

Case No: 88279  
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Decision No: 089/24/COL

## EFTA SURVEILLANCE AUTHORITY DECISION

of 26 June 2024

issuing an opinion on the draft permit to permanently store carbon dioxide in Hellisheiði, in accordance with Article 10(1) of Directive 2009/31/EC of 23 April 2009 on the geological storage of carbon dioxide

THE EFTA SURVEILLANCE AUTHORITY,

Having regard to:

the Agreement on the European Economic Area ('the EEA Agreement'),

the Agreement between the EFTA States on the Establishment of a Surveillance Authority and a Court of Justice ('the Surveillance and Court Agreement'), in particular Article 5(2)(b), and

the Act referred to at point 21at of Annex XX to the EEA Agreement:

*Directive 2009/31/EC of the European Parliament and of the Council of 23 April 2009 on the geological storage of carbon dioxide and amending Council Directive 85/337/EEC, European Parliament and Council Directives 2000/60/EC, 2001/80/EC, 2004/35/EC, 2006/12/EC, 2008/1/EC and Regulation (EC) No 1013/2006 ('the CCS Directive'),<sup>1</sup>*

as adapted to the EEA Agreement by Protocol 1 thereto, and in particular Article 10(1) of that Directive.

Whereas:

Article 6(1) of the CCS Directive requires that no carbon dioxide ('CO<sub>2</sub>') storage site is operated without a storage permit.

Article 10(1) of the CCS Directive requires an EEA EFTA State to make the permit applications available to the EFTA Surveillance Authority ('the Authority') within one month after receipt, and to inform the Authority of any draft storage permits.

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<sup>1</sup> *Directive 2009/31/EC of the European Parliament and of the Council of 23 April 2009 on the geological storage of carbon dioxide and amending Council Directive 85/337/EEC, European Parliament and Council Directives 2000/60/EC, 2001/80/EC, 2004/35/EC, 2006/12/EC, 2008/1/EC and Regulation (EC) No 1013/2006 (OJ L 140, 5.6.2009, p. 114-135), incorporated into the EEA Agreement at point 21at of Annex XX by the Decision of the EEA Joint Committee No 115/2012 (OJ L 270, 4.10.2012, p. 38 and EEA Supplement No 56, 4.10.2012, p. 39), which entered into force on 1 June 2013.*

Article 10(1) of the CCS Directive provides that the Authority may, within four months after receipt of the draft storage permit, issue a non-binding opinion on it.

Article 10(2) of the CCS Directive requires the competent authority of the EEA EFTA State to notify the final decision to the Authority, and to state its reasons where it departs from the opinion of the Authority.

On 13 February 2023, the Authority received from the Icelandic Environment Agency a copy of the application from Carbfix hf. for CO<sub>2</sub> injection and storage permit in a storage complex located at Hellisheiði, southwest Iceland.

On 28 February 2024, the Authority received from the Icelandic Environment Agency a draft permit for the storage of CO<sub>2</sub> by Carbfix hf. ('the Draft Permit').

On 5 June 2024, the Authority received from the Icelandic Environment Agency a revised version of the Draft Permit. For the purpose of this Decision, any reference to the Draft Permit includes its revision.

The Authority's opinion on the Draft Permit is set out in the Annex to the present Decision.

HAS ADOPTED THIS DECISION:

1. The Authority's opinion on the draft storage permit to Carbfix hf. is set out in the Annex to this Decision.
2. The Annex forms an integral part of this Decision.
3. This Decision shall be notified to the Icelandic Environment Agency.

Done at Brussels,

For the EFTA Surveillance Authority

Arne Røksund  
President

Stefan Barriga  
College Member

Árni Páll Árnason  
Responsible College Member

Melpo-Menie Joséphidès  
Countersigning as Director,  
Legal and Executive Affairs

*This document has been electronically authenticated by Arne Roeksund, Melpo-Menie Josephides.*

## ANNEX:

### **EFTA Surveillance Authority Opinion on the draft permit to permanently store carbon dioxide in Hellisheiði, in accordance with Article 10(1) of Directive 2009/31/EC of 23 April 2009 on the geological storage of carbon dioxide**

## **1 The legal framework**

Directive 2009/31/EC of 23 April 2009 on the geological storage of carbon dioxide ('the CCS Directive')<sup>2</sup> entered into force in the European Economic Area ('EEA') Agreement on 1 June 2013. It establishes a legal framework for the environmentally safe geological storage of carbon dioxide ('CO<sub>2</sub>').

