Guidance and questions for further work on a structured consultation and to prepare an information note on recommendations for activities involving removals

C-Capsule welcomes the opportunity to be heard on the development of the modalities of Article 6.4 following separate submissions in October 2022 and May of this year. We believe that robust integrity and quality principles for carbon markets are essential for genuine climate action.

Carbon Finance Labs and Evident began development on C-Capsule almost two years ago to develop an attribute tracking system to certify durable Carbon Dioxide Removal (CDR). C-Capsule has a heritage dating back to the first renewable energy certificate trading in Europe during the 1990s and the creation of the Guarantee of Origin scheme. Co-Founder Evident includes the technical designers behind the highly successful I-REC, the international renewable energy certificate system, which currently serves over 50 countries outside Europe and North America. C-Capsule's work is independently accredited to the International Attribute Tracking Standard, ensuring that the fundamental principles of trust and quality are enshrined in all we do.

2. Elements for structured consultation and further work Cross-cutting questions:

1. Discuss the role of removals activities and this guidance in supporting the aim of balancing emissions with removals through mid-century.

As the Intergovernmental Panel on Climate Change (IPCC) has highlighted, the world needs to reach a net-zero carbon dioxide emissions status by around mid-century to limit global warming to the aforementioned target. To achieve this, our best estimates suggest that up to 10 gigatons (Gt) of removals will be required by 2050.

While reducing emissions remains our primary strategy and is unequivocally crucial, certain sectors pose greater marginal abatement challenges due to the inherent technical or economic difficulties in mitigating emissions. These "hard-to-abate" sectors, which include, but are not limited to, aviation, heavy industry, and agriculture, will inevitably have to rely on carbon removal to counterbalance their residual emissions.

Achieving the requisite scale of carbon removal necessitates significant early-stage investments in technology and policy development. Many of the technologies required to remove carbon from the atmosphere are in their infancy and require substantial capital to research, develop, and scale. Simultaneously, policies that support and incentivise these technologies will also need to be designed and implemented.

In this context, Article 6.4 can play a pivotal role by creating a framework that promotes cooperation, stimulates investment, and facilitates access to capital and carbon markets. Such a

mechanism would provide policymakers and technology developers with the resources they need to foster innovation and scale effective solutions.

It is, therefore, essential that carbon removals are not perceived as a distraction from emissions reduction efforts, but rather as a complementary strategy that enables us to meet our ambitious climate goals.

2. What are the roles and functions of the following entities in implementing the operations referred to in this guidance: Activity proponent(s), Article 6.4 mechanism Supervisory Body (6.4SB), 6.4 mechanism registry administrator, Host Party, stakeholders?

- An 'activity proponent' is an entity that registers a carbon dioxide removal facility with an eligible 6.4 mechanism registry administrator against and accredited methodology
- The Article 6.4 mechanism SB govern the Article 6.4 crediting mechanism and overall operations, including creation and approval of methodologies.
- The Article 6.4 mechanism registry administrator provides an accredited database that of Article 6.4 CDRs that includes records for the full lifecycle of ownership and use of such certificates. The registry administrator should be independent from the market and act as a single source of truth to support multiple types of removal certificates and end-user claims.

3. How are these elements understood, in particular, any interrelationships in their functions, timeframes, and implementation?

(a) Monitoring period

(b) Crediting period

(c) Timeframe for addressing reversal

a) The monitoring period represents the length of time during which the carbon removal activity is overseen to ensure it is functioning as anticipated. The duration of this period should be variable, depending on the removal pathway. It should be long enough to account for all relevant carbon cycle dynamics and potential variations in performance of different removal technologies. To mitigate risks of carbon reversals, we recommend implementing insurance mechanisms that provide safeguards against unforeseen Events of Carbon Default (EOCD).
b) The crediting period is defined as the period in which certificates, representing the removal of a ton of carbon dioxide, can be issued. This period should be designed to coincide with the shortest duration among the monitoring period and the timeframe for addressing reversals. Shorter crediting periods, which are reassessed frequently by independent auditing bodies, offer greater flexibility and enable adjustments to respond to advances in scientific understanding and technological developments.

The timeframe for addressing reversals depends largely on the removal method utilised. Given the diverse nature of carbon removal technologies and their variable durability and risk profiles, the timeframe to address any potential reversal should be commensurate with the identifiable risks associated with each method.

Questions on specific elements

A. Definitions:

Discuss the role and potential elements of definitions for this guidance, including "Removals".

In our view, "removals" should be defined as the process that effectively subtracts carbon dioxide (CO2) from the atmosphere. Importantly, this definition must incorporate a long-term perspective. We propose that, to qualify as a removal, the action should result in the extraction of carbon from the atmosphere for a period of 100 years or longer. This definition sets a stringent standard that encourages meaningful and lasting efforts towards carbon dioxide removal (CDR).

Further, the risk of reversal or, Event of Carbon Default (EOCD)— the potential for the stored carbon to re-enter the atmosphere — should be minimised to the greatest extent possible. This risk management is crucial to ensure the integrity and effectiveness of removal activities over the long term. C-Capsule views risk assessment agencies such as Sylvera and BeZero Carbon, as essential to the evaluation of risk.

Moreover, it's important to recognise that "removals" should not be considered exclusively as a pathway towards storage, but also as an avenue to make use of captured carbon in a manner that continues to keep it out of the atmosphere in the long term. For instance, integrating captured carbon into construction materials such as cement could qualify as a removal, given that it results in the long-term sequestration of carbon.

However, we need to draw clear boundaries on what constitutes a removal. For instance, while captured carbon can be utilised in various ways, its use as a fuel should not qualify as a removal. This is because burning captured carbon as a fuel would reintroduce it into the atmosphere, contradicting the requirement of the 100-year sequestration benchmark we propose.

In summary, it is paramount to construct clear and robust definitions for terms like "removals" to ensure a common understanding and strict adherence to the long-term goals of carbon dioxide removal. By setting these high standards, we can ensure that every removal contributes effectively and enduringly towards the balance of emissions by mid-century.

B. Monitoring and Reporting:

1. What timeframes and related procedures should be specified for these elements referred to in A6.4-SB003-A03?

a. For initial monitoring and submission of monitoring reports (paragraph 3.2.14);

Reiterating C-Capsule's experience designing governance documentation relating to the monitoring of removals, we view initial monitoring and submission of monitoring reports should occur on an annual basis.

(a) For subsequent monitoring and submission of monitoring reports (paragraph 3.2.14)

After initial monitoring and monitoring reports, C-Capsule requires a minimum of five years between monitoring reports. Within this timeframe, monitoring should not cease, and preference should be given to removals that have the capability to provide real time monitoring. C-Capsule and accredited Local Issuers reserve the right for ad hoc site visits and recommends the SB reserves the same right for registered removal facilities.

(b) For monitoring and submission of monitoring reports following an observed event that could potentially lead to a reversal (paragraph 3.2.14);

Again, technologies with the capacity for real time monitoring should be treated preferentially to enable closer monitoring after potential reversal events. Where this is not possible, a maximum of six months between reports for the following two years should be allowed. After the subsequent two years post-event, monitoring can return to normal timeframes. This should be reviewed on a case-by-case basis, however, as there is a variety of potential reversal events, and some may require more frequent monitoring.

(c) For monitoring and reporting, including any simplified reporting, conducted after the end of the last crediting period of activities involving removals (paragraphs 3.1.10 and 3.2.13).

C-Capsule agrees with the SB's decision to tailor policy to methodological specifications, both for timeframe relevant queries and all other requests for guidance. For post-crediting period monitoring, timeframes for reporting should be informed by the expected durability of the removal pathway and the quantified risks of reversal or Event of Carbon Default (EOCD).

2. Discuss any further considerations to be given to the core elements for monitoring and reporting in A6.4-SB003-A03; where possible, identifying the applicable scope, i.e., relevance to all 6.4 mechanism activities, to removals activities, or to specific removal activity categories or types.

C. Accounting for removals:

1. Discuss the applicability and implementation aspects of these approaches, including as stand-alone measures or in combination, and any interactions with other elements of this guidance:

a. Non-permanence risk buffer (pooled or activity-specific);

We see merit in the creation of a non-permanence risk buffer. Whether pooled or specific to an activity, this buffer would serve as a safeguard against the risk of carbon re-emission. As with all safeguards, its applicability should be tailored to the specific characteristics and risks of each removal activity.

b. Insurance / guarantees for replacement of ERs where reversals occur (commercial, sovereign, other);

We propose the adoption of an insurance model, such as the one outlined in the C-Capsule guidelines (Product Code), where registrants can contract with insurance bodies (commercial or sovereign) to provide independent risk management services against the risk of Event of Carbon Default (EOCD). This would act as a guarantee for replacement of removals where reversals occur. Such an insurance account should be regularly monitored by the Article 6.4 SB, ensuring effective risk management and adding an extra layer of security against non-permanence.

c. Other measures for addressing reversals in full.

3. What risks of non-permanence need to be minimized, and how can these risks identified, assessed, and minimized?

In our understanding, the risks of non-permanence, also known as reversal risks, stem from the possibility that carbon, once removed from the atmosphere, might be unintentionally or intentionally released back into it. These risks can be broadly divided into four categories:

1) Natural, Unintentional: This includes risks arising from natural occurrences or disturbances such as forest fires, pest infestations, or extreme weather events that could potentially release stored carbon back into the atmosphere. These risks can be minimised by diversifying removal methods, promoting ecosystem resilience through adaptive management, and ensuring that removal projects are strategically located to minimise exposure to these disturbances.
2) Natural, Intentional: This involves human actions that intentionally interfere with natural carbon removal methods, such as deforestation or land-use changes. To address these risks, it is crucial to uphold strong regulatory frameworks and to promote sustainable land-use practices.
3) Unnatural, Unintentional: These risks might occur when a technological failure or accident in an engineered carbon removal process leads to unintentional carbon release. Mitigation strategies could include maintaining rigorous safety protocols, regular equipment checks, and backup systems in engineered removal facilities.
4) Unnatural, Intentional: This includes risks arising from deliberate human actions, like the misuse of removed carbon, for instance, using carbon captured for long-term storage as a fuel source. To minimise these risks, clear guidelines on acceptable uses of captured

carbon should be established and enforced, and the adherence to these guidelines should be regularly audited.

For effective risk management, it is essential to conduct a thorough and methodical assessment of the potential risks associated with each removal activity, considering both its natural or unnatural classification and the likelihood of its being deliberate or non-deliberate. Regular monitoring and reviews should be carried out to ensure that risk mitigation strategies are up-to-date and effectively implemented.

4. In respect of risk assessment, how should the following elements be considered in the implementation of the approaches in

(a) and any other relevant elements in this guidance?

a. Level of non-permanence risk assessment, e.g., activity- or mechanism-level

b. Timing for risk assessment(s)

c. Entity(ies) responsible for risk assessment(s), e.g., activity proponent, 6.4SB, actuary

5. How should the following elements be considered in the implementation of the approaches in (1) above and any other relevant elements in this guidance?

a. Methods for determining the level of buffer pool contributions

In order to ascertain the extent of contributions towards the buffer pool, it is imperative to understand the inherent non-permanence risk of the removal activities. For example, when examining biochar as a method of carbon removal, the risk of non-permanence lies in the potential degradation or "leakage" of carbon from the biochar over time. This can be modeled by an exponential decay, with a Mean Residence Time (MRT) indicating the effective half-life of the biochar.

The difference between the initial carbon value and the value at the end of a 100-year period can be expressed as a Leakage Buffer value, effectively determining the potential contributions to the buffer pool. This value is influenced by the nature of the feedstock and the pyrolysis process conditions, and can be determined through proximate analysis of representative samples.

Each removal method would therefore require its own protocol for calculating non-permanence risk and, subsequently, the appropriate buffer pool contributions.

b. Composition of buffer pool, including in relation to ER vintages and contributing activity types or categories

The buffer pool's composition should be reflective of the various types of removal activities and the corresponding non-permanence risks. For instance, the buffer for

biochar would be determined by factors like the Mean Residence Time (MRT), the type of feedstock used, and the pyrolysis conditions. Each ER vintage, activity type, or category would contribute to the buffer pool proportionately to its non-permanence risk.

c. Intentional and unintentional reversals

Intentional reversals, such as the deliberate mishandling of carbon, and unintentional reversals, like a forest fire, each bring unique challenges to risk management and should be treated accordingly in terms of buffer pool contributions and mitigation strategies.

d. Treatment of uncancelled buffer ERs, including after the end of the last crediting period of the contributing activity

Uncancelled buffer ERs should remain untradable until the risk of reversal is eliminated or the durability defined has been fulfilled.

e. Specifications for ERs that cancelled for compensate for reversals, including in relation to ER vintages and contributing activity types or categories

Cancelled ERs to compensate for reversals should be matched with the original removal activity's type or category, ER vintage, and the determined non-permanence risk.

f. Replenishment in case buffer cancellations exceed contributions; slide language on re-raising baseline level of storge before new crediting

In the event that cancellations exceed contributions, the buffer pool should be replenished or underwritten by an insurer/reinsurer. This could involve increasing the buffer contributions from removal activities, or potentially recalibrating the non-permanence risk and buffer pool calculations. In essence, the baseline level of carbon storage should be restored prior to issuing new carbon credits.

6. In the event of a reversal, what interactions and implementation aspects should be considered in respect of other elements of the activity cycle?

In the event of a reversal, various aspects of the activity cycle will require careful consideration and adjustment, irrespective of the specific carbon dioxide removal (CDR) technology used. The following aspects need to be addressed:

1. **Audit and Verification:** Post-reversal, an exhaustive audit and verification process is crucial. This includes assessing the reasons behind the reversal and scrutinizing potential risks associated with the CDR technology in use, taking into account factors such as the type and context of utilisation.

2. **Adjustment of Risk Mitigation Measures:** Mitigation strategies may need to be re-evaluated and adapted as needed to prevent further reversals. Depending on the specific CDR method, this

might involve improving control measures, storage conditions, or handling procedures to ensure compliance with prescribed methodologies.

3. **Re-Education and Training:** Education and training programs should be revisited to help personnel better understand the reasons behind the reversal and to prevent similar future instances. This could be particularly necessary if the reversal was due to improper handling or usage of the technology.

4. **Regulation Compliance:** The project's adherence to local and international regulations must be reassessed. This is especially crucial if the reversal was due to non-compliance with any regulations. Steps should be taken to ensure all future activities align with these regulations to prevent future reversals.

5. **Stakeholder Engagement:** Clear and effective communication with all stakeholders is vital in the event of a reversal. Stakeholders need to be informed about the reasons behind the reversal, the corrective measures taken, and the strategies put in place to avoid similar incidents in the future.

6. **Project Continuity and Financial Stability:** The project's financial viability needs to be assessed to ensure its continuity despite the reversal. This could involve exploring additional funding sources, reassessing project management strategies, or developing contingency plans for potential future reversals. It should be noted, that there are times when continuing the financial support of a project that has had a reversal is an ill-advised endeavor, and project continuity should only be considered when the above steps are followed. The following situations wherein continuing financial support for a project would be ill-advised include:

> 6a. **Repeated Reversals**: If the project experiences multiple instances of carbon reversal, it may indicate fundamental issues with the technology or its implementation. Constant reversals can undermine the effectiveness of the carbon sequestration efforts and lead to wasted resources.
>
> 6b. **Non-compliance with Regulations**: If the project continuously fails to comply with local, national, or international regulations related to carbon sequestration, continuing financial support could put funders at legal risk and tarnish their reputation.
>
> 6c. **Unsustainable Practices:** If the project is linked to unsustainable practices, such as using non-renewable resources or causing significant environmental harm, continuing financial support may contradict the broader goal of environmental stewardship.
>
> 6d. **Lack of Adequate Management:** If the project consistently demonstrates poor management, lack of oversight, or inadequate response to setbacks, it can indicate a higher likelihood of failure and thus a poor return on investment.

6e. **Technological Obsolescence:** As CDR technology evolves, certain methods may become outdated or inefficient compared to newer alternatives. Continually investing in such projects may not be financially viable or environmentally beneficial in the long term.

6f. **Insufficient Impact:** If the project is not producing the expected carbon sequestration results, it may be more beneficial to invest in other projects with a better performance track record or potential for higher carbon sequestration.

Before making decisions about continuing financial support, it's crucial to conduct a comprehensive review of the project, its challenges, and its potential for success. A balance should be struck between supporting innovative carbon sequestration approaches and ensuring that funds are used in the most effective and responsible way possible.

By addressing these aspects, the goal is to maintain the integrity of the CDR activity, ensure the stability of the sequestered carbon, and to prevent future reversals.

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Garrett Guard	Methodology Specialist	garrett.guard@evident.global
Travis Caddy	Product Owner	travis.caddy@evident.global