quality standards by prohibiting the permittee from conducting any injection activity that allows the movement of fluid containing contaminants into any USDW in a manner that violates and primary drinking water regulation or otherwise adversely affects human health, safety, or the environment.[18]

- Compatibility of injected CO_2 with Subsurface Minerals. An applicant for a Class VI well is required to provide operating data showing the compatibility of the injected CO_2 stream with minerals in both the injection and confining zones.[19] As part of its financial assurance cost estimate, the applicant must analyze the possibility of mineral rights infringement and include financial coverage for such potential infringement in its bond or other financial assurance instrument submitted to WDEQ.[20]

- Testing & Monitoring Requirements. An operator of a Class VI well is required to prepare and submit to WDEQ a testing and monitoring plan to confirm that the geologic sequestration project is operating as permitted and is not endangering any USDW.[21] This plan requires the installation and use of continuous recording devices to monitor (among other things) the injection pressure and the injection rate and volume of CO_2. To ensure the injection well components meet the minimum regulatory standards for material strength and

[15] *Id.*

[16] *Id.*

[17] *Id*. at § 10(b)(xiv).

[18] *Id*. at § 11(a)(iv).

[19] *Id*. at § 10(b)(xviii).

[20] *Id*. at § 26(b)(ii)(B).

[21] *Id*. at § 20(a).

performance, the operator must install a corrosion monitoring system to detect any loss of mass, thickness or other signs of corrosion in the well materials.[22]

The operator must provide for the periodic monitoring of the groundwater quality and geochemical changes above the confining zones that may be the result of the movement of CO_2 or displaced formation fluids through the confining or additional zones.[23] The operator is also required to establish testing and monitoring system to track the extent of the CO_2 plume and the position of the pressure front.[24] Finally, the operator is required to establish a quality assurance and surveillance plan for all testing and monitoring requirements.[25]

- Post-injection site care & closure. All operators of Class VI wells are required to prepare and update at regular intervals a plan for post-injection site care and closure that is subject to approval by the WQD Administrator in consultation with the EPA.[26] Among other things, this plan must include a demonstration that following active injection activities, the geologic sequestration project will not pose a risk of endangerment to USDWs and will not harm or present a risk to human health, safety, or the environment.[27] The plan must also address all reclamation, monitoring, and remediation requirements.[28] The operator is required to monitor the site as specified in the site care and closure plan until the WDQ Administrator certifies site closure.[29]

- Financial responsibility. WDEQ's regulations require an operator of a Class VI well to establish and maintain financial responsibility for all the phases of the geologic sequestration project, including permitting/characterization, testing and monitoring, operations (including injection and well plugging), post-injection site care, and emergency and remedial response.[30] To carry out this obligation, the operator must develop and annually update a written financial assurance cost estimate that includes the cost in current dollars of each phase of the sequestration project.[31]

  The cost estimate must cover a number of potential (even if unlikely) specific events, including contamination of underground sources of water (including drinking water), mineral rights infringement, release or leakage of CO_2 that impacts human health and safe, storage rights infringement, property and infrastructure damage, accidents and unplanned events, well capping and permitted abandonment, and the removal of above-ground facilities and site

[22] *Id*. at § 20(b)(iii).

[23] *Id*. at § 20(b)(iv).

[24] *Id*. at § 20(b)(viii).

[25] *Id*. at § 20(c).

[26] *Id*. at § 24(a).

[27] *Id*. at § 24(a)(ii)(A).

[28] *Id*. at § 24(a)(ii)(B).

[29] *Id*. at § 24(b)(i).

[30] *Id*. at § 26(a).

[31] *Id*. at § 26(b).

reclamation.[32] The operator is required in turn to obtain a qualifying financial responsibility instrument (such as a surety bond) to cover the estimated financial assurance cost estimate. The operator's financial assurance instrument must in turn be approved by the WQD Administrator. To ensure that there is financial coverage of any unforeseen adverse event throughout the life of a sequestration project, the WDEQ Director must approve the applicant's financial responsibility demonstration for all phases of the geologic sequestration project before issuing a Class VI permit.[33]

In sum, WDEQ's comprehensive regulatory process will ensure that the SW Wyoming Sequestration Project operates in a safe and effective manner that protects the resources on BLM-administered lands. Once Moxa Carbon Storage submits its Class VI well application(s) to WDEQ, BLM will receive a copy of the application and will be provided an opportunity to ensure that BLM's public lands management expertise and responsibilities are considered and addressed. Similarly, BLM will have the opportunity to review the final Class VI permit and undertake any supplemental NEPA analysis that may be necessary prior to issuing a NTP to the ROW holder.

Project's Potential to Significantly Reduce GHG Emissions

The final details of projected GHG emissions and GHG reductions from the Southwestern WY geologic sequestration project will be known only after Moxa Carbon Storage drills its stratigraphic well(s) and prepares its applications for Class VI wells and develops a site-specific plan for necessary surface infrastructure and related construction activities. Even at this early stage, however, this project has considerable promise to significantly advance the current administration's goal of significantly reducing GHG emissions through large-scale geologic sequestration on public lands.