The CCS Directive aims to contribute to mitigating climate change and to ensure that carbon capture and storage ('CCS') is deployed in an environmentally safe way.

The CCS Directive requires that no storage site is operated without a storage permit<sup>3</sup> and establishes requirements for the national permitting process and the content of the storage permit.<sup>4</sup>

Pursuant to Article 10(1) of the CCS Directive, the EEA EFTA States are required to make any storage permit applications and draft storage permits, together with relevant material, available to the EFTA Surveillance Authority ('the Authority'), for its review.

The Authority may within four months after receipt of draft storage permits issue non-binding opinions on them, to ensure consistency in the implementation of the CCS Directive requirements across the EEA.

If the competent authority departs from the Authority's opinion, Article 10(2) of the CCS Directive requires the competent authority to state its reasons.

The competent authority for issuing CO<sub>2</sub> storage permits in Iceland is Umhverfisstofnun, the Icelandic Environment Agency (the 'Competent Authority').

## **2 The project and national permitting process**

### **2.1 Application for a storage permit**

On 20 January 2023, Carbfix hf. ('the Applicant') submitted to the Competent Authority an application ('the Application') for a permit to permanently store CO<sub>2</sub> in the Hellisheiði industrial park in southwest Iceland ('the Project').

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<sup>2</sup> Directive 2009/31/EC of the European Parliament and of the Council of 23 April 2009 on the geological storage of carbon dioxide and amending Council Directive 85/337/EEC, European Parliament and Council Directives 2000/60/EC, 2001/80/EC, 2004/35/EC, 2006/12/EC, 2008/1/EC and Regulation (EC) No 1013/2006 (OJ L 140, 5.6.2009, p. 114-135), incorporated into the EEA Agreement at point 21 at of Annex XX by the Decision of the EEA Joint Committee No 115/2012 (OJ L 270, 4.10.2012, p. 38 and EEA Supplement No 56, 4.10.2012, p. 39), which entered into force on 1 June 2013.

<sup>3</sup> Article 6 of the CCS Directive.

<sup>4</sup> Articles 7 to 11 of the CCS Directive.

## 2.2 Project description

The Project is intended to permanently store CO<sub>2</sub> in the Hellisheiði industrial park. The CO<sub>2</sub> will be sourced from a combination of a geothermal effluent stream and direct air capture ('DAC') facilities. The Applicant has undertaken CO<sub>2</sub> injection at the Hellisheiði industrial park since 2012 as part of a demonstration project, following studies initiated in 2007.<sup>5</sup>

The draft permit, received from the Competent Authority on 28 February 2024 and revised on 5 June 2024 ('the Draft Permit'), authorises the Applicant to store a total of 3,180,000 t/CO<sub>2</sub>, based on the storage of 106,000 t/CO<sub>2</sub> per year, for a duration of 30 years.

The CO<sub>2</sub> will be injected into the storage site through four injection points, identified with GPS coordinates in the Draft Permit.

Pursuant to the Draft Permit, the CO<sub>2</sub> will be transported with different means and injected at different injection rates, pressure limits and depths according to the injection points:

- Húsmúli 1 injection point: transport via a water pipe, maximum injection rate of 1.5 kg CO<sub>2</sub> per second and of 132 kg H<sub>2</sub>O per second, with injection of gas charged water at a pressure of 14 bar-g;
- Þrengsli 2 injection point: transport via a gas pipe, maximum injection rate of 0.15 kg CO<sub>2</sub> per second and of 3.5 kg H<sub>2</sub>O per second, with injection at a pressure between 19 and 22 bar-g for the gas and between 0 and 10 bar-g for the water;
- Geopark 3 injection point: transport via a water pipe, maximum injection rate of 1.5 kg CO<sub>2</sub> per second and of 92 kg H<sub>2</sub>O per second, with injection of gas charged water at a pressure of 21 bar-g;
- Geopark 4 injection point: transport via a gas pipe, maximum injection rate of 0.5 kg CO<sub>2</sub> per second and of 12.8 kg H<sub>2</sub>O per second, with injection at a pressure between 19 and 22 bar-g for the gas and between 0 and 10 bar-g for the water.

Injection at the first injection point will be in the deep system (1,800-2,500 m), while it will be in the intermediate system for the three remaining injection points (depth of 300–700 to 1,000 m).

The Draft Permit authorises the storage of CO<sub>2</sub> and associated substances from the source (such as hydrogen sulphide ('H<sub>2</sub>S')) as well as trace testing substances (tracers) that are added to assist in monitoring and verifying CO<sub>2</sub> migration. The CO<sub>2</sub> and associated substances will be dissolved in water and injected into basaltic rocks.

## 3 Review by the Authority

On 13 February 2023, the Competent Authority submitted to the Authority the Application for the permanent storage of CO<sub>2</sub> in the Hellisheiði industrial park.

The Authority met with the Competent Authority to discuss the application on 7 June 2023.

On 28 February 2024, the Competent Authority submitted to the Authority the Draft Permit and other supporting documents, including the monitoring plan, information related to the financial security and financial mechanism, the summary of the environmental impact assessment, a compilation of relevant Icelandic legislation and the full environmental impact assessment.

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<sup>5</sup> Pursuant to Article 2(2) of the CCS Directive, the CCS Directive does not apply to geological storage of CO<sub>2</sub> with a total intended storage below 100 kilotonnes, undertaken for research, development or testing of new products and processes.

On 16 April, 8 May, 15 May and 11 June 2024, the Authority met with the Competent Authority to discuss the Draft Permit.

On 5 June 2024, the Competent Authority sent a revised Draft Permit to the Authority. In particular, the revisions concerned the financial security and financial mechanism, the monitoring, corrective measures and post-closure plans, the total amount of CO<sub>2</sub> authorised to be stored, the CO<sub>2</sub> stream composition and the description of the storage site and storage complex. For the purpose of this opinion, any reference to the Draft Permit includes its revision.

The Authority and the Competent Authority had several exchanges for the purpose of completing the information and documents submitted with the Application and Draft Permit.

In order to ensure a homogeneous approach concerning CO<sub>2</sub> storage permits within the European Economic Area, during its review the Authority took into account, insofar relevant, the European Commission's guidance documents on the implementation of the CCS Directive.<sup>6</sup>

## 4 Opinion

The Draft Permit, the Application and supporting documents provided by the Competent Authority constitute the basis for the Authority's review and this opinion. The Authority has the following comments on the technical, environmental, and financial aspects of the Draft Permit.

### 4.1 Technical requirements

The Authority considers that the information provided in the Application, Draft Permit, and supplementary information adequately documents the suitability of the storage site for permanent geological storage of CO<sub>2</sub>, from a technical point of view.

The Authority in this context refers to the detailed characterisation and assessment of the storage site and storage complex in the Application, including static, dynamic, fracture, geochemical and well performance modelling. Pursuant to the information provided, the proposed storage site has been the subject of significant data gathering, including detailed reservoir characterisation, dynamic reservoir modelling and preparations for field testing the process since 2007. The Applicant has also undertaken demonstration injection since 2012 with corresponding monitoring and reporting for research and development purposes.

The information provided to the Authority furthermore includes references to peer reviewed and published technical papers and reports<sup>7</sup> that contain assessments concerning the suitability of the site and information on the storage process. Detailed reservoir simulation and forecasting models have also been developed and used to develop risk management, monitoring and corrective measures plans.

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<sup>6</sup> [https://climate.ec.europa.eu/eu-action/carbon-capture-use-and-storage/implementation-ccs-directive\\_en#documentation](https://climate.ec.europa.eu/eu-action/carbon-capture-use-and-storage/implementation-ccs-directive_en#documentation). The guidance documents are in the process of being revised. The last available public versions of the draft revised guidance documents at the time of this opinion are available at: <https://sway.cloud.microsoft/kpWmA2aP5oKX03gQ?ref=Link&loc=play>.

<sup>7</sup> <https://carbfix.com/scientific-papers>: Snæbjörnsdóttir, S.Ó., Marieni, C., Voigt, M., Sigfússon, B. (2022). 7.16 - Carbon Capture and Storage in Geothermal Development. In Comprehensive Renewable Energy (Second Edition), Editor: Trevor M. Letcher, Elsevier, 2022, 315-330, and Ratouis, T., Snæbjörnsdóttir, S., Ó., Voigt, M. J., Sigfússon, B., Aradóttir, E., A., Hjörleifsdóttir, V. (2022). A transport model of long-term CO<sub>2</sub> and H<sub>2</sub>S injection into basaltic rocks at Hellisheidi, SW-Iceland, International Journal of Greenhouse Gas Control, 114, 103586.

The Authority finds that the Draft Permit clearly defines the storage complex and the storage site, including their precise location and delimitation.<sup>8</sup> Considering that the storage site and the storage complex have similar lateral boundaries pursuant to the Draft Permit, the Authority invites the Competent Authority, for clarity purposes, to refer in Annex 1 to both the storage site and the storage complex in the heading, the paragraph preceding the coordinates and the legend on Figure 1. For completeness, the Authority also invites the Competent Authority to reference the faults in the legend of the diagram representing vertically the storage site and the complex.<sup>9</sup> The Draft Permit describes the geological formations pertaining to the storage site, consisting of a geologically homogenous volume with a succession of layers of basaltic rock formations and hyaloclastites. The Draft Permit defines the systems in which the Applicant will inject the CO<sub>2</sub> as one geological storage site with different depth profiles and four injection locations. The CO<sub>2</sub> stream captured from the geothermal power plant will be stored in the deep system, while the CO<sub>2</sub> captured from DAC facilities will be stored in the intermediate system.

The Authority finds that the requirements in the Draft Permit concerning the total quantity of CO<sub>2</sub> to be injected, the reservoir pressure limits and the maximum injection rates and pressures<sup>10</sup> in the wells, both during and after cessation of injection appear reasonable. The permissible injection rates are based on detailed dynamic reservoir simulation and modelling and the permissible well injection pressures on detailed reservoir simulation and well dynamic modelling. Regarding the reservoir pressures, the Draft Permit specifies a reservoir pressure limit at the periphery of the injected CO<sub>2</sub> plume, considering the storage of CO<sub>2</sub> by mineralisation into basaltic rocks and reflecting modelling results to ensure that injected fluids do not laterally migrate to adjacent groundwater resources and supplies.<sup>11</sup> The Authority notes that models indicate that the CO<sub>2</sub> will not migrate into the adjacent groundwater resources and supplies, both for the deep and intermediate systems.<sup>12</sup>

Article 12 of the CCS Directive concerns the requirements for the CO<sub>2</sub> stream. It requires the CO<sub>2</sub> stream to consist overwhelmingly of CO<sub>2</sub> and for no waste or other matter to be added for the purpose of disposing of that waste or other matter. Article 12 addresses the acceptance of non-CO<sub>2</sub> constituents in the CO<sub>2</sub> stream. A CO<sub>2</sub> stream may contain incidental associated substances from the source, capture or injection process and trace substances added to assist in monitoring and verifying CO<sub>2</sub> migration, provided that these do not adversely affect the integrity of the storage site or the relevant transport infrastructure or pose a significant risk to the environment or human health.

Article 12 of the CCS Directive requires a detailed assessment by the Competent Authority and the Applicant, specific to the site considered for a Permit, the natural surroundings around the storage site, and specific to the technology and CO<sub>2</sub> source.

The Authority takes note of the site-specific assessment made by the Competent Authority. The Draft Permit lists for each injection point, the minimum content of CO<sub>2</sub> and the maximum content of associated gases.<sup>13</sup> It sets the limits at the Húsmúli 1 injection point at a minimum content of 80.9% CO<sub>2</sub> and a maximum content of 18.9% H<sub>2</sub>S. For other injection points, the ratio of CO<sub>2</sub> will be ranging from 98.8-99.9%, with no H<sub>2</sub>S present. The weighted average of the CO<sub>2</sub> stream for the storage site will consequently be 90.1% CO<sub>2</sub> and 9.4% H<sub>2</sub>S.<sup>14</sup> The Draft Permit requires the Applicant to ensure that any injection of CO<sub>2</sub>

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<sup>8</sup> Chapter 1.2 and Annex 1 of the Draft Permit.

<sup>9</sup> Figure 2 in Annex 1 of the Draft Permit.

<sup>10</sup> Annex 1 of the Draft Permit.

<sup>11</sup> *Model of the Injection of CO<sub>2</sub> at Hellisheiði, Possible Effects of the Proposed CO<sub>2</sub> Injection and Mineral Storage Operations*, Thomas Ratouis and Matt Villante, Carbfix, Section 7.4.

<sup>12</sup> *Model of the Injection of CO<sub>2</sub> at Hellisheiði, Possible Effects of the Proposed CO<sub>2</sub> Injection and Mineral Storage Operations*, Thomas Ratouis and Matt Villante, Carbfix, Sections 8.1.2 and 8.2.1.

<sup>13</sup> Chapter 2.3 of the Draft Permit.

<sup>14</sup> Chapter 2.3 of the Draft Permit.

and incidental substances will not adversely affect the integrity of the storage site or the transport infrastructure, pose a significant risk to the environment or human health or breach the requirements of applicable legislation, such as legislation on water management. It furthermore obliges the Applicant to accept the CO<sub>2</sub> stream only following analysis and risk evaluation and to keep a register of the quantity and quality of the CO<sub>2</sub> streams, including the stream composition.

In its assessment, as presented in the Draft Permit, the Competent Authority has considered the following with regard to the site for the Project:

- i. H<sub>2</sub>S is naturally present in the geothermal source and therefore can be considered an incidental associated substance in the meaning of Article 12(1) of the CCS Directive, and be injected as part of the CO<sub>2</sub> stream;
- ii. there is limited technical feasibility to separate the CO<sub>2</sub> and H<sub>2</sub>S from the source for the Project;
- iii. the geothermal power plant is subject to requirements to limit H<sub>2</sub>S emissions to address risk for the environment and human health for surrounding municipalities;
- iv. the storage of the CO<sub>2</sub> and H<sub>2</sub>S from the geothermal power plant should not lead to negative impact on the operation on this power plant;
- v. the negative impacts on the environment of not storing the H<sub>2</sub>S outweigh the effects of storing the H<sub>2</sub>S;
- vi. independent studies<sup>15,16</sup> have shown that H<sub>2</sub>S follows the same principles in forming secondary minerals as CO<sub>2</sub> in the geothermal aquifer and the storage site.

The Competent Authority also explains that the water injected as part of the storage process is considered as a transport medium for the CO<sub>2</sub> stream into the storage site and is therefore not part of the CO<sub>2</sub> stream.

The Authority finds that the Draft Permit and the approved monitoring, corrective measures and post-closure plans,<sup>17</sup> sent by the Competent Authority along the Draft Permit, comply with the CCS Directive's requirement that storage permits contain approved plans. The Competent Authority clarified to the Authority that, under Icelandic law, permits and related plans are approved as distinct documents. Furthermore, the Competent Authority explained that the permits and plans approved under the Icelandic Act No. 7/1998 on Hygiene and Pollution Prevention<sup>18</sup> are publicly available on the same website as the permits. The Draft Permit explicitly sets out that the plans are approved and will be made public. The Authority also notes that the Draft Permit and approved plans are interlinked, thus clearly showing that they together outline the necessary requirements for the Project.

The approved monitoring plan and the obligations in the Draft Permit to implement the plan and to update it every five years comply with the CCS Directive.<sup>19</sup> The monitoring plan includes baseline monitoring of any new injection locations, though for the existing injection sites in operation (Húsmúli, Þrengsli), monitoring activities are already ongoing. Monitoring at the complex has been ongoing since 2012 when the pilot demonstration project was

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<sup>15</sup> Clark et al. 2020. CarbFix2: CO<sub>2</sub> and H<sub>2</sub>S mineralization during 3.5 years of continuous injection into basaltic rocks at more than 250°C. *Geochimica et Cosmochimica acta* 279, 45-66.

<sup>16</sup> Gunnarsson Robin et al. 2020. H<sub>2</sub>S sequestration traced by sulfur isotopes at Hellisheiði geothermal system, Iceland. *Geothermics* 83, 101730.

<sup>17</sup> Annex II – Monitoring plan for Carbfix hf. Hellisheiði - Permit UST202301-351, Annex IV – Corrective measures plan for Carbfix hf. Hellisheiði - Permit UST202301-351 and Annex V – Provisional post-closure plan for Carbfix hf. Hellisheiði - Permit UST202301-351.

<sup>18</sup> *Lög nr. 7/1998 um hollustuhætti og mengunarvarnir.*

<sup>19</sup> Chapter 4.2 of the Draft Permit and Annex II – Monitoring plan for Carbfix hf. Hellisheiði - Permit UST202301-351.

initiated, and this has included operational phase monitoring activities in both injection and dedicated monitoring wells. The Authority further welcomes the Draft Permit's requirement to install monitoring wells in adjacent ground water resources to ensure they are not polluted.<sup>20</sup>

The Authority acknowledges the information provided in the Application, Draft Permit and supplementary information<sup>21</sup> suggesting that the risks of leakage during operation and after closure of the storage are very limited. The detailed risk assessment conducted as part of the Application and based on technical studies<sup>22</sup> concludes that there is minimal risk of leakage from the site, indicating mineralisation of the CO<sub>2</sub> within two years of injection while H<sub>2</sub>S mineralisation is reportedly faster.<sup>23</sup> Possible risks are further mitigated by the approved monitoring plan.<sup>24, 25</sup> The Draft Permit also considers various risks associated with the environment, assessed in the section below.

The Authority takes note of the requirement in the Draft Permit for the Applicant to notify the Competent Authority in the event of leakages or significant irregularities.<sup>26</sup> The Authority notes that the Draft Permit requires to implement the approved provisional corrective measures plan, satisfying therefore the requirements of the CCS Directive.<sup>27</sup> The corrective measures plan lists four categories of measures and also foresees a set of preventive measures. For clarity purposes, the Authority invites the Competent Authority to clarify the distinction between the corrective measures plan required under the CCS Directive and the corrective plan referred to in Chapter 1.11 of the Draft Permit and aiming to address environmental damages.

The Authority finds that the Draft Permit's provisions on the closure of the storage site satisfy the requirements of the CCS Directive.<sup>28</sup> The approved closure and post-closure plan<sup>29</sup> is fit for purpose, as a provisional plan. It foresees the monitoring of the injection area for at least 20 years after cessation of injection. It raises the possibility that this period could be shortened if the monitoring indicates that at least 95% of the injected CO<sub>2</sub> is permanently bound up in minerals. The Authority invites the Competent Authority to clarify when and how they would consider that the possibility to shorten the monitoring on the basis of 95% is coherent with the CCS Directive's requirements to permanently and completely contain the injected CO<sub>2</sub>.

Finally, the Authority finds that the Draft Permit and related documents provide sufficient assurance that the Applicant is technically competent and reliable to operate and control the site. The Applicant demonstrated to date technical and operational expertise in implementing, operating and evaluating the demonstration project which has been

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<sup>20</sup> Chapter 4.3 of the Draft Permit.

<sup>21</sup> EIA Summary for ICF February 2024; NPA opinion on the EIA for geological storage of CO<sub>2</sub> at Hellisheiði; EIA report on geological storage of CO<sub>2</sub> at Hellisheiði, Doc No. 1439597.

<sup>22</sup> Storage Permit Application: CO<sub>2</sub> injection and storage at Carbfix's storage site at Hellisheiði: Chapter 2.3.1: Significant risk of leakage. Annex I: Section 3.3.1: Hazard characterisation. Figure 21: Potential leakage pathways (i to v).

<sup>23</sup> Deirdre E. Clark, Eric H. Oelkers, Ingvi Gunnarsson, Bergur Sigfússon, Sandra Ó. Snæbjörnsdóttir, Edda S. Aradóttir, Sigurður R. Gíslason. CarbFix2: CO<sub>2</sub> and H<sub>2</sub>S mineralization during 3.5 years of continuous injection into basaltic rocks at more than 250 °C, *Geochimica et Cosmochimica Acta*, Volume 279, 2020, Pages 45-66, ISSN 0016-7037, <https://doi.org/10.1016/j.gca.2020.03.039>.

<sup>24</sup> Chapter 4.2 of the Draft Permit.

<sup>25</sup> Annex II – Monitoring plan for Carbfix hf. Hellisheiði - Permit UST202301-351.

<sup>26</sup> Chapter 2.5 of the Draft Permit.

<sup>27</sup> Annex IV – Corrective measures plan for Carbfix hf. Hellisheiði - Permit UST202301-351.

<sup>28</sup> Chapters 1.5 and 1.7 of the Draft Permit.

<sup>29</sup> Annex V – Provisional post-closure plan for Carbfix hf. Hellisheiði – Permit UST202301-351.

operational since 2012 at the proposed storage site, in addition to publication and collaboration with research and technical organisations.<sup>30, 31</sup>

Additionally, the Draft Permit requires the staff to be equipped with the necessary training to effectively manage pollution-related incidents and to possess comprehensive knowledge of the instruments and safety equipment within the premises.<sup>32</sup>

## 4.2 Environmental requirements

The Authority acknowledges the environmental impact assessment ('EIA') undertaken and the conclusion of the Icelandic Authorities that the construction, operation and closure of the storage site and necessary facilities will not pose a significant risk to the environment and human health.

The Authority notes that the Draft Permit includes requirements on monitoring of groundwater and seismicity, as per the opinion of the Competent Authority on the EIA. With regard to groundwater, the Draft Permit requires additional monitoring activities in the adjacent ground water resources, the monitoring having to demonstrate the status of the water bodies and whether their environmental targets are reached.<sup>33</sup> With regard to seismicity, the Draft Permit requires the Project to comply with the rules set by the Icelandic Energy Authority (Orkustofnun) on preparatory measures and responses for earthquakes.<sup>34</sup>

The Draft Permit also requires injection into geological strata to be controlled by a traffic light system where injection into the intermediate and deep systems is increased slowly and in small steps. The approved monitoring plan finally includes detailed information on the positioning of seismographs in the area.

## 4.3 Financial requirements

In line with the conditions for issuing a storage permit in Article 8 of the CCS Directive, the Authority takes note of the Competent Authority's assessment that the Applicant is financially sound to operate and control the site.

Pursuant to Article 9 of the CCS Directive, the permit shall contain a requirement to establish and maintain the financial security or any other equivalent pursuant to Article 19 of the CCS Directive. This latter article requires the financial security to be valid and effective before commencement of injection and periodically adjusted to take account of changes to the assessed risk of leakage and the estimated costs of all obligations arising under the permit.

The Authority welcomes the Draft Permit's requirements to have the financial security active before the injection of CO<sub>2</sub> and reviewed every five years. The Authority however notes that the Draft Permit requires the Applicant only to "*provide confirmation of the ability to take sufficient measures in the form of financial security or its equivalence*".<sup>35</sup> The Authority finds such confirmation insufficient to comply with Articles 9 and 19 of the CCS

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<sup>30</sup> Chapter 2.2, *Proof of the technical competence of the potential operator* in the Storage Permit Application CO<sub>2</sub> injection and storage at Carbfix's storage site at Hellisheiði Application in line with Article 6 of Regulation 1430/2022.

<sup>31</sup> <https://carbfix.com/scientific-papers>

<sup>32</sup> Chapter 2.4 of the Draft Permit.

<sup>33</sup> Chapter 3.6 and 4.3 of the Draft Permit.

<sup>34</sup> OS-2016-R01-01 on preparatory measures and responses for earthquake risk due to the injection of liquid into the deep system (*Reglur nr. OS-2016-R01-01 um viðbúnað og viðbrögð við jarðskjálftavá vegna losunar á vökva í jörðu um borholur*).

<sup>35</sup> Chapter 2.6 of the Draft Permit.

Directive. The Authority therefore recommends the Competent Authority to align the final permit on the CCS Directive's requirement.

Regarding financial security, proof that valid and effective provisions can be established, by way of financial security or any other equivalent, must be presented as part of the application for a storage permit, to ensure that all obligations arising under the permit can be met, in line with Articles 7 and 19 of the CCS Directive. The Authority takes note of the information on financial security reflected in the Application, as revised,<sup>36</sup> and the supporting documents accompanying the Draft Permit.<sup>37</sup> These documents contain information on the instruments that are expected to cover the operational, closure and post-closure periods respectively, with corresponding letters of intent from expected issuers of these instruments. The Authority further notes that the Application, as revised, lists and details the costs of monitoring operations for a period of six months as well as costs related to different scenarios for foreseen and unforeseen CO<sub>2</sub> releases from the injection system. The Application also lists expected costs for closure and post-closure, based on the Applicant's estimation. The costs are said to represent third-party costs and a contingency of at least 25% and represent the expected costs until the end of the post-closure period (20 years), although information to validate data sources and calculation methods were generally not provided. Costs from the operation of the storage site following a potential withdrawal of the permit are also not covered. The Authority invites the Competent Authority to seek from the Applicant justification of the underlying assumptions, data sources and calculations for the amounts of financial security.

With regard to the financial mechanism under Article 20 of the CCS Directive, the Authority notes that the Draft Permit requires the Applicant to give the Competent Authority access to a financial contribution before the transfer of responsibility takes place. The Application, as revised, lists and estimates the concerned costs and states that this amount will be included in the bank guarantee. The Authority notes that both the parent company and bank guarantees must be valid and effective before commencement of injection because each instrument covers obligations triggered by commencement of injection under the permit, such as the financial contribution.

The Authority notes an inconsistency in the references to the duration of monitoring to be covered by the financial contribution in paragraphs 1, 2 and 3 of Chapter 2.6 of the Draft Permit. The Authority understands from the Application, as revised, and the exchanges with the Competent Authority that the financial contribution will cover the cost of monitoring for at least 30 years following the transfer of responsibility. The Authority recommends the Competent Authority to amend the final permit accordingly.

## 5 Final remarks

Pursuant to Article 10(2) of the CCS Directive the Competent Authority shall notify the final decision to the Authority, and where it departs from the Authority's opinion it shall state its reasons.

The present opinion is based on the documents and information submitted by the Icelandic Environment Agency and is without prejudice to the Authority's position on any future Draft Permit, or vis-à-vis national authorities responsible for the transposition of EEA legislation, as regards the compatibility of any national implementing measure with EEA law.

The Authority will publish this Decision on its website.

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<sup>36</sup> Revised Application submitted by the Competent Authority to the Authority on 5 June 2024, along with the submission of the revised Draft Permit.

<sup>37</sup> Documents clarifying Carbfix proposal for the financial security, and corresponding letters of intent.

The Authority does not consider the information contained herein to be confidential. The Icelandic Authorities are invited to inform the Authority within five working days following receipt whether it considers that, in accordance with EEA and national rules on business confidentiality, this document contains confidential information which it wishes to have deleted prior to such publication. Reasons should be given for any such request.