Energistyrelsen

The rightsholder for licence C2023/01
c/o INEOS E&P A/S
Technikerbyen 5, 1. sal
2830 Virum
Denmark
Attn: [redacted]

c/o Harbour Energy International GmbH
Dampfærgevej 27-29
DK-2100 Copenhagen Ø
Attn: [redacted]

c/o Nordsøfonden
Sankt Kjelds Plads 11
DK-2100 Copenhagen Ø
Attn: [redacted]

Department
CCS

Date
18-12-2025

J nr. 2024 - 1977

/AMJPS, TRSKK, JBR, MKRST

Decision regarding approving the storage plan for Nini A (Nini West) for permit C2023/01

The Danish Energy Agency hereby notifies the rightsholder of Licence C2023/01 (INEOS E&P A/S, CVR: 73349613 (hereinafter referred to as "INEOS"), Harbour Energy International GmbH, HRB 163200 (hereinafter referred to as "Harbour Energy") and Nordsøfonden, CVR: 29435065)) of the following decision:

- Approval of the plan dated 2 February 2024 for the CO_2 storage activity for Nini West, Siri Canyon
- Approval of modifications on the Nini A platform and wells NA-3B and NA-5 for transition to CO_2 injection.
- Approval of the monitoring programme regarding the plan of 2 February 2024 and with subsequent changes.[1]

The decision is made pursuant to section 23(d)(2) of the Act on the Use of the Danish Subsoil (Subsoil Act)[2] and section 11(1) of the Executive Order on Geological Storage of CO_2 (CCS Executive Order).[3] The decommissioning plan will be dealt with in a separate decision, cf. section 32(a) of the Subsoil Act.

[1] See *other comments* regarding the approval of specific works related to the monitoring programme.
[2] Consolidating Act no. 1461 of 29 November 2023 on the Use of the Danish Subsoil and subsequent amendments
[3] Executive Order no. 845 of June 26, 2024 on geological storage of CO_2, etc.

Danish Energy Agency

Carsten Niebuhrs Gade 43
DK-1577 Copenhagen V

T: +45 3392 6700
E: ens@ens.dk

The decision is made by the Danish Energy Agency by delegation, cf. section 4(1)(1) of Executive Order no. 840 of 25 June 2025 on the tasks and powers of the Danish Energy Agency.

The decision is also made in accordance with Chapter III of the Act on Environmental Assessment of Plans and Programmes and of Specific Projects (Environmental Assessment Act)[4]. The decision replaces a permit for the project under section 25 of the Environmental Assessment Act, cf. section 10, no. 4 of the Executive Order on Environmental Assessment of Plans and Programmes and of Specific Projects, (the Environmental Assessment Executive Order) [5].

The Danish Energy Agency furthermore grants, pursuant to Section 23d(2) of the Subsoil Act, a legalising approval for the existing Nini A platform with jacket structure and wellhead deck as well as the wells NA-3B and NA-5, which are necessary for the CO_2 storage project. The installations were previously approved, but the approval was not in compliance with the EIA regulations[6].

The installations and the environmental impacts derived from it since the establishment of the installations are therefore also described in the environmental impact report for the applied project and the Danish Energy Agency has assessed this information (see section 2.10.6).

Non-binding opinion by the EU Commission

The Danish Energy Agency received by email on 19 November 2025 the Commission's "Opinion on the draft permit to permanently store carbon dioxide in the Nini West area of the Danish continental shelf." The opinion was delivered pursuant to Section 26(2) of the CCS Executive order, which implements Article 10(1) of the CCS Directive.

The Commission's email containing the opinion includes two recommendations regarding the Energy Agency's decision:

1. The Commission calls on the competent authority to update the draft permit with a description or map of the Nini West storage site, as the storage site and the storage complex have distinct boundaries. This update will ensure compliance with Article 9(2) of Directive 2009/31/EC. The draft permit further states that it is a prerequisite for the decision that the licence [...] be extended. The permit must clearly specify the type of extension envisaged, and the timing or area thereof.

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[4] Consolidating Act no. 4 of 03 January 2023 of the Act on Environmental Assessment of Plans and Programmes and of Specific Projects (EIA)
[5] Executive Order on Environmental Assessment of Plans and Programmes and of Specific Projects, no. 1608 of 09 December 2024
[6] Der henvises til Kammeradvokatens rapport af 12. august 2024 om supplerende undersøgelse af Energistyrelsens VVM-praksis for godkendelse af anlæg i Nordsøen og Østersøen, afsnit 11.3. Rapporten kan læses her.

2. The Commission encourages the competent authority to include in the draft permit a description of the precise terms and conditions of the financial guarantee.

The Danish Energy Agency notes the Commission's additional remarks and attaches the Commission's opinion to this decision as Annex 5.

The Danish Energy Agency responds to the Commission's recommendations as follows:

1. The Energy Agency notes that clear specifications of the type of extension, the timing, and the area are included in the decision on the 30-year extension of the Nini West area in permit C2023/01. Accordingly, the Energy Agency has updated Figure 1 in this decision to show the delineation of the storage site, and added a new Table 2 with UTM coordinates of the boundary as well as a brief text describing the stratigraphic boundary. On this basis, the Energy Agency considers the Commission's request to be fulfilled.

2. The Energy Agency notes that the financial guarantees have been provided pursuant to the requirements of Sections 24f and 23q of the Subsoil Act, as well as Section 32a in permit C2023/01. The Energy Agency approved these guarantees with the corresponding terms and conditions by decisions of 21 March 2023, and therefore considers that it is not necessary to describe these terms and conditions further in this decision.

Background information

The decision is based on the application materials "Application for CO_2 storage licence Siri Canyon - Nini West Storage Complex" with a number of associated background documents submitted by INEOS on behalf of the rightsholder in Licence C2023/01 on 2 February 2024, the published environmental impact report[7], the consultation responses received and the consultation for the draft decision.

On 9 February 2024, a clarification meeting was held with INEOS followed by a total of five follow-up meetings up until 8 October 2024. Information from these meetings, ongoing dialogues with INEOS and additional documentation provided on request from the Danish Energy Agency form a supplementary basis for the case presentation and assessment in this decision.

Finally, on 2 May 2025, INEOS has submitted additional material in the form of the document "Nini West - NA-5 Injection Optionality" with associated background

[7] The environmental impact report can be accessed at: https://hoeringsportalen.dk/Hearing/Details/69757

documents regarding an option to swap injection and monitoring wells, cf. the application materials. This may become relevant if sufficient CO_2 volumes are not available in the start-up phase to support the long reservoir section in the planned injection well.

On 10 August 2025, the Danish Energy Agency received by e-mail an application for a partial decision that would grant permission to establish the offloading system pursuant to Section 23d(2) of the Danish Subsoil Act. On 23 September 2025, the Danish Energy Agency issued to INEOS a partial decision approving the establishment of the offloading system for Nini A[8].

The approval covers only the activities relating to the offloading system as described in Sections 5.4.1 and 5.4.2 of the project's Environmental Impact Assessment Report as well as in INEOS's application for partial decision dated 10 August 2025. The present approval does not cover the approval of the offloading system.

It is a prerequisite for this decision that the rightsholder implements the project within the physical and environmental framework and assumptions stated in the application materials and the environmental impact report. The environmental impact report also includes an assessment of whether the project will have a significant impact on Natura 2000 areas in accordance with Section 3 of the Offshore Habitats Executive Order[9] and an assessment in accordance with the rules on species protection in Section 5 of the Executive Order. The report also addresses impacts on conditions and target fulfilment pursuant to the Marine Strategy Act[10] and the Executive Order on River Basin Management Plans ('indsatsbekendtgørelsen').[11]

Terms

The decision is granted on the following terms, cf. section 23(d)(5) of the Subsoil Act and section 8 of the Offshore Habitat Executive Order:

1. It is an assumption for this decision that the licence, delimited after Figure 1 under licence C2023/01, is extended. The extension is addressed in a separate decision.

2. The storage operation has the following requirements:
    a. The storage operation must be initiated no later than [redacted]

[8] The partial decision is available under *Publications 2025* here
[9] Executive Order on the administration of international nature conservation areas and the protection of certain species in connection with scientific studies, feasibility studies, exploration and extraction of hydrocarbons, underground storage, pipelines, etc. offshore, no. 846 of 26.06.2024.
[10] Consolidating Act no. 123 of 1 February 2024 on Marine Strategy.
[11] Executive Order no. 797 of 13 June 2023 on action programmes for river basin districts.

b. CO_2 may only be injected and stored in the hydraulic unit Frigg Sandstone (Sst), within the rock volume defined as storage site in the application materials (see Figure 1).
c. A maximum of 2.4 Mt of CO_2 can be stored.
d. The maximum reservoir pressure in Frigg Sst must be kept below [redacted] bar at all times.
e. At no time may the injection rate exceed [redacted]
f. [redacted]
g. Bottom hole pressure (BHP) in the injection well must not exceed [redacted] bar.
h. Tubing head pressure (THP) in the injection well must not exceed [redacted] bar.

3. The following requirements are set for the composition of the CO_2 stream's composition:
   a. The composition of the CO_2 stream shall be in accordance with the composition as stated in the [redacted] The CO_2 stream shall consist of at least 95% CO_2 [redacted]. Impurities shall not affect the integrity of the CO_2 interim storage, the permanent CO_2 storage or the equipment and processes associated with transportation from interim storage and injection into the CO_2 storage, respectively.
   b. Verification of the composition of the liquid CO_2 stream, [redacted]

4. Annual ROV monitoring is required annually. Deviation from this term is permitted via approval by the Danish Energy Agency, based on documentation provided by INEOS showing that the Lander technology is proven reliable.

5. Injection in Nini West shall not be initiated before the Danish Energy Agency has received the following information:
   a. [redacted]
   b. [redacted]

c. [redacted]

d. [redacted]

[redacted]

6. The holder of the licence is obliged to:
    a. ensure compliance with the approved monitoring programme and update the monitoring programme in line with the risk picture and the development of new technology, cf. Section 11(3) of the CCS Executive Order.
    b. report to the Danish Energy Agency annually regarding
        i. conformity modelling results
    c. report to the Danish Energy Agency monthly regarding
        i. the monitoring technology used and results of monitoring, including injection rates, pressure and temperature developments (on a daily and well basis)
    d. report to the Danish Energy Agency monthly regarding
        i. quantities and properties of delivered and injected CO_2, including composition of the CO_2 stream during the reporting period (on a daily basis)
    e. annually report data to the Danish Energy Agency for use in the national emissions inventory in accordance with the requirements applicable at any given time
    f. immediately notify the Danish Energy Agency in case of leakage or significant irregularities.
    g. Implement the approved corrective action plan in case of leakage or significant irregularities or other necessary actions.

7. In case of significant irregularities, such as if the CO_2 distribution is significantly different from modelling predictions or moving towards possible leakage paths, the Danish Energy Agency may require a change (for example in the form of upscaling/downscaling) of the monitoring programme, including requiring that a full 3D seismic survey is performed with follow-up campaigns to uncover the CO_2 distribution.

   If seepage occurs or significant irregularities occur or there is a risk thereof, the Danish Energy Agency may revoke the licence and thus this approval, cf. section 23(m)(1) of the Subsoil Act. The Danish Energy Agency may then decide to close the storage site, cf. section 23(n)(1) of the Subsoil Act. The Danish Energy Agency also refers to Section 15 of the CCS Executive Order.

8. In relation to the monitoring programme, the following conditions apply:
    a. The seismic monitoring activities shall be carried out according to *best environmental practice*, which means that the choice of equipment must ensure that the sound from the seismic sound

source is reduced as much as technically possible in order to achieve the necessary data quality.

b. In order to avoid displacing sand eels in Norwegian waters, seismic surveys shall not be carried out in December and January if these would lead to a sound impact in the Norwegian *area of special value* '*Tobisfelt*' on SELcum 10s of 145 dB re 1 uPa^2 or more, integrated over 10 seconds for the frequency band 1-1,000 Hz. Background noise can be subtracted.

9. Other terms related to underwater noise:
   a. For remotely operated vehicle (ROV) surveys, a soft-start of 7.5 minutes is required.
   b. For diving activities, a 15-minute soft-start must be completed.
   c. In order to monitor impulse noise caused by the project, it must be reported to the Danish Environmental Protection Agency (noise@mst.dk) and the Danish Energy Agency (ccs-miljo@ens.dk). The report shall include the time of the noisy activity (day), position, sound level and an indication of which activity caused the impulse noise. A reporting form to be used when reporting underwater noise shall be requested from the Danish Energy Agency. The collection of data for the Danish Environmental Protection Agency is part of Denmark's obligations in the Marine Strategy Framework Directive to monitor and assess the environmental status of the Danish marine areas.

10. The current guarantee for licence C2023/01, as approved in the Danish Energy Agency's decision of 21 March 2023, shall be maintained until it is required to be amended or supplemented, cf. section 32(1), third sentence of the licence.

11. [redacted]

12. [redacted]

If all conditions in the storage licence are met, including that storage of the maximum permitted amount of CO_2 has been achieved, that the Danish Energy Agency has received documentation that all available information indicates that the stored CO_2 will remain completely and permanently contained and that there is an approved post closure plan, the conditions for closure pursuant to section 23(k)(2)(1) of the Subsoil Act are deemed to be met.

Other remarks

INEOS shall submit an application under section 28(1) of the Subsoil Act for permission to carry out specific seismic work associated with the monitoring programme.

In connection with the application for a permit for the individual seismic survey, a noise modelling report shall be submitted as well as an account of how the selected equipment complies with the condition to apply a *best environmental practice, cf.* condition 8.a. The report should also present the lessons learned from the previous studies (if relevant), including whether the source strength used in the previous monitoring was necessary and whether any changes have been made to the method of implementation to ensure *best environmental practice*. Finally, the report shall indicate how soft-start is planned to avoid temporary and permanent hearing damage. This description shall be accompanied by the completion of the table below regarding the step-by-step increase of the source strength.

Soft start step	Source level $L_{S,E}[dB\ \mathrm{re}\ 1\ \mu Pa^2 s]$	Duration T [minutes]
1		
2		
…		
N		

If seismic monitoring is planned to be carried out in December or January, noise modelling showing the noise impact on *SVO Tobisfeltet* shall be submitted in connection with the application for the permit for this activity (cf. Section 28 of the Subsoil Act) at the latest, cf. condition 8.b.

For approvals under section 28(1), the Danish Energy Agency will stipulate separate conditions for the execution of the specific seismic work.

This approval does not exempt INEOS from obtaining all other necessary permits, approvals, exemptions, etc. required by law. The Danish Energy Agency also points out that general requirements under the Danish Subsoil Act and the CCS Executive Order still apply.

Energistyrelsen

Contents

1 Application and case presentation

INEOS, as operator on behalf of the rightsholder in Licence C2023/01, submitted a plan for the storage of CO_2 in Nini West accompanied by an environmental impact report for Nini A (West) for approval. The submitted storage plan is also accompanied by a decommissioning plan as required under section 32(a) of the Subsoil Act.

The Nini West storage plan is based on a cooperation agreement between the Nini licence and the Iris licence, where the Nini licence grants the Iris licence access to the Nini A platform and related infrastructure under a third-party agreement.

Nini West consists of a separate reservoir that is stratigraphically isolated from the other reservoir units in the Nini licence. The rightsholder plans to expand CO_2 storage to the other reservoirs in the Iris licence. This potential expansion will take place based on a subsequent application and will depend, among other things, on the experiences from Nini West. The Nini West storage application is thus potentially the first phase of a larger storage project.

1.1 Development concept and activities

The Iris licence (C2023/01) was awarded in the first offshore CO_2 storage round and granted to the applicant on February 3, 2023. The submitted application is limited to Nini West, while the rest of the Iris licence is still in the exploration phase and co-exists with Nini oil and gas licence 4/95. There is no longer oil production from Nini West. The planned production stop for the other reservoirs in the Nini licence is scheduled for the end of 2026.

The exact location, licence boundary / storage complex outline is shown in Figure and Tabel 1. The storage site is limited to the stratigraphic unit Frigg Sst and laterally delimited as outlined in Figure 1 (Table 2).

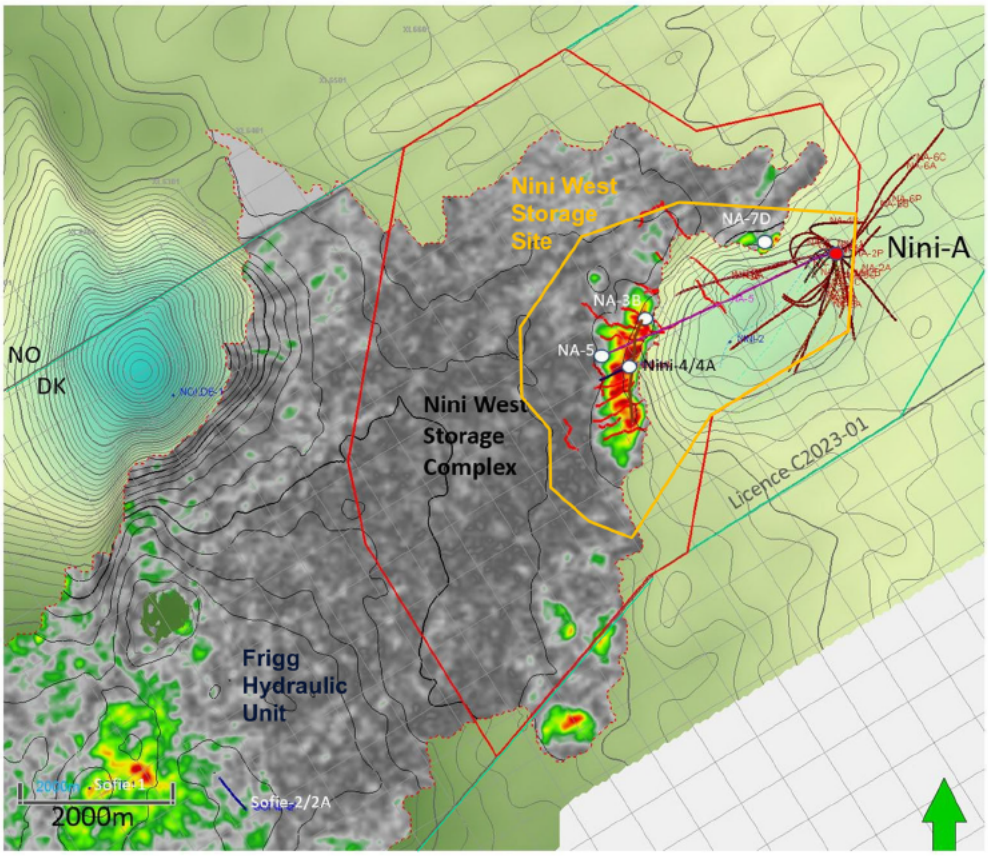

Figure 1: Map of the Licence boundary / storage complex (red polygon) as set out in INEOS' application and lateral delimitation of the storage site (orange polygon). The storage site is stratigraphically delimited by the Frigg Sst. Coordinates for the licence boundary are given in Table 1. Coordinates for the lateral delimitation of the storage site is given in Table 2. The map also shows the amplitude anomaly pre-oil production. The coordinates are given in ED 1950 UTM 31N.

Table 1: Coordinates (UTM ED50) of the licence boundary, as shown in Figure 1

Index	X	Y	Latitude	Longitude
1	640047.51	6275828.13	56.60385	5.279943
2	640536.71	6276132.36	56.60643	5.28807
3	640858.47	6277916.44	56.62235	5.294279
4	642590.34	6279011.48	56.63166	5.323083
5	642738.29	6281150.56	56.65081	5.326675
6	642232.54	6281936.02	56.65802	5.318867
7	640656.24	6281589.27	56.65538	5.292986
8	638987.89	6282646.94	56.66537	5.266365
9	636934.41	6281374.62	56.65456	5.232212
10	636222.02	6277309.27	56.61827	5.218457
11	636446.00	6276246.61	56.60867	5.221544
12	638113.33	6273502.61	56.58355	5.247222
13	640047.51	6275828.13	56.60385	5.279943

Table 2: Coordinates (UTM ED50) of the lateral delimitation of the storage site, as shown in Figure 1

Index	X	Y	Latitude	Longitude
A	640453.04	6280666.82	56.64716	5.289172
B	639203.44	6280229.50	56.64361	5.268574
C	638422.38	6279052.99	56.63328	5.255218
D	638432.90	6278169.13	56.62534	5.254916
E	638801.49	6277742.21	56.6214	5.260689
F	638807.97	6277006.07	56.61479	5.26040
G	639299.34	6276545.88	56.61052	5.268152
H	639829.83	6276336.67	56.60848	5.276674
I	640858.47	6277916.44	56.62235	5.294279
J	642590.34	6279011.48	56.63166	5.323083
K	642694.69	6280520.23	56.64517	5.325616

General information

The Nini West storage project builds on experience from Project Greensand and is the third phase of the project, briefly described below.

Project Greensand Phase 1 (completed 2021):

- Screening and suitability assessment
- Feasibility validation of Nini West
- DNV certification "Certificate of conformity – Site Feasibility"

Project Greensand Phase 2 (completed 2023):

- Study and pilot injection project

- Evaluation of Nini West reservoir description, well design, materials and monitoring solutions
- Demonstration of offshore transportation and pilot CO_2 injection

Project Greensand Phase 3 (Project Future - injection start planned for 2025)

- Permanent storage of CO_2
- Demonstrating commercial viability of the entire value chain and storing a maximum of [redacted]
- Secure use of existing wells and offshore transportation via converted PSV (platform supply vessel)[12]
- Third party verification (DNV)

Project Greensand Phase 4 (Nini Main & East - injection start planned for 2028/2029)

- Permanent storage of CO_2
- New injection wells
- Permanent closure of historic oil/gas wells
- CO_2 freighters or pipeline transportation

This approval only concerns Phase 3 of Project Greensand.

Nini West development concept and activities (plan for development, execution, operation and injection)

The expansion concept is based on storing biogenic CO_2 collected primarily from Danish biogas producers. The liquid CO_2 is transported by truck to the Port of Esbjerg, where it is temporarily stored. The liquid CO_2 is transferred to a converted platform supply vessel (PSV)[12], which transports it to the Nini West site (see also Section 2.3). Here, the liquid CO_2 is pumped via an unloading buoy system (SAL) to the Nini A platform and injected via existing well NA-3B into the Frigg Sst reservoir. NA-5 is used as an observation well.

The responsibility for the establishment of the supply chain is shared between the biogas producers and INEOS. Biogas producers are responsible for collecting, compressing and transporting CO_2 to Port Esbjerg. The establishment of storage facilities at Port Esbjerg is handled by INEOS. INEOS is responsible for the procurement and conversion of the PSV (platform supply vessel)[14] for CO_2 transportation, carrying out modifications on the Nini A platform (new flowline and transfer hose reel system), establishing the unloading buoy system (SAL), preparing the well for injection and operating and monitoring the CO_2 storage equipment at the storage site.

CO_2 injection is estimated to take approximately 16 hours per shipload. Unloading requires wave heights below 4.5 metres. It is planned to use 60-70% of the ships' full capacity with approximately 80 round trips per year. The full capacity

[12] After submission of application this was changed to a 'modified bulk carrier'

corresponds to 130 round trips per year and thus the programme has room to make up for any delays due to, for example, weather conditions.

A measuring system is to be established at the pump on the cargo ship, which contains flow, pressure and temperature sensors as well as a density meter.

All work to establish the connection between the freighter and the injection system is to be done by personnel on the freighter. The Nini A platform is unmanned and remotely operated from the larger Siri Platform (35 km southwest of the Nini field). Access to Nini A can be achieved both by boat and helicopter.

Iris Licence's access to the Nini A platform is via a third-party access agreement with the partners in Licence 4/95 Nini.

The monitoring plan includes baseline seismicity studies using the *Ocean Bottom Stations (OBS)*, monitoring of CO_2 distribution movements with 2D seismic, continuous monitoring of the seabed around the historic Nini-4/4A well with bubble detection and chemical sensors (using a 'Lander' concept) and annual ROV monitoring for detecting bubbles to complement Lander monitoring until this technology is proven reliable.

INEOS' plan to establish an operating organisation for the operational phase of the project is described in the document 'Ready for Operation (RFO) Plan'.

1.2 Storage complex characterisation and storage complex suitability

General information

Nini West is located in the northern part of Siri Canyon, approximately 240 km NW of Esbjerg, and is part of a larger area of oil-gas fields connected to the Siri field. Four historic wells run through the Nini West reservoir: Exploration well Nini-4/4A (permanently closed in 2002), NA-03B (former oil producer), NA-05 (former water injector and used as injector during the pilot injection in Phase 2 of Project Greensand) and NA-07D (oil producer from Hermod/Heimdal reservoir, isolated from Frigg reservoir).

The suitability assessment of Nini West for CO_2 storage is based on several seismic surveys over the area (NODAB97, SIRINOR and DN1010N including re-processing and inversion studies), data from the Nini West wells and Sofie-1 and Sofie-2/2A, which are located outside the storage complex, and dynamic data from 17 years of production/injection history.

Hydraulic unit

The Nini West storage complex consists of the hydraulic unit (reservoir) Frigg Sandstone Member (hereinafter referred to as “Frigg Sst”) and a primary and secondary seal formed by the Horda and Lark Formations. The 12-30-metre thick Frigg Sst is a fine-grained sandstone of Eocene age with a high content of

glauconite. It is one of several high-porosity, high-permeability sandstone formations deposited during the Paleocene/Eocene period in the Siri Canyon area, deposited by turbidite flows in a deep-marine environment guided by local topography. Average porosity, permeability and net sand content are 37%, 800 mD and 97% respectively. The trap is a combination of stratigraphic and structural closure. The top of the structure is at 1,710 m TVDSS and the original free water level at 1,764 m TVDSS. The current pressure is 215 bar compared to a 185 bar (1,708 m TVDSS) initial pressure. The pressure change is due to water injection. Studies of Frigg Sst reactivity with CO_2 show good resistance (see Subsection in 2.2 about 'Reactivity with CO_2'.

Seal

Frigg Sst is enclosed in clay stones: the overlying Horda and Lark Fm formations and the underlying formations: Balder, Sele and Lista Fm. These formations are regionally widespread and extend far beyond the storage complex area.

The *primary seal* is formed by the approximately 340 m thick clay stone sequence of Eocene to Oligocene age, Horda and Lark Fm, which overlies Frigg Sst and extends to the first porous and permeable layer within Lark Fm. The *secondary seal* is located immediately above it. The sequence has a thickness of 550 m and belongs to the Middle to Upper Lark Fm. The bottom and side seals consist of Balder Fm and Horda Fm, respectively.

There has been made thorough analyses of core and cuttings data from Nini-4/4A to determine mineralogy, grain size, porosity, permeability, surface area and pore space structure from MICP (Hg injection capillary pressure study) of the primary and secondary seal. The lower and side seals have been examined for mineralogy. Total porosity ranges from 9.3-18.7% and permeabilities range from 0.021-12.4 µD. The primary seal can hold a minimum 600 m column of liquid CO_2. The secondary seal can hold a 100 m column.

In the analysis of the seal, the permeable layers that form the boundary between the primary and secondary seal have been assessed to be targets for migrating CO_2 leaking from Frigg Sst into Nini-4/4A (in case the deepest plug in the well should leak). This is addressed in the seismic monitoring programme (see Section 2.7).

Distribution and mapping of the storage complex

The storage complex extends over an area of 360 km^2. It is bounded to the north and east partly by the reservoir and partly by the licence boundary, to the west by the structural configuration (guided by the boundary syncline around the Nolde structure) and to the south by the licence boundary. To the east, the storage complex boundary is extended to include the Nini A platform with injection facilities.

The mapping of Frigg Sst within the former oil fill is aided by a good impedance contrast against the surrounding clay. In the aquifer, however, the impedance

contrast is weak. The overall geometries from the upper and lower horizons are used for support.

Three types of faults have been mapped: a. extensional faults, b. radial faults, c. faults in the sequence above the storage complex ('overburden') including polygonal faults within the primary seal (Horda Fm). The extensional faults (a) are related to the top of the Nini salt structure and do not affect the Frigg reservoir. The faults terminate internally in Lark Fm (secondary seal). The radial faults (b) intersect Frigg Sst. According to production data, they have no dynamic impact on the reservoir. The polygonal faults (c) are internal to the primary seal and do not affect the integrity of the seal, and no penetrating faults were found at the top of the secondary seal.

Seal integrity

The qualitative assessment is based on very limited vertical migration of thermogenic gas into the lower part of the primary seal, the absence of shallow gas over the Nini salt structure (as seen over the Nolde structure) and several hundred metres of overlying interval over the thermogenic migration front.

Quantitative assessment is done through geomechanical modelling: 1D, 3D & 4D modelling. The models were created by Baker-Hughes and based on log & seismic data respectively; as well as data from analogues (no geomechanical tests have been performed on core data for Nini West and no core material has been preserved to get this done). There is limited data from LOT and an absence of XLOT. Seal integrity, fault stability, surface settlement and risk of earthquakes and thermal fracturing have been analysed. With the planned injection and reservoir pressure development, the applicant estimates that there is very little risk of geomechanical integrity issues in the Nini West storage complex.

Reactivity with CO_2

Based on a geochemical analysis of core material from two samples in Nini-4, it is concluded that the seal and reservoir rocks are stable and have good integrity in relation to reactivity with CO_2 (Section 4.6. in 'Reservoir Characterisation Nini West' in the application materials).

The long-term effect of exposure to CO_2 is modelled for the reservoir rock types. The modelling, which is associated with significant uncertainty, shows that a corrosive environment can occur in the immediate vicinity of the injection well (15-30 cm). Over a 10-year period, this can cause significant dissolution of the rock (~20%) and negatively impact transmissibility around the injection well as the well completion in the injection zone. The long-term effect of exposure to CO_2 for the primary and secondary seal has been studied in connection with Project Greensand Phase 1 and 2 (see Section 2.1). The geochemical models and analyses were performed and described by GEUS. Due to minimal changes in the geochemical batch experiments, it was difficult to model the long-term effect. INEOS has not done any further modelling due to the limited changes in the trials.