As the Council on Environmental Quality ("CEQ") acknowledged in its June 2021 Carbon Capture, Utilization, and Sequestration Report, the United States will have to "capture, transport, and permanently sequester significant quantities of carbon dioxide" to meet the current administration's ambitious climate goals. Moxa Carbon Storage's SW Wyoming CO_2 sequestration project represents a significant opportunity to reduce atmospheric CO_2 through large scale commercial sequestration with "net zero emissions". Once completed, the Southwestern Wyoming project may be able to permanently sequester up to an estimated total of 600 million metric tons of CO_2 over its predicted 30-year injection horizon. By way of comparison, the project's estimated *annual* sequestration of 20 million metric tons is equivalent to *annual* GHG emissions from more than 4.7 million gasoline-powered passenger vehicles.[34] A more detailed analysis of site-specific GHG emissions, and GHG reductions, will be possible once the final details of the SW Wyoming Sequestration Project are finalized.

[32] *Id*. at §26(b)(ii).

[33] *Id*. at § 26(f).

[34] *See* EPA's Greenhouse Gas Equivalencies Calculator, available at https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator (tool for estimating annual CO_2 emissions from cars and other sources).

Suggested Revisions to Proposed Stipulations

The SW Wyoming Sequestration EA contains a number of proposed stipulations.[35] Several of these proposed stipulations, as currently written, could impose unreasonable burdens on Moxa Carbon Storage and frustrate BLM's stated goal of encouraging geologic sequestration. Moxa Carbon Storage recommends that the following stipulations be revised.

Pore Space Stipulation #1. This stipulation provides: "The Holder must avoid interference with any operations authorized under the Mineral Leasing Act of 1920 (MLA), as amended, and prevent damage to all other potentially recoverable mineral resources and other surface and subsurface authorized uses."[36]

While well intentioned, this stipulation is subject to an over-broad interpretation. The BLM's multiple use mandate, however, cannot be properly applied to prevent activities by Moxa Carbon Storage that are deemed to "interfere" with any MLA operations, even where such "interference" is minor and does not materially disrupt an MLA lessee's development rights.[37]

Moxa Carbon Storage recommends that this stipulation be revised as follows to protect existing mineral lessees while also encouraging the development of CO_2 sequestration projects:

> To prevent unreasonable interference with operations on existing mineral leases, the Holder must prevent unnecessary or unreasonable damage or material interference to (a) surface operations of existing leases, and (b) economically recoverable minerals in the injection and confining zones.

Notice to Proceed (NTP) stipulation #1. This proposed stipulation currently provides: "The Holder shall not initiate any construction, drilling, injection, or other activities on the right-of-way without the prior written authorization of the authorized officer. Subpart (i) of this stipulation provides further that "The Holder must submit the Class VI well authorization(s) to inject from the Wyoming Department of Environmental Quality to the BLM authorized officer with their request for BLM approval of the NTP."[38]

This stipulation could be read to prevent BLM from issuing a NTP for construction of an injection well on BLM lands until after the permittee has obtained the "authorization to inject" from the WDEQ. WDEQ will not, however, issue an authorization to inject until after an injection well is constructed and the agency has the opportunity to review the drilling logs and inspect the well. As noted above, WDEQ first issues a Class VI permit, which authorizes the permittee to construct a Class VI injection well. Only after the well is constructed—and after

[35] *See* SW Wyoming Sequestration EA, Appendix 4- Proposed Right-of-Way Stipulations.

[36] *Id*. at p. 74.

[37] The Federal Land Policy and Management Act (FLPMA) directs BLM to manage public lands within its jurisdiction "be on the basis of multiple use and sustained yield," 43 U.S.C. § 1701(7), where "multiple use" is defined as "the management of the public lands and their various resource values so that they are utilized in the combination that will best meet the present and future needs of the American people". *Id*. at § 1702(c).

[38] SW Wyoming Sequestration EA at p. 75.

WDEQ is provided an opportunity inspect or review the injection well and drilling results—will WDEQ authorize the permittee to commence CO_2 injection activities.

To harmonize this stipulation with WDEQ's Class VI regulatory process, Moxa Carbon Storage recommends that NTP stipulation 1(i) be revised as follows:

> The Holder must submit the Class VI well permit from the Wyoming Department of Environmental Quality to the BLM authorized officer with their request for BLM approval of the NTP.

Mitigation Measures/Conditions of Approval. These proposed mitigation measures and conditions of approval (COAs) deal exclusively with surface impacts on the proposed ROW. However, as BLM acknowledges in it's the description of the "Proposed Action", "[t]he BLM's pore space ROW grant would not authorize surface-disturbing activities or surface occupancy of BLM-administered lands. Additional ROWs may be submitted to the BLM in the future, should Moxa Carbon eventually seek BLM authorization to construct and use surface infrastructure on BLM-administered public lands."[39]

Because its ROW application does not include the request to use *any* surface of any BLM-administered lands, Moxa Carbon Storage recommends that BLM remove these surface-related Mitigation Measures/COAs until BLM is presented with a specific request to use BLM-administered surface. Once BLM is presented with a request for specific surface ROW(s), the agency will be positioned to assess which surface-related mitigation measures and COAs are appropriate to address resource concerns related to the use of particular BLM surface area.

Conclusion

Thank you for the opportunity for Moxa Carbon Storage to provide additional background and recommendations related to the SW Wyoming Sequestration Project. We would welcome the opportunity to discuss these thoughts and recommendations with you in more detail at your convenience.

Sincerely,

Cody Wagoner
Director, Land-Subsurface & New Ventures
Tallgrass Energy

[39] *Id*. at 4.