Article 6.4 Mechanism: Call for Input - Structured Public Consultation
Further Input on Removal Activities (July 2023)
Cella Mineral Storage, Inc. (New York, NY and Nairobi, Kenya)

Cella Mineral Storage, Inc. is grateful for the opportunity to submit a brief comment for the Article 6.4 Supervisory Board. Cella is a carbon mineralization company that aims to develop carbon storage in subsurface basalt rocks and advance this technology to permanently sequester atmospheric CO2 to mitigate climate change. Carbon storage in basalt offers secure, long-term CO2 storage due to the potential for mineralization.

This method involves in-situ injections of carbon into basaltic formations, where carbon is sequestered in an aqueous phase through dissolution and subsequently in mineral form through geochemical reactions. This process accelerates natural processes, like the long-term carbon cycle, where dissolved carbon (e.g., carbonic acid) chemically weathers silicate minerals hosted in volcanic rocks.

2.1. Monitoring and reporting

Currently, Cella is utilizing a multi-proxy approach, which combines both geophysical and geochemical monitoring and verification techniques so that we have multiple independent datasets during the pilot phase and after completion.

The pilot and Phase 1 DAC will include reactive and unreactive tracer injections where mass balance calculations will be compared to measured data to quantify mineralized CO2. Ongoing direct measurements of monitoring fluid aqueous geochemistry will be performed thereafter to ensure continuous mineralization. Samples will be further analyzed according to our proprietary monitoring technique to ensure highest-quality verification of mineralization.

Cella finds that CDR project developers and MRV liaisons should update the monitoring plan per injection site every five years, whether it be at pilot or commercial phase.

We will monitor soil CO2 gas flux against background measurements that have been made at the concession site since 1993, taking measurements once a month for the first year, and once a year thereafter (Fridriksson et al. 2006). Where monitoring well temperatures are high, we will use the geothermal sampling and analysis method described by Arnorsson et al., (2006) and Clark et al., (2020). Injectivity will be assessed by measuring the outflow rate of the monitoring fluid over time to ensure no changes in formation permeability (Gunnarsson et al., 2018). Monitoring fluid samples will be collected biweekly for the first year, bi-monthly for the subsequent five years, and twice annually for the remainder of the well lifetime and analyzed with the methods outlined in Snæbjörnsdóttir et al. (2017) and Nelson et al. (2022).

Upon notification of a reversal event, though highly unlikely, practitioners should submit a notification reversal within the first 90 days of observation. A full monitoring report should be released within one year of notification upon completion of a thorough analysis.

We anticipate a <1% leakage or storage reversal. Mineral storage has been proved as durable and secure in relevant environments. Moreover, employing a water-dissolved method ensures immediate storage via solubility trapping (Sigfusson et al., 2015). While existing literature focuses on freshwater-dissolved CO_2, we are employing a new technique of saline groundwater+geothermal brine-dissolved CO_2. We have designed our injection parameters to account for CO_2 solubility differences between these methods, thus we anticipate that our pilot will prove equally negligible risk.

In order to demonstrate the ongoing proof of permanent and durable geologic sequestration of injected CO_2 through carbon mineralization, project developers or activity proponents should be required to address reversal risks and continue MRV practices later throughout the project's life cycle. With regards to our operations focusing on mineralization through injection, project developers should have a cradle-to-grave analysis of the site's reversal potential, though we project a zero-percent uncertainty level with a dual-proxy monitoring approach of two independent geochemical and geophysical datasets to cross reference for storage success. However, we find that host parties should set their own timeframe specific to their own CDR methodologies.

We will take measurements once a month for the first year and then once a year thereafter until the end of the project's crediting period or life cycle. Additionally, we anticipate a zero percent uncertainty impact of the storage monitoring and maintenance. With such low residual risk of storage reversal, durability is sufficiently established by demonstration that the stable form has been achieved through injection and subsequent mineralization; thus, there is no ongoing liability risk.