1.3 Capacity and injection conditions

The proposed project utilises a smaller part of the full capacity: A storage of a total of 2.4 Mt of CO_2 injected over a period of 8 years has been proposed, i.e. an average of 300,000 tonnes per year. The maximum reservoir pressure is modelled to reach approximately [redacted] after 8 years of injection. The concept is based on expected CO_2 available for injection.

The effective injection rate is based on vessel capacity and pump capacity limitations. Only around 90% of a ship's cargo can be unloaded. The shut-in period between injections is 2 days, corresponding to the time it takes for the transport vessel to make the round trip between Nini A and Port Esbjerg. See also 2.1 (Nini West expansion concept and activities).

The injection of a total of 2.4 Mt CO_2 results in filling the existing oil trap down to the pre-production water table at 1,764 m TVDSS (~1.4 Mt) and filling part of the associated aquifer (~1.0 Mt). Due to gravitational effects, CO_2 will eventually migrate from the aquifer into the former oil trap. A few megatons are expected to migrate northward, including approximately 0.5 Mt to the area around NA-7D (100-1,000 years after injection). Approximately 40% of the injected CO_2 will be dissolved or capillary bound. More than 90% of the remaining free CO_2 will be within the former oil trap.

Supply and transport of CO_2

The supply of CO_2 to Nini West is planned from biogas plants in Denmark with overland transportation by truck. The CO_2 is captured and compressed by the emitters. It is temporarily stored at a storage facility at Port Esbjerg, from where it is transferred to a converted platform supply vessel (PSV)[14] and sailed out to Nini West.

The liquid CO_2 is pumped from the cargo ship via a single anchor offloading (SAL) system via a flexible pipe to a fixed pipe on the seabed, which is connected to a flowline in the riser on Nini A.

1.4 CO_2 stream composition and procedure for receiving it

Composition

The CO_2 composition specification is shown in Table 2 of the document *Storage Development Plan Nini West*, which is based on the PACE report attached to the application and used in an ongoing dialogue with the emitters.

The specification was developed as part of the Greensand Phase 2 pilot injection project in 2023 and will also be used for the Nini West project. It is developed based on the expectation that CO_2 will be delivered from multiple emitters with some degree of impurities. However, the CO_2 stream must consist of at least 95% CO_2.

For the Nini West project, INEOS has set an additional requirement that the water content of the delivered CO_2 must be 0%.

As the Nini West project focuses on storing CO_2 from biogas production, it is not expected to have NO_X or SO_X content. It is therefore being investigated whether the corrosion risk on well materials can be reduced through more restrictive requirements for emitters. Table 3 of the document, *Storage Development Plan Nini West,* illustrates the cleaner (food) CO_2 specification that INEOS is considering using as a more restrictive alternative to the specifications shown in Table 2.

Procedure for receiving

See section 2.1 (Nini West expansion concept and activities).

1.5 Well status and activities

The development of Nini West is based on the use of existing wells. It is planned that NA-3B will be used as an injection well and NA-5 as an observation well.

On 2 May 2025, the Danish Energy Agency received a contingency plan which concerns an alternative concept where the two wells are swapped in the start-up phase if there are insufficient CO_2 volumes to support injection in the over 1,000 m long reservoir section in NA-3B. The content of the contingency plan can be found in Annex 2.

NA-3B is a former oil producer. NA-5 is a former water injector and was also used for CO_2 injection during the pilot injection project in Phase 2. There is a good hydraulic connection between the two wells and pressurisation is expected to be measured in NA-5 a few days after injection start. CO_2 propagation is expected to reach the observation well 4-8 years after injection start.

The well history, well design and well completion for both wells are described in the application materials *Project Future Storage Site* Application - *Storage Development Plan.* A well description report for each of the two wells is also included in the application supplementary material *(NA-3B Well Description* and *NA-5 Well Description*), explaining the integrity of the wells. The resistance of the casing cement to CO_2 was investigated in Project Greensand Phase 2, where it was concluded that it was highly resistant. Geo-mechanical modelling studies showed that the cement used, when exposed to CO_2, gained strength on average *(NA-3B Well Description, p. 11).*

In addition to the two wells NA-3B and NA-5, which are reused in the injection phase, there are two historic wells Nini-4/4A and NA-7/7A/7B/7C/7D within the storage complex.

Nini-4/4A is an exploration well that was drilled in 2002 and subsequently permanently closed. The well history and design and permanent closure are described in the application materials *Project Future Storage Site* Application-*Storage Development Plan* and reviewed in detail in subsequent dialogues with INEOS. The risk associated with a possible leakage through the well has been investigated through additional modelling studies and is addressed in the MMV plans.

NA-7/7A/7B/7C/7D was drilled as a production well. It was only the side tracks NA-7B and -7D which found Frigg Sst. NA-7B is permanently closed with two cement plugs installed in Lark Fm. The side track -7D produced oil from Frigg Sst from 2005 to 2007. A retrievable bridge plug was then installed, isolating the deeper part of the well (completed in Frigg Sst) from the part completed in Hermod Sst (which continues to produce oil from Nini Main). The annulus between the Frigg and Hermod/Heimdal intervals is closed with a swellable packer. NA-7/7A/7B/7C/7D are located within the storage complex but outside the storage location. According to modelling studies, CO_2 only reaches the well in some scenarios and not before 100 years. INEOS states that a pressure increase in Frigg in the area of NA-7D due to CO_2 injection of approximately 10 bar is expected and that this will cause a differential pressure across the removable plug of approximately 35 bar. According to the product specification, the plug is certified to withstand pressures up to 551.6 bar.

NA-3B

In addition to ongoing well maintenance while the wells were in use, a wireline operation was carried out in NA-3B in November 2023, where the well was pressure tested to the planned injection pressure and mechanical integrity was examined. The well was assessed to be in good condition and ready for CO_2 injection, given a number of minor modifications (described in the application materials *Storage Development Plan*, Section 5.1.4.) to be implemented by a wireline intervention.

NA-5

A wireline intervention was completed on NA-5 both before and after the pilot injection (see Section 2.1). Caliper measurements showed that the well was in good mechanical condition, that casing and tubing had the required strength and integrity and that there were no signs of corrosion post test injection in the lower completion (5 ½").

Minor modifications are made to the well to convert it into a CO_2 observation well (see application materials *Storage Development Plan*, Section 5.2.3)

The main risk at the wells is L80-1% tubing and L80 casing, which will be exposed to corrosion if exposed to wet CO_2 (p.6 in *NA-3B Well Description*). It is concluded that choice of annulus and interventional fluid is critical and controlling the free water is necessary. Please also refer to the monitoring of the condition of the well, cf. the monitoring plan (see 2.7).

1.6 Plant and process-related conditions

The project utilises the existing infrastructure at the Nini A platform on the Nini licence. Injection will take place via the existing well and former oil producer NA-3B. NA-5 (former water injector) is used as an observation well.

Construction work for the transition to CO_2 storage includes modifications to the seabed in the form of installing subsea spools from risers at the bottom of the platform to a flexible pipe 200-300 metres from the platform.

A single anchor offloading (SAL) system is to be established. The system consists of a suction anchor, a mooring line and a collection station with a flexible pipe connected to a fixed pipe on the seabed, connecting to the riser on the Nini A platform.

Minor modifications to the NA-3B oil well include decommissioning of an existing flowline and the installation of a new flowline from riser to the X-mas tree (flow control unit). The modification of well control and shutdown functions and the installation of a communication line between transport vessel (PSV)[14] and platform in case of any leakage of CO_2.

A more detailed description of construction activities can be found in the 'Greensand Future Project - Concept Select Report'.

In accordance with the Danish Energy Agency's guidance regarding reuse of oil and gas infrastructure in the context of CCS, the Nini licence and Iris licences have, following the submission of a plan for CO_2 storage activities in Nini West, agreed on a commercial framework (as presented verbally to the Danish Energy Agency). The framework concerns a Tie-in Agreement (TIA) and an Operations and Service Agreement (OSA). TIA concerns offshore installation activities and modification of the Nini licence's existing infrastructure[13] (collectively referred to as the Modifications) for the purpose of the Iris licence's commercial CO_2 storage activities covered by the storage plan (the Operational Activity). Modifications are carried out by the Nini licence at the expense of the Iris licence. The operational activity is furthermore the object of OSA, which secures the Iris licence access to the necessary Nini installations and services which are required by the Operational Activity. The Operational Activity commences once the Iris licence has provided written acceptance of the notification from the Nini Operator that the commissioning

[13] Including the Nini A platform and NA-3B and NA-5 wells.

activities[14] for the Modifications have been completed (Commencement of Operations (CoO))[15] (the Notification). New facilities and new equipment established under the TIA are owned by the Iris licence. Pursuant to the commercial agreement, the Iris licence also takes over the NA-03B and NA-05 wells (including the X-tree) at the CoO. Furthermore, the OSA requires that the Nini licence's regulatory decommissioning liability for the NA-03B and NA-05 wells (including the X-tree) terminates simultaneously (and not prior to) with this transfer, and that this decommissioning liability is fully and simultaneously (and not prior to) assumed by the Iris licence. Thus, the regulatory decommissioning liability for the wells (including the X-tree) is transferred at the same time at the CoO from the Nini licence to the Iris licence, and the Nini lisence is not released from this obligation until the Iris Licence has assumed the responsibility.

1.7 MMV plans

INEOS has provided five documents that together form a Measurement, Monitoring and Verification (MMV) plan for the Nini West CO_2 storage complex.

- Containment Risk Assessment and Preventive Measures Report (Doc no C081-INEO-Z-RA-0006)
- Monitoring, Measurement and Verification (MMV) Plan (Doc no C081-INEO-X-RA-0002-4_IFU_2023_11_29_02)
- Predictive Maintenance Plan Nini West (Doc no C081-INEO-X-RA-0003_ IFU_2024_11-29_02)
- Monitoring Governance (Doc no C081-INEO-Z-RA-0015_ 2_IFU_2024_11-11_02)
- Corrective Measures Plan (Doc no C081-INEO-Z-RA-0011_ 2_IFU_2024_11-12_02)

These documents include an assessment of the safety of CO_2 storage in the storage complex in question, risks of leakage from the storage complex, monitoring plans, description of how to prevent significant irregularities, corrective actions should significant irregularities or leakages occur and a post-closure plan for the licence period after injection ceases.

Containment risk assessment and preventive action plan

The main document, *Containment Risk Assessment and Preventive Measures Report*, is based on work performed by an independent third party. The assessment of risks related to subsurface conditions is highlighted by Risktec in the *Containment Risk Assessment* report. Risks associated with the surface installations have been assessed by Rambøll and described in three separate reports: *Nini West Risk Assessment Report - Facilities - HAZID*, *Nini West Risk*

[14] So called 'commissioning', including 'run-in tests', which is regulated by the TIA.
[15] So called 'redelivery of a countersigned completion certificate' issued by the Nini Operator upon completion of the commissioning activities (see the note above).

Assessment Report - Facilities - Bowties and *Nini West Risk Assessment Report - Facilities - ALARP*.

Subsurface risks

The subsurface risk assessment has resulted in several main risks which are listed below with relevant bowtie diagrams:

1. Vertical leakage of CO_2 through the seal (S1)
2. Lateral leakage of CO_2 from the storage complex (S2)
3. Leakage of CO_2 via wells permanently closed with a historical standard (Nini-4/4A) (L1)
4. Leakage of CO_2 via temporarily closed wells (NA-5) (L2)
5. Leakage of CO_2 via permanently closed wells with modern closure methods (NA-5) (LA-1)
6. Leakage of CO_2 via internal leaks in the injection well (NA-3B) (I1)
7. Leakage of CO_2 via external leaks in the injection well (NA-3B) (I2)
8. Leakage of CO_2 post-injection via permanently closed injection well (NA-3B) (I3)

Based on the risk assessment and preventive measures, the applicant considers the residual risks to be very low (historical well < 0.1%; other risks < 0.01%). The monitoring plan is based on the risk assessment and can be directly linked to the bowtie diagrams.

Operational risks

The operational risks are identified through HAZID analysis, bowtie diagrams and ALARP performed by third party Ramboll.

The following significant risks have been identified:

1. CO_2 pollution, which in worst case can result in quality degradation of pipes and sealing elements (elastomers)
2. Low temperatures at the CO_2 stream, which in worst case can form dry ice in pipelines, flowlines and/or casing.

A description of preventive measures for equipment integrity and personal safety equipment is provided in relation to equipment integrity and personal protective equipment.

Monitoring plan

The monitoring plan is phased and describes monitoring measures (1) before injection start-up (establishment of baseline), (2) the injection phase, (3) at closure and (4) post-injection until decommissioning. The monitoring program is available at Table 3 and refers to relevant bowtie diagrams in the risk assessment.

Table 3 Overall monitoring program

	Pre-injection	Injection	Closure	Post-injection
Environmental studies	x		x	
Seabed samples	x		x	
Seismic re-processing	x			
2D seismic	x	X	x	x
3D seismic				x
Seismicity	x	X		x
Lander	x	X		x
Well monitoring	x	X	x	x
Volatile substances	x	X		
Impurities		X		

2D seismic

CO_2 propagation, fault integrity and potential leakages at spill points or through the Nini-4/4A well to Lark Fm will be monitored with repetitive 2D seismic surveys. Each survey consists of eight 2D seismic lines as specified at Figure 1. The frequency of the surveys can be found in Table 4

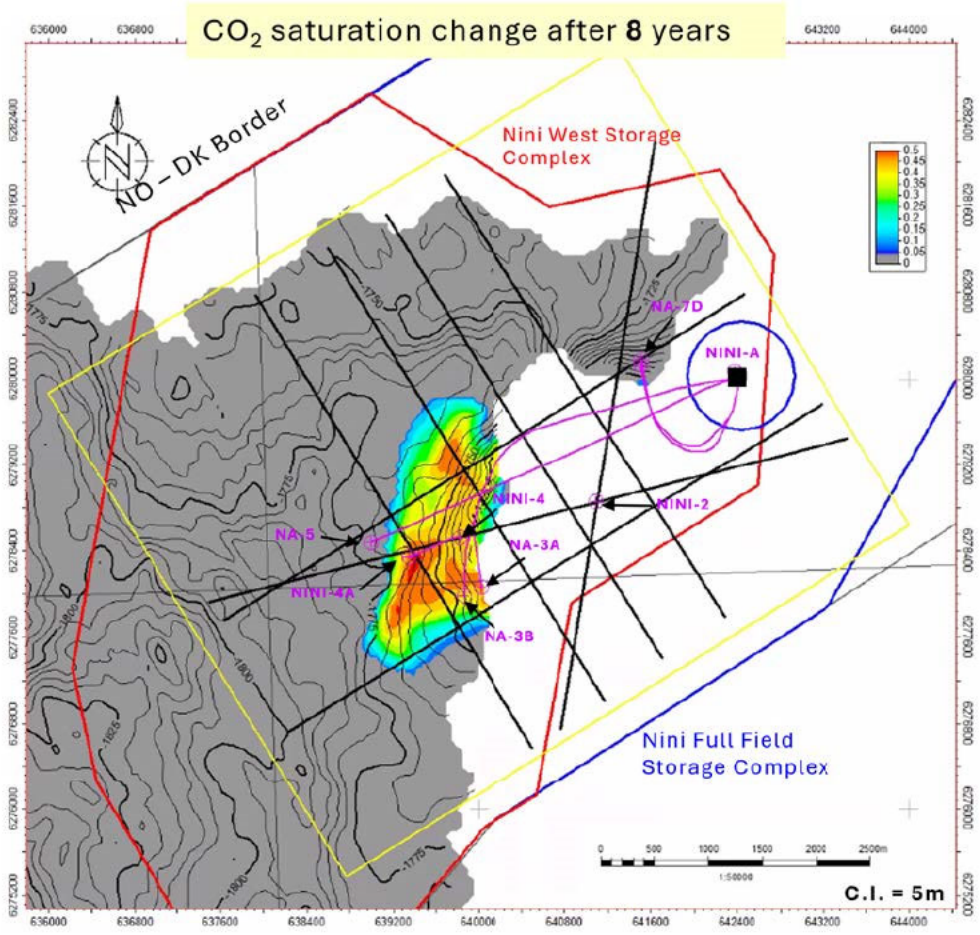

Figure 1: Map of the 8 2D seismic lines and the expected CO_2 distribution after 8 years.

Table 4: Frequency of 2D seismic surveys

Year 0	Baseline is collected before injection
Year 2	Collected after injection of [redacted]
Year 4*	Collected after injection of [redacted]
Year 6	Collected after injection of [redacted]
Year 8*	Collected after injection of [redacted]
Year 10	After the injection period has ended.
Year 10 - Closure	Frequency is determined by monitoring experiences and the predictive model

*The decision to collect 2D seismic data in years 4 and 8 will be decided based on the results of the previous survey and shall be agreed upon between the Danish Energy Agency and INEOS.

No signal is expected from the CO_2 plume within the oil trap. However, this will be tested at the first seismic data acquisition after injection start-up. INEOS considers the exact CO_2 distribution in the oil trap to be of minor importance as the trap has already been demonstrated.

As a future alternative, INEOS mentions new technologies such as spot seismic and short streamer 3D seismic. Spot seismic validation can lead to an update of the monitoring plan to replace conventional 2D seismic.

3D seismic

The re-processed 3D seismic (NODAB97) data from 1997 is used as a baseline for conditional time-lapse or VSP surveys in the aquifer. Upon closure of the area and before handover to the authorities, a final 3D seismic data collection will be carried out. The timing will depend on the results of the monitoring, the stability of the CO_2 plume and will be agreed upon with the Danish Energy Agency.

Seismicity

Seismicity is continuously monitored through an array of 8 permanent Ocean Bottom Stations (OBS) placed on the seabed. If fractures occur or existing fractures are reactivated in the subsurface, this could be measured as induced seismicity higher than the background level measured by the baseline. Seismicity monitoring will continue until the licence expires.

As a future alternative, INEOS proposes to use Fibre-Optic Distributed Acoustic Sensing (DAS) cable arrays to monitor seismicity. DAS is a new technology where optical fibres are used as a sensor to measure vibrations in the subsurface.

Monitoring the Nini-4/4A

An installation called a "lander" will be placed on the seabed to permanently monitor any leakage from the Nini-4/4A well. The lander is equipped with a chemical sensor, bubble detection capabilities and a battery. The lander measures at an angle of 160° with a range of up to 150 metres.

The chemical sensor is a well-known and well-documented technology that measures changes in pH that can occur with CO_2 leakage when the CO_2 dissolves in the water. Bubble detection is also a well-known and proven technology, but not in relation to CO_2 storage, and therefore tests using the method have been carried out in collaboration with the National Oceanography Centre in Southampton (UK), which is developing the lander to measure the range and sensitivity of the sonar. Bubble detection measures undissolved air bubbles from any potential CO_2 leakages.

The lander has not been tested for prolonged use in a seabed environment, especially in terms of battery capacity and continuous data transfer, but these tests will be completed during the baseline measurement. Until this is in place and the test results from the bubble detection are published, the lander will be supplemented with annual surveys by an ROV.

As a future alternative to the lander, INEOS proposes to use Automated Underwater Vehicles (AUVs), which are still under development.

Monitoring in wells

The former production well NA-3B will be used as an injection well. Pressure, temperature and flow rate are monitored with standard gauges. The following is also done:

- Pressure test before starting the injection.
- Regular wireline-based (WL) well integrity monitoring (Calliper). This is done before injection, four times during the first 18 months and then no later than three years after the start of injection.
- Conditional injection logging tool (ILT/PLT) for determining the inflow profile triggered by reduced injectivity.
- Conditional cement bond logging (WL) triggered by unexpected pressure loss in the well.
- Conditional time-lapse saturation log (WL) triggered by unexpected results from the Calliper log.
- Conditional drill hole fluid (WL) sampling triggered by unexpected Calliper log results.

Well NA-5 is used as an observation well where pressure and temperature are measured at the wellhead. A check valve will be installed at the production packer depth. By pumping fluid past the check valve, the formation pressure can be derived from measurements at the top.

If oil production in the Hermod/Heimdal reservoir ceases, the Iris Licence may attempt to keep NA-7D open for the purpose of monitoring pressure and temperature. This would, in such case, require a commercial agreement between the Iris Licence and the Nini Licence, providing insight into dynamic relationships between Nini West and Nini Main. The pressure gauge is separated from the Frigg reservoir by a retrievable bridge plug and only measures pressure in the

Hermod/Heimdal sand, where irregularities would indicate that the integrity of the plug is compromised.

Corrective measures

The corrective measures plan is based on the risk analysis bowtie diagrams and is triggered by significant irregularities or leakage.

Operational control and safe injection

In case of equipment damage and potential leakage, the injection will be adjusted or discontinued. If the leak occurs through the X-mas tree (flow control unit) or valves, the well can be shut down using backup valves built into the well design. Both measures can be implemented in a matter of minutes, after which additional measures can be initiated.

Well integrity

Well integrity problems can occur for several reasons for both active and decommissioned wells. In case of leakage due to damage to seals and valves, these will be repaired from the platform. If the leak is significant, a temporary barrier will be installed first before repairs are begun. The repair process can take from weeks to months.

If an injection or observation well leaks past the production packer, the well must be repaired using a rig operation. The repair involves removing the damaged casing, cement, tubing and gasket, installing a new casing, cementing the annulus and inserting a new production pipe and production packer. Leaks from a decommissioned well will be repaired using a drilling rig if the leak occurs within the casing. Repairs using a drilling rig can be completed in approximately one year. If the leak is happening below the casing, repairs will probably not be possible. If this is the case, pressure reduction in the reservoir will be attempted by CO_2 re-production or the need for drilling a pressure relief well will be assessed.

In case of leakage from the lower part of a well that has not been abandoned, the lower part can be abandoned and replaced by a new side track. Drilling a new side track will take approximately one year.

A well will be decommissioned if the benefits of repairing the well are not compatible with the costs. The decommissioning of a well will take approximately one year.

CO_2 outside the storage complex

Lateral and vertical leakage is avoided by limiting or stopping the injection of CO_2 if, for example, the CO_2 plume movement is different than expected. If lateral or

vertical leakage does occur, this can be limited by affecting the pressure in the reservoir.

The pressure in the reservoir can be reduced by producing CO_2 back from the injection well or by drilling a pressure relief well and producing salt water from the formation. The technologies are known in principle, but there is currently no plan for handling the fluids produced.

A hydraulic barrier can be created by increasing the pressure through the injection of salt water into an existing or new well, slowing or diverting the movement of CO_2 propagation. The technology is known in principle, but the method requires extensive reservoir modelling.

Re-production can begin in months to a year, while drilling a new well can take several years.

1.8 Preliminary post-closure plan

The preliminary post-closure plan includes monitoring and predictive maintenance during the period from the end of CO_2 injection until the area is handed back to the authorities.

The post-closure plan shall ensure that

- the injected CO_2 does not migrate laterally or vertically out of the storage complex
- The stored CO_2 is gravitationally stable
- Storage integrity and containment in the storage location is proven via post-closure studies

The following activities are planned during the post-closure period:

- 2D seismic campaigns for verification of CO_2 plume migration
- 3D seismic campaign before relinguishing the area
- Measuring seismicity
- Bubble detection and chemical sensors above wells NA-3B and Nini-4/4A
- Monitoring in wells NA-3B and NA-5

The decommissioning plan attached to the application is processed in its own decision pursuant to Section 32(a).

1.9 Economy and organisation / Technical and financial capacity

Technical capacity

INEOS is an active part of Project Greensand. Through the first and second phases of the project, INEOS has built up significant knowledge and experience in CO_2

storage. In 2023, as part of Project Greensand, they carried out the first actual injection and storage of CO_2 in Denmark via a demonstration and pilot project of CO_2 injection in the Frigg reservoir in Nini West.

INEOS plays an active role in oil and gas production and has assets in the US, UK and Danish North Sea. In the Danish North Sea, INEOS is the operator of several fields in the Siri Fairway area and for Syd Arne. In addition, INEOS is the operator of two development projects Solsort and Hejre. INEOS has technical staff with relevant skills in geology, geophysics, petrophysics, reservoir engineering, facilities engineering, well construction and petroleum engineering. As operator of the Nini licence (4/95), which has been producing oil since 2002, INEOS has a significant understanding and experience of the subsurface in this area - both static and dynamic. INEOS employees have extensive experience from the oil and gas industry.

In addition to internal skills, INEOS uses external consultants from ERCE (UK-CCS risk management), Ross Offshore (geo-modelling), PACE (CO_2 phase behaviour and thermodynamics), Axis (well design and materials), Vysus Group (historic wells and reusing them), among other things. In addition, INEOS has used Risktec (Subsurface risk assessment), Rambøl (facility risk assessment and environmental impact report), SLB (reservoir studies), Kent (LCO2 ship and pipeline studies), MacGregor (LCO2 ship concept study) and Aquaterra Energy (Life time extension study). In the field of geomechanics, INEOS uses Baker Hughes.

Financial capacity

The establishment costs, CAPEX, for the project are based on preliminary price estimates from potential PSV suppliers as well as from manufacturers of relevant offshore and storage equipment. The expected operating costs, OPEX, relate to the operation and manning of PSV, fuel consumption and other operational activities offshore.

The total CAPEX is estimated at DKK 280 million, while OPEX is expected to amount to approximately DKK 76 million, cf. the application materials *(Concept Select Report*, Se*ction 7.3*).

In addition to establishment and operating costs, total decommissioning costs, ABEX, of DKK 175 million have been estimated, cf. Table 26 in "*ABEX cost Iris Licence "*[16]. The costs include well closure, removal of installations and subsequent environmental measures. The single largest expense item is "*Well Abandonment*", estimated at DKK 111 million.

The above cost estimates (CAPEX, OPEX and ABEX) are calculated in real prices, based on 2024 levels. This means that the figures are adjusted for inflation and

[16] Annex C095-INEO-Z-TC-0001-0003.pdf to Iris decommissioning plan C095-INEO-Z-TC-0001.pdf

express the expected cost profile in constant 2024-Danish kroner. The price and discount assumptions used have been disclosed by INEOS.

The rightsholder group consists of INEOS E&P A/S, Harbour Energy and Nordsøfonden. The commercial companies and their guarantors are reviewed below.

The guarantor of the operator INEOS E&P A/S is [redacted]. As no consolidated financial statements are available for [redacted], the assessment of the financial capacity is based on proxy analysis of the two wholly-owned subsidiaries INEOS Group Holdings S.A. (registration number Luxembourg B157810) and INEOS Industries Limited (registration number UK 06959146). [redacted] The income statement for 2023 shows a total loss of [redacted]. The operating company itself, INEOS E&P A/S, had equity of [redacted] at the end of 2023. DKK and a negative result after tax of DKK -0.8 billion in the financial year 2023.[17]

The guarantor for the participant [redacted] According to the company's 2024 Annual Report, Harbour Energy PLC had a turnover of [redacted] [18] The company has earned an investment grade credit ratings and reported liquidity of [redacted] as of Q1 2025.[19]

1.10 Fiscal measurement and allocation

The injected CO_2 is allocated back to the individual emitter. The allocation is adjusted for the emissions associated with the storage project from the time the CO_2 leaves the emitter to the completed of injection into the Nini West reservoir.

Measurements of the quantity of CO_2 transferred will be made each time the liquid CO_2 is reloaded, i.e. when loading onto a truck at the emitter's location, when reloading from truck to temporary storage at Port Esbjerg, when reloading from port to PSV and from PSV to direct injection in Nini West. Upon delivery, emitters must

[redacted]

certify that the loaded CO_2 meets the specification requirements required by the operator.

All measurements throughout the transportation process, from the emitters to the injection site, will be included in the operational procedures. A system for collecting all measurements is planned to be established so that measurement and allocation is auditable.

1.11 Environmental conditions

CO_2 storage projects are covered by Annex 1, sentence 23 of the Environmental Assessment Act, and INEOS is thus required by section 20(1) of the Environmental Assessment Act to prepare an environmental impact assessment (EIA) report containing an assessment of the project's impact on the environment. The report shall include at least the information specified in section 20(2) of the Danish Environmental Assessment Act. The information specified in section 20(2) shall be supplemented with the information in Annex 7 of the Act if this is relevant to the project applied for.

INEOS has, cf. above, prepared an EIA for the implementation of the storage project which is being applied for. The EIA prepared for the project highlights the environmental impacts of the development, operation and decommissioning of the project, both for planned activities and unplanned events. The assessment of impacts from the decommissioning is a preliminary assessment as the details of the decommissioning are not yet known. A future EIA for decommissioning will assess the activities in more detail in connection with the approval of the decommissioning plan.

In addition to the information listed in section 20 of the Danish Environmental Assessment Act, the EIA also contains an assessment of the project's relation to the marine strategy, the maritime spatial plan, the Water Framework Directive and the habitat rules, including an assessment of the impact on Natura 2000 sites and Annex IV species.

The environmental impact assessment report

The EIA prepared by INEOS includes a description and assessment of the significant direct and indirect effects of the project as well as impacts from accidental events, cumulative impacts and cross-border impacts.

Planned activities

Environmental impacts of the planned project described and assessed in the report consist in the construction phase of air emissions, land take, discharge of chemicals, physical disturbance of the seabed, underwater noise, light and disturbances from vessels. In the operating phase, the environmental impacts consist of emissions to the air, reduced concentration of CO_2 in the atmosphere,

occupation of space, underwater noise, light, disturbance from vessels and safety zones. The EIA also addresses the decommissioning of the Nini A installation at a general level, as the decommissioning itself will be addressed in a separate EIA before the installation is decommissioned.

The report concludes that the most significant impact from the project's planned activities is a moderate positive impact on the climate associated with the CO_2 storage. The area of 850m^2 used for the offloading system and CO_2 leakage monitoring system is assessed in the report to have a negligible impact on hydrographic and sedimentary conditions. The two systems are expected to result in a loss of benthic fauna, which the report assesses to be negligible. The report also assesses that there is a risk that the installed structures may cause damage to any potential cultural heritage sites that may exist within the affected area. The report assesses a limited/negligible impact from underwater noise on fish and marine mammals. The impact is assessed to occur primarily during the monitoring phase of the project in connection with seismic surveys. The report includes noise modelling of the activities that can be expected to emit noise. The report's assessment of the noise impact is described in more detail in the sections below on Natura 2000 sites and Annex IV species. The report assesses a limited impact from light on fish, marine mammals and birds and a negligible impact from vessel disturbances on birds and marine mammals. Finally, the impact on fisheries and material assets from establishing a safety zone around the CO_2 leakage monitoring system is considered negligible.

