

Comment on “Carbon Capture and Storage: From Global Cycles to Global Solutions” by Oelkers and Gislason, 2023

Sævar Freyr Þráinsson (Reykjavík Energy, Iceland)

Comment

doi: 10.7185/geochempersp.12.3

Serious inaccuracies have been brought to our attention in a recent publication of *Geochemical Perspectives*, volume 12, no. 2, October 2023. While the authors' contribution to developing the Carbfix method for the permanent mineral sequestration of CO₂ is beyond question, their article contains serious errors. Whether intentional or not, they reflect poorly on the integrity and honour of Reykjavík Energy (RE) and members of its staff. These errors, listed below, were brought to the attention of the editorial board of *Geochemical Perspectives* on November 9th, 2023, which made us aware of this newly established platform for corrections.

Following are Reykjavík Energy's comments. Here, referring to chapters and page numbers of aforementioned publication.

- 1. Section 4.7, p. 294: *Over the next 11 years much of the funding to support the project was obtained by the academic partners in collaboration with Reykjavík Energy.***

This is incorrect. Most of the funding to support the project over the period between 2008 and 2019 came directly from RE. Overall management of Carbfix has, from the beginning, been in the hands of its employees; RE has covered most of the project's cost and provided access to expensive infrastructure for testing and scaling while also funding and constructing new infrastructure specific to the project. Furthermore, the EU-funded projects CarbFix, CarbFix2, and GECO were all led, co-funded, and coordinated by RE.¹

- 2. Section 4.7, p. 295: *At a January 2018 CarbFix2 partners' meeting in Zürich Switzerland we discussed the need for us to trademark the name CarbFix, as it was becoming very valuable. At the next CarbFix2 partners' meeting in September 2018 in Reykjavík Iceland, Edda Sif Aradóttir, a former CarbFix student and at this time acting as coordinator of the CarbFix2 EU-funded project, announced that Reykjavík Energy had trademarked the CarbFix name on their own without the knowledge agreement of the other partners. They had bought, on their own, the CarbFix logo rights from the artist and designer***

¹ See e.g. EU H2020 projects' websites for Carbfix, Carbfix2 and GECO projects <https://cordis.europa.eu/project/id/764760>, <https://cordis.europa.eu/project/id/283148>, <https://cordis.europa.eu/project/id/818169>

Marijo Murillo, the wife of Domenik Wolff-Boenish, the former University of Iceland CarbFix project manager. By this time, Domenik and Marijo had moved to Perth Australia. We were shocked, and Siggi commented that there had always in the past been complete trust between the CarbFix partners, and he was confident that this unilateral taking of CarbFix by Reykjavík would be rectified. Edda suggested that we instead should focus on submitting a CarbFix patent application and for all of us to continue to use the name and the logo - that from then on owned by Reykjavík Energy.

At the CarbFix2 meeting in January 2018 in Zürich, Switzerland, the need to trademark the name Carbfix was discussed. It was decided that the project coordinator, Edda Aradóttir, would take this subject further and contact the Carbfix logo designer to negotiate the transfer of associated rights. The trademark process concluded with Carbfix as a registered trademark in March 2018.² This information was shared promptly by email with relevant parties on the 28th of March - including both authors of the publication – one of whom replied with positive and congratulatory remarks.

In this respect, it is worth highlighting that a patent application related to Carbfix injection technology was submitted in 2018. Ownership of the prospective patent is aligned with both the original Carbfix consortium agreement and a subsequent agreement made between RE, The University of Iceland, Columbia University, and Barnard College. This is still the ownership of the corresponding patent.

The publication ignores this but presents innuendos of deceit regarding IP protection. RE and its respective employees denounce such presentation of their conduct.

3. Section 4.7, p. 295: *Edda Sif Aradóttir, a former CarbFix student and at this time acting as coordinator of the CarbFix2 EU-funded project.*

It is well documented that work by female researchers is often overlooked, and an opportunity was missed in this volume to bring more visibility to female colleagues, especially their leadership roles in the project. Women have played a crucial role in transforming the idea behind Carbfix into a proven technology and business. From its formalisation, the Carbfix project has been led by women, first by Hólmfríður Sigurdardóttir and subsequently by Edda Aradóttir. This is disregarded in the publication.

Describing Edda Aradóttir's role as "...at this time acting as coordinator of the CarbFix2 EU-funded project" is deceptive. Edda Aradóttir was the project coordinator of CarbFix2 for the whole project's duration. Subsequently, she took on the role of project manager of the Carbfix project from 2011-2020, when she became the CEO of Carbfix.

A similarly missed opportunity in this publication is mentioning the contribution of engineers and tradespeople to implementing Carbfix scientific findings. Without their expertise and

² See registration on the website of the Icelandic Intellectual Property Office <https://www.hugverk.is/leit/trademark/V0107677>

hard work, it would have been impossible to transcend successfully from an idea to a proven technology and business³.

- 4. Section 4.7, p. 295: *In December 2019 it was announced in the Icelandic media that Reykjavík Energy had established a subsidiary with the name Carbfix, fully owned by Reykjavík Energy, again without our prior knowledge.***

RE announced on November 27th, 2019, its plans to establish Carbfix as a new subsidiary. Following the announcement, a town hall meeting was held at RE HQ on December 11th, 2019. There, Sigurður Gíslason, one of the publication's authors, participated and presented the story of Carbfix⁴.

The company started operations in January 2020. Subsequently, discussions between RE and the University of Iceland resulted in an agreement that the latter should acquire a 10% share in the company based on the original share capital of the company. This process was, however, not concluded until 2021 as formal governmental authorisation and budget approval were required, and this process takes time⁵.