2.2. Addressing reversals

2.2.1. General

11. What type of risk rating is used to calculate an activity's buffer contributions?

(a) The results of an individual activity's risk assessment;
(b) A standard rate determined by the 6.4SB;
(c) Either measure could be appropriate, depending on the circumstances (in this case, what factors should determine the use of an activity-specific or standard risk rating)?

- Either measure could be appropriate in the case of determining which type of risk rating to assign to a removal activity's buffer contributions. Every project developer is working at the intersection of differing geographies, methodologies, and policies to govern their activities, so having a standard rate determined by the 6.4 SB may not be widely applicable in all cases. However, if the 6.4 SB develops a standard base rate for risk calculations that could present a smaller threshold for evaluating risk of reversal, that could be very useful to let projects exist on a case-specific basis.

12. What are the options for circumstances/triggers and/or periodic milestones for reviewing and possibly updating activity baselines, risk assessments (so, risk ratings), and monitoring plans, including in relation to:
(a) Verified reversals of removals; and
(b) The stages of activity cycle implementation?

- Third-party verification for removal activity may have different incentives for certifying successful removal methodologies and MRV approaches. Gold Standard, Verra, Puro, C-Capsule, and CCS+ are all private sector initiatives that have completed their own removal rating and verification processes. However, some removal project developers, like Charm Industrial and Project Vesta, have developed their own rating and monitoring plans. Different interests inherently will have different modes of codifying verification processes for proof of safe, durable removal. Reversal risk calculations should be performed at the initiation, midterm, and conclusion of a removal project's timeline in order to mitigate overall risk of undermining durability.

13. On what basis could requirements provide for the use of simplified / standardized elements or mandate the use of more frequent, full, or activity-specific elements and what are the requirements that may be relevant?
(a) Activity type or category;
(b) Risk rating level (e.g. above versus below a given %-based threshold);
(c) Risk assessment contents (e.g. nature, number, variety of risk factors);
(d) Monitoring plan (e.g. complexity, frequency, responsible entity).

- It is difficult to to set universal MRV standards for compliance due to the variable nature of each removal projects' activity-specific methodology. Standardized verification of removal and durability should be evaluated on a methodology-specific basis, with set standards applicable to each mode of removal. E.g., DAC and electrochemical approaches to mCDR shall not be beholden to the same criteria. However, the structure for each activity type/category of CDR methodology should be similar, with a baseline set of standards for each.

14. Should procedures take the same or different approaches to instances of reversals that are (a) intentional/planned versus (b) unintentional / unplanned?
(a) How/would other tools to address reversals involving direct credit replacement (including use of insurance / guarantees) be used in combination with a buffer pool?

- Whether intentional or unintentional, all reversals should be subject to the same set of procedural criteria to evaluate environmental impact and address credit replacement.

2.2.2. - 2.2.4 Reversal risk tools—General: Buffer pools, direct credit replacement, insurance / guarantees

15. Regarding reversal risk buffer pools, direct credit replacement, and insurance / guarantees: (a) What is the current practice with these reversal risk tools, including the extent and nature of their use (respectively and in combination), transaction costs and how these are financed, and potential roles of the Host Party in multi-decadal compensation requirements; (b) The circumstances under which the use of a given tool may be required or supplemental— for example, for intentional versus unintentional reversals, or during versus beyond the last active crediting period—and rationales.

- As a carbon mineralization company, it is critical for us to illustrate the low-risk reversal rate of our novel injection technology. The use of direct negative emissions credit replacement or buffer pools is not something we anticipate having to utilize in the development of our company. As we continue to develop our robust verification methodologies, insurance for credits will be increasingly prevalent for all of our stakeholders, including third-party verification and crediting entities, credit customers/purchasers, and technology partners. At this time, due to the extremely low uncertainty nature of risk reversals associated with in-situ mineralization technology and beginning stages of our company, we do not have specific requirements around the buffer pools or refinancing of potentially lost credits. However, some companies, like Sylvera, are utilizing independent reversal risk assessments to monitor and score project performance over time. Should we need to explore these options, we believe we could easily incorporate some of these third-party entities into our crediting and verification system.