Incidents

In addition to the impacts of the planned activities, the report also assesses the impacts of accidental releases of oil and CO_2 associated with CO_2 blowouts, CO_2 leaks and ship collisions. To assess the impact of an accidental oil spill, INEOS has used an oil spill model for the possible movement of the oil spill. The environmental impact is assessed in the report to be moderate to high without mitigation measures and the probability of the incident is assessed to be low. The report presents a statistical probability assessment based on historical incidents, resulting in a blowout probability of 9.7×10^{-6} per well per year in a European producing well. The report describes the systems and emergency responses in place to mitigate the impact of a potential release. INEOS has an emergency response plan for chemical and oil spills, which is presented in the report. As part of the emergency response plan, INEOS has entered into a legally binding cooperation agreement with TotalEnergies EP Denmark for mutual assistance in the event of an oil spill incident from either operator. Under the agreement, TotalEnergies EP Denmark is obligated to immediately provide available emergency response resources and assistance in the event of a spill incident. INEOS owns an oil recovery system with floatation barriers which is permanently on duty and located on the Esvagt Innovator standby vessel, and TotalEnergies EP Denmark owns two similar systems. The EIA describes the strategy's planned actions depending on the scale of the release.

Cumulative impacts

In addition to the above assessments, cumulative and transboundary impacts are also addressed in the EIA, both throughout the assessment of the environmental impact on individual receptors and in separate sections. The report describes other projects and activities in the vicinity of the application area, including existing oil and gas activities, upcoming production wells in the Halfdan field and offshore wind development in the Norwegian *Sørlige Nordsø*. The EIA concludes that due to the distance to other platforms, there is no risk of cumulative effects of known projects and activities. The EIA assesses that cumulative impacts may occur with future offshore wind projects in *Sørlige Nordsø*, and that these must be addressed in connection with specific project proposals in the area.

Cross-border impacts

In the cross-border effects section of the report, impacts from underwater noise and accidental oil spills are identified as having the potential to cause cross-border effects. Underwater noise is assessed to have negligible cross-border effects. For the impact of accidental oil spills, the report concludes that based on the modelling of an oil spill, an impact on fish populations cannot be excluded within a radius of approximately 20 km, which includes a small part of the Norwegian *area of special value,* Tobisfelt, while a negligible risk of impact on Natura 2000 sites in the Netherlands and Germany is assessed. The assessment is based on oil spill modelling from a blowout without mitigation measures.

Marine strategy

It should be noted that the project is not located in a Marine Strategy Area, but is approximately 17 km from the nearest Marine Strategy Area (Area G). Part of this area is strictly protected.

In the assessment of whether the project's expected impacts will hinder the fulfilment of the environmental objectives set out in the Danish Marine Strategy II, the impacts of the descriptors found relevant to the applied project have been accounted for. These consist of: D1 (biodiversity), D4 (marine food web), D5 (eutrophication), D6 (seabed integrity), D7 (hydrographic changes), D8 (contaminants - acute pollution incident), D9 (contaminants in seafood) and D11 (underwater noise). The report concludes that the project will not delay or hinder the Marine Strategy's objective of achieving a good environmental condition for the descriptors of the Marine Strategy Framework Directive. With the exception of descriptor D11 (underwater noise), the impact on the descriptors is assessed as immaterial/insignificant. For D11 (underwater noise), the report concludes that there may be a limited impact, but that the project will not cause negative impacts at the population level for fish or marine mammals.

Natura 2000 sites and Annex IV species

The EIA also includes an assessment of whether the project is likely to have a significant impact on Natura 2000 sites. The EIA states that underwater noise is assessed to be the only impact relevant for the assessment of the impact on Natura 2000 sites due to the distance to the sites, with the closest Natura 2000 site (Jyske Rev, Lillefiskerbanke) being 71 km away from the project area. The EIA presents six areas that are considered relevant:

- DK00VA257 Jyske Rev, Lillefiskerbanke (basis for designation: reef (1170)),
- DK00VA347 Southern North Sea (basis for designation: sandbanks (1110), harbour porpoise (1351), grey seal (1364), harbour seal (1365), common guillemot, black-throated guillemot and little gull),
- DK00VA348 Thyborøn Stenvolde (basis for designation: reef),
- DK00FX112 Skagens Gren and Skagerrak (basis for designation for the marine part: reef (1170), sandbank (1110), porpoise (1351), herring (1103), fulmar and great skua),
- DE1003301 Dogger Banke (basis for designation: sandbank (1110), harbour porpoise (1351), harbour seal (1365), fulmar, glaucous gull, northern fulmar, common guillemot, kittiwake and guillemot)
- NL2008001 Dogger Banke (basis for designation: sandbank (1110), harbour porpoise (1351), harbour seal (1351) and grey seal (1364)).

The report concludes that due to the distance, there will be no impact on the habitats in the designated areas and that species of marine mammals and seabirds in the designated areas will not be significantly affected.

The report's assessment of the impact on Annex IV species is based on the following impacts: underwater noise, disturbance from vessels, light emissions and oil spills from CO_2 blowout. The report reviews the expected impact on the following Annex IV species: harbour porpoise, white-beaked porpoise and minke whale. Underwater noise is assessed in the report to be the biggest impact and mitigation measures (soft-start) are planned to prevent any potential impacts. Underwater noise will occur from several parts of the project, with the primary impact during the construction phase associated with the ROV surveys and the use of the USBL system with transponders and transmitter during diving activities. During the monitoring phase, underwater noise will occur during seismic surveys. The underwater noise from the ROV surveys is assessed in the report to cause temporary hearing damage to porpoises within 550 metres and permanent hearing damage to porpoises within 35 metres. INEOS therefore plans to begin studies with 5 minutes of soft start. For the diving activities, the impact is assessed in the EIA in terms of temporary hearing damage to porpoises within 1.2 km from the source and permanent hearing damage to porpoises within 80 metres from the source. To avoid this impact, INEOS schedules a 15-minute soft start prior to diving activities. The impact of monitoring activities depends on whether 2D or 3D seismic study is conducted and what equipment is used. The EIA explains the impact of both 2D and 3D seismic studies, but as the specific activities are not yet planned, the EIA is based on examples of equipment. The Danish Energy Agency notes that this

impact must be assessed in the applications for the specific activities, which must be approved separately under section 28(1) of the Subsoil Act.

The report concludes that there is a very low risk of disturbance and harm to marine mammals.

The impact of an oil spill from a CO_2 blowout on 11 international nature conservation areas[20] is also assessed in the report. For five of the areas,[21] the risk of adverse effects on the basis for designation is considered negligible, while for five of the other areas,[22] there is considered to be a minor or certain risk of impact on reefs. For the area DK00FX112 Skagens Gren and Skagerrak, there is considered to be some risk of impact on the benthic habitats of the area.

Accidental leakage of CO_2 is assessed in the report to have a negligible impact on the environment and a limited impact on the climate.

River Basin Management Plans

The EIA also assesses the impact on the environmental status and fulfilment of environmental objectives for the River Basin Management Plans (RBMP) along the west coast of Jutland. Two impacts presented in the EIA are presented as relevant to the state of the RBMP areas and the achievement of the objectives: the emission of chemicals and accidental oil spills.

The project will be sited approximately 150 km from the nearest RBMP area (no. 223) with a good chemical status objective (1-12 nautical miles from the baseline) and approximately 170 km from a RBMP area (no. 221) with good ecological and chemical status objectives (1 nautical mile from the baseline).

RBMP area 223 has a good chemical status, while RBMP area 221 has not-good chemical status and good ecological status in VP3 but moderate ecological status in the re-visit of VP3, which is in consultation until 20/6 2025. The poor chemical status for RBMP area 221 is due to an exceedance of the environmental quality standards for the level of mercury in fish and the level of lead and cadmium in mussels. The moderately good ecological status of area 221 is partly due to an exceedance of nationally specified substances for the environmental quality standard for the level of arsenic in mussels and sediment and the level of

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[20] DK00VA257 Jyske Rev, Lille-fiskerbanke; DK00VA258 Store rev; DK00VA259 Gule rev; DK00FX112 Skagens Gren og Skagerrak; DK00VA301 Lønstrup Rødgrund; DK00VA348 Thyborøn
Stone barriers; DK00EX023 Agger Tange; DK00VA340 Sandbanks off Thyborøn; DK00VA347 Southern North Sea; DE1003301 Dogger Bank; NL2008001 Dogger Bank

[21] DK00EX023 Agger Tange; DK00VA340 Sandbanks off Thyborøn; DK00VA347 Southern North Sea; DE1003301 Dogger Bank; NL2008001 Dogger Bank

[22] DK00VA257 Jyske Rev, Lille-fiskerbanke; DK00VA258 Store rev; DK00VA259 Gule rev; DK00VA301 Lønstrup Rødgrund; DK00VA348 Thyborøn Stenvolde

benz(a)anthracene and chromium in sediment. In addition, the biological requirements for phytoplankton are not met.

Due to the distance to coastal waters and the low risk of oil spills, the report concludes that the project will not delay or hinder the Water Framework Directive's objective of achieving a good ecological and chemical status in Danish coastal waters.

The maritime spatial plan

The environmental impact report also addresses the location of the project in relation to the maritime spatial plan.

The project area is located in areas with designated development zones for oil and gas exploration and extraction, CO_2 storage and renewable energy and energy islands.

The EIA assesses how safety zones related to the project may affect the spatial utilisation of the area. The EIA concludes that the new safety zone from the CO_2 leakage monitoring system is assessed to have no significant impact on the use of the area for other purposes.

Description and assessment of existing installations

The environmental impact report contains a description of the existing Nini A platform and associated wells, and the report also contains a description and assessment of the impacts from these facilities. This includes impacts from the installation of the existing infrastructure and its operation, including impacts from underwater noise and produced water, chemicals and light.

The report assesses that there has been a negligible impact on harbour porpoises from underwater noise from the use of USBL. The piling carried out for the installation of the platform is assessed in the report to have had no lasting effect on marine mammal populations in the North Sea. No negative impacts on fish or marine mammals are assessed to have occurred from the wells themselves, however it is considered likely that the ramming in of casing pipes may have resulted in scaring off marine mammals. The EIA assesses that the area being used has not caused significant effects on the surrounding sediment composition or fauna.

1.12 Consultations

National consultation

The EIA was sent into consultation with the relevant Danish authorities, organisations and the public from 27 January 2025 to 24 March 2025, cf. section 35(3)(3) and (5) of the Environmental Assessment Act.

During the consultation period, the Danish Energy Agency received 11 responses from 8 authorities and 3 organisations. Seven of the eight authorities indicated that they had no comments.

The Danish Energy Agency has submitted the consultation responses to INEOS and INEOS has, at the request of the Danish Energy Agency, commented on these. A summary of the consultation responses and INEOS' and the Danish Energy Agency's comments can be found in Annex 3.

In its consultation response, the Danish Emergency Management Agency pointed out that INEOS, no later than four weeks before the project commences, shall send a navigation risk analysis, cf. section 3 of Executive Order no. 1229 of 3 October 2023 on navigation safety in construction work and other activities in Danish waters to the Danish Emergency Management Agency (sifa@dma.dk) with a copy to the Danish Energy Agency (ccs-miljo@ens.dk). For this purpose, an information form can be obtained from the Danish Emergency Management Agency.

The Danish Emergency Management Agency also pointed out that INEOS, no later than four weeks before the project begins, shall send information about the project to Efterretninger for Søfarende (efs@dma.dk) with copies to the Danish Emergency Management Agency (sifa@dma.dk) and the Danish Energy Agency (ccs-miljo@ens.dk).

International consultation

CO_2 storage projects are covered by the Espoo Convention if the project can lead to transboundary impacts. This means that Denmark is obliged under Article 3 of the convention to notify the potentially affected countries about the project. If a neighbouring country expresses interest in participating in the environmental assessment process, it must be involved.

In accordance with Article 3 of the Espoo Convention, on 11 July 2024, Denmark notified the Netherlands, Norway, Sweden, the UK and Germany that an EIA would be carried out for the project. In the notification, countries were asked to indicate whether they intended to participate in the process and to submit any comments in relation to cross-border environmental impacts on their territory. In response to the notification, Sweden, Norway and the Netherlands expressed a desire to participate in the further process. Germany and the UK did not want to participate.

Based on the notification and in accordance with Article 5 of the Espoo Convention, the Espoo material has been subject to public consultation from 31 January 2022 to 28 March 2025. During the consultation, comments were received from Sweden, Norway and the Netherlands. From Sweden, two responses were received from the Swedish Meteorological and Hydrological Institute and the Swedish Pelagic Federation. From the Netherlands, a consultation response was received from the Dutch Ministry of Infrastructure and Water Management. Due to an administrative error, Norway did not receive the consultation notification at the same time as the Netherlands and Sweden, and therefore - in agreement with the Norwegian Espoo

Secretariat - a separate consultation was held for Norway, where a response was received from the Norwegian Directorate of Fisheries.

The Danish Energy Agency submitted the comments received from Sweden, Norway and the Netherlands to INEOS, and INEOS, at the request of the Danish Energy Agency, responded to the comments. Denmark submitted written responses to the countries concerned, which include responses from INEOS. For the single Swedish response, the process required two rounds, after which the Minister for the Environment consented to complete the international consultation process.

An overview of the Espoo process can be found in Annex 4.

2 The Danish Energy Agency's comments and decision

2.1 Build-out concept and activities

The Danish Energy Agency assesses that the planned development is appropriate and recognises the high degree of reusing existing infrastructure, installations and wells. Based on a life cycle analysis prepared by INEOS, the Danish Energy Agency assesses that the project is appropriate in terms of its net emission reduction. The lifecycle analysis shows that there is a net reduction in CO_2 emissions of 92% compared to the total amount stored.

2.2 Storage complex characterisation and storage complex suitability

The Danish Energy Agency assesses that the Nini West storage complex, comprising the hydraulic unit Frigg Sst and the seal and lateral rocks and the Horda and Lark Formations are well described in terms of geological characterisation and that satisfactory 3D modelling has been performed. The static, dynamic and geo-mechanical models are built based on well data (cores and well logs), petrophysical and seismic interpretations, dynamic data and production data from 17 years of production history.

In relation to the geo-mechanical modelling, there are two points that require attention: a.) the absence of tests on core material (the model is based on log data), and b.) the limited amount of LOT data (leak off test) and absence of XLOT data for seal and reservoir. These deficiencies should be addressed if it becomes necessary to drill a new well.

Overall, the Danish Energy Agency assesses that the submitted work and additional information provided during the assessment period constitute a sufficient

and representative data basis for assessing the suitability of the storage site and finds the conditions for suitability met.

The Danish Energy Agency has emphasised the availability of sufficient capacity for the planned project, the reservoir properties and homogeneous composition of the hydraulic unit, good seal integrity, the ability of the seal to retain a sufficient column of CO_2, the absence of penetrating faults, a pressure regime that stays below the critical limits for reactivation of faults, shear and tensile failure.

In connection with the leakage risk from the historic well Nini-4/4A, the Danish Energy Agency has emphasised the additional modelling of leakage scenarios. The modelling shows that any leakage from the reservoir through the deepest cement plug will be very limited and that the CO_2 will migrate into silt layers internal in the storage complex seal where it will be contained. In addition, the Danish Energy Agency emphasises that the high content of mobile clay in the seal (60%) may have caused the borehole above the reservoir to be closed. The Danish Energy Agency thus assesses that there is a very low risk of leakage to the seabed from the well.

2.3 Capacity and injection conditions

According to the application materials, the Danish Energy Agency assesses that the planned CO_2 injection rate and the total amount of CO_2 injected after 8 years is realistic and justifiable. The Danish Energy Agency agrees with the choice of NA-3B as an injection well, which with the long reservoir section enables the desired injection rates and a sound pressure regime, cf. the dynamic and geo-mechanical studies.

The Danish Energy Agency is aware that cyclic injection increases the risk of corrosion in the injection well due to formation water influx, but is satisfied with the planned mitigating measures and ongoing monitoring of well integrity.

2.4 CO_2 stream composition and transfer procedure

The Danish Energy Agency assesses that the CO_2 composition specification shown in Table 2 in the application materials *Storage Development Plan Nini West* is adequate for the transportation of CO_2 by ship. The Danish Energy Agency assesses that the applied transfer procedure with transfer from ship to and storage from the Nini A platform's NA-3B injection well facilities in the Nini West storage facility is appropriate.

2.5 Well status and activities

The Danish Energy Agency considers the plan to use the existing wells NA-3B and NA-5 to be appropriate. The decision to use NA-3B as an injection well with existing

well completion is acceptable given regular monitoring of well integrity, as proposed in the application materials, along with a corrective action plan. In addition, the Danish Energy Agency assesses that the risk of leakage from the historic well Nini-4/4A to the seabed or other surroundings is very small and thus acceptable. This assessment is based on modelling work carried out by INEOS at the request of the Danish Energy Agency, which shows that releases from Frigg Sst into the well will migrate in very limited quantities into permeable layers within the storage complex seal where it will be contained.

If less CO_2 volumes than planned are available in the start-up phase of the project, the Danish Energy Agency believes that it is appropriate to use the concept in the so-called 'contingency plan' (Annex 2) due to the cyclical injection.

2.6 MMV plans

Containment risk assessment and preventive measures plan

INEOS has in it's application identified the risks relevant to the Nini West storage project. Risks are identified for activities related to the subsurface (geological and well conditions) and to surface facilities. A Risk Management Plan is attached which follows the industry standards from ISO 27914:2017.

No contingency plan is included. See section on Terms 5.

Based on the application materials, including reference documents, follow-up dialogues and supplementary material as well as third-party verification (DNV), it is the Danish Energy Agency's assessment that the safety of the storage plan has been adequately risk assessed and meets the legal requirements that follow from the Danish CCS Executive Order and the EU CCS Directive, recommendations from EU guidance documents and standards (ISO 27914:2017) that apply in the area.

Monitoring plan

The Danish Energy Agency assesses that the monitoring plan of 27 February 2025 follows the requirements set out in the Danish CCS Executive Order and is in accordance with the requirements of the EU Directive. The monitoring plan adequately monitors the risks identified in the risk analysis and the technologies used are deemed mature enough to reliably monitor these risks.

The Danish Energy Agency notes that the seismic monitoring programme after injections stop will be determined at a later stage based on experience, modelling and agreement with the authorities.

Corrective measures

The Danish Energy Agency assesses that the corrective measures are sufficient to secure the project against potential risks identified in the risk assessment. The

corrective measures are initiated in case of leakage or significant deviations identified by monitoring or if the integrity of equipment is compromised.

The Danish Energy Agency notes that there are no special corrective measures in case of leakage from the decommissioned well Nini-4/4A, other than stopping injection of CO_2 or by drilling a relief well (to achieve pressure reduction). This can take several years. The Danish Energy Agency assesses that the risk of leakage is very small and the migration will be limited and at a slow pace, and thus acceptable. This assessment is based on modelling performed by INEOS.

2.7 Preliminary post-closure plan

The preliminary post-closure plan is described in very general terms, which is acceptable at this stage of the project. A monitoring plan is in place where the frequency of seismic campaigns will be determined at a later date based on the rate of CO_2 propagation and modelling. Wells are monitored at the seabed using lander, ROV or AUV surveys. Monitoring in the wells is carried out until decommissioning.

The Danish Energy Agency assesses that the preliminary post-closure plan is currently sufficient and meets the requirements of the Danish CCS Executive Order and the EU CCS Directive and complies with ISO 27914:2017.

A final post-closure plan shall be submitted and approved before the conditions for closure of the storage facility are considered fulfilled, cf. condition 10.

The Danish Energy Agency's decision on the decommissioning plan for Nini West is dealt with in a separate decision in accordance with section 32(a)(2) of the Subsoil Act.

2.8 Economy and organisation / Technical and financial capacity

Technical capacity

It is the Danish Energy Agency's assessment that INEOS possesses the necessary technical capacity to assess the suitability of the subsoil for CO_2 storage and to initiate and operate a CO_2 storage site. In addition, INEOS has shown that they utilise third-party expertise in areas where they need to supplement internal knowledge. Likewise, INEOS has third-party verification performed to ensure the quality of their work. INEOS is considered a competent and responsible operator for a future CO_2 storage site.

Financial capacity

The Danish Energy Agency has assessed the financial capacity of the 'rightsholder' - consisting of INEOS E&P A/S [redacted], Harbour Energy (with [redacted]) and

Nordsøfonden - to ensure compliance with the statutory requirements on having the necessary and sufficient capacity.

Assessment of individual participants and guarantors:

- [redacted]
- [redacted]

[redacted]

[redacted]

- Nordsøfonden: Nordsøfonden is owned by the Danish state and manages the state's financial interests in CO_2 storage licences in Denmark. By virtue of its state ownership and the resulting financial robustness, Nordsøfonden is assessed to have the necessary and sufficient financial capacity to meet its obligations under the licence.

Overall rating for the Rightsholder

The rightsholder overall possesses the necessary and sufficient financial capacity. This conclusion is based on comparing the specific financial obligations and risk profile of the licence, as defined by the project costs (CAPEX, OPEX, ABEX) described in section 1.9, against the overall financial strength of the commercial companies and their guarantors. Although the individual assessments of the commercial companies and their guarantors contain nuances and complex accounting relationships, a detailed review of the relevant financial ratios and guarantee structures confirms the overall conclusion. It is thus assessed that the rightsholder has sufficient financial capacity to meet the specific requirements of this licence.

2.9 Fiscal measurement and allocation

The Danish Energy Agency assesses that the described measuring and allocation concept with allocation back to the individual emitter, correcting for the emission that occurs as part of the storage process from emitter to injection well, is appropriate. It is considered appropriate to establish a fully auditable measurement and allocation system. A *final* fiscal measurement and allocation plan shall be submitted no later than 3 months prior to the start of injection (cf. Terms 5).

2.10 Environmental conditions

The Danish Energy Agency has assessed how the project may affect the environment and has found that the project will not cause unacceptable impacts on the environment if the specified conditions are met.

Below is an account of the Danish Energy Agency's assessment pursuant to the Environmental Assessment Act, the Offshore Habitats Order, the Marine Strategy

[26] The DKK values disclosed for [redacted] (the proxy companies) have been converted from EUR based on Danmarks Nationalbank's year-end exchange rate as of December 29, 2023, where 1 EUR = 7.4560 DKK

and the Executive Order on River Basin Management Plans ('indsatsbekendtgørelsen').

The assessments below relate to both the use of wells as stated in the application and the use of wells as described in the contingency plan (Annex 2).

The environmental impact assessment

The Danish Energy Agency is the authority for the processing of the submitted environmental impact report, cf. section 17(4)(1) of the Environmental Assessment Act in the Executive Order on the tasks and powers of the Danish Energy Agency[27].

It follows from section 24(1) of the Environmental Assessment Act that the Danish Energy Agency, upon receipt of the EIA from the developer, shall review the report with the involvement of the necessary expertise to ensure that it meets the requirements in section 20.

Pursuant to section 25 of the Environmental Assessment Act, the Danish Energy Agency will then decide whether the project can be given a permit. The decision is based on the developer's application, the EIA, any additional information, the results of the consultations and the authority's reasoned conclusion[28].

The Danish Energy Agency's reasoned conclusion

The Danish Energy Agency has reviewed the EIA and finds that the report meets the requirements for the information to be included in an EIA as stated in section 20 of the Environmental Assessment Act, cf. 2.11 in this decision.

In accordance with the EIA, the Danish Energy Agency finds that the expected environmental impacts during the construction phase consist of emissions to air, occupation of space, discharge of chemicals, physical disturbance of the seabed, underwater noise, light and disturbance from vessels. In the operating phase, the environmental impact consists of emissions to the air, reduced concentration of CO_2 in the atmosphere, occupation of space, underwater noise, light, disturbance from vessels and safety zones. The Danish Energy Agency assesses that there will be no significant impacts on the environment from the planned activities, provided that the conditions 8 and 9, which are elaborated upon in the section below, are followed.

Unplanned incidents can consist of oil spills, CO_2 leakages and ship collisions. Impacts from incidents are considered very unlikely, and with the existing safety

[27] Executive Order no. 259 of 6 March 2025 on the tasks and powers of the Danish Energy Agency.
[28] A permit under Section 23(d) of the Subsoil Act replaces in whole or in part a permit under Section 25 of the Environmental Assessment Act, cf. Section 10(1) no. 4 of the Environmental Assessment Executive Order.

measures and emergency response in place in the North Sea for incidents, the risk of impacts from incidents is thus considered to be acceptable.

In the assessment, the Danish Energy Agency has particularly emphasised the following factors due to the characteristics of the project:

Planned activities in the construction and operating phase

The Danish Energy Agency has in the assessment of the impact from the occupation of space and disturbance of the seabed emphasised that the area of 850 m^2 is limited and very homogeneous with the seabed environment in the part of the North Sea where the project will take place. When establishing the offloading system, including the placement of concrete mattresses and anchor blocks, a disturbance of the seabed is expected and it is assessed that some individual benthic fauna may be lost. However, the impact on the benthic population is assessed to be negligible and the population is expected to recover quickly from the disturbance.

The impact from discharges is assessed by the Danish Energy Agency to be negligible, as the chemicals that will be discharged during the leak test are yellow-classified and amount to a total of approximately 11 kg. The discharged volume is estimated to be mixed quickly due to the generally high mixing rate in the North Sea, including in the project area.

The impact from underwater noise is primarily relevant for species covered by Annex II and Annex IV of the Habitats Directive[29] and in relation to the marine strategy and the impact is therefore addressed in the sections below.

Underwater noise is not expected to cause significant impacts on fish in the Danish Exclusive Economic Zone (EEZ). In this assessment, the Danish Energy Agency has considered that the impact on fish is mitigated with the planned soft-start, and that any impact on fish eggs and larvae is considered minimal and recoverable. Cross-border impacts on fish are discussed in the section 'Transboundary impacts' on the next page.

Incidents

The Danish Energy Agency assesses that the probability of incidents in the form of ship collisions and oil or CO_2 leaks is very low.

The impact of a CO_2 blowout is estimated to be limited, primarily with a negative impact on the climate and a negligible impact on the local environment. Impacts from leakage of CO_2 from the reservoir and offloading system are assessed to be negligible. In assessing the impact of CO_2 releases, the Danish Energy Agency has considered the planned storage volume, that parts of the stored volume will remain

[29] Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora.

in the reservoir in the event of a blowout and that the majority of any CO_2 release is estimated to be absorbed into the air.

The Danish Energy Agency considers the impact of oil spills to be particularly relevant for international nature conservation areas and species covered by Annex IV of the Habitats Directive and in relation to targeted marine areas along the coast. The impact on these is therefore addressed in the sections below. Oil spills are also estimated to affect grey seals and harbour seals. The Danish Energy Agency assesses that a potential oil spill could affect seals in several ways, including directly through inhalation/intake of oil and gases and by the oil settling on the seals' fur. Such an impact is considered to pose a risk of death in very severe cases. However, the risk of such an impact on seals is considered to be very low, as the likelihood of an oil spill is very small. In addition, the seal population is primarily located close to the coast, although when foraging they may be far from the coast and thus generally found at a great distance from the area where the release will have the greatest concentration. Due to the very low risk of oil spills and with the existing systems and emergency response capacity in the North Sea for incidents, the risk of impact on grey seals and harbour seals is considered acceptable.

Transboundary impacts

The Danish Energy Agency assesses that there may be a cross-border impact on sand eel in the Norwegian area; SVO Tobisfelt (includes the former Tobisfelt sør and Vikingbanken) from underwater noise in connection with monitoring. Tobisfelt is located approximately 15 km from the area where the seismic surveys will take place. The agency notes that there are few studies that shed light on the effect of seismic surveys on sand eel and fish in general and that a precautionary principle should therefore be applied in the management of seismic surveys that will take place close to areas with sand eel. Existing research indicates that sand eels can temporarily be scared away by underwater noise, and as sand eels are associated with a specific area of the seabed, scaring them off is considered particularly critical during the spawning period when it can affect the outcome of spawning and thus the reproduction of the population. The Danish Energy Agency therefore assesses that seismic surveys should not be conducted during the spawning period for the dominant sand eel species in Tobisfelt *(Ammodytus marinus)* if they are powerful enough to impact Tobisfelt. Based on this, the Danish Energy Agency sets conditions 8b that no seismic surveys may be conducted in December and January if the sound impact in Tobisfelt is above 145 dB re 1 uPa^2s, integrated over 10 seconds. This is based on the recommendations from the Norwegian Institute of Marine Research[30].

[30] Cf. the Institute of Marine Research's recommendations for 2025, where the calculation of the sound impact in relation to sound limit of 145 dB re 1 uPa 2s is elaborated upon in chapter 10. https://www.hi.no/hi/nettrapporter/rapport-fra-havforskningen-2025-1

The Danish Energy Agency also assesses that there will be no impacts from underwater noise in the Norwegian EEZ if conditions related to underwater noise, including soft-start, are followed (conditions 8 and 9).

In addition, the area may be affected by accidental oil spills in connection with a CO_2 blowout. Such a CO_2 blowout is estimated to affect fish eggs and larvae in Tobisfeltet, which is a spawning area for mackerel and sand eel. The probability of impact is considered very low, and with the existing blowout prevention systems and the existing emergency response capacity in the North Sea for accidents, the risk is considered acceptable.