- 5. Section 4.7, p. 295: *We had a very strange CarbFix2 partner meeting in Paris mid-January 2020, where we tried to determine our role. Did we even have permission from Carbfix (the company) to present or publish our research?***

RE's establishment of its new subsidiary had no impact on existing agreements, e.g. in relation to the Carbfix2 project, which clearly stipulated the rights and responsibilities of project partners regarding ownership and publication of project results.

The meeting in question was a regular consortium meeting held in relation to the H2020-funded Carbfix2 project. The published meeting agenda was traditional, involving a review of project status and progress within individual work packages. Furthermore, it should be noted that the consortium consisted of more parties than those represented by the authors and RE⁶.

- 6. Section 4.7, p. 295: *We both were invited to remain as part of Carbfix as the company's unpaid scientific advisors. We felt insulted and refused. Subsequently, at Siggi's insistence, the University of Iceland started negotiations with Reykjavík Energy to try to resolve this issue. After substantial negotiation, the University of Iceland was allowed to purchase 10 % of the Carbfix company from Reykjavík Energy in 2022. Shortly after, as the Carbfix company grew, it required further funding. As the University was not legally allowed to invest further, Reykjavík Energy provided these funds and cut the University ownership to less than 0.1 percent without compensating the University. If Carbfix were to be sold at present, due to the current interest***

³ See e.g. Gíslason, S.R., Sigurðardóttir, H., Aradóttir, E.S., Oelkers, E.H. (2018) A brief history of CarbFix: Challenges and victories of the project's pilot phase. *Energy Procedia* 146, 103-114.

⁴ See e.g. meeting agenda and recording of the meeting <https://www.youtube.com/watch?v=WJjzsDVMenK>

⁵ See e.g. media coverage: <https://www.visir.is/g/20212190106d/hi-kaupir-i-carbfix-og-stofnar-felag-utan-um-sprotasafnid>

⁶ See e.g. EU H2020 project's website: <https://cordis.europa.eu/project/id/764760/>

in carbon capture and storage it would likely be worth in excess of several millions of dollars.

As mentioned above, discussions between RE and the University of Iceland resulted in an agreement that the latter should acquire a 10% share in the company based on the original share capital of the company. This process was, however, slow, as mentioned above. In the meantime, the company's share capital was increased, and the University of Iceland decided not to participate.⁵ As a result, the University's ownership percentage decreased in line with law, regulations, and market practices.

It should be noted that the publication's authors' view is at odds with the assessment of the rector of the University of Iceland, who publicly expressed his satisfaction with the results of the matter on December 1st, 2021⁷.

- 7. Section 4.7, p. 295: *Note again, in this text, the term CarbFix (upper case F) refers to the academic-industrial partnership from 2006 to 2020 led by us and others. The term Carbfix (lower case f) refers to the company created in 2020 without our prior knowledge or participation by Reykjavík Energy to exploit and profit from the results of the Carbfix consortium. The naming of the company 'Carbfix' was likely intentional to give the impression that the company generated the technology on their own from the beginning.***

Yet again, unfounded innuendos find their way into this peer-reviewed publication. It is commonplace that naming and branding change over time. *Orkuveitan* is now the Icelandic RE brand, for example, instead of *Orkuveita Reykjavíkur*.

Carb-Fix was the original spelling of the academic-industrial partnership used for the first couple of years. This evolved to *CarbFix*, which in turn evolved to *Carbfix*. No conspiracy or deceit lies behind the changes, as suggested by the authors.

RE and its respective employees cannot accept such a presentation of their conduct.

- 8. Section 4.7, p. 296: *Nevertheless, this twist of events in the CarbFix story should serve as a warning to our fellow scientists. One needs to beware and wary of the actions of private sector partners. Once they sniff profit from one or more of your ideas, they have a large motivation to discard you once you develop the technology to the level that it is profitable.***

RE and its respective employees reject this presentation of their conduct. As the publication's conclusion, it is based on inaccuracies, misrepresentation, personal innuendos, and a surprisingly long list of factual errors, noting it is peer-reviewed.

It is worth mentioning that RE is a publicly owned company, owned by the city of Reykjavík (93.5 %) and the municipalities of Akranes (5.5 %) Borgarbyggð (1 %). As mentioned

⁷ Per the rector's comments sharing the news on his Facebook account <https://www.facebook.com/Jon.Atli.Rektor/posts/2891005814563616/>

above, RE has invested heavily in the development of Carbfix and provided direct financial support to related research and academic work, as well as access to the company's infrastructure and data.

It is peculiar to challenge industrial scaling of the underlying research and technology in this respect, especially since the original goal of the industrial-academic partnership from 2007 was to develop a solution that could be used and scaled by industry. The fact that the ownership of the underlying IP remains fully in accordance with the original collaboration agreement further negates the author's narrative.

■ References

Gíslason, S.R., Sigurðardóttir, H., Aradóttir, E.S., Oelkers, E.H. (2018) A brief history of CarbFix: Challenges and victories of the project's pilot phase. *Energy Procedia* 146, 103-114.

Oelkers, E.H., Gíslason, S.R. (2023) Carbon Capture and Storage: From Global Cycles to Global Solutions. *Geochemical Perspectives* 12, 179-349.

■ Additional information

Received 9 January 2024 | Accepted 11 March 2024 | Published 14 June 2024

Editors: Mihály Pósfai, Sarah Gleeson, Richard Pancost