From: Edda Björk Ragnarsdóttir <Edda.Bjork.Ragnarsdottir@carbfix.com>
Sent: Tuesday, 11 October, 2022 22:39
To: Supervisory-Body <Supervisory-Body@unfccc.int>
Cc: Edda Sif Pind Aradóttir <edda.aradottir@carbfix.com>; Sandra Ósk Snæbjörnsdóttir <sandra.osk.snaebjornsdottir@carbfix.com>; Olafur Teitur Guðnason <olafur.teitur.gudnason@carbfix.com>; Thomas Ratouis <Thomas.Ratouis@carbfix.com>; Selja Ósk Snorradóttir <Selja.Osk.Snorradottir@carbfix.com>
Subject: Call for input 2022 – activities involving removals under the Article 6.4 Mechanism of the Paris Agreement

To whom it may concern,

The Article 6.4 Mechanism Supervisory Body (Supervisory Body) has sought inputs on the documents entitled:

- Draft recommendation: Requirements for the development and assessment of mechanism methodologies pertaining to activities involving removals (as Annex 5 to the SB002 annotated agenda)
- Information note: Removal activities under the Article 6.4 mechanism (as Annex 6 to the SB002 annotated agenda)
- In-meeting working document on "Recommendations for activities involving removals under the Article 6.4 mechanism" (SB002 in-meeting working document)

Stakeholders were invited to provide their inputs on the above documents.

Please find attached Carbfix's input on the above listed documents relating to: *Activities involving removals under the Article 6.4 Mechanism of the Paris Agreement*.

Best Regards,
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11 October 2022

Submission by CARBFIX relating to the

Call for input 2022:
Activities involving removals under the Article 6.4 Mechanism of the Paris Agreement

Carbfix welcomes the opportunity to hereby provide inputs on the three documents under consideration by the Article 6.4 Mechanism Supervisory Body.

Summary

Carbfix has developed and successfully operates a method for subsurface mineralization of CO_2. The method imitates and accelerates natural processes that permanently transform CO_2 to minerals in subsurface rock formations. The method is proven, safe, economical, independently validated, internationally recognized and highly scalable. **Carbfix recommends that the documents under consideration account for CO_2 storage via mineralization as a viable and recognized alternative approach to the conventional CO_2 storage in geological formations.**

I – The mineral storage method

The Carbfix mineral storage method imitates and accelerates natural processes that permanently transform CO_2 to minerals in subsurface rock formations. The main concept of Carbfix is to increase the security of the geological storage of CO_2 in comparison to conventional methods of geological storage that consist of injecting gaseous, liquid, or supercritical CO_2 into subsurface reservoirs such as depleted oil and gas reservoirs or deep saline aquifers. The risk of CO_2 leakage is eliminated, both over the short term, due to the dissolution of CO_2 in water that leads to the density-related inhibition of such CO_2 to migrate back towards the surface, and in the long term by the rapid and permanent mineralization of the injected CO_2 via reactions with the subsurface bedrock, turning the CO_2 into solid carbonate minerals.

Carbfix has captured, injected and mineralized CO_2 in Iceland since 2014. The Carbfix process has been in development since 2007 with results being published in over 100 peer-reviewed scientific papers. Carbfix has successfully mineralized over 80 thousand tons of CO_2 and is developing rapid upscaling of Carbon Capture and Mineral Storage (CCMS) both in Iceland and worldwide.

The main features of the Carbfix mineral storage method are:

- **Large storage potential** – Mineral storage of CO_2 in basalts and other reactive rock formations unlocks large regions in the world whereCO_2 storage have until now not been considered possible. Altogether, the theoretical global storage capacity in such rocks is significantly larger than emissions from burning of all fossil fuels on Earth.

- **Natural** – The method imitates and accelerates a natural process. What is required, in addition to CO_2, is water and favorable reactive rock formations. No other chemicals are used or required.

- **Permanent** – Mineralized CO_2 remains stable for millennia. Within the natural carbon cycle, carbon has thousands to millions of years residence time in rocks, which is by far largest carbon reservoir on Earth. Mineral storage of CO_2 is therefore substantially more permanent than the 42 to 150 years referred to by the IPCC to qualify as permanent removal (Information note, 4.5.1., paragraph 100).

- **Proven, tried and tested** – Carbfix has successfully applied the method in Iceland on an industrial scale since 2014 and its effectiveness has been demonstrated in numerous peer-reviewed scientific articles.

- **Independently validated** – In 2022, a methodology for the Carbfix mineralization method was independently validated by global assurance leader DNV. The methodology has been published (https://www.carbfix.com/dacs-certification-methodology) and is attached to this submission for consideration as an input into the development of appropriate requirements relating to the method.

- **Internationally recognized** – Projects demonstrating and/or applying the Carbfix method have received numerous competitive grants and support, including from the EU's Horizon 2020 programme and the US Department of Energy. Carbfix's largest ongoing project – the Coda Terminal, which will mineralize 3 million tons of CO_2 annually – has been chosen to receive a grant from the EU's Innovation Fund.

- **Economical** – The cost of CO_2 storage via mineralization using the Carbfix method is in the region of USD 5-20 per ton of CO_2.

II – Comments on the documents under consideration

The general recommendation of Carbfix is that the documents under consideration account for CO_2 storage via mineralization as a viable and recognized alternative approach to the conventional geological storage of free-phase CO_2 in sedimentary formations.

As for specific paragraphs of the documents, Carbfix submits the following comments.

Document **A6.4-SB002-AA-A05**:
"Draft Recommendation – Requirements for the development and assessment of mechanism methodologies pertaining to activities involving removals"

- **Appendix 2, Paragraph 1**
  The definition of a "geological storage site" describes only traditional methods. It is recommended that the definition also encompasses subsurface mineral storage. This could for example be achieved by adding the sentence: "It also means a geological site consisting of reactive subsurface rock formations into which CO_2 dissolved in water can be injected for mineralization."

- **Appendix 2, general comment on requirements**
  The Appendix details requirements that are geared towards traditional methods of geological storage of CO_2 in sedimentary formations, some of which (such as those referring to "caprocks", "sealing" etc.) are not appropriate for mineralization. It is therefore recommended that separate requirements be adopted for subsurface mineralization. In this respect, the independently validated methodology that is attached to this submission might serve as a reference. Alternatively (or additionally) a more general wording could be

adopted, for example: “Appropriate trapping structures or mechanisms (physical or chemical) shall be in place to impede the upward movement of CO_2 from the storage formation.”

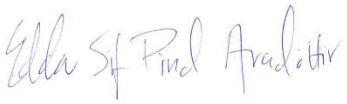
Document **A6.4-SB002-AA-A06**:
“Information note – Removal activities under the Article 6.4 mechanism”

- Paragraph 203
  The paragraph mainly describes the conventional method of storing CO_2 as a free phase in geological formations. Although the last sentence mentions CO_2 mineral storage, it is recommended that mineral storage by injection of CO_2 dissolved in water be more clearly identified as a viable alternative storage method, distinct from the traditional method of injecting liquid or gaseous CO_2 for geological storage in sedimentary formations.

- General comment
  The document contains discussions of requirements appropriate for the conventional method of CO_2 storage in geological formations, some of which are not appropriate for CO_2 storage via mineralization. An example of this is the concept of a “permanence buffer”. It is therefore recommended that the document takes into account the specific attributes of mineralization and separates the requirements appropriate for that method as opposed to the traditional method. In this respect, the independently validated methodology that is attached to this submission might serve as a reference.

With thanks in advance for your kind consideration of the above comments and recommendations.

Sincerely,



Edda Sif Pind Aradóttir
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