Cumulative impacts

The Danish Energy Agency agrees with the assessment in the EIA that the project will not cause significant cumulative impacts. In this assessment, the Danish Energy Agency has emphasised the distance to other platforms as well as other activities, projects and plans from which the impacts could accumulate with the impacts of the project. It is noted that cumulative impacts may occur at some point in time from a possible expansion of renewable energy in Sørlige Nordsjø, where Ventyr SN II AS was granted an exclusive licence in March 2024. There are no concrete plans for the area yet, so it cannot be ruled out that cumulative impacts may occur if the area is put into use. These impacts are assessed to be primarily related to seismic surveys and the installation of infrastructure. In that case, an EIA for the specific development in Sørlige Nordsjø shall include any cumulative impacts from this project. Cumulative impacts may also occur with a possible further expansion of the Greensand Future project, as activities may occur in the same area where this decision approves activities. The cumulative impacts are assessed to be primarily related to underwater noise and increased traffic in the area. The detailed cumulative impacts will be assessed in the EIA of the potential expansion of the Greensand Future project.

2.10.2 The Marine Strategy Act

In exercising its powers under the Subsoil Act, the Danish Energy Agency is bound by the environmental objectives and action programmes established under sections 12 and 13 of the Marine Strategy Act, cf. section 18 of the Marine Strategy Act.

The Danish Energy Agency is thus obliged to promote the environmental objectives of the Marine Strategy by exercising its powers within the framework of the applicable legislation. This means that when exercising its powers under the Subsoil Act, including approval pursuant to section 23(d), the Agency shall base its decisions on the marine strategy.

The Danish Energy Agency's assessment

The Danish Energy Agency has assessed the project's impact in relation to the descriptors of the Marine Strategy and finds, in accordance with assessments in the EIA, that descriptors D1 (biodiversity), D4 (marine food web), D5

(eutrophication), D6 (seabed integrity), D7 (hydrographic changes), D8 (contaminants - acute pollution incident), D9 (contaminants in seafood) and D11 (underwater noise) are relevant to the assessment of the project.

The Danish Energy Agency agrees with the conclusion of the EIA that the construction and operation of the project will not affect the achievement of a good environmental status and the fulfilment of objectives for the relevant descriptors, cf. section 18 of the Marine Strategy Act. In this assessment, the Danish Energy Agency has considered that conditions 8 and 9 will prevent hearing damage to marine mammals, and thus avert any impacts on descriptor D11 (underwater noise) from the permitted activities. The Danish Energy Agency has also considered that the execution of specific seismic work associated with the monitoring programme shall be approved separately and that the Danish Energy Agency in this connection will set the necessary conditions for the execution of the work.

2.10.3 Natura 2000 sites and Annex IV species

The EIA contains an assessment of the project in relation to potentially affected Natura 2000 sites and impacts on Annex IV species in accordance with the rules of the Offshore Habitat Executive Order.

The Offshore Habitat Executive Order

CO_2 storage projects approved under section 23(d)(2) of the Subsoil Act are covered by the Offshore Habitat Executive Order, cf. section 1(2)(3) of the Executive Order.

Before the Danish Energy Agency can grant a permit for the project, an assessment shall be made regarding whether the project in itself, or in connection with other plans and projects, may have a significant impact on an international nature conservation area, cf. section 3(1) of the Executive Order. If the Danish Energy Agency assesses that the project may have a significant impact on an international nature conservation area, a more detailed impact assessment of the project's effects on the international nature conservation area shall be carried out, taking into account the conservation objective for the area in question, cf. section 3(3) of the Executive Order.

As a general rule, no permit can be granted for an activity if the above assessment shows that the activity may affect the integrity of an international nature conservation area, cf. section 3(3) of the Executive Order.

In addition to the assessment of the impact on international nature conservation areas, the Executive Order also requires an assessment of whether the application may 1) cause deliberate disturbances in the natural habitats of Annex IV species listed in Annex IV(a) of the Habitats Directive at all life stages and in particular during periods where animals are breeding, caring for their young, wintering or migrating and (2) damage or destroy breeding or resting places in the natural habitat range of the animal species listed in Annex IV(a) of the Habitats Directive,

or (3) destroy plant species listed in Annex IV(b) of the Habitats Directive at any life stage.

The Danish Energy Agency's assessment

The Danish Energy Agency finds that the elements of the project that in themselves, or in connection with other projects, may have a significant impact on Natura 2000 sites and Annex IV species are potential oil spills and underwater noise in connection with the execution of the project as these can have a large geographical impact and as the Annex IV species are considered particularly sensitive to these impacts. Other impacts are thus not considered to have a significant impact on Natura 2000 sites and Annex IV species, due to their nature and limited temporal and geographical extent.

The Danish Energy Agency agrees with the conclusion of the EIA that the potentially affected areas include:

- Danish Natura 2000 sites: DK00VA257 Jyske Rev, Lille-fiskerbank, DK00VA258 Store rev, DK00VA259 Gule rev, DK00FX112 Skagens Gren og Skagerrak, DK00VA301 Lønstrup Rødgrund, DK00VA348 Thyborøn Stenvolde, DK00EX023 Agger Tange, DK00VA340 Sandbanks off Thyborøn and DK00VA347 Southern North Sea.
- International Natura 2000 sites: DE1003301 Dogger Bank and NL2008001 Dogger Bank.

The areas are not assessed to be affected by underwater noise as the closest area (71 km) is outside the radius that a seismic survey could affect.

In assessing the impact on Natura 2000 sites and Annex IV species from a potential oil spill, the Danish Energy Agency has considered that there is a very low probability of blowout (see the section on incidents on page 30) and that valves will be installed/are installed to prevent leaks and regulate well pressure. In addition, the agency has considered the established emergency response capacity in the North Sea, including the existing agreement with TotalEnergies EP Denmark and INEOS. Below is an account of the impacts assessed to occur from an oil spill that is not mitigated by emergency response capacities or other measures.

The Danish Energy Agency finds that there is very little likelihood of an impact from an oil spill on the Dutch and German Natura 2000 sites due to the dominant current direction in the North Sea, which is primarily eastbound. For the same reason, the Danish areas DK00VA301 Lønstrup Rødgrund, DK00VA348 Thyborøn Stenvolde, DK00EX023 Agger Tange, DK00VA340 Sandbanks off Thyborøn and DK00VA347 Southern North Sea are not considered to be affected by a potential oil spill. The Danish areas DK00VA257, Jyske rev, Lillefiskerbanke, DK00VA258, Store Rev, DK00VA259, Gule Rev and DK00FX112, Skagens Gren and Skagerrak are located within the dominant current direction and these areas are therefore assessed to be affected by an oil spill without mitigation measures.

The first three areas have reefs (Jyske Rev, Lillefiskerbanke), porpoises, reefs and bubble reefs (Store Rev) and porpoises and reefs (Gule Rev) on the designation basis, respectively. The reefs are assessed to be affected by oil sedimentation, which will affect the associated flora and fauna, especially the epi-benthic fauna that lives on rocks. Harbour porpoises are expected to be primarily affected directly by an oil spill through inhalation of toxic gases and indirectly through an impact on the food supply.

The area DK00FX112, Skagens Gren and Skagerrak, has porpoises, herring, sandbanks, reefs, fulmar and great skua on the designation basis. The impact on harbour porpoises is estimated to be similar to the other areas. The population of Atlantic herring is estimated to be affected by an oil spill in the form of increased mortality among fish eggs and larvae due to oil sedimentation. The two habitats on the designation basis (reef and sandbank) can also be affected by an oil spill through oil sedimentation. Both fulmars and great skuas forage and roost at sea and are considered highly vulnerable to oil spills, especially if their plumage comes into contact with oil, which can inhibit their movement and the insulation properties of their plumage.

Based on the impacts described above and the probability of occurrence of oil spills, the Danish Energy Agency assesses that there will be no significant impact on Natura 2000 areas in connection with the project or in combination with other projects. The achievement of the goals for the areas is also not considered to be hindered. There is thus no basis for conducting a habitat impact assessment, cf. section 3(2) of the Executive Order. In this assessment, the Danish Energy Agency has emphasised the distance to the nearest Natura 2000 areas, the dominant current direction, the very low probability of oil spills and the existing emergency response capacity in the North Sea and INEOS' emergency response strategy.

The Danish Energy Agency agrees with the statement in the EIA that the project's underwater noise emissions may affect Annex IV species in terms of hearing damage, behavioural disturbance, masking and detection if mitigation measures are not applied.

The Danish Energy Agency does not find the proposed soft-start for the ROV surveys sufficient to ensure that hearing damage is avoided, which is why a soft-start of 7.5 minutes has been set as opposed to the proposed 5 minutes (condition 9.a). In setting this condition, the Danish Energy Agency has considered that it cannot be ruled out that marine mammals are present at the source point when the noise impact is initiated. The soft start procedure ensures that porpoises can reach beyond a radius from the sound source within which their hearing can be damaged, even if they were to initially be present at the location of the sound source. A soft start of 15 minutes for the diving activities is considered sufficient.

In addition, it is a condition that the monitoring activities shall be planned using *best environmental practice* (condition 8.a), which means that the noise impact is reduced as much as possible in order to achieve the necessary data quality.

The Danish Energy Agency assesses that the activities approved by this decision with the conditions set out will not cause an deliberate disturbance in the natural range of the animal species listed in Annex IV of the Habitats Directive, which for the applied project are assessed to be harbour porpoises, minke whales and white-beaked dolphins. The project is also assessed not to cause damage or destruction of the species' breeding and resting areas. In this assessment, the soft start of the activities that may emit underwater noise is considered sufficient for harbour porpoises, minke whales and white-beaked dolphins to reach outside a radius where hearing may be affected. In assessing the impact of incidents, the agency has also considered the existing blowout prevention systems and the existing emergency response capacity in the North Sea and INEOS' emergency response strategy.

This approval does not grant permission for the specific seismic activities in the monitoring programme that may cause underwater noise. Implementation of these activities requires separate approval from the Danish Energy Agency under section 28(1) of the Subsoil Act. Therefore, no conditions regarding these activities are imposed in this decision. In connection with the application for the specific seismic work, and the Danish Energy Agency's assessment of these, conditions will be set to ensure that there will be no intentional disturbance or impact on Annex IV species in connection with these activities.

2.10.4 River Basin Management Plans

Executive Order on River Basin Management Plans ('indsatsbekendtgørelsen')

According to section 8 of the Executive Order on River Basin Management Plans ('indsatsbekendtgørelsen'), the Danish Energy Agency must ensure that the permit is only granted if the project will not lead to a deterioration of conditions or prevent the fulfilment of the environmental objectives laid down in the Executive Order on environmental objectives for surface water areas and groundwater bodies.

In marine areas, there are objectives for reaching a good ecological and chemical status. The objective of a good ecological status applies within 1 nautical mile from the baseline (cf. the Convention on the Law of the Sea), while the goal of a good chemical status applies within 12 nautical miles from the baseline.

The Danish Energy Agency's assessment

The Danish Energy Agency agrees with the conclusions of the EIA that none of the planned activities will have an impact into river basin management plan (RBMP) areas due to the distance to these (approximately 150 km). The Danish Energy Agency also agrees that it cannot be ruled out that an accidental oil spill without mitigation measures could affect coastal waters. In a blowout without mitigation measures, the coastline along northern Jutland and to a lesser extent the Norwegian and Swedish coasts are estimated to be affected.

The Danish Energy Agency also agrees that an oil spill without mitigation measures may introduce environmental pollutants into the coastal areas, which may affect

some of the parameters for the chemical and ecological status. However, the Danish Energy Agency assesses that the approved emergency response plan for chemical spills and oil spills will prevent an oil spill from reaching the RBMP areas. In its assessment, the Danish Energy Agency has emphasised that there is a very low probability that a release will occur and that the modelled release, presented in the EIA, is approximately three times larger than the worst-case scenario for the project.

The Danish Energy Agency thus assesses that the project will not directly, indirectly or in cumulation with other activities cause a deterioration of the chemical and ecological status of the RBMP areas and that the project will not prevent the fulfilment of the environmental objectives.

2.10.5 The maritime spatial plan

The maritime spatial plan's legal basis is the Act on Maritime Spatial Planning, which implements EU Directive 2014/89/EU on the framework for maritime spatial planning.

Development zones for CO_2 storage have been designated in the maritime spatial plan and CO_2 storage can only be permitted within the designated zones. The maritime spatial plan also stipulates that an authority wishing to grant a licence in an area where a development zone or special use zone has been designated must seek consultation with the minister responsible for the zone before a licence can be granted.

The project is located in an area designated as a development zone for CO_2 storage in the maritime spatial plan (zone Ec1). A licence for CO_2 storage is thus possible and in accordance with the maritime spatial plan. The area is also designated as a development zone for oil and gas exploration and extraction, renewable energy and energy islands. When processing this application, the Danish Energy Agency has therefore in accordance with the consultation procedure outlined in the ensured that the Minister for Climate, Energy and Utilities has no objections to the granting of a licence for the CO_2 storage project in question.

2.10.6 Existing installations

The Danish Energy Agency assesses that INEOS has sufficiently described the existing installations that will be used in the applied project and assessed the associated environmental impacts.

The Danish Energy Agency has tested the assessment forwarded by the applicant. The agency agrees with the conclusions of the EIA that there may have been impacts from noisy activities on marine mammals during the installation and that the installations themselves have resulted in a permanent impact on the local environment and benthic communities, but that there has not been a significant impact. In the assessment, the Agency considered the limited scope and temporary nature of the polluting activities (including noise pollution) and the robustness and uniformity of the local environment and benthic communities.

On this basis, it is the Danish Energy Agency's assessment that legal approval can be granted for the Nini A platform, well head and the wells NA-3B and NA-5.

2.11 Other comments regarding the application of the Subsoil Act to the applied for project

It should be noted that the Danish Energy Agency shall also approve significant changes to the plan for the extraction activity in the existing hydrocarbon licence 4/95, cf. section 10(3) of the Subsoil Act. The Cease of Production (CoP) that will be a consequence of the project is a significant change.

Approval pursuant to section 10(3) of the Subsoil Act requires a separate application and is not covered by this decision.

An application for a licence or approval under Section 10 of the Subsoil Act shall also be accompanied by a decommissioning plan, cf. section 32(a) of the Subsoil Act.

In connection with approval under section 10(3) and section 32(a) of the Subsoil Act, a decision shall be made on what to do with all plants and installations etc. covered by licence 4/95.

However, as the project involves the reuse of existing hydrocarbon plants, this decision shall consider the handling of rights and obligations, including the fulfilment of decommissioning obligations. The Danish Energy Agency assesses that with regard to plants and installations above the seabed, the decommissioning obligation shall remain with the Rightsholder of Licence 4/95. This means that these plants and installations shall be included in the decommissioning plan submitted together with the application under section 10(3) for significant changes in the operation of the hydrocarbon installations under licence 4/95.

The Danish Energy Agency also assesses that the specific work associated with the conversion of wells NA-3B and NA-5 can be accommodated within the framework of existing approvals under Section 28 of the Subsoil Act and this approval.

The Danish Energy Agency also assesses that the wells NA-3B and NA-5 should be considered an integral part of the exclusive licence where they are used, i.e. C2023/01. With regard to wells NA-3B and NA-5 (including X-mas trees), the Danish Energy Agency therefore assesses that the responsibility and decommissioning obligation shall rest with the Rightsholder (C2023/01) for CO_2 storage, after the offshore installation activities and modifications to the Nini Licence's existing infrastructure have been completed, including those related to NA-3B and NA-5 (in respect of the Iris Licence's commercial CO_2 storage activities by the storage plan), and these facilities have been commissioned. It is stipulated in the terms that INEOS, as operator of the Iris Licence, must notify the Danish Energy Agency without undue delay once this has taken place. A further term is

stipulated requiring that the agreements on third-party access entered into between the Iris Licence and the Nini Licence must be submitted to the Danish Energy Agency no later than 30 days after approval has been granted.

Any decommissioning of these wells shall therefore be described in the decommissioning plan that belongs to INEOS' application under section 23(d()2) of the Subsoil Act, cf. section 32 a of the Subsoil Act. Details of the decommissioning obligation for these wells are described in a separate decision regarding approval of the decommissioning plan.

As the storage plan requires the use of existing hydrocarbon infrastructure in Licence 4/95, it is stipulated that the Danish Energy Agency shall receive the concluded agreements on third-party access between Licence C2023/01 and Licence 4/95 as documentation that the necessary installations and plants are available for use for the execution of the storage plan.

3 Complaint guide

Appeals against this decision may be brought before the Danish Energy Appeals Board, cf. section 37(a)(1) of the Subsoil Act.

Anyone with a substantial and individual interest may appeal against this decision, cf. section 37(a)(2).

Local and national associations or organisations whose main purpose is the protection of nature and the environment or which, according to their purpose, safeguard significant recreational interests, are entitled to complain about environmental conditions, cf. section 37(a)(3) of the Subsoil Act. These associations or organisations shall submit their articles of association to the Danish Energy Appeals Board no later than at the same time as the complaint as documentation that they are local or nationwide and that their purpose meets the stated requirements.

The complaint shall be submitted in writing to the Energy Board of Appeal within 4 weeks from the time the decision is announced. However, if the decision is publicly notified, the deadline is always calculated from the moment of notification. If the appeal deadline expires on a Saturday or a public holiday, the deadline is extended to the following working day, cf. section 37(a)(4) of the Subsoil Act.

With Act No. 468 of 14 May 2025 on the Energy Board of Appeal, it is mandatory to use the Complaint Portal of the Danish Appeals Boards Authority (Nævnenes Hus) for submitting a complaint to the Energy Board of Appeal, cf. section 15 of the Act. The Complaint Portal is accessed via borger.dk or virk.dk, and login is done using MitID. A complaint is considered submitted once it is available to the Danish Energy Agency in the Complaint Portal. A receipt is sent once the complaint has been submitted.

The complaint is initially sent automatically to the Danish Energy Agency. If the Danish Energy Agency upholds its decision, the complaint is forwarded to the Energy Board of Appeal through the Complaint Portal. Notification is given when the complaint has been forwarded.

As a general rule, the Energy Board of Appeal will reject complaints submitted outside the Complaint Portal, unless special reasons exist for doing so. Anyone wishing to be exempted from using the Complaint Portal must send a reasoned request to the Danish Energy Agency. The Danish Energy Agency will forward the request to the Energy Board of Appeal, which will decide whether the request can be granted.

A copy of this decision will be sent to Harbour Energy and Nordsøfonden.

Sincerely,

Henrik Sulsbrück
Head of Unit CCS

hesu@ens.dk

Danish Energy Agency

4 APPENDICES

APPENDIX 1

Excerpt from the Act on the Use of the Danish Subsoil, cf. Consolidating Act no. 1461 of 29 November 2023

Section 23(d). Exploration and storage or other use of the subsoil under Section 23 shall take place in a safe and appropriate manner.

Subsection 2 Before storage or other use of the subsoil and related measures are initiated, a plan for these activities, including the organisation of activities and the related plants, and a plan for corrective measures in the event of leakage or significant irregularities involving a risk of leakage from a storage complex shall be approved by the Minister for Climate, Energy and Utilities.

Subsection 3 The rightsholder of a licence under Section 23 shall notify the Minister for Climate, Energy and Utilities of planned changes in the operation of the enterprise. The Minister shall issue an updated licence if necessary.

Subsection 4 Significant changes and additions to the plan for the enterprise, cf. subsection (2), shall be approved by the Minister for Climate, Energy and Utilities before they are implemented. The Minister shall issue a new or updated licence.

Subsection 5 The Minister for Climate, Energy and Utilities may lay down conditions in connection with approvals and permits under subsections 2-4.

APPENDIX 2 Contingency Plan

INEOS Energy Denmark Project Title / Facility Name:

Greensand Project Future

Document Title:

DEA Application

Nini West - NA-5 Injection Optionality

0	02-05-2025	Issued For Use	IFU	Mette Fürstnow & Michael Larsen	Kurt Lykke	Christian Christen-sen
Rev.	Revision Date (dd-mmm-yyyy)	NA-5 Injection Optionality		Prepared by	Verified by	Approved by

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PO No: N/A	Contract No: N/A	Page: **1** of **15**

Document No.:

C081-INEO-A-RA-0061

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1 Introduction

As the Greensand Project Future is progressing towards CO_2 injection by late 2025/early 2026, it has become clear that lower than initially anticipated CO_2 volumes will be ready for injection at start of injection operations, and therefore a ramp up injection period must be expected and planned for.

We therefore apply for changing the status of the NA-5 well from CO_2 monitor (see Ref /5/ SDO) to CO_2 injector and to prepare the NA-5 well as injector to be used for ramp-up and backup injection optionality. Our application is based on the following technical justification:

- The initial ramp up volumes are expected to match the NA-5 injection capacity.
- The 2023 pilot injection in NA-5 confirmed a good injectivity at lower CO_2 volumes.
- With a high inclination and short reservoir section (70 m) a dry-out zone around the well is expected to develop faster than in NA-3B and hence the brine backflow can be prevented sooner – even at small injection volumes. This will most likely not be possible in NA-3B until larger volumes can be received from the emitters.

The decision to change the NA-5 functionality is based on the following criteria's:
- To provide optionality within the project, to accommodate the uncertainty of the initial CO_2 delivery rates from the emitters
- To provide the best possible protection of well injectivity during injection of low CO_2 volumes
- To retain cost at an acceptable level given the corrosion risk during the initial injection phase.

2 Background

The forecasted delivery of CO_2 from the Project Future emitters is expected to be slower than originally anticipated. This is a consequence of the project FID being later than originally planned. Figure 1 below illustrates the most recent forecast illustrating the expected CO_2 supply including a long ramp up period during 2026.

Figure 1: Expected CO_2 supply forecast.

In order for the project to accommodate the uncertainty in CO_2 delivery rates and the initial CO_2 injection, it is paramount to have the option to allocate CO_2 rates to corresponding well capacities and provide the best conditions for displacing the reservoir water away from the near wellbore area as fast as possible.

With initial low injection volumes during the ramp-up period it is concluded to be challenging to provide the best conditions to displace the reservoir water away from NA-3B fast. With nearly 1000m completion length in the reservoir and hence large near wellbore area, the low CO_2 volumes could cause a prolonged exposure of the screens to acidic conditions before the dry-out zone can isolate an acidic waterfront away from the well. Consequently, a long injection ramp-up period could potentially increase the risk to the NA-3B well integrity and well longevity.

Instead, the NA-5 well, as already used for the pilot injection, can provide a better match with the lower CO_2 rates, as it is accessing a significantly shorter reservoir section than the NA-3B and consequently requires lower CO_2 volumes to displace the water away from the near-wellbore area.

Despite the lower injection potential of the NA-5 well, as compared to the NA-3B, having both of them refurbished for injection will provide the best possible risk mitigation for the largest risks to the Greensand Future Project, i.e. the rate of CO_2 supply from the emitters and corrosion induced deterioration of injection performance.

2.1 Nini West Injection Outlook

Preparing NA-5 for injection provides the opportunity to utilize the Nini West wells according to received volumes in the ramp-up period.

Figure 2 shows a possible outlook for the well preparations and use for injection.

Figure 2. Possible Nini West injection outlook.

2.2 Risks associated with the optionality

Risk	Mitigation
Offshore schedule delay	The NA-5 offshore preparation will add additional 10 days to the planned offshore scope in Q3 2025. It will not impact the time of first injection in Q1 2026.
Late authority approval	Close follow-up with the DEA to ensure alignment.
NA-5 found not applicable for CO_2 injection	In case NA-5 cannot be prepared for CO_2 injection (due to unexpected poor integrity or other issues) the NA-3B will be prepared and used for injection according to the original PDO plan.
Uncertainty on CO_2 emitter forecast	NA-5 can be used until the supplied CO_2 volumes exceeds the max injection capacity. Dynamic modelling indicates that NA-5 can accommodate the current 2026 ramp up profile ([redacted]) within the given injection pressure constraint.
Uncertainty to NA-5 injection capacity	In case NA-5 cannot meet the required injection rates/volumes due to salt precipitation, corrosion induced injectivity decline or weather conditions the NA-3B well will be phased in earlier.

2.3 Measures

Measure	Deadline
Complete offshore well programme	[redacted]
Consolidate emitter forecast for 2026	
Define injection well strategy based on consolidated emitter forecast for 2026	
Submit Final Injection Plan to the DEA	3 months prior to injection start

3 NA-5 Well Design

The NA-5 well was constructed as a water injector and the design was reviewed as part of the Nini West development plan submitted in February 2024. With 2023 caliper surveys the well was confirmed in a healthy condition to be used as CO_2 monitoring well.

See details in Ref /1/: NA-5 well description report.

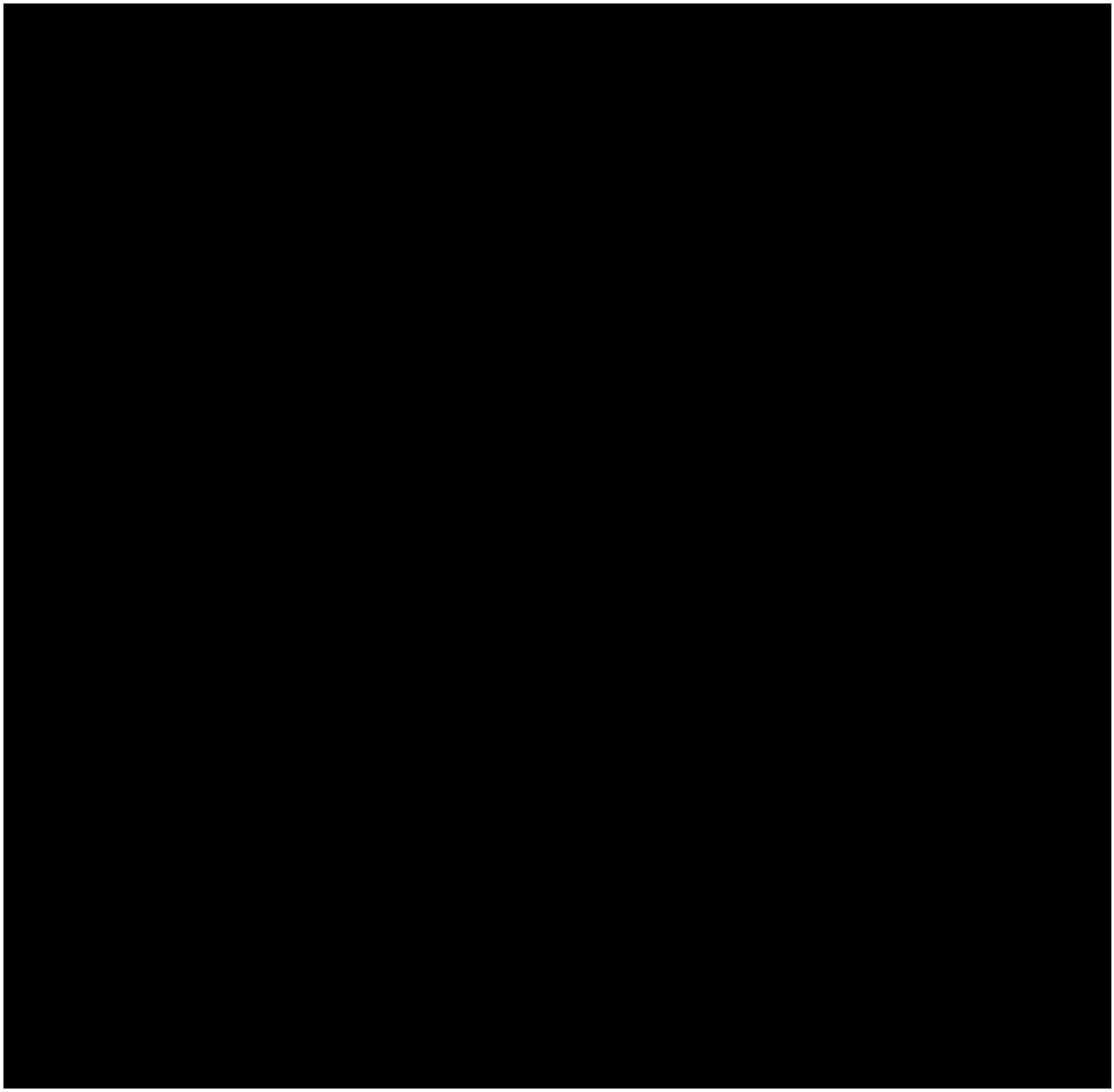

Figure 3. NA-5 Well design as is.

3.1 Preparation for CO_2 injection

To be used for CO_2 injection additional preparations will be required:

1. Rig up on well with Wireline equipment
2. Install Bridge Plug – temporarily in tubing at Production Packer depth – to enable:
    a. Pressure test of tubing to [redacted] bar
    b. Pressure test of A-casing to [redacted] bar
3. Retrieve Bridge Plug
4. Install Straddle Lower Part with Check Valve at Liner Hanger depth
5. Install Straddle Upper Part
6. Punch hole in tubing (to A-annulus to enable displacement) above Production Packer
7. Displace A-annulus content (original completion fluid) to Glycol (app 100M3).
    a. No emissions to the environment. Present content being displaced into formation or taken back to process.
8. Isolate hole with Straddle
    a. Confirm Integrity by applying pressure to A-annulus
9. Install BPV (plug at tubing hanger in wellhead) – temporarily – to enable:
    a. Redress of XMT valves – soft seals and packings
10. Retrieve BPV
11. Rig Down Wireline
12. Pipe modifications to connect NA-5 to the injection pipeline

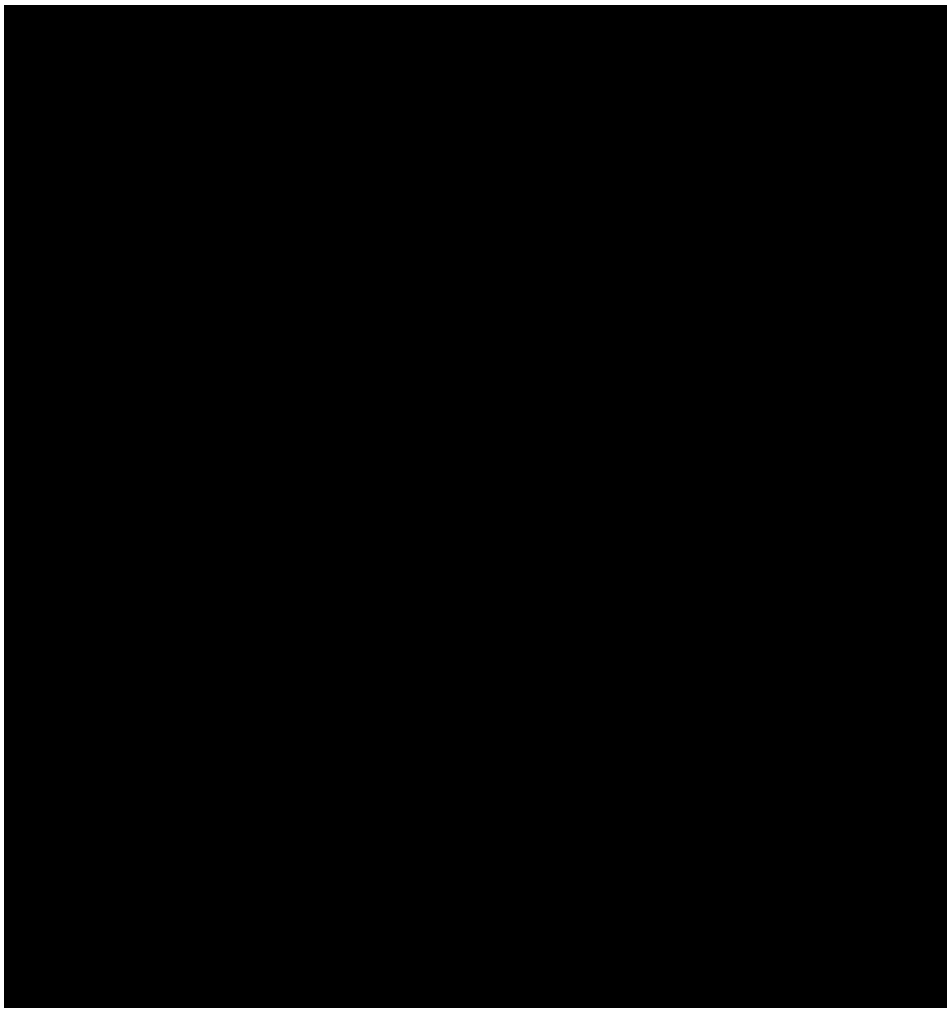

Figure 4. NA-05 Barrier design after conversion to CO_2 injection.

The composition of the injected CO_2 should not cause corrosion of the existing tubulars unless the CO_2 is mixed with water. As water is present in the reservoir, flow back of reservoir fluids should be avoided.

To mitigate flowback during injection cycles a downhole check valve will be installed as shown in the below schematics.

4 NA-5 CO_2 injection performance

CO2 injection forecast modelling has been conducted including evidence data from the injection pilot test performed in NA-5.

4.1 Pilot CO_2 injection data

A successful CO_2 pilot injection test was conducted in NA-5 in 2023 as part of the Greensand Phase 2 project.

To protect the well against corrosion risk and maintain it as a water injector after the CO_2 test with minimum well changes, the CO_2 injection was performed through a temporarily installed coiled tubing and the existing well valves (master valve and SSSV) were replaced with dummies.

The Pilot CO_2 injection operation was performed between the 11th February and the 23rd March 2023. In total, seven injection cycles were executed with a total of approximately 4,100 tons of CO_2 injected. The main objectives of the injection program were achieved, despite fewer injection cycles than originally planned.

Surface pressure, temperature and injection rates were recorded and monitored during injection cycles whereas reservoir pressure and temperature were recorded by downhole memory gauges throughout the duration of the Pilot. The downhole memory gauges were retrieved upon completion of the injection operations.

Figure 5. Injection bottom hole pressure during the water injection tests and the seven CO_2 injection cycles were kept below [redacted] bar constrained by geomechanical modelling. For more details see Ref. /2/: Pilot summary report.

Figure 6. NA-5 modelled bottom hole pressure prior, during and after the pilot test. The well injection pressures were matched to gauge data during the pilot injection. The modelled forecast predicts the reservoir pressure at the injection start of c. 200 bar, which has been used in the injection forecast modelling.

The CO_2 pilot injection data was used to constrain the Nini West numerical model and NA-5 was re-used as water injector after the CO_2 Pilot with no observation of change to injectivity.

In March 2024, the NA-5 water injection was stopped in preparation for the Greensand Project Future.

4.2 CO_2 injection forecast modelling

Modelling of the expected Project Future volumes have been performed using the history matched Nini West numerical model. The model setup is described in Ref /3/ Nini West reservoir Characterisation report submitted as part of the February 2024 application.

Based on the Project Future emitter's profile an initial NA-5 injection forecast is proposed as shown in Figure 7. The modelling shows that the emitters CO_2 supply can be accommodated with start-up injection rates of [redacted] tonnes/d corresponding to the pilot injection rates and with gradually increasing daily discharge in time, due to the expected dry-out formation around the well and the subsequent injectivity improvement. The forecasted injectivity performance was used to suggest the cargo offloading frequency, with up to 6 trips/month and injection duration of 48 hrs.

Ramp-up injection forecast					
Month *	#Trips/ offloading	Cargo load, t	Discharge time, days	Daily discharge, t/24hrs	Cumulative injection, t
1.03	1	[redacted]	2	[redacted]	[redacted]
1.04	2		2		
1.05	3		2		
1.06	4		2		
1.07	5		2		
1.08	5		2		
1.09	6		2		
1.10	6		2		
1.11	6		2		
1.12	6		2		

*batch injection start

Figure 7. NA-5 ramp-up injection forecast with daily injection rates and cargo load (table) and graphical representation of number of trips discharge time and cumulative injection volumes (graph). The actual injection plan will be based on the final emitter's supply available nearer the injection start, coupled with the logistical model of weather window constraints.

Figure 8 below illustrates the results of dynamic modelling of NA-5 injection based on the ramp-up forecast.

Figure 8: NA-5 injection forecast and modelled pressure based on the expected ramp-up CO_2 supply. The forecast entails ship offloading with 1-6 trips per month and fixed offloading duration with 2 days of injection. Maximum safe injection pressure [redacted] bar is defined from the geomechanical modelling and will be honoured through the injection scheme for the final injection plan, see Ref /3/ Reservoir Characterisation Report.

The modelling indicates an initial increase in the well injection pressure (iBHP) during the first few offloading events whereafter a slight decline in pressure is observed. The decrease is a result of a dry-out zone being established around the well which impacts the relative permeability conditions positively and improves the well injectivity over time. The forecast modelling indicates that the 2026 supply forecast can be injected with pressures below the max allowable limit of [redacted] bar. In case the injection pressure (iBHP) approaches [redacted] bars the injection rate/offload time will be adjusted to ensure not exceeding the maximum limit.

The dynamic modelling does not account for potential salt precipitation or corrosion induced injectivity decline. The actual injection scheme will furthermore be influenced by the logistics and weather conditions.

5 CO_2 Plume Migration Modelling

To illustrate the effects of including NA-5 for CO_2 injection and the following CO_2 plume migration in the reservoir two examples are shown below; A) 1 year of injection in NA-5 followed by no further injection in NA-3B, totalling [redacted] injected for storage; B) 1 year of injection in NA-5 followed by 7 years of injection in NA-3B reaching a total CO_2 injection of 2.4 Mt.

Model A mimics the plume geometry and long-term migration predicted from the Pilot injection application (although with higher injection volumes). The injected CO_2 is seen to slowly migrate up dip from the NA-05 and move along the top of the reservoir/cap rock base, as driven by the buoyancy forces, to eventually be trapped within the structural closure of the former Nini West oil accumulation. (Figure 9).

The CO_2 plume residing initially locally around NA-05 gradually dissolves in the formation brine, causing the free phase CO_2 saturations to decrease. It should be noted that the dissolution rate is an uncertain parameter as it depends on kinetic factors not handled by the applied models.

Figure 9. Model A; Top reservoir 3D view showing the local CO_2 distribution around NA-5 injection site. The long-term simulation shows the plume migration along the top of the reservoir/cap rock base, as driven by the buoyancy forces.

Model B illustrates the injection scenario with ramp-up injection in NA-5 (2026) followed by injection in NA-3B (Fig. 10). It is forecasted that the CO_2 accumulations from the two injection wells will merge after c. 5 years. Although the shape of the combined CO_2 plume after 8 years shows a slightly irregular boundary in the NA-5 area the modelling does not indicate any CO_2 migration towards the spill point to the Nolde structure. Long term simulation (+100 years) illustrates the free CO_2 residing within the former Nini West oil trap.

At this time, the distribution of the free CO_2 from the combined NA-5/NA-3B injection scenario is almost identical to CO_2 distribution from utilising NA-3B alone.

Figure 10. Model B; Top reservoir 3D view showing the CO_2 distribution with ramp up injection in NA-5 followed by injection in NA-3B. The simulation shows the merge of the two CO_2 plumes and the long-term plume migration.

A set of maps below (Fig. 11) illustrate average CO_2 saturation after 1 year of injection and after the injection end: 8, 20 and 100 years for NA-5 and NA-3B pair (Model B, left) as compared to the injection scenario with NA-3B only (right).

Figure 10. Depth structure maps (2D) showing injection from model B; NA-5 injection followed by NA-3B injection (left) – average CO_2 saturations in 2D plane, in comparison with NA-3B injection only (right) - Ref /3/ Reservoir Characterisation Report. Black lines illustrate 2D seismic survey design for plume conformance monitoring.

6 Environmental impact assessment

NA-5 injection activities have been assessed by Rambøll in relation to the Project Future EIA. The impacts from changing the injection well from NA-3B to NA-5 have been identified and assessed following a similar method as in the submitted the EIA. Each potential impact is assessed to determine if they are covered by the overall EIA conclusions.

The changes to the project activities of Project Greensand Future have been assessed to cause only negligible consequences to the environment. The limited additional emissions during the construction phase and few extra parts required for wireline work and pipe modifications do not have significant impacts. The proposed changes will not result in additional discharges to the sea.

Overall, the changes in the project activities of Project Greensand Future do not change the conclusions of the existing EIA, which remain valid.

For more details see Ref. /4/: Assessment of environmental impact from changing the NA-5 Well from CO_2 Monitor to CO_2 injector, Greensand Project Future. Rambøll.

7 Conclusions

The NA-5 well can be prepared for CO_2 injection with additional well intervention activities.

Modelling indicates that:

- the expected ramp up CO_2 profile can be injected in NA-5 within the reservoir pressure constraint of max [redacted] bar.
- the CO_2 plume will be located deeper in the reservoir short-term, compared to the original plan with only NA-3B injection. Long-term there is only a small difference in the plume migration distribution.

Changing the NA-5 to an injector does not change the conclusions of the existing Project Future EIA, which remain valid.

8 References

Ref. /1/: NA-5 well description report (C081-INEO-Z-RA-0009)

Ref. /2/: Pilot summary report (C081-INEO-A-RA-0006)

Ref. /3/: Reservoir Characterisation Nini West (C081-INEO-X-RA-0001)

Ref. /4/: Assessment of environmental impact from changing the NA-5 Well from CO_2 Monitor to CO_2 injector, Greensand Project Future. Rambøll. (C081-INEO-S-RA-0014)

Ref. /5/: Storage Development Plan, Nini West Storage Complex. (C081-INEO-Z-RA-0001)

N.b. This document was translated through the use of AI.

Energistyrelsen

Appendix 3

National hearing

Kontor/afdeling
CCS

Dato
21. maj 2025

J nr. 2024 - 1977

/WLMGA

Content

Hearing responses

Below is an account of the national consultation responses for the CO_2 storage project Greensand Future in the Nini West field in the North Sea.

Energistyrelsen

Carsten Niebuhrs Gade 43
1577 København V

T: +45 3392 6700
E: ens@ens.dk

www.ens.dk

Ocean Institute (OI) (DK: Tænketanken Hav)

The table below contains comments from the consultation response received, along with corresponding remarks from INEOS Oil & Gas Denmark and the Danish Energy Agency.

No.	Hearing response	Svar INEOS Oil & Gas Denmark	Svar Energistyrelsen
1	OI notes that CO_2 storage beneath the seabed is a new technology and that a precautionary approach should therefore be applied, ensuring that gaps in knowledge and uncertainty benefit the marine environment.	The technology and concept have been proven and tested, including through the Greensand pilot project operated by INEOS, which in early 2023 permanently stored CO_2 in the same reservoir used for the Greensand Future project. The operational experience gained from the pilot project will form the basis for the Greensand Future project. Reference is also made to the Sleipner and Snøhvit projects in Norway, which have stored CO_2 beneath the seabed since 1996 and 1998, respectively. The storage and monitoring principles are the same as those followed in the Greensand Future project.	The Danish Energy Agency acknowledges comment of the OI and has reviewed the application material with the aim of ensuring that all reasonable scientific doubt benefits the marine environment.
2	OI believes that the environmental assessment should apply an environmental risk assessment approach, in which risk is evaluated based on impact and likelihood.	Probability has been incorporated into the overall assessment of impacts on receptors. For example, if effects are assessed as significant, this is also because they are considered likely to occur. This interpretation of probability aligns with our understanding of Executive Order No. 4 of 3 January 2023. It is not always possible to apply a mathematical aggregation method for the overall assessment of effects. This is due to the differing nature of the receptors, the impacts, and the associated legal requirements. Therefore, a professional judgment is still required to delineate the parameters and determine the overall significance of an impact on a receptor.	The Danish Energy Agency agrees with OI's comments and has applied this approach in its own independent assessment of the project's environmental impact.

3	OI believes that a monitoring period of 20 years is too short and that monitoring should be carried out more frequently than every two years.	The monitoring period is in accordance with EU Directive 2009/31/EC (and the associated guidance documents) on the geological storage of carbon dioxide. The monitoring frequency is determined based on the evaluation and analysis of current monitoring data and will be adjusted if there is a technical basis for doing so.	When the operational phase ends (expected eight years after the first injection), the storage site must be closed with approval from the Danish Energy Agency, and a post-closure plan must be prepared. This plan includes, among other things, monitoring activities up until the transfer of responsibility to the state. Responsibility is transferred to the state after at least 20 years. Upon transfer, the license holder must cover the monitoring costs for the subsequent 30 years.
4	OI acknowledges that the treatment of cumulative effects is in accordance with the regulations. However, they believe that all pressure factors should be included – not only those arising from projects and plans.	The treatment of cumulative effects is in accordance with the applicable regulatory framework.	The Danish Energy Agency notes that the treatment of cumulative effects has been carried out appropriately but acknowledges that all pressure factors are relevant in an analysis of potential environmental impacts. Based on the Agency's independent assessment, the Danish Energy Agency does not expect the project, in combination with other activities, to result in significant cumulative impacts.
5	OI notes that there is a conflation of benthic fauna and microorganisms in the environmental impact report.	Since the bacteria live in the seabed, it was considered most appropriate to present the results in connection with the description of the benthic fauna theme.	The Danish Energy Agency agrees that benthic fauna and microorganisms are very different groups but does not consider the report's presentation of these to affect the Agency's decision.

Fossil Free Future (FFF) (DK: Fossilfri Fremtid)

The table below contains key comments from the consultation response received, along with corresponding remarks from INEOS Oil & Gas Denmark and the Danish Energy Agency's comments.

Nr.	Bemærkning	Svar INEOS Oil & Gas Denmark	Svar Energistyrelsen
1	FFF generally misses a more detailed CO_2 accounting that, among other things, includes energy consumption for transport and compression, as well as INEOS's own emissions (Scope 1, 2 and 3 emissions).	A Life Cycle Assessment has been carried out for the project, showing that it is expected that 92–95% of the captured CO_2 will be delivered to the permanent CO_2 storage site. This figure is calculated for the full value chain from capture, liquefaction, transport and storage, and is presented both on the Greensand Future website[1] and in the Innovation Fund's description of the project[2].	The Danish Energy Agency has nothing to add to INEOS' response.
2	FFF is missing a clear account of the risks associated with CO_2 migration in sediments, as well as migration between reservoirs (including possible impacts on the marine ecosystem).	The risk of CO_2 leakage to the marine ecosystem via migration in sediments has been evaluated in cooperation with RiskTec, TÜV Rheinland. RiskTec assesses that leakage through the overlying sedimentary units ("diffusion/vertical migration through the caprock") would have a negative but temporary impact on the marine environment, and also considers this scenario unlikely given the geological conditions around Nini West. RiskTec's evaluation states the following: ***"Consequence C2**: Small (but detectable) single point-source CO_2 leaks reaching the seabed via geological pathways result in an increased concentration of CO_2 in the seawater, which has a negative but temporary effect on the immediate marine environment.* ***Frequency F0**: <10-5 per year. Physically possible and credible, but extremely unlikely."* Leakage is furthermore noted in EU Directive 2009/31/EC (and associated guidance documents) as being defined as CO_2 migration out of the defined "storage complex", which for the project comprises the Frigg reservoir unit and the overlying sealing sedimentary units (approximately 900 m thick). The risk of CO_2 migration in the overlying sealing sedimentary units is furthermore described and assessed as unlikely by GEUS.	In addition to INEOS's response, the Danish Energy Agency notes that, in the event of significant irregularities, the Agency may require additional monitoring. Furthermore, the Danish Energy Agency notes that migration of CO_2 between reservoirs has been assessed through modelling of internal leakage within the seal, from Nini-4/4A into Lark. At the same time, the primary seal in the project area has low permeability and a high sealing capacity, and the likelihood of CO_2 migrating to the seabed is therefore low.

[1] https://greensandfuture.com/next-chapter
[2] https://ec.europa.eu/assets/cinea/project_fiches/innovation_fund/101191033.pdf

		The study was published in the international peer-reviewed Journal *International Journal of Greenhouse Gas Control.* *Petersen, H. I., Springer, N., Weibel, R., Schovsbo, N. H., 2022. Sealing capability of the Eocene – Miocene Horda and Lark formations of the Nini West depleted oil.*	
3	FFF also raises a concern about the lack of projection of extreme weather impacts in the environmental assessment, emphasizing that the influence of weather conditions on offloading capabilities should be better addressed, referencing experiences from the pilot project. This aspect should be considered in evaluating the expected CO_2 storage and the project's potential benefits.	There have been thorough analyses and calculations of significant amounts of existing weather data from the area where Greensand Future will take place. Based on these analyses and calculations, it is clear that the weather windows available for CO_2 injection represent 125% of the number of weather windows necessary to inject the planned annual CO_2 volume. During the pilot, fewer trips were made than originally planned. The reasons for this are not relevant to Greensand Future and therefore were not included in the assessment of weather windows: during the pilot, a drilling rig was used as the host for the offloading system, and delays in rig arrival as well as operational limitations on the rig's crane related to wind caused the total injected volume to be less than planned.	The Danish Energy Agency has nothing to add to INEOS' response.
4	FFF misses a no-action alternative that includes the positive effects of removing the large platforms and leaving the area undisturbed.	By implementing Greensand Future, a net storage of between 276,000 and 285,000 tons of CO_2 per year is expected over the project's lifetime, which would otherwise be emitted if the project is not carried out (according to the project's Life Cycle Assessment). If the project is not carried out, the corresponding negative CO_2 emissions, which are significant for achieving Denmark's climate goals, will not be realized. Moreover, the related oil extraction infrastructure in the area is expected to be decommissioned and removed within a shorter timeframe if the project does not proceed, leading to environmental consequences. Removal means that the infrastructure will no longer be available for reuse in future CCS projects, and a subsequent lifting of the fishery ban could expose the area to future overtrawling.	The Danish Energy Agency notes—in addition to INEOS' response—that there are indications offshore platforms can, over time, develop into habitats with high relative species richness[3]. It therefore cannot be excluded that removing the platform may have a negative impact.
5	FFF believes that the evaluation period of 20 years is too short to conclude on the continued integrity of the storage and that it should be extended.	The monitoring period is in accordance with EU Directive 2009/31/EC (and its associated guidance documents) concerning the geological storage of carbon dioxide.	When the operational phase ends (expected 8 years after the first injection), the storage site must be closed with approval from the Danish Energy Agency, and a post-closure plan must be prepared. This plan must include,

[3] Ibanez-Erquiaga, B., Baktoft, H., Mildenberger, T. K., Teilmann, J., Kleivane, L., Kornau, L. M., Agersted, M. D., Hüllert, S. M., & Svendsen, J. C. (2025). Increased fish abundance, biodiversity, and body size near a North Sea oil and gas platform. Marine Environmental Research, 204, Article 106959.

			among other things, monitoring until responsibility is transferred to the state. Responsibility transfers to the state after a minimum of 20 years. Upon transfer, the license holder must cover the following 30 years of monitoring costs.
6	FFF believes that the entire Nini facility must undergo environmental assessment if the facility is to be lawful, as the project must be considered a "suitable first occasion," according to the Kammeradvokaten report from 2024.		The Danish Energy Agency agrees that an environmental assessment of the historical activities, including the installation of existing wells and the platform at Nini West, remains outstanding and notes that these activities are addressed in the environmental impact assessment report. The Danish Energy Agency will handle this environmental assessment at an appropriate forthcoming occasion.

The Danish Emergency Management Agency (DEMA) (DK Beredsskabsstyrelsen)

The Danish Emergency Management Agency requested in their consultation response a navigation risk analysis and reporting of planned construction work to the Danish Maritime Authority's Notices to Mariners (Efterretning for Søfarende).

WWF Wildlife Fund

WWF agrees with the comments from the Ocean Institute.

Agency for Green Transition and Aquatic Environment (DK: Styrelsen for grøn arealomlægning og vandmiljø)

The Agency for Green Transition and Aquatic Environment notes that they do not provide comments on consultations regarding activities at sea.

Other consultation responses

The Danish Safety Technology Authority, the Danish Agricultural and Fisheries Agency, the Danish Geodata Agency, the Danish Maritime Authority, the Danish Patient Safety Authority, and the Danish Competition and Consumer Authority have all indicated that they have no comments on the consultation.

Energistyrelsen

Attached consultation responses

Consultation responses from the Ocean Institute and Fossil Free Future are presented below

Energistyrelsen
Carsten Niebuhrs Gade 43
1577 København
ens@ens.dk
trskk@ens.dk

Fossilfri Fremtid
c/o Klimabevægelsen
Bragesgade 8B
2200 København

Kontaktperson:
Lasse Nyholm Jensen
Tlf: 31450145
Mail: lanyje@gmail.com

28. marts 2025

Høringssvar vedr. Miljøkonsekvensrapport for CO_2-lagringsprojektet Greensand Future i Nini Vest-feltet i Nordsøen

Generelle bemærkninger

De hidtidige internationale erfaringer med CO_2-fangst giver ikke anledning til at tro, at der vil ske den store opskalering i løbet af de kommende 10 år, som kan gøre det økonomisk attraktivt eller klimamæssigt meningsfuldt at komprimere og transportere CO_2 over store afstande og lagre den i undergrunden.

Institute for Energy Economics and Financial Analysis (IEEFA) skriver: "Selv hvis CCS realiseres med sit fulde annoncerede potentiale, vil det kun stå for omkring 2,4 % af verdens kulstofreduktion i 2030, ifølge FN's klimapanel (IPCC). Det er værd at bemærke, at ikke et eneste CCS-projekt nogensinde har nået sin mål for CO2-fangst."

Fossilfri Fremtid betragter derfor CCS som greenwashing med henblik på at kunne fortsætte med at afbrænde fossile brændsler og biobrændstoffer i modsætning til anbefalinger fra IPCC. CCS-teknologien vil lede investeringerne væk fra et energisystem baseret på energibesparelser, energieffektivitet og vedvarende energi.

CCS-projektet, Greensand Future, vil i sig selv være meget energikrævende at gennemføre og vil knap nok kunne bidrage med at fjerne den CO_2, projektet selv genererer.

Energiregnskab og klimaeffektivitet

Driften af et CCS-system er meget energikrævende. Når udledningerne fra de forskellige CCS-aktiviteter medregnes, betyder det, at kun 70-75 % af CO_2-udledningerne undgås.

I Fossilfri Fremtid savner vi energiregnskab til *transport* af CO_2 fra produktion til recipient samt energiforbrug til *kompression*.

Vi savner også en sammenligning mellem injiceret CO_2 og operatøren INEOS' egne udledninger i DK i scope1:

Fra Siri-platformen ("hub" for behandling af olie fra Siri-, Cecilie- og Nini-felterne (Nini V er det, der skal bruges til CCS i Greensand-projektet)) - årligt ca. 75-85.000 ton CO_2

Fra Syd Arne-platformen ("hub" for behandling af olie og gas fra Syd Arne-, Solsort- og måske på sigt Hejre-felterne) - årligt ca. 165-180.000 ton CO_2

(INEOS er desuden kun 40 % ejer af Greensand Future, så de overskrider langt deres egen del af den lagrede CO_2).

Scope3-udledninger fra den producerede olie er pt. i omegnen af 2,2 mio. ton CO_2 pr. år, og med åbning af Hejrefeltet stiger det til ca. 7 mio CO_2 pr år. For at få et retvisende billede for CO_2-balancen burde en sammenligning mellem injiceret CO_2 og udledningerne fra den olie, der er hentet op af felterne, synliggøres i regnskabet, særligt da Greensand Future jo er det første projekt, og da INEOS fortsat åbner nye oliefelter sideløbende med deres CCS-indsats.

Endvidere må anføres at konceptet ikke er skalerbart - en evt. opskalering vil kræve brug af et andet reservoir, flere skibe, flere off-loading-anlæg, flere overvågningsbrønde mv. og anvendelse af flere materielle ressourcer.

Prognoserne skød over målet

Greensand Future forventes at injicere ***300.000 t/år*** i undergrunden ***i 8 år*** fra 2026 (eller med start i december 2025) https://eudp.dk/projekter/project-greensand-fase-2

Til sammenligning var planen oprindeligt at lagre ***1,5 mio. t/år*** fra 2025.

På trods af de stærkt reducerede ambitioner taler man stadig om at ville lagre ***8 mio. t/år*** i 2030, hvilket synes aldeles uopnåeligt.

I pilot-projektet var planen ***15.000 ton***, men det lykkedes dog kun at injicere ca. 4.000 ton

Ift. Kammeradvokatens rapport om fejlfyldt VVM-praksis på Nordsø-platformene:
Siri-, Cecilie- og Nini-felternes VVM-rapporter er alle godkendt på ufuldstændigt grundlag. Dette bemærkes ikke i Miljøkensekvensrapporten for Greensand Future fra januar 2025, selvom projektet gør brug af eksisterende installationer, som er godkendt på fejlfyldt grundlag.

I forbindelse med Kammeradvokatens rapport fra september 2024 blev det ellers slået fast, at eksisterende installationer ved en "*passende førstkommende lejlighed*" skal miljøvurderes med henblik på en retlig lovliggørelse af forholdene.

Greensand Futures anvendelse af Nini-installationerne må vel anses som en sådan "førstkommende lejlighed", hvilket betyder at hele Nini-anlægget skal miljøvurderes i denne forbindelse, og ikke blot de dele af Nini-anlæggene, som skal ændres i forbindelse med eller anvendes til brug for CCS-projektet.

Risiko for lækage

Stål

Der er praktisk taget ingen oplysninger vedr. det stål, der anvendes i Nini, hverken af ressourceforbruget (3.2.7) eller af kvaliteten af ståltyperne. Der er ingen information vedr. stålets udsættelse for korrosion eller læk, som det skete i 2024 i Decatur, USA, hvor 8.000 t flydende CO_2 slap ud.

"CO_2 kan ikke anbringes sikkert i undergrunden, hverken til langtidsopbevaring eller forbedret olieudvinding," sagde Carolyn Raffensperger, administrerende direktør for Science & Environmental Health Network, i et interview i december 2024. "Alle de planer rundt om i verden, der hævder, at CO2 vil blive liggende dybt under jordens overflade, skal revurderes."

Af tabel 24-2 på side 333 i Miljøkonsekvensrapporten fremgår det, at de fleste større ulykker vil resultere i store skader på internationalt niveau. Der bør derfor under alle omstændigheder foretages en international høring.

Sediment

Vi savner fuldstændige oplysninger om CO_2, der migrerer i sediment og dets indflydelse på det marine økosystem.

Seismicitet

Nedpumpning under tryk kan udløse små jordskælv, hvilket er set ofte i områder med fracking i skifergas.

Det er dybt problematisk, at "Teknologien til overvågning af seismicitet til havs er under udvikling, og de eksisterende planer og udstyr kan blive ændret i forbindelse med den løbende udvikling." (Miljøkonsekvensrapporten s. 12). Det er derfor umuligt at estimere miljøkonsekvenserne. Man burde vente med at iværksætte projektet indtil dette aspekt er helt blotlagt.

Det norske Sleipner-felt er det bedst undersøgte CO_2-lager mht. geologi. Alligevel forekom der uventede bevægelser af den injicerede CO_2, som bevægede sig opad forbi otte lag, der forventedes at tilbageholde CO_2'en. Det var først et niende lag, som ikke var identificeret på forhånd, der reelt tilbageholdt CO_2'en.

Vi har jo set, hvor galt det gik med vurdering af pesticiders migration pga. sprækker i ler. Denne katastrofe bør man ikke gentage.

Klimaforandringer, voldsomt vejr og bølger:
Alle platforme i Nordsøen er bygget til at kunne modstå bølger op til 18 meter. Transportskibet og offloading-systemet må forventes at være funktionelt op til bølgehøjder på 3-5 meter, hvilket har betydning for hvor mange af de max 130 injicerings-cyklusser, der rent faktisk kan foretages.

I pilot-projektet (s. 44) var planen at sejle 10-14 gange, men man nåede kun 7 gange pga. vejret og tekniske problemer, og for 4 ud af de 7 injiceringer måtte man slutte for tidligt eller sætte injiceringen på pause pga. vejret. Disse erfaringer medtages ikke i rapporten.

Fossilfri Fremtid savner i Miljøkonsekvensrapporten en fremskrivning af hvor mange dage om året, bølgerne er så høje, at offloading-systemet ikke fungerer. Eksisterende data vil kunne give et mere realistisk bud på, hvor meget CO_2 der kan offloades på et år end det optimistiske max-estimat, man synes at basere sig på pt.

Det er et simpelt regnestykke: Jo mere CO_2, der udledes til atmosfæren - fx fra INEOS-produceret olie fra DK-Nordsø - desto flere dage får vi så høje bølger, at CO_2-offloading-konceptet ikke virker.

I Miljøkonsekvensrapporten finder Fossilfri Fremtid fremskrivningerne alt for optimistiske:

Vi savner en realistisk fremskrivning af voldsomt vejr i relation til alle aspekter vedr. miljøpåvirkning, herunder transport, sedimentmigration, fauna og ikke mindst ved ulykker, herunder lækage.

Faunapåvirkning

Fossilfri Fremtid mener, at faunapåvirkningen i Miljøkonsekvensrapporten er underestimeret. Vi savner, at rapporten relaterer sig til Natura2000-basisanalyse 2022-2027

Det sydlige Nordsøområde ligger Natura2000-felt nr. 246 og Habitatsområde nr. 255 – ca. 150 km fra Ninifeltet. Mange fuglearter trækker til og yngler i N246 og H255. Hvad vil voldsomt vejr betyde for dem, hvis der sker en lækage, og deres områder oversvømmes og forsures i yngleperioderne?

I Miljøkonsekvensrapporten s. 26 står der: "I løbet af den 5-10 dages seismiske kampagne kan adfærdsmæssige reaktioner forekomme op til 6,1 km for marsvin og 28,9 km for sæler." Det betyder, at bilag-IV-arten, marsvin, vil blive påvirket på et område på 116,9 km^2 og sæler på et område på 2.624 km^2, svarende til 6 % af Danmarks landareal.

Der er generelt et stort fokus på, at dyr forventes at undgå området, hvorfor "der ikke forventes en direkte påvirkning" – men det er jo i sig selv en påvirkning af dyrenes levevilkår, at der i en periode er et område, dyrene ikke kan leve i.

Ophvirvlet sediment vil forstyrre havpattedyrenes sonarsystem og det kan lægge sig på gællerne af fisk og andre vandlevende dyr, heraf nogle truede eller sjældne arter, med fatale følger.

Evalueringsperioden:
En 20-årig evalueringsperiode efter 8 års injektion for at vise at CO_2'en er lagret "for evigt" synes noget kort. Man kunne f.eks. forestille sig dårligt forseglede borehuller og sprækker over tid.

Samfundsøkonomiske overvejelser:

Hvis INEOS får statsstøtte pr. ton CO_2 de formår at pumpe ned i undergrunden, og de lykkes med at få omkostningerne under dette niveau, vil de generere et overskud, som ikke nødvendigvis går til at udvikle CCS, men som lige så vel kan gå til at udvikle olie-/gasprojekter. Statsstøtten kan altså mere eller mindre direkte/indirekte gå til øget olie-/gas-produktion. Det finder vi ikke rimeligt al den stund, INEOS fortsat udvikler og åbner nye oliefelter sideløbende med deres CCS-projekter.

Lageransvar:

Fossilfri Fremtid mener, at operatøren af CO_2-lageret skal pålægges det fulde ansvar for lageret og hensætte økonomiske midler for - i tilfælde af blowout - at kunne kompensere for udslippet ved hurtig anvendelse af sikre reduktionsteknologier. Følges de nuværende regler, slipper operatøren, og byrderne knyttet til lagrene bliver i praksis efterladt til kommende generationer. Det er ikke ansvarligt.

Nul-alternativ

Beskrivelsen af nul-alternativet virker ikke udtømmende, da den samlede påvirkning på miljøet må antages at være større, hvis anlæg beholdes i vandet i længere tid. Det må antages, at livet omkring Nini-A vil genetablere sig, når platformen fjernes, og at en mængde kulstof vil blive bundet i dette liv.

Dette nul-alternativ bør overvejes, særligt hvis fiskeforbud i området fastholdes således, at livet omkring Nini-A ikke forstyrres.

Alt i alt mener vi i Fossilfri Fremtid at:

- Miljøkonsekvensrapporten bør sendes i international høring, da konsekvenserne ved fx et blowout el.lign. er internationale/grænseoverskridende
- At der bør redegøres tydeligere for risikoen for migration i sedimenter samt risikoen for migration mellem reservoirer, fx fra Nini Vest til Nini Main
- At INEOS ikke bør få statsstøtte til deres CCS-projekter så længe de udvider olieproduktionen, da statsstøtten så indirekte går til fortsat olieudvinding
- At der bør redegøres mere nøjagtigt for mængden af CO_2 der forventes lagret, når der tages højde for vejrets indflydelse på offloading-mulighederne
- At et mere realistisk estimat (justeret for aflyste injiceringscyklusser på grund af vejrlig eller tekniske problemer) inddrages i vurderingen af projektets potentielt gavnlige effekter, fremfor det mest optimistiske estimat
- At der inddrages et mere nuanceret nul-alternativ, som inddrager de positive effekter af at pille platformene ned og lade naturen i fred i området
- At det kommunikeres tydeligt til befolkningen at risiciene for uønskede konsekvenser ved projektet aldrig er nul
- At evalueringsperioden bør forlænges

TÆNKE TANKEN Hav

Energistyrelsen

Carsten Niebuhrs Gade 43

1577 København V

13. marts 2025

Vedrørende offentlig høring af miljøkonsekvensrapport for CO_2-lagring i Nini West reservoir i Nordsøen – Projekt Greensand Future

Tænketanken Hav takker for muligheden for at komme med bemærkninger til denne miljøkonsekvensrapport.

Tænketanken Hav bemærker først og fremmest at lagring af CO_2 under havbunden er en ny teknologi hvor der i høj grad mangler viden om og erfaringer med eventuelle miljøproblemer der kan opstå i forbindelse med alle faser af projektet: anlæg, driftsfase, dekommissionering men også den permanente lagring som rækker ud over selve driftsfasen med efterfølgende dekommissionering.

Ikke mindst af den grund bør der ved CO_2-lagring under havbunden anlægges et forsigtighedsprincip som enkelt udtrykt tilsiger at manglende viden og usikkerhed med hensyn til effekter og påvirkninger bør komme havmiljøet til gode. Desuden mener Tænketanken Hav at der ved vurdering af effekter på miljøet bør anvendes en egentlig miljørisikovurderings-tilgang, hvor såvel konsekvenser (effekter) som sandsynlighed for at noget indtræffer inddrages. I sin enkleste form kan man sige at risiko = effekt * sandsynlighed, og vurderingen af konsekvenser på miljøet bør ske som en vurdering af risikoen.

Tænketanken Hav mener at man kan identificere følgende elementer med hver deres sandsynlighed for effekter, hver sin konsekvens og dermed hver sin risiko:

Etablering, driftsfase og dekommissionering: I disse faser vil der forekomme støj, vibrationer og udslip af forskellige kemikalier, ikke ulig hvad der er kendt i forbindelse med offshore olie- og gasudvinding og andre typer af anlægsaktiviteter på havet. Sandsynligheden for at dette indtræffer er endog meget høj, til gengæld er konsekvenserne for miljøet kendte og relativt begrænsede.

"Sivning" af CO_2 fra det etablerede anlæg. Sandsynligheden for dette kan formentlig anses for lille men dog eksisterende. Konsekvenser for det marine miljø kan derimod blive betydelige hvis situationen indtræffer.

Stor-skala abrupt udslip af CO_2 fra lageret. Sandsynligheden for at dette indtræffer er meget lille, til gengæld ville det få endog meget store miljømæssige konsekvenser hvis det skete.

Tænketanken Hav
Læderstræde 20
1201 København K
Tlf: +45 4498 800
E-mail: info@tænketankenhav.dk
www.taenketankenhav.dk
CVR: 42479446
- Støttet af VELUX FONDEN

Tænketanken Hav noterer sig desuden at det planlægges at overvåge evt. udsivning fra lageret i en periode på 20 år. Det er en meget kort periode, set i betragtning af at oplagringen forventes at være af permanent karakter og at teknologien er ny og uprøvet. Netop på meget langt sigt kan seismisk aktivitet betyde betydelige lækager fra lagere, og eventuelt decideret tab af lagerets integritet. Overvågningen bør være af samme permanente karakter som lageret, og bør også gennemføres hyppigere end hvert andet år, som der lægges op til.

Med hensyn til vurderingen af kumulative effekter noterer Tænketanken Hav at der kun inddrages effekter af andre (anlægs)projekter. Dette er i overensstemmelse med retningslinjer for VVM-redegørelser, men vurderingen af kumulative effekter bør reelt omfatte effekter af alle presfaktorer, i denne sammenhæng fx også forurening (miljøfarlige stoffer såvel som næringsstoffer), fiskeri, sejlads etc.

Af mere specifikke forhold synes der at være sket en uheldig sammenblanding af bentisk fauna og mikroorganismer når det gælder biodiversitet, da disse to meget forskellige organismegrupper behandles under et.

Tænketanken Hav står til rådighed en uddybning af ovenstående om det måtte ønskes.

Med venlig hilsen,

Søren Laurentius Nielsen

Chefbiolog

- Støttet af VELUX FONDEN

N.b. This document was translated through the use of AI.

Energistyrelsen

Appendix 4

Espoo hearing

Kontor/afdeling
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/WLMGA

This document contains hearing responses from Sweden, Norway and the Netherlands as well as the Danish Energy Agency's response to the individual remarks.

Content

Energistyrelsen

Carsten Niebuhrs Gade 43
1577 København V

Niels Bohrs Vej 8
6700 Esbjerg

T: +45 3392 6700
E: ens@ens.dk

www.ens.dk

Energistyrelsen

Kontor/afdeling
CCS

Dato
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/trskk

Response to consultation comments on the Environmental Impact Assessment (EIA) for the Greensand Future project

The Danish Energy Agency hereby acknowledges receipt of the consultation response from the Swedish Meteorological and Hydrological Institute (SMHI) regarding the EIA for the CO_2 storage project, Greensand Future. In cooperation with the applicant, the Energy Agency has responded to SMHI's comments and hopes that SMHI finds its concerns adeq uately addressed.

SMHI points out that the EIA lacks sufficient consideration of the issue of ocean acidification and requests clarification of the consequences of various types of CO_2 releases—for both pelagic and benthic organisms, as well as for the ecosystem as a whole.

The Energy Agency has submitted the consultation response to INEOS, which notes that a CO_2 blowout is considered an unintended event, as unlikely as an oil spill. A brief elaboration on the model results presented in the EIA: Figures 13-9 and 13-10 represent statistical minimum pH values, meaning they illustrate the lowest pH values recorded during a 14-day simulation period, which therefore do not occur simultaneously. The average pH values in Figure 13-11, however, represent the cumulative average impact, showing a zone around the blowout of approx imately 40 meters in diameter with an average pH value below 7.5, indicating that the impact area is very limited both horizontally and vertically (see Figure 13-10). R eference is also made to a minimal impact zone from the leakage scenario (Figure 13-15).

The affected area in seawater is therefore limited, as the buffering capacity is high, and the effect of increased H ion concentration will rapidly diminish, as illustrated by the modeling. The natural pH value will q uickly re-establish once the blowout is under control. It is worth noting that the duration of blowouts is most likely a short-term event (approx imately 15 days).

Section 13.2 describes how the environment may be affected by a CO_2 release (and the corresponding pH change). The pH reduction in the water phase during a blowout primarily occurs near the sea surface and is therefore not critical to the seabed environment. It is concluded that the described CO_2 release would not be critical for benthic fauna. Furthermore, impacts higher up the food chain (fish and marine mammals) are not expected.

The Danish Energy Agency notes that it agrees with INEOS's assessment of the impact from a CO_2 blowout. The Agency further assesses that the likelihood of a blowout is very low and considers that the risk of a significant environmental impact is low, due to the established systems such as blowout preventers and the ex isting emergency preparedness for unintended incidents in the North Sea.

Energistyrelsen

Carsten Niebuhrs Gade 43
1577 København V

Niels Bohrs Vej 8
6700 Esbjerg

T: +45 3392 6700
E: ens@ens.dk

www.ens.dk

SMHI points out that it is problematic to use the pH measurements from the two coastal DEPA stations referred to in the environmental impact report, because:

1. **There is no information about the laboratory temperatures applicable during the pH measurements.**
2. **The samples are of the "composite sample" type, and are therefore difficult to compare with the actual conditions in the sea.**
3. **The pH measurements are partly from before the 1990s, which in itself is considered problematic due to the great uncertainty associated with pH sensors from that time.**
4. **Coastal processes may result in greater local variation in pH than the conditions currently prevailing closer to the project area.**

INEOS notes in response to the above points that the pH measurements carried out by NOVANA comply with a range of quality requirements, including the use of technical guidelines to ensure samples are taken in a standardized manner, quality assurance of results, intercalibration of sampling and field methods, etc. Further technical guidelines can be found on the websites of the subject data centers, as well as data technical guidelines available on the Danish Environmental Protection Agency's website (www.mst.dk/overvaagning), where links to the subject data centers' websites can also be found.

Due to the locations of the NOVANA stations, another reference has also been included in the report to support the conclusion: "In the surface waters of the North Sea, pH values range between 7.7 and 8.6, with a typical value of 8.1 (Bolding et al. 2016)."

The background pH values are not part of the field investigations and analyses conducted in connection with the report, since the exact background level is of limited relevance for the performed modelling and related assessments. The purpose of Sections 13.2 and 13.3 of the report is instead to illustrate possible resulting changes in pH in the marine area close to the discharge points. The exact background values will vary over time and have no bearing on the conclusions of the conducted assessments, as summarized on page 1.

SMHI subsequently recommends that all questions concerning CO_2 discharges (including modelled pH in Chapter 13 of the environmental impact report) should be based on a more well-documented pH variation in the open sea areas of the North Sea, within the range of about 8.0–8.2.

See previous response. INEOS further notes that this is assessed not to have any bearing on the conclusions of the assessments carried out in the environmental impact report, as previously summarized (pages 1 and 2).

SMHI suggests including figures showing deviations in pH from initial conditions so that signs of acidification become more evident, and proposes that additional pH levels be included in Figures 13-9 and 13-10 of the environmental impact report, since many marine organisms are sensitive to pH values well above the indicated levels.

INEOS comments that it is not considered that adding further figures would affect the conclusions, namely that pH values are only reduced in the immediate vicinity of the well.

SMHI assesses that all figures showing statistical minimum pH values in the range 7.5 < pH < 8 indicate ongoing acidification and therefore lack a more detailed description of how changes in pH may affect marine organisms in the area.

A more detailed explanation of the figures is provided on page 1, including why the distribution of the shown statistical minimum values does not represent a simultaneous impact on areas and volumes.

SMHI finds that Figures 13-11, 13-15, and 13-17 in the environmental impact report do not specify which initial pH values were applied in the model (the pH values prevailing before the start of the discharge).

INEOS notes that the model uses a background pH value of 8.0, but does not operate with a fixed background. pH is continuously calculated in the model based on alkalinity, dissolved inorganic carbon, temperature, etc., which is why the value is 8.0 under standard conditions but changes thereafter depending on the modeled physico-chemical conditions. The purpose of the modelling is to show possible resulting changes in pH in the marine area caused by CO_2 discharge. The exact background values will vary over time and have no bearing on the conclusions of the assessments performed.

SMHI points out that different life stages of marine organisms may be sensitive to different pH values and emphasizes that there may be significant seasonal variation in pH, which should be taken into account in the modelling.

INEOS notes that the blowout modelling is based on a scenario in which the blowout occurs during summer, as this is considered a worst-case scenario. The modelling was carried out for a calm summer period, when weather-induced effects on dispersion are minimal. The leakage modelling has likewise taken seasonal as it was carried out for both March and June to cover different metocean conditions, and no significant differences were observed between these scenarios.

Additional scenarios are not considered to alter the conclusions of the environmental impact report.

The Danish Energy Agency once again thanks you for the consultation response and hopes that the above has been sufficiently addressed. Should the above give rise to further questions, SPF is welcome to contact the Danish Energy Agency directly at ccs-miljo@ens.dk, with a copy to espoo@sgav.dk. The Danish Energy Agency would also be pleased to arrange a meeting to clarify any remaining issues.

If the Danish Energy Agency does not receive notice to the contrary by 9 May, the Espoo process will be considered concluded.

Kind regards,

Trine Skovgaard Kirkfeldt
Special Advisor, Danish Energy Agency

Energistyrelsen

Kontor/afdeling
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25-04-2025

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/trskk

Svar på bemærkninger til høring af miljøkonsekvensrapport for projekt Greensand Future

The Danish Energy Agency hereby acknowledges receipt of the consultation response from the Swedish Pelagic Federation (SPF) in connection with the public hearing on the environmental impact assessment for the CO_2 storage project Greensand Future. The Agency, in cooperation with the applicant, has responded to SPF's comments and hopes that SPF will find their remarks sufficiently addressed.

SPF finds that the environmental impact report is lacking in its assessment of how the project will affect fish stocks and thereby Swedish herring and sandeel fisheries.

The Danish Energy Agency has presented the consultation response to INEOS, which notes that the assessment of impacts on fish stocks is described in Section 11.7, while the impact on fisheries is described in Section 12.3. Any impacts are mainly expected to be associated with the establishment of, among other things, safety zones and seismic surveys. However, the impact on fisheries and fish stocks in the area is assessed to be negligible as a result of the planned activities and has therefore not been broken down to reflect potential changes in catches by individual countries.

The Danish Energy Agency notes that it agrees with the assessment that the project will have a negligible impact on fisheries, and that this impact is considered to be sufficiently described in the environmental impact report.

SPF does not consider the description of commercial fisheries to be adequate and in particular points to the absence of information on the geographical distribution of fisheries in the form of trawl marks.

INEOS notes that the description of commercial fisheries is based on existing data from OSPAR and ICES. These data present the geographical distribution of average annual fishing intensity in the area, based on vessels >12 m equipped with a vessel monitoring system (VMS), and include trawlers. During baseline surveys of the benthic fauna in the area, trawl marks were recorded (DHI and Rambøll, 2023). Data on fishing intensity have been supplemented with catch data from the Danish Fisheries Agency. In relation to the planned project activities, the data basis for describing commercial fisheries is considered sufficient to assess the overall impacts on fisheries and fish stocks.

Energistyrelsen

Carsten Niebuhrs Gade 43
1577 København V

Niels Bohrs Vej 8
6700 Esbjerg

T: +45 3392 6700
E: ens@ens.dk

www.ens.dk

SPF asks whether only Danish fisheries data have been used in the description of the fishery and fears that the volume and value of the fishery may have been underestimated.

INEOS notes that Section 11.7 of the report explains the potential impacts associated with the planned activities, stating that these impacts will mainly be of short duration or affect a very limited area, and that the overall conclusion is that impacts will be negligible and will not lead to changes in fish stocks in the area. Data on catches in the area have been obtained, and it is assessed that additional catch data would not change the overall conclusion that catches in the area will not be significantly affected.

SPF does not consider a four-year period (2015–2018) sufficient to give a representative picture of the fishery over time.

INEOS notes that fisheries in the vicinity of the project area have, among other things, been assessed on the basis of logbook datasets from the Danish Fisheries Agency, as described in Section 11.9. The logbook contains data on landings by species, weight, ICES rectangle, year, and gear type. The project area is located in ICES rectangle 42F5, but data were also obtained for the neighbouring rectangles 42F4, 42F6, 41F4, 41F5, and 41F6 for the period 2013–2022. The chosen period for catch data is considered the best available and most representative picture of recent catches in the area and is deemed sufficient for the environmental impact report in light of the planned activities and their effects on local fish stocks.

The distribution of activity from the different commercial fisheries operating in and around the survey area is based on ICES data on the geographical distribution of average annual fishing intensity (mW fishing hours) in the North Sea region for 2015–2018. Data on fishing intensity are only shown for vessel over 12 m equipped with a vessel monitoring system (VMS). Fisheries with pots and pelagic trawlers are less used in the area compared to mobile bottom trawl fishing gear (Figure 10-29).

SPF is missing a map showing the restriction areas in relation to the fishing areas.

Restriction areas associated with the installation of the pipeline will be included within the already existing restriction areas related to existing platforms (500 m radius) or pipelines (200 m on each side). Any additional permanent restriction areas are limited to the placement of monitoring equipment on the seabed near an existing shut-in well. The safety zone is expected to have a maximum radius of 200 meters, and its final position will be determined at a later stage and is therefore not mapped at this time. As described in Section 12.3.3, the impact on fisheries will thus be insignificant due to the relatively low fishing intensity in the area and the very limited exclusion zone.

The Danish Energy Agency notes that a map of the final location of the monitoring equipment and the associated safety zone can be forwarded to SPF once the location is confirmed, if SPF expresses a wish for this.

SPF lacks a more detailed explanation regarding the degradation time, dispersion, and uptake in the ecosystem of chemicals expected to be discharged during the leak test.

INEOS notes that the risk of impacts associated with discharges is described in sections 11.5 and 11.6. All chemicals added to the pressure test water are assessed according to the Oslo Paris Convention guidelines (OSPAR) applicable to the use and discharge from offshore installations, including in the North Sea. These guidelines require that individual components of the chemicals used are tested for toxicity at various trophic levels (algae, crustaceans, and fish). The toxicity tests are based on fish being exposed to effect-causing concentrations typically for 96 hours. Additionally, individual components of the chemicals have been tested and evaluated concerning biodegradability and risk of bioaccumulation. This information for each chemical will appear in the Harmonised Offshore Chemical Notification Format (HOCNF), completed according to OSPAR guidelines and verified by the Environmental Protection Agency during final chemical selection.

The assessment shows that very small amounts of fluorescent tracer chemicals are used, i.e., at a concentration of 50 ppm in the discharged pressure test water. In total, 13 m3 of water is discharged during the pressure test, corresponding to less than 1 kg of tracer substance as described in section 5.7.1. The discharge occurs over a few hours and dilutes more than 100 times over a distance of about 10 meters.

Corrosion inhibitors can be added if the hydrotest water is present in the pipeline for a longer time before actual testing starts. Corrosion inhibitors typically consist of water, an alcohol, and an active component. The latter usually accounts for 10-30% of a corrosion inhibitor. The initial concentration of the added corrosion inhibitor will be a maximum of 500 ppm, and the total discharge will be about 10 kg. Depending on the final chemical composition, effects on fish may be expected if the concentration of the active component exceeds 10-100 ppm in the receiving water. Based on the dilution described above, there is therefore a risk of toxic effect a few meters from the discharge point, but since the discharge occurs over a few hours, the risk of toxic effect is insignificant.

Two specific questions are raised:

- **Can they be taken up by the benthic fauna and further spread through the food web, including fish?**

INEOS notes that the chemicals used will contain components that are biodegradable and will not be bioaccumulative, and thus will not accumulate in the food chain. Chemicals containing components that may be carcinogenic will not be used. This will be documented in the aforementioned HOCNF document, which will be submitted to the Environmental Protection Agency in connection with the final approval for use and discharge.

- **Can this again pose a risk to people who eat the fish?**

INEOS notes that there is only a very small risk that some fish ingest the discharged chemicals. As explained above, the risk that they are exposed to a toxic effect is very small. Furthermore, there will be no real risk that people who might eat fish that have been near the discharge will ingest substances in amounts that could cause acute or chronic harm.

SPF lacks an explanation of where fish may be affected by the loss of benthic fauna as a result of the leak test.

INEOS notes that any potential risk to benthic fauna from the discharge of water during the leak test is described in section 11.6. The impact on benthic fauna has been assessed based on biological tests and information for each chemical conducted according to OSPAR guidelines. As described in that section, the impact on benthic fauna will be limited to an area a few meters from the discharge point. Therefore, there will be an insignificant impact on the food supply for any fish in the area.

SPF considers the impact of underwater noise on fish species insufficiently addressed and believes that data and knowledge about one fish species at one specific location cannot be applied to another fish species or the same species in another location. There is particular concern that the impact on herring and sandeel is not sufficiently elucidated.

INEOS notes that the impact of underwater noise on fish is described in section 11.7. Underwater modeling of the main noise sources has been conducted as described in Appendix 1 of the environmental impact report. Differences in the hearing ability and sensitivity of fish species have been addressed in the report. The noise threshold values used, which could potentially affect fish, are internationally recognized. Noise thresholds for fish at both larval and adult stages are used, and the assessment includes the most sensitive life stages. The noise modeling and associated assessment provide a conservative estimate of the impact area and intensity, and are therefore considered to sufficiently account for all fish species in the area. Fishing and catch of sandeel and herring in the project area are relatively low compared to catches in surrounding ICES squares, further supporting the assessment of a very limited effect on these fish stocks and associated fisheries.

SPF requests a more detailed account of the effects of CO_2 leakage and larger releases, including acidification and changes in temperature and salinity on benthic fauna and fish.

INEOS initially notes that a CO_2 blowout is considered an unintended event that is just as unlikely as an oil spill. With regard to the pH scale, careful consideration was given to how the pH distribution is depicted in connection with the modelling performed and the purpose of the Environmental Impact Assessment (EIA) report. A brief elaboration on the presented model results: Figures 13-9 and 13-10 represent statistical minimum pH values, meaning that they illustrate the lowest pH values found during a 14-day simulation period, and these values will therefore not occur simultaneously. The average pH values in Figure 13-11, however, represent the accumulated mean effect, showing a zone around the blowout approximately 40 metres in diameter with an average pH value below 7.5. This demonstrates that the impact has a very limited extent both horizontally and vertically (see Figure 13-10). Furthermore, reference is made to a very minimal impact zone in the leakage scenario (Figure 13-15).

INEOS also notes that the impact area in seawater is limited due to the high buffering capacity, meaning that the effect of the increased H ion concentration will rapidly diminish, as illustrated by the modelling. The natural pH level will then quickly re-establish once the blowout is under control. It is worth mentioning that the duration of blowouts is most likely short-term (approximately 15 days). Section 13.2 describes how benthic fauna may be affected by CO_2 releases (and thus changes in pH). The pH reduction in the water phase during a blowout occurs primarily near the sea surface and is therefore not critical to the seabed environment. It is therefore concluded that the described CO_2 release is not critical for the benthic fauna. In addition, no effects are expected further up the food chain (fish and marine mammals).

SPF notes that cumulative effects could arise from activities in other development zones of the marine spatial plan as well as in Norway's Sørlige Nordsjø II area.

Cumulative effects are described in section 22 of the EIA report. As mentioned, there is currently no knowledge of planned projects in the immediate vicinity of the Nini Field in the Danish sector of the North Sea. Underwater noise, for example from seismic surveys, may affect especially marine mammals over distances of several kilometres and should be considered the pressure factor posing the greatest risk of cumulative effects in the event of large-scale construction activities such as the establishment of offshore wind projects.

As described in the report, there is currently no detailed planning in place for OWFs in the vicinity of the project area. However, such projects must be taken into account once available, in order to assess the need for any additional measures.

The Danish Energy Agency agrees with this assessment and notes that, for specific project applications—such as offshore wind projects in the Danish and Norwegian Exclusive Economic Zones—the potential cumulative effects in connection with seismic surveys under the Greensand Future project must be evaluated.

The Danish Energy Agency once again thanks you for your consultation response and hopes that the above has been adequately addressed. Should the above give rise to any further questions, SPF is welcome to contact the Danish Energy Agency directly at ccs-miljo@ens.dk, with a copy to espoo@sgav.dk. The Danish Energy Agency would also be pleased to arrange a meeting to clarify any remaining questions.

Unless the Danish Energy Agency receives notice to the contrary by 9 May, the Espoo process will be considered concluded.

Kind regards,

Trine Skovgaard Kirkfeldt

Special Adviser, Danish Energy Agency

Energistyrelsen

Kontor/afdeling
CCS

Dato
16-04-2025

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/trskk

Response to comments on the notification of the Environmental Impact Assessment report for the Greensand Future project

The Danish Energy Agency hereby acknowledges receipt of the consultation response from the Norwegian Directorate of Fisheries regarding the notification of the environmental assessment process for the CO_2 storage project, Greensand Future. The Energy Agency received the response from the Directorate of Fisheries on 23 September 2024. In connection with the second consultation phase, the Norwegian Environment Agency requested a response to the Directorate of Fisheries' comments on the notification. The Danish Energy Agency, in collaboration with the applicant, has provided responses to the Directorate's remarks and hopes that these are considered sufficiently addressed.

The Directorate of Fisheries points out that the nearest fisheries to Nini West, located on the Norwegian continental shelf, are only 20 nautical miles away and thus within the assumed area of influence. On this basis, the Directorate encourages that the annual seismic monitoring be carried out after June.

The Danish Energy Agency notes that knowledge—and therefore certainty—about the exact impacts of seismic surveys on fish, including sandeel (Ammodytes spp.), remains limited. However, several studies indicate that sandeel may be displaced by seismic activity. The Agency further notes that its assessments are prepared in accordance with the precautionary principle, meaning that scientific uncertainty shall benefit environmental protection.

As sandeel is a demersal species associated with a specific habitat, the Energy Agency agrees that special attention should be given to avoiding displacement, particularly during the spawning season, when disturbance can affect reproduction. Therefore, the Agency will include a time restriction in the conditions of INEOS's permit to prevent noise exposure during the sandeel spawning period, in line with recommendations from the Norwegian Institute of Marine Research.

The Danish Energy Agency once again thanks the Directorate of Fisheries for its consultation response and hopes that the above is considered adequately addressed. Should the above give rise to further questions, the Directorate of Fisheries is welcome to contact the Danish Energy Agency directly at ccs-miljo@ens.dk, with a copy to espoo@sgav.dk.

Kind regards,
Trine Skovgaard Kirkfeldt
Special Adviser, Danish Energy Agency

Energistyrelsen

Carsten Niebuhrs Gade 43
1577 København V

Niels Bohrs Vej 8
6700 Esbjerg

T: +45 3392 6700
E: ens@ens.dk

www.ens.dk

Energistyrelsen

To: Rijkswaterstaat,
Ministry of Infrastructure and Water Management

Kontor/afdeling
CCS

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/WLMGA

Response to comments from the Netherlands on the environmental impact assessment for CO_2-storage project Greensand Future

The Danish Energy Agency (DEA) hereby acknowledges the consultation response from the Dutch Ministry of Infrastructure and Water Management regarding the environmental impact assessment for the CO_2 storage project, Greensand Future. In collaboration with the applicant, the DEA has sought to provide comprehensive responses to the submitted comments and hopes that concerns have been sufficiently addressed.

It is considered likely that the Norwegian SVO's, "Tobisfelt" and "Vikingbanken", which are important spawning grounds for mackerel and sandeel, would be affected in the event of an oil spill from a blowout. Potential oil concentrations above 25 ppb may be harmful to fish eggs and larvae, and therefore, the spawning grounds could be significantly impacted.

The DEA agrees that the Norwegian SVO Tobisfelt (the former Tobisfelt sør and Vikingebanken) covers important spawning grounds for mackerel and sandeel, and the DEA recognizes the threat of a potential oil spill on fish eggs and larvae. However, the probability of such an event is considered very unlikely, while the Nini West reservoir is nearly depleted of oil and due to the probability of a blowout incident from a producing oil well in Europe, which has been calculated to be approximately 0.0000097 incidents per continuously active well per year, according to the IOGP. Furthermore, the well is fitted with a blowout preventer to regulate pressure and prevent blowouts. Based on the very low probability of an oil blowout and given the existing emergency preparedness in the North Sea for unintended incidents, the risk for significant impacts on the spawning grounds of mackerel and sandeel is therefore

Energistyrelsen

Carsten Niebuhrs Gade 43
1577 København V

Niels Bohrs Vej 8
6700 Esbjerg

T: +45 3392 6700
E: ens@ens.dk

www.ens.dk

In the event of a blowout, the German and Dutch Natura 2000 sites in Doggerbank (i.e., DE1003-301 and NL2008-001, respectively) could be affected by a potential oil spill. However, as the impact would last less than one day, a significant effect is therefore considered less likely.

The DEA concurs that N2000 areas potentially affected by an accidental oil spill caused by a blowout include both German and Dutch portions of the Doggerbank site. However, the DEA has assessed such an event to be very unlikely and the probability of a significant impact on these areas to be very low, primarily due to the direction of the dominant ocean current in the North Sea, which is predominantly eastward.

The DEA thank you once again for the comments. If the above raises any further questions, the Dutch Ministry of Infrastructure and Water Management is welcome to contact the DEA directly on ccs-miljo@ens.dk with the Espoo secretariat on cc (espoo@sgav.dk). Any further questions can also be addressed over a meeting with the DEA and the Danish Espoo secretariat.

If the DEA does not receive any further comments before April 28, the Espoo process will be considered concluded.

Kind regards

William Emil Groth-Andersen
Advisor, the Danish Energy Agency

Brevdato	28-03-2025
Afsender	Richard.Kristoffersson@Naturvardsverket.se
Modtagere	ESPOO (espoo@sgav.dk); Maria Birkholm Søndermark (Sagsbehandler, Skov)
Akttitel	Sveriges svar på samråd gällande koldioxidlagring i danska Nordsjön (2024-42787)
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Udskrevet	28. mar 2025

Til: ESPOO (espoo@sgav.dk), Maria Birkholm Søndermark (marbs@sgav.dk)
Cc: Nanna.Wikholm@naturvardsverket.se (Nanna.Wikholm@naturvardsverket.se), Eleonora Rönström (eleonora.ronstrom@regeringskansliet.se), sandra.jalalian@regeringskansliet.se (sandra.jalalian@regeringskansliet.se), Asa.Blomster@Naturvardsverket.se (Asa.Blomster@Naturvardsverket.se)
Fra: Richard.Kristoffersson@Naturvardsverket.se (Richard.Kristoffersson@Naturvardsverket.se)
Titel: Sveriges svar på samråd gällande koldioxidlagring i danska Nordsjön (2024-42787)
Sendt: 28-03-2025 14:56
Bilag: 20250319095728212.pdf; 250313 SPF yttrande DK koldioxidlagring.pdf;

Ärende nr: NV-05742-24 **Ert Journalnummer: 2024-42787**

Hej,

Svar från Sverige på samråd gällande planer för koldioxidlagring , ”Greensand Future” i dansk ekonomisk zon
Naturvårdsverket har remitterat miljökonsekvensbeskrivning med tillhörande underlag till berörda myndigheter och organisationer.
Remisstiden pågick mellan 4 februari och 21 mars 2025.

Svar har inkommit från Sveriges meteorologiska och hydrologiska institut och Swedish Pelagic Federation.

Se bifogat inkomna kommentarer.

Hälsningar, Richard

RICHARD KRISTOFFERSSON
Point of Contact, Esbokonventionen
NATURVÅRDSVERKET
Avdelningen för planering, prövning och tillsyn
Samhällsplaneringsenheten

BESÖK: Virkesvägen 2, Stockholm
POST: 106 48 Stockholm
TELEFON: 010-698 17 69
INTERNET: naturvardsverket.se
FACEBOOK: facebook.com/naturvardsverket

SMHI

Naturvårdsverket
Samhällsplaneringsenheten
106 48 Stockholm

Datum 2025-03-17
SMHI Dnr: 2025/408/5.4.1
Er referens NV-05742-24

registrator@naturvardsverket.se

Samråd gällande koldioxidlagring i Nordsjön, Danmark i enlighet med Art. 4 - 5 i Esbokonventionen

SMHI har tagit del av rubricerade handlingar och lämnar följande yttrande.

Myndigheten vidhåller de synpunkter som har tagits upp i tidigare remissvar och kommer med följande tillägg och förtydliganden. Generellt saknas en adekvat hantering av problematiken med havsförsurning i miljökonsekvensrapporten, en risk som IPCC (2021[1]) pekat ut för lagring av koldioxid (CO_2) i marin miljö.

I den uppdaterade miljökonsekvensrapporten finns en ny referens till sensormätningar av pH som utförts längs den danska västkusten vid två DEPA stationer, 91300001 (från 1983-1991) och 9230002 (1992 och 1994) med mätningar från ytan ned till 18 och 25 m. I tillägg finns också från dessa stationer pH data som uppmätts i laboratorium, men laboratorietemperatur saknas och de flesta proverna är av typen blandningsprover vilket gör det svårt att relatera data till förhållanden i havet.

[1] IPCC, 2021: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Chen, D., M. Rojas, B.H. Samset, K. Cobb, A. Diongue Niang, P. Edwards, S. Emori, S.H. Faria, E. Hawkins, P. Hope, P. Huybrechts, M. Meinshausen, S.K. Mustafa, G.-K. Plattner, and A.-M. Tréguier, 2021: Framing, Context, and Methods. InClimate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change[Masson-Delmotte, V., P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 147–286, doi:10.1017/9781009157896.003.]

SMHI – Sveriges meteorologiska och hydrologiska institut
Postadress SMHI 601 76 • Norrköping • **Växel** 011-495 80 00 • **Fax** 011-495 80 01 • **E-post** registrator@smhi.se

SMHI huvudkontor
Besöksadress Folkborgsvägen 17
601 76 Norrköping

SMHI
Besöksadress Stationsgatan 23, 6 tr.
753 40 Uppsala

SMHI
Besöksadress Göteborgseskaderns plats 3
426 71 Västra Frölunda

Här önskar myndigheten att förtydliga att övervakning av havsförsurning kräver data av tillräckligt god kvalitet, något som tagits fasta på av FN:s SDG (Sustainable Development Goals) 14.3.1 som i första hand strävar efter data med en osäkerhet bättre än 0.02 pH enheter.

I tillägg bör det förtydligas att pH mätningar före 1990-talet betraktas som metodologiskt problematiska och har en stor osäkerhet (Stips et al., 2016[2]), och det är först nu som pH sensorer närmar sig den kvalitet som efterfrågas i SDG 14.3.1. Samtidigt förstår myndigheten svårigheten i att få tag i bra mätdata.

För att illustrera variationen i pH från ytan ner till 25 meters djup med en kalibrerad dataprodukt (Global Ocean Data Analysis Product (GLODAPv2.2023), Olsen et al., 2016[3], Key et al., 2015[4]) som möter ovannämnda kvalitetskrav, visas dessa data tillsammans med de pH mätningar som utförts vid DEPA stationerna i Fig. 1. I tillägg visas en karta över var data har samlats in (Fig. 2).

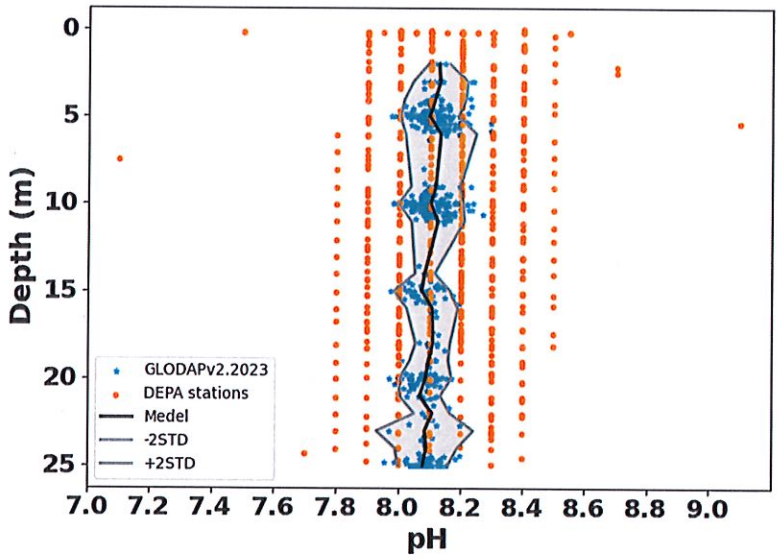

Fig. 1. In situ pH i total skala från GLODAPv2.2023 plottat mot djup (blå stjärna (n= 639), medelvärde indikerat med svart linje samt grå linjer som markerar medelvärdet ± 2 standard avvikelser (STD)). pH av okänd skala från DEPA stationerna 91300001 och 9230002 plottat mot djup (orange cirkel (n= 583)).

[2] Stips, A., Bolding, K., Macias, D., Bruggeman, J., & Coughlan, C., 2016. Scoping report on the potential impact of on-board desulphurisation on the water quality in SOx Emission Control Areas, EUR 27886 EN. doi:10.2788/336630

[3] Olsen, A., Key, R. M., van Heuven, S., et al,. 2016. The Global Ocean Data Analysis Project version 2 (GLODAPv2) – an internally consistent data product for the world ocean, Earth Syst. Sci. Data, 8, 297–323, doi:10.5194/essd-8-297-2016

[4]Key, R.M., Olsen, A., van Heuven, S., et al., 2015. Global Ocean Data Analysis Project, Version 2 (GLODAPv2), ORNL/CDIAC-162, NDP-093, Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, US Department of Energy, Oak Ridge, Tennessee, doi:10.3334/CDIAC/OTG.NDP093_GLODAPv2

Mätningarna från GLODAPv2.2023 uppvisar en variation i stort sett inom 8.0 och 8.2 i de översta 25 m (Fig. 1). Detta resultat stämmer väl med andra resultat från forskningsstudier som undersökt ytvatten pH i området (Salt et al., 2013[5], Omar et al., 2019[6]). Provtagningarna sträcker sig över större delen av Nordsjön och ligger generellt närmare verksamhetsområdet än de två kustnära DEPA stationerna (Fig. 2). Därmed rekommenderar SMHI att alla resonemang runt effekten av CO_2 utsläpp på den marina miljön i kapitel 13 i miljökonsekvensrapporten utgår från denna väldokumenterade variation. Notera att kustnära processer kan resultera i en större variation i pH lokalt.

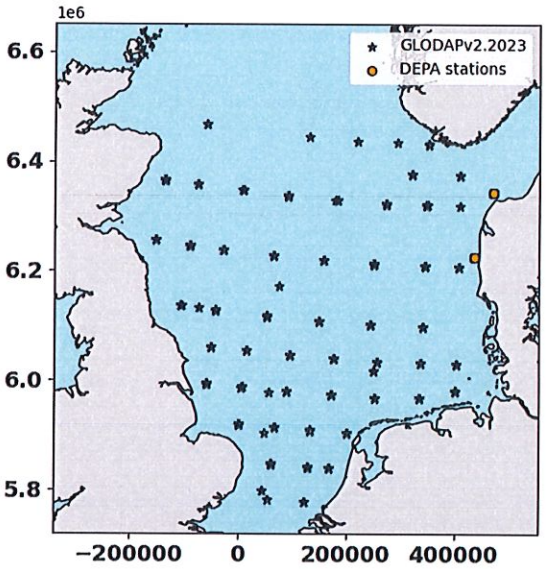

Fig. 2. Karta över provtagningar i Nordsjön mellan 2001 och 2006 från GLODAPv2.2023 (mörkblå stjärna), samt provtagningar vid DEPA stationerna 91300001 (från 1983 till 1991, orange cirkel) och 9230002 (från 1992 och 1994, orange cirkel)

När det gäller figurerna över modellerat pH i kapitel 13 i miljökonsekvensrapporten, rekommenderar myndigheten precis som tidigare att använda en skala och upplösning som inkluderar den typiska pH variationen i Nordsjön även om modellerade data ligger under denna (se Fig. 3). I tillägg vore det lämpligt att också visa figurer på avvikelsen i pH från de initiala förhållandena, då det därmed framgår om vattnet har en signal av försurning från CO_2 utsläppen. När det gäller tabell 13-9 och 13-10 vore det också lämpligt att inkludera fler pH nivåer då många marina organismer är känsliga för pH värden långt över 7.5.

[5] Salt, L.A., Thomas, H., Prowe, A. E. F., Borges, A.V., Bozec, Y., deBaar, H. J.W., 2013.Variability of North Sea pH and CO_2 in response to North Atlantic Oscillation forcing, J. Geophys. Res. Biogeosci., 118, 1584–1592, doi:10.1002/2013JG002306

[6] Omar, A. M., Thomas, H., Olsen, A., Becker, M., Skjelvan, I., Reverdin, G., 2019. Trends of ocean acidification and pCO2 in the northern North Sea, 2003–2015, Journal of Geophysical Research: Biogeosciences, 124, https://doi.org/10.1029/2018JG004992

SMHI – Sveriges meteorologiska och hydrologiska institut
Postadress SMHI 601 76 • Norrköping • **Växel** 011-495 80 00 • **Fax** 011-495 80 01 • **E-post** registrator@smhi.se

SMHI huvudkontor
Besöksadress Folkborgsvägen 17
601 76 Norrköping

SMHI
Besöksadress Stationsgatan 23, 6 tr.
753 40 Uppsala

SMHI
Besöksadress Göteborgseskaderns plats 3
426 71 Västra Frölunda

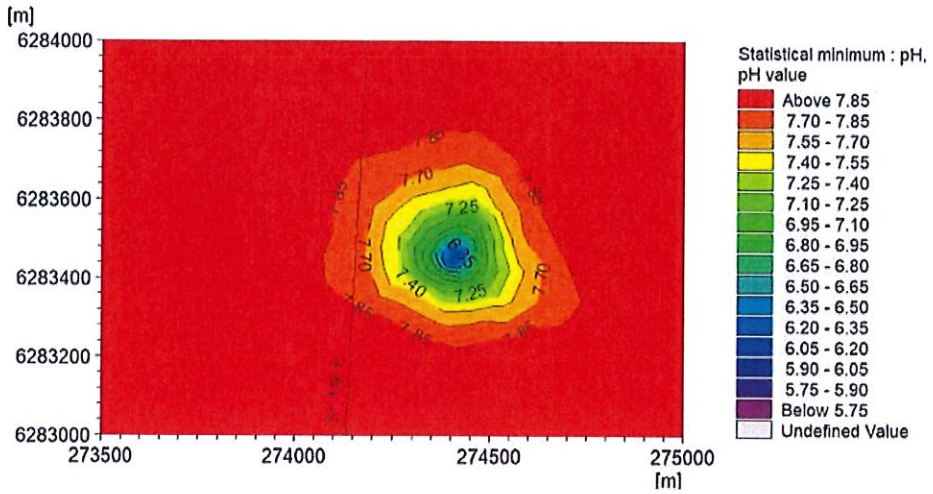

Fig. 3. (Figur 13-9 i miljökonsekvensrapporten). Havoverfladens pH værdier. Statistiske minimumsværdier for simuleringsperioden på 14 dage.

Vidare önskar SMHI att förtydliga att alla figurer med det statistiska minimum pH visar på en genomgående havsförsurning då pH är i intervallet $7.5 < pH < 8$ eller lägre (se till exempel Fig. 3 ovan, men även Fig. 13-10 i miljökonsekvensrapporten). Dessa värden är jämförbara med IPCC:s projicerade ytvatten pH scenarier SSP2-4.5, SSP3-7.0 och SSP5-8.5 för slutet av detta århundrade (Fig. 4, IPCC, 2021).

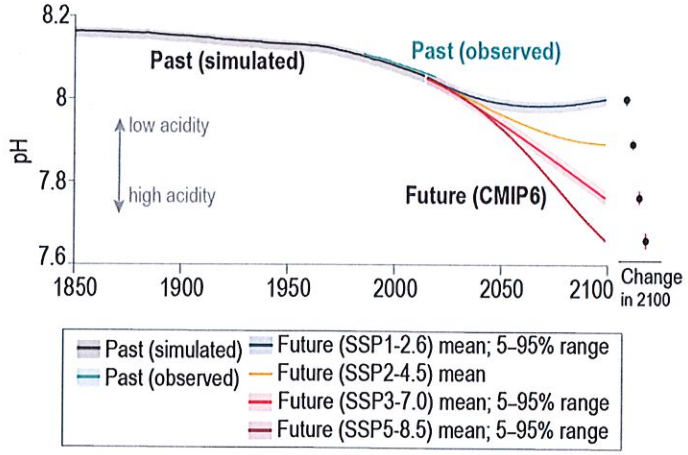

Fig. 4. (Figur TS.11d i IPCC, 2021). Globalt havsmedel för ytvatten pH. Skattade förändringar från observationer mellan 1985 och 2019 är från CMEMS SOCAT-baserade rekonstruktion (skuggning runt medelvärdet visar 90% konfidensintervall).

På så vis är det relevant att miljökonsekvensrapporten beskriver hur förändringen i pH kan påverka marina organismer. Forskning har visat att pågående och projicerad havsförsurning kan påverka organismer på alla nivåer från cellulär metabolism, fysiologi, sensorisk förmåga, till hela ekosystemets dynamik (Doney et al., 2021[7]).

[7] Doney, S.C., Busch, D.S., Cooley S.R., Kroeker, K.J., 2020. The impacts of ocean acidification on marine ecosystems and reliant human communities, Annual review of environment and resources, 45, 83-112, https://doi.org/10.1146/annurev-environ-012320-083019

Olika livsstadier kan vara olika känsliga, men klart är att havsförsurning har konsekvenser för fiskerinäring och annan förvaltning av marina resurser inklusive marina naturreservat (Doney et al., 2021). I de nordiska vattenområden förväntas till exempel blåmusslor och ostron klara sig sämre i ett surare hav (Doney et al., 2021).

Även när modellerat pH når 8.0 eller över, som i fallen med det statistiska medelvärdet (Fig. 13-11, Fig. 13-15, och Fig. 13-17 i miljökonsekvensrapporten), så kan vattnet vara försurat då det inte framgår vilka initiala pH värden som användes till modellen, det vill säga innan utsläppen startade.

I linje med detta så är det också viktigt att uppmärksamma att Nordsjöns pH uppvisar en ganska tydlig säsongsvariation, vilket framgår i Fig. 5. Ett ytvattenvärde runt 8.0 på sommaren kan alltså peka på en försurning mellan 0.1 och 0.2 pH enheter. Till exempel en minskning i pH på 0.15 pH enheter (från 8.15 till 8.0) ger en kraftig ökning i vätejonkoncentration på mer än 40%. Även om marina organismer kan hantera ett pH runt 8.0 i vintertid, är det inte självklart att deras larvstadier under sommartid klarar det lika bra.

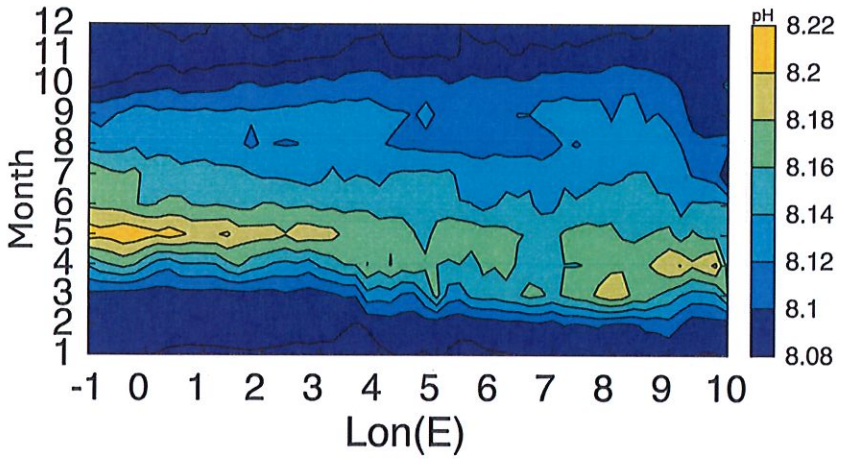

Fig. 5. (Figur 2e från Omar et al., 2019) Beräknad pH. Alla data från 2004-2014 har kondenserats till ett virtuellt år, binnats och sedan medlats i 0.2 longituder för att upplösa säsongs- och rumsliga variationer.

Sammanfattningsvis rekommenderar myndigheten att ovanstående och tidigare inlämnade synpunkter hanteras, så att konsekvenserna av olika typer CO_2 utlsäpp, också i ett potentiellt gränsöverskridande perspektiv, för både pelagiska och bentiska organismer, men även ekosystem, framgår.

Avdelningschef Magnus Rödin har beslutat i detta ärende som beretts av Ylva Ericson.

För SMHI

Magnus Rödin
Chef Avdelning Samhällsplanering

SMHI – Sveriges meteorologiska och hydrologiska institut
Postadress SMHI 601 76 • Norrköping • **Växel** 011-495 80 00 • **Fax** 011-495 80 01 • **E-post** registrator@smhi.se

SMHI huvudkontor
Besöksadress Folkborgsvägen 17
601 76 Norrköping

SMHI
Besöksadress Stationsgatan 23, 6 tr.
753 40 Uppsala

SMHI
Besöksadress Göteborgseskaderns plats 3
426 71 Västra Frölunda

SPF
SWEDISH PELAGIC FEDERATION
PRODUCENTORGANISATION

Kontaktuppgifter:
E-post: malin.skog@pelagic.se
Telefon: 0731-508 708

Datum: 2024-03-13
Mottagare: **Naturvårdsverket**
Dnr.: Ärendenr. NV-05742-24

Yttrande om koldioxidlagring i Nordsjön (Danmark)

Swedish Pelagic Federation producentorganisation (SPF) företräder det pelagiska fisket efter bl.a. sill, skarpsill, tobis och makrill i Bottenhavet, Bottenviken, Östersjön, Kattegatt, Skagerrak, Nordsjön och Atlanten. Vi har medlemmar med fartyg från 5 till över 60 meter som fiskar med pelagisk trål, not, krok och garn. Våra medlemmar står varje år för ca 90% av den totala fiskade volymen i Sverige. Vi tackar för möjligheten att lämna synpunkter i detta samråd.

Slutsats

SPF anser att det finns brister i ansökan med tillhörande miljökonsekvensbeskrivning (MKB). Den projekterade koldioxidinlagringen kan potentiellt få negativa konsekvenser på fiskbestånd som fiskas av svenska yrkesfiskare. Denna påverkan sker direkt genom undervattensljud, samt indirekt genom möjlig påverkan på bottenfaunan. Vidare kan en olyckshändelsemed utflöde av stora mängder koldioxid och olja, kan medföra allvarliga risker för miljön i ett större geografiskt område.

Kommentarer på ansökan och MKB

Våra medlemmar bedriver fiske av sill. Skarpsill och tobis i nära anslutning till den planerade platsen för koldioxidlagring i Nordsjön och är beroende av att denna inte får någon som helst negativ påverkan på de kommersiella fiskebestånden eller deras livsmiljö för att kunna fortsätta bedriva ett långsiktigt hållbart fiske i detta område. Det är därför väsentligt att potentiella effekter av den planerade verksamheten på fiskbestånden utreds noggrant. SPF anser att det finns brister i MKB på denna punkt.

Swedish Pelagic Federation PO
Fiskebäcks Hamn 32
456 58 Göteborg
www.pelagic.se
info@pelagic.se
Organisationsnr:
769625-3454

Beskrivning av och påverkan på yrkesfisket

SPF anser att det finns brister i beskrivningen av yrkesfisket i MKB. Den allvarligaste bristen är att man inte visar fiskets geografiska bedrivande i form av faktiska tråldrag utan istället endast i form av fiskeintensitet per ICES-ruta. Det senare är ett väldigt trubbigt mått på fisket, och ger inte en rättvisande bild och tillräckliga möjligheter för myndigheter att bedöma faktisk påverkan på fisket av den planerade verksamheten.

Vidare verkar beskrivningen endast baseras på data för danska fartyg, medan en rad olika nationer inklusive Sverige har möjlighet att fiska inom det aktuella området. Detta innebär att fiskets volymer och värden kan vara kraftigt underskattade.

Beskrivningen omfattar i vissa delar 10 års fiske (2013-2022) vilket är en tillräcklig referensperiod för att visa på stora mellanårsvariationer i fisket av olika arter. Däremot visas fiskeintensiteten endast för en fyraårsperiod (2015-2018),vilket inte är tillräckligt för att ge en rättvisande bild av fiske över tid.

Vi saknar kartor som visar omfattningen av det planerade utökade området med fiskerestriktioner kring övervakningssystemet för CO2-läckage i förhållande till fiskeområden.

Påverkan på fisk och miljö

I underlaget beskrivs att påverkan på bottenfaunan kommer ske genom kemiska utsläpp från läckagetester (”chemical discharges from hydrotest water”). Även om volymerna som planeras användas är relativt små saknar SPF en tydlig beskrivning av livstiden för dessa kemikalier samt hur de sprids, bryts ned och/eller eventuellt kan tas upp av faunan och i miljön i övrigt. Kan de tas upp av bottenfaunan och spridas vidare i näringsväven till bland annat fisk? Kan detta i sin tur medföra en risk för människor som äter fisken? Vi förstår att en relativt lokal mycket negativ påverkan på bottenfaunan förväntas vid läckagetester, där denna dör. Vi saknar en beskrivning av hur detta i sin tur kan påverka fisk som nyttjar bottenfaunan som föda.

SPF anser att påverkan på olika fiskarter av undervattensljud från den planerade verksamheten inte har beskrivits med tillräcklig noggrannhet. Här är det viktigt att vara medveten om att undersökningar på en fiskart på en plats inte kan översättas till att gälla för andra fiskarter eller ens alltid för samma art men på en annan plats. Varje art

Swedish Pelagic Federation PO

Fiskebäcks Hamn 32
456 58 Göteborg

www.pelagic.se
info@pelagic.se

Organisationsnr:
769625-3454

har sin unika biologi och anpassningar till lokala förhållanden. Vad gäller påverkan från undervattensljud hyser vi en särskild oro för att sillen, som är en hörselspecialist och som använder ljud för att kommunicera inom stimmet, kan påverkas i sitt beteende inom betydligt större områden än de som anges för en direkt skadlig/fysisk påverkan i rapporten. SPF menar att denna typ av beteendeförändringar kan få stora konsekvenser för yrkesfisket om exempelvis fiskens rörelsemönster förändras. Vidare saknar vi en analys av eventuell påverkan på tobis, och dess reproduktion i närheten av projektområdet.

Olycksrisker

Projektet medför flera olycksrisker, och SPF saknar en diskussion i MKB kring risken för försurning av havsvattnet samt vilka lokala följdeffekter detta kan få på bottenfauna och fisk (även indirekt då många fiskarter är beroende av bottenfauna som föda), både vid ett långsamt koldioxidläckage över lång tid och vid en större olycka (blowout) där stora mängder CO_2 frigörs i ett relativt snabbt förlopp. Vi förstår också av underlaget att ett klodioxidläckage kan medföra en lokalt ökad temperatur och salthalt på grund av salter i det vatten som samtidigt kan läcka från CO_2-deponierna, samt att detta vatten skulle kunna innehålla bland annat svavelväte som är toxiskt. SPF menar att effekterna av dessa faktorer på bottenfaunan och fisk behöver beskrivas betydligt bättre. Det behöver dessutom ges en tydlig redogörelse för utbredningen av denna påverkan och hur den kan påverkas av bottenströmmar etc.

Kumulativa effekter

Vad gäller de kumulativa effekterna, på kort och lång sikt, anser SPF att kumulativ påverkan kan uppkomma från möjlig verksamhet i den danska havsplanens ”Development zones” samt det norska planerade vindkraftområdet Sørlige Nordsjø II. Kumulativ påverkan av t.ex. undervattensljud från vindkraftparker och planerad verksamhet i detta projekt kan inte uteslutas och kan få effekter på bl.a. fisk och fiske. S

Om ni har några frågor kopplat till vårt yttrande eller gällande det pelagiska fisket i övrigt, kontakta oss gärna!

Vänliga hälsningar,
Malin Skog
Swedish Pelagic Federation PO

Swedish Pelagic Federation PO

Fiskebäcks Hamn 32
456 58 Göteborg

www.pelagic.se
info@pelagic.se

Organisationsnr:
769625-3454

Til: Maria Birkholm Søndermark (marbs@mst.dk)
Cc: mari.lise.sjong@miljodir.no (mari.lise.sjong@miljodir.no)
Fra: Guro Sylling (guro.sylling@miljodir.no)
Titel: Sv: Notification. Nini West CO2 storage project, referanse 2024 - 42787
E-mailtitel: Sv: Notification. Nini West CO2 storage project, referanse 2024 - 42787 (MST Id nr.: 10992436)
Sendt: 23-09-2024 12:26
Bilag: Espoo-konvensjonen - Høring av planlagt prosjekt CO2-lagring Danmark (Nini West)_Fiskeridirektoratet.pdf;

Hei igjen Maria,

Vi oppdaget akkurat at et høringssvarsvar fra Fiskeridirektoratet til denne saken hadde blitt registret feil i vårt system, og dermed ikke blitt fanget opp i tide til vår oversendelse til dere. Nå er det en stund siden fristen gikk ut, men vi lurte på om det var mulig at vi likevel kunne levere dette svaret?

Jeg har lagt det ved her, men tenkte også å sende det til espoo@mst.dk hvis vi får mulighet til å levere svaret?

Hilsen Guro

Guro Sylling
seniorrådgiver, seksjon for arealplan og klimatilpasning
Nasjonalt kontaktpunkt for Espoo-konvensjonen og SEA-protokollen

mobil: 913 99 746
guro.sylling@miljodir.no

Miljø-
direktoratet

www.miljødirektoratet.no | www.miljøstatus.no
sentralbord: 73 58 05 00

Fra: Maria Birkholm Søndermark <marbs@mst.dk>
Sendt: fredag 13. september 2024 14:16
Til: Guro Sylling <guro.sylling@miljodir.no>
Emne: Sv: Notification. Nini West CO2 storage project, referanse 2024 - 42787 (MST Id nr.: 10992436)

Hej Guro

Intet problem :-)

God weekend til dig også.

Venlig hilsen

Maria Birkholm Søndermark
Fuldmægtig | Landskab & Skov | Miljøvurdering & Espoo PoC
+45 21 30 96 28 | +45 21 30 96 28 | marbs@mst.dk

Miljø- og Fødevareministeriet
Miljøstyrelsen | Tolderlundsvej 5 | 5000 Odense C | Tlf. +45 72 54 40 00 | mst@mst.dk | www.mst.dk

Til: Maria Birkholm Søndermark (marbs@mst.dk)
Fra: Guro Sylling (guro.sylling@miljodir.no)
Titel: Sv: Notification. Nini West CO2 storage project, referanse 2024 - 42787
E-mailtitel: Sv: Notification. Nini West CO2 storage project, referanse 2024 - 42787 (MST Id nr.: 10988054)
Sendt: 13-09-2024 12:10

Takk så mye, Maria
Og beklager at jeg brukte feil epostadresse for vårt svar, jeg var dessverre litt for rask da jeg skulle sende.

Ønsker deg en god helg!

Hilsen Guro

Fra: Maria Birkholm Søndermark <marbs@mst.dk>
Sendt: fredag 13. september 2024 09:32
Til: Guro Sylling <guro.sylling@miljodir.no>
Emne: Sv: Notification. Nini West CO2 storage project, referanse 2024 - 42787 (MST Id nr.: 10988054)

Kære Guro

Mange tak for det norske bidrag, jeg sender det videre til den ansvarlige myndighed.

Venlig hilsen

Maria Birkholm Søndermark
Fuldmægtig | Landskab & Skov | Miljøvurdering & Espoo PoC
+45 21 30 96 28 | +45 21 30 96 28 | marbs@mst.dk

Miljø- og Fødevareministeriet
Miljøstyrelsen | Tolderlundsvej 5 | 5000 Odense C | Tlf. +45 72 54 40 00 | mst@mst.dk | www.mst.dk

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Til: Maria Birkholm Søndermark (marbs@mst.dk)
Fra: Guro Sylling (guro.sylling@miljodir.no)
Titel: Sv: Notification. Nini West CO2 storage project, referanse 2024 - 42787
Sendt: 13-09-2024 08:28

Kjære PoC i Danmark,

Miljødirektoratet har som nasjonalt kontaktpunkt for Espoo-konvensjonen og SEA-protokollen sendt mottatte dokumenter om Nini West CO2 storage project, med referanse **2024 - 42787,** på høring til relevante parter i Norge.

Vi har ikke mottatt noen kommentarer til prosjektet, og Norge trenger ikke å følge prosjektet videre.

Beste hilsen

Guro Sylling

Senior adviser, Section for land use planning and climate adaptation
Point of contact for the Espoo Convention and the SEA Protocol

Mobile: (+47) 913 99 746
guro.sylling@miljodir.no

Norwegian Environment Agency

[http://www.environmentagency.no|]www.environmentagency.no| www.environment.no
Front desk: 73 58 05 00

Fra: Maria Birkholm Søndermark <marbs@mst.dk>
Sendt: torsdag 11. juli 2024 11:01
Til: point-notification.espoo@rws.nl <point-notification.espoo@rws.nl>; Mari Lise Sjong <mari.lise.sjong@miljodir.no>; Guro Sylling <guro.sylling@miljodir.no>; richard.kristoffersson@swedishepa.se <richard.kristoffersson@swedishepa.se>; asa.blomster@swedishepa.se <asa.blomster@swedishepa.se>; GI2@bmuv.bund.de <GI2@bmuv.bund.de>; Philippa.sumner@levellingup.gov.uk <Philippa.sumner@levellingup.gov.uk>; ryan.shean@levellingup.gov.uk <ryan.shean@levellingup.gov.uk>
Kopi: ESPOO <espoo@mst.dk>
Emne: Notification. Nini West CO2 storage project (MST Id nr.: 10574069)

Dear Espoo colleagues in:

Norway
Sweden
Germany
The Netherlands
The United Kingdom

Notification regarding the Nini West CO2 storage project

Please find enclosed a notification letter and information regarding the first public hearing. Furthermore we forward the current version of the EIA-report, not as consultation material as such, but as extra background material. Note that all the relevant information is included in the notification letter.

The project is named the Greensand Future Project in the EIA, this is the working name used by the developer, however it revolves around the Nini West CO2 storage project.

The consultation will take place from 18th of July to the 13th of September 2024.

Denmark, as Party of origin, kindly asks you to answer to the following no later than **13th of September 2024.**

- Please acknowledge receipt of the present notification and let us know if you wish to participate in the EIA-process.
- Please submit any comments you might have concerning the consultation material.

Please kindly send your comments to espoo@mst.dk with reference to journal number **2024 - 42787**.

If you have any questions please do not hesitate to contact me.

Kind regards

Maria Birkholm Søndermark

Espoo Point of Contact for Notification | Landscape and Forest
+45 21 30 96 28 | marbs@mst.dk

Ministry of Environment
Environmental Protection Agency | Tolderlundsvej 5 | 5000 Odense C | Tel. +45 72 54 40 00 | mst@mst.dk | www.mst.dk

FISKERIDIREKTORATET

Adm.enhet: Miljøseksjonen
Saksbehandler: Kristian Landmark Skaar
Telefon: 55 23 80 00
Vår referanse: 24/8819
Deres referanse: 2024/7094
Dato: 09.09.2024

Miljødirektoratet
Att:
Postboks 5672 Torgarden
7485 TRONDHEIM

Espoo-konvensjonen - Høring av planlagt prosjekt CO2-lagring Danmark (Nini West)

Fiskeridirektoratet viser til brev mottatt fredag 2. august 2024 om innspill til konsekvensutredningen for et planlagt prosjekt for CO2-lagring på dansk sokkel - *Nini West CO2 storage, part of Greensand future project.*

Konsekvensutredningen gjelder etablering av CO2-lagring i reservoaret under Nini A plattformen ca. 170 km vest av danskekysten og 4 km sørøst for grensen mellom Danmark og Norge, sør i Nordsjøen.

Fiskeridirektoratets oppgave ved slike uttalelser er å ivareta fiskeriinteressene som blant annet omfatter at fiskeriene kan gjennomføres uten nevneverdig hinder på grunn av faste installasjoner, midlertidige installasjoner på havbunnen eller andre midlertidige tiltak som arealbeslag ifm seismikk el.

I konsekvensutredningen vises det til potensielle hendelser ved prosjektet som kan ha grenseoverskridende effekter som oljeutslipp, CO2-utslipp og påvirkning fra seismiske undersøkelser ifm overvåking av reservoaret. Nevnte hendelser som oljeutslipp og CO2 utslipp vurderes i konsekvensutredningen til å ha svært lav sannsynlighet, mens effekten av seismisk skyting vurderes som neglisjerbar både for fisk og marine pattedyr.

Disse vurderingene anser Fiskeridirektoratet som dekkende, men vil påpeke at fiskeriene som er nærmest Nini Vest på norsk sokkel foregår på tobisfeltene, og nærmeste felt ligger innenfor antatt påvirkningsavstand på 20 nm. Fiskeridirektoratet vil derfor oppfordre at de årlige seismiske overvåkingsundersøkelsene foretas etter juni.

Fiskeridirektoratet har ingen øvrige merknader til saken.

Med hilsen

Paul Magnus Oma

seksjonssjef

Kristian Landmark Skaar
seniorrådgiver

Brevet er godkjent elektronisk og sendes uten håndskreven underskrift.

Mottakerliste:
ESPOO

Miljødirektoratet	Postboks 5672 Torgarden	7485	TRONDHEIM

Kopi til:
Gunnstein Bakke
Kari Grundvig

Trine Skovgaard Kirkfeldt

Emne: VS: 2024 - 42787 - Response the Netherlands Project Greensand Future (SGAV Id nr.: 12233109)

Til: ESPOO (espoo@sgav.dk)
Cc: Erfeling, Mareike (ZD) (mareike.erfeling@rws.nl), point-notification.espoo@rws.nl (point-notification.espoo@rws.nl)
Fra: Borghart, Sven (RWS ZD) (sven.borghart@rws.nl)
Titel: 2024 - 42787 - Response the Netherlands Project Greensand Future
Sendt: 07-04-2025 17:08

Dear sir / madam,

Sincere apologies for the late reply to your notification regarding Project Greensand Future (also called Nini West), with reference number 2024-42787. The Netherlands has two concise comments regarding Natura 2000 and protected areas.

- It very likely (75-95 %) that Norwegian SVOs to the north of the Nini A platform may be affected by an unmitigated spill from a blowout. The SVOs "Vikingbanken", and "Tobisfelt" are spawning areas for mackerel and sand eel from May to July. The concentration of oil in these areas could be above 25 ppb, which is above the concentrations that are harmful to fish eggs and larvae. Spawning in this area is therefore at risk.

- In the event of a blowout, the German and Dutch Natura 2000-sites south-south-west of Nini A are less likely to be affected by the spill (1-5 %). The German DE 1003301, Doggerbank, would have an exposure time of less than one day while maximum oil concentrations at the surface would reach 25-50 ppm. The Dutch NL2008-001, Doggerbank, is also less likely to be affected.

We would appreciate to be kept up to date about any possible additional expansions or modifications regarding the project.

With kind regards,

Sven Borghart
Advisor North Sea

Rijkswaterstaat
Ministry of Infrastructure and Water Management
Visitors address: Lange Kleiweg 34 | 2288 GK | Rijswijk
Correspondance address: Postbus 2232 | 3500 GE | Utrecht
Invoice address: Postbus 2232 | 3500 GE | Utrecht
E-mail: sven.borghart@rws.nl
Phone: +31 6 27 40 48 70
www.rijkswaterstaat.nl/en

Water. Wegen. Werk. Rijkswaterstaat

Ministeriet for Grøn Trepart
Styrelsen for Grøn
Arealomlægning og Vandmiljø

Energistyrelsen
Carsten Niebuhrs Gade 43
1577 København V

Styrelsen for Grøn Arealomlægning
og Vandmiljø

Miljøvurdering og Plan

J.nr. 2024 - 42787
Ref. MARBS
Den 23. juni 2025

Samtykke til VVM for CO2-lagringsprojektet Greensand Future

Styrelsen for Grøn Arealomlægning og Vandmiljø (SGAV, som før ressortdeling ved kongelig resolution af den 29. august 2024 var en del af Miljøstyrelsen) giver hermed samtykke til, at Energistyrelsen kan udstede tilladelse til CO_2-lagringsprojektet Greensand Future jf., LBK nr. 4 af 03/01/2023 (bekendtgørelse af lov om miljøvurderinger af planer og programmer og af konkrete projekter (VVM) § 38 stk. 1.

Espoo-proces

Espoo-processen blev igangsat med et notifikationsbrev den 11. juli 2024 til Norge, Sverige, Tyskland, Holland og England, hvor Energistyrelsen som ansvarlig myndighed orienterede om projektet. Frist for eventuelle kommentarer var den 13. september 2024.

Tilbagemeldinger fra Tyskland og England viste, at de tyske og engelske myndigheder ikke havde kommentarer og ikke ønskede at blive inddraget i den videre proces. De svenske, norske og hollandske myndigheder gav derimod udtryk for, at de ønskede fortsat inddragelse. Norges høringssvar blev modtaget den 23. september på grund af en fejlregistrering i deres system, men blev oversendt til Energistyrelsen.

Høringssvarene blev fremsendt til Energistyrelsen som miljøvurderingsmyndighed. Her blev de behandlet på samme måde som høringssvar fra den danske offentlighed og berørte myndigheder.

Konsultationsbrev, miljøkonsekvensrapport samt resumé af projektansøgningen blev fremsendt den 27. januar 2025 fremsendt til Sverige og Holland med frist for kommentarer den 28. marts 2025. Dette skete i overensstemmelse med artikel 4-5 i Espoo-konventionen. Ved en fejl blev konsultationsmaterialet ikke oversendt til Norge fra start. Ved notifikationsbrevet havde kun det norske Fiskeridirektorat kommentarer, så i samarbejde med den norske Point of Contact nåede man til enighed om den løsning, at Energistyrelsen skulle forholde sig til Fiskeridirektoratets høringssvar i den videre planlægning. På den måde skulle konsultationsmaterialet ikke sendes i en separat høring til Norge.

Fra Sverige kom bemærkninger fra *Swedish Pelagic Federation (SPF)* og Sveriges *meteorologiske och hydrologiska institut (SMHI)*.

SPF påpegede, at miljøkonsekvensrapporten manglede en tilstrækkelig vurdering af projektets påvirkning på fiskebestande og fiskeriet, især mangler i geografisk data og brug af danske fiskeridata kan føre til undervurdering af fiskeriets omfang. Derudover savnede SPF en bedre vurdering af kemikalieudslip, bundfaunatab, undervandslydeffekter på fisk (særligt sild og tobis) og konsekvenser af CO_2-lækage og kumulative effekter.

SMHI påpegede, at miljøkonsekvensrapporten ikke i tilstrækkelig grad adresserede problematikken omkring havforsuring. De efterspurgte en tydeligere beskrivelse af konsekvenserne af forskellige CO_2-udslip for både marine organismer og økosystemet som helhed. Derudover påpegede de, at de anvendte pH-målinger var usikre og ikke repræsentative, og de anbefalede en mere detaljeret og opdateret analyse af pH-variationer for at illustrere forsuringens omfang mere klart.

Holland påpegede, at norske gydeområder nord for Nini A sandsynligvis påvirkes af et blowout, mens de tyske og hollandske Natura 2000-områder syd-sydvest for Nini A kun har lav og kortvarig risiko.

Det norske Fiskeridirektoratet påpegede, at de nærmeste fiskerier til Nini Vest på norsk sokkel befinder sig blot 20 sømil derfra og dermed inden for den antagede påvirkningsafstand. På den baggrund opfordrer Fiskeridirektoratet til, at den årlige seismiske overvågning gennemføres efter juni, for at undgå forstyrrelser under tobisens gydeperiode, som kan påvirke bestandens reproduktion.

Alle høringssvar blev fremsendt til Energistyrelsen, som udarbejdede individuelle besvarelser. Besvarelsen til Holland blev fremsendt den 10. april med frist for yderligere kommentarer den 28. april 2025. Energistyrelsen besvarede det norske fiskeridirektorat den 24. april og blev af SGAV opfordre til at fremsende eventuelle yderligere bemærkninger senest den 8. maj 2025. Afslutningsvist blev besvarelserne til de svenske høringssvar fremsendt den 25. april med frist den 9. maj, som senere blev ændret til d. 20. maj.

Kun svenske SMHI havde opfølgende bemærkninger til Energistyrelsens besvarelse. SMHIs høringssvar blev igen besvaret af Energistyrelsen og oversendt til Sverige den 23. maj med frist for yderligere bemærkninger den 6. juni 2025. Der blev herefter ikke modtaget yderligere kommentarer.

Det er på baggrund af ovenstående Styrelsen for Grøn Arealomlægning og Vandmiljøs vurdering, at Espoo-processen med Sverige, Norge og Holland, der har ønsket at deltage i miljøvurderingsprocessen for projektet CO_2-lagringsprojekt Greensand Future, er sket i overensstemmelse med reglerne i Espoo-konventionen.

Den videre proces

Når projektet er endeligt vedtaget, skal tilladelsen fremsendes til alle de berørte lande via SGAVs Espoo Point of Contact. Projektet fremsendes samtidigt med offentliggørelsen i Danmark for at sikre, at de berørte lande har samme klageadgang

som den danske offentlighed. Projektet fremsendes i dette tilfælde, hvor de berørte lande er Sverige, Norge og Holland, på hhv. dansk og engelsk. Fremsendelse af det vedtagne projekt, afslutter Espoo-processen.

Med venlig hilsen

Maria Birkholm Søndermark
ESPOO
+45 21 30 96 28
marbs@sgav.dk

EUROPEAN
COMMISSION

Brussels, 19.11.2025
C(2025) 7748 final

COMMISSION OPINION

of 19.11.2025

on the draft permit to permanently store carbon dioxide in the Nini West area of the Danish continental shelf

(Only the Danish text is authentic)

COMMISSION OPINION

of 19.11.2025

on the draft permit to permanently store carbon dioxide in the Nini West area of the Danish continental shelf

(Only the Danish text is authentic)

1. LEGAL CONTEXT

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 ('Directive 2009/31/EC') establishes a legal framework for the environmentally safe geological storage of CO_2 to contribute to the fight against climate change.

Directive 2009/31/EC covers CO_2 storage in geological formations in the Union during the entire lifetime of storage sites and harmonises the requirements for selecting and operating CO_2 storage sites. Chapter 3 of Directive 2009/31/EC requires the Member States to ensure that no storage site is operated without a storage permit and establishes the requirements for the national permitting process and the content of storage permits.

Article 10 of Directive 2009/31/EC establishes an additional safeguard to ensure that storage permits are in line with Directive 2009/31/EC through the dialogue between the Member State concerned and the European Commission ('the Commission'). In this respect, Article 10 of Directive 2009/31/EC requires the Member States to inform the Commission of all draft storage permits and to provide all material taken into consideration for the adoption of the draft decision to award the storage permit.

Article 10 of Directive 2009/31/EC provides for the Commission to issue a non-binding opinion within four months after receipt of a draft storage permit ('draft permit'). Where the Commission issues a non-binding opinion, the competent authority is expected to take the utmost account of it when adopting the final storage permit. Where the competent authority decides to depart from the Commission's opinion, Article 10(2) of Directive 2009/31/EC requires the competent authority to state the reasons.

The Competent Authority for issuing the storage permit is the Danish Energy Agency (Energistyrelsen, 'the Competent Authority').

2. PROJECT AND PERMITTING PROCESS

2.1. APPLICATION FOR A STORAGE PERMIT

In February 2023, INEOS E&P A/S ('INEOS') ('the Applicant')[1], Wintershall Dea, and Nordsøfonden were granted an exploration permit under Directive 2009/31/EC for the Siri Canyon area. The Siri Canyon area encompasses the Nini West depleted oil field.

[1] INEOS E&P A/S, is a company registered in Denmark, has its registered address at Teknikerbyen 5, 1st floor, 2830 Virum, Denmark and is registered under CVR-No. 73 34 96 13. INEOS E&P's sole legal owner is INEOS UK E&P Holdings

In February 2024, INEOS submitted an application to the Competent Authority for a permit for the permanent storage of CO_2 in the Nini West depleted oil field (CO_2 storage site). Following the request of the Competent Authority, the Applicant updated the Application in July, August, September, and October 2024.

The Applicant indicates that the Nini West storage site is Phase 3 of Project Greensand, also known as 'Project Greensand Future'.

2.2. PROJECT DESCRIPTION

The CO_2 storage concept proposed by the Applicant for Phase 3 of Project Greensand comprises the transport, by dedicated ship, of CO_2 sourced from biogas facilities onshore Denmark and its injection into the storage site. A total of 2.4 million tonnes of CO_2 is proposed to be injected over an 8-year period, starting in 2026, and permanently stored in the Nini West storage site.

The Nini West CO_2 storage site and storage complex include the following elements:

- The primary Nini West CO_2 storage reservoirs, which are formed by Frigg Formation sandstones. The 12-30 metre thick, fine grained Frigg sandstone is of Eocene age with a high content of glauconite. It is one of several high-porosity, high-permeability sandstone formations deposited during the Palaeocene/Eocene period in the Siri Canyon area by turbidite flows in a deep-marine environment guided by local topography. Average porosity, permeability and net sand content are 37%, 800 millidarcy and 97% respectively. The secondary storage reservoir is comprised of thin sandy/siltstones of the Lark Formation approximately 340 metres above the primary storage unit.
- The primary seal is formed by the approximately 340 metres thick claystone sequence of Eocene to Oligocene age, Horda and Lark Formations, which overlies the Frigg sandstone sequence and extends to the first porous and permeable layer within the Lark Formation (a secondary storage formation). The secondary seal is located immediately above this, has a thickness of 550 metres and belongs to the Middle to Upper Lark Formation. The bottom and side seals consist of Balder Formation and Horda Formation, respectively. These formations are regionally widespread and extend far beyond the storage complex area.
- The trap is a combination of a stratigraphic and a structural closure. The top of the structure is at 1,710 metres True Vertical Depth Sub Sea (TVDSS) and the original free water level is at 1,764 metres TVDSS.
- The current pressure in the primary storage reservoir is 215 bar compared to a 185 bar (1,708 metres TVDSS) initial pressure. The pressure change is due to water injection into the NA-5 well to support oil production in Nini West. Water injection has now ceased.
- The NA-5 and NA-3B wells.

Limited a company incorporated in the United Kingdom with company number SC200459 ("INEOS UK E&P"). INEOS E&P and INEOS UK E&P are indirectly controlled by a holding company within the INEOS Group, INEOS Holdings AG ("IHAG"). IHAG is a company incorporated in Switzerland, has its registered office at Avenue des Uttins 3, Rolle 1180, Switzerland, and registered under company number CHE-115.604.963. As security for certain liabilities assumed by INEOS E&P A/S in relation to the Iris licence C2023/01, IHAG has provided the Danish Energy Agency with a guarantee in the model form stipulated by the Danish Energy Agency.

- The injection facilities and associated above-ground facilities on the Nini West platform, up to and including the wellheads.

The geographical area to which the storage complex and storage site application applies is clearly specified and displayed in the Application. The draft permit clearly specifies the geographical co-ordinates of the storage complex.

The NA-5 well was used for the Greensand pilot Project (Phase 2 of Project Greensand), which injected a total of 4,100 tonnes of CO_2 into the Frigg sandstone reservoir, proving the feasibility of expanding the project.

The injectate will be delivered to the Nini West storage complex in tanks on modified platform support vessels and will have a CO_2 content of >95% with 0% water[2]. Since the CO_2 is from biogenic sources, it is not expected to have any SO_x or NO_x content.

The Nini West storage project would be permitted to store up to 2.4 million tonnes of CO_2 over an 8-year[3] period, starting no later than the end of 2026[4]. This equates to approximately 0.3 million tonnes of CO_2 stored per year.

The maximum pressure in the Frigg sandstone storage reservoir must not exceed 280 bar, while the tubing head pressure must not exceed 200 bar at any time, based on geomechanical assessments and well design considerations, to ensure the caprock is not fractured[5].

Monitoring of the storage complex will be undertaken using a combination of well-established technologies (pressure/temperature/flow rate sensors), 2D seismic, seabed deployed sensors for bubble detection and water chemistry analyses combined with ongoing plume migration and conformance modelling. The draft permit[6] requires the potential permit licence holder to ensure compliance with the approved monitoring programme and to update the monitoring programme in line with risk assessments and new technologies.

The draft permit requires the application of best environmental practices to reduce noise when undertaking underwater activities such as seismic data acquisition, remote vehicle operations and diving. This is to ensure minimal disturbance to nearby ecologically sensitive marine areas.

The draft permit states that the Nini West storage project cannot be initiated until a number of conditions have been met[7]. These include completion and submission to the Competent Authority of fiscal metering and allocation plans, Ready for Operations plans, and an emergency response plan. These must be submitted no later than three months prior to the start of injection.

The draft permit discusses the actions required in the event of significant irregularities. These actions may include stopping injection, additional monitoring activities or potentially revoking the storage permit and closing the storage site[8]. The draft permit includes the conditions for closure and an acceptance of the post-closure plan, stating *"that the preliminary post-closure plan is currently sufficient"*[9] and that the closure of the storage site requires that *"all conditions in the storage licence are met, including that storage of the*

2 Term 3a of the draft permit.
3 Draft permit – Section 2.3 Capacity and Injection Conditions.
4 Terms 2a and 2c of the draft permit.
5 Terms 2d, 2g, and 2h of the draft permit.
6 Term 6a of the draft permit.
7 Term 5 of the draft permit.
8 Term 7 of the draft permit.
9 Draft permit – Section 2.7 Preliminary post-closure plan.

maximum permitted amount of CO_2 has been achieved, that the Danish Energy Agency has received documentation, that all available information indicates that the stored CO_2 will remain completely and permanently contained, and that there is an approved post-closure plan"[10].

3. REVIEW BY THE COMMISSION

In March 2024, the Competent Authority submitted to the Commission the application for the permanent storage of CO_2 in the Nini West storage site on the Danish continental shelf. The Competent Authority submitted to the Commission several additional updates to the application in July, August, September, and October 2024.

On 9 July 2025, the Competent Authority submitted to the Commission their draft permit for the Nini West storage site.

The draft permit, application and supporting documents provided by the Competent Authority constitute the basis for the Commission's review and for this Non-Binding Opinion ('Opinion'). The Commission has reviewed the draft permit in light of the requirements set out in Directive 2009/31/EC and prepared this Opinion.

4. OPINION

Following the review of the application, draft permit and other supporting documents, the Commission is issuing an Opinion on technical, environmental, and financial aspects of the draft permit in line with Article 10 of Directive 2009/31/EC.

4.1. Technical requirements

The Commission considers that, from a technical point of view, the Nini West storage complex is suitable for the permanent geological storage of CO_2.

The draft permit clearly specifies the geographical co-ordinates of the storage complex. However, there does not appear to be a clear and explicit delimitation of the storage site in the draft permit as required by Article 9(2) of Directive 2009/31/EC. The Commission invites the Competent Authority to update the draft permit with a description or a map of the Nini West storage site since the storage site and the storage complex have different lateral boundaries. This update will ensure compliance with Article 9(2) of Directive 2009/31/EC. The draft permit also notes that "*it is an assumption for this decision that the licence [...] is extended"*[11]. The permit needs to clearly specify the type of extension that is envisaged, time or area.

The draft permit includes the necessary requirements for the safe operation of the storage complex and site, in line with Directive 2009/31/EC.

In this respect, the Commission notes that the suitability of the storage complex and site is demonstrated by the detailed characterisation and assessment of the storage site and complex contained in the application and confirmed by the technical reports. The technical assessment provided in the application contains static, dynamic, geomechanical, and well performance modelling demonstrating that the Nini West storage site and complex is hydraulically isolated and suitable for the long-term storage of CO_2.

[10] Draft permit – Terms.

[11] Term 1 of the draft permit.

In addition, the maximum permissible volumes to be injected (total quantity of CO_2 authorised to be geologically stored) have been set in the draft permit at a maximum of 2.4 million tonnes of CO_2, equivalent to approximately 0.3 million tonnes per annum.

The maximum 8-year period of injection, the proposed maximum injection rates and pressures in the injection well and in the reservoir during injection established in the draft permit, are reasonable. The maximum permissible reservoir pressure allowed in the Frigg sandstone storage unit is 280 bar while the tubing head pressure in the injection well must not exceed 200 bar. These limits have been established by detailed static, dynamic and well performance modelling using a significant database of information and standard industry techniques and technologies.

The draft permit requires the CO_2 stream to consist of a minimum content of 95% CO_2 with 0% water[12]. The draft permit also requires verification of the composition of the liquid CO_2 stream, including qualitative and quantitative recording, to be conducted in the part of the supply chain for which the Applicant is responsible, which is from delivery at Port Esbjerg and transport by ship to the injection point at the Nini West storage site[13]. These requirements in relation to the CO_2 stream are in line with Article 12 of Directive 2009/31/EC.

The Commission notes that the monitoring and corrective measures plans presented by the Applicant, as well as the requirements related to their updating and approval prior to the start of the injection period contained in the draft permit, are compliant with the requirements set in Directive 2009/31/EC.

The Nini West storage site includes the NA-4/4A legacy well abandoned in 2002. This well was plugged and abandoned to standards current at the time and is now inaccessible[14]. This plug and abandonment operation was inadequate: no casing is present below the 9 5/8" shoe and the cement plug at the base of the open hole section could not be tested. No specific concerns have been identified from the available information and reservoir pressure performance to date does not suggest the well is leaking under the current operational reservoir pressures.

The Commission acknowledges that risks associated with a possible leakage through the NA-4/4A legacy well have been investigated. Modelling studies have been conducted of potential leakage paths through the micro annuli that are most likely present between the cement plug and wellbore walls. These studies suggest that, due to friction induced losses on any migrating CO_2 in these micro annuli, there is minimal risk of CO_2 moving out of the storage complex via the micro fractures around the cement plug in the NA-4/4A well. Any CO_2 that does migrate out of the storage reservoir would most likely be contained in the secondary storage reservoirs in the Lark Formation and should therefore remain within the storage complex[15].

The Commission notes that the Environmental Impact Assessment finds that *"the probability of leakage is assessed to be very low"*[16]. The Commission also notes the Competent Authority's assessment, included in the draft permit, that *"the risk of leakage from the historic well Nini-4/4A to the seabed or other surroundings is very small and thus acceptable"*[17].

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12 Term 3a of the draft permit.

13 Term 3b of the draft permit.

14 Application – Predictive Maintenance Plan Nini West 2024/25.

15 Application – Greensand Future Storage Site Application – Nini West Overburden Model.

16 Application – Environmental Impact Assessment – Section 24.2: Accidental events.

17 Draft storage permit – Section 2.5: Well status and activities.

The Commission further acknowledges that the amendments made to the monitoring programme and technologies to be used should ensure that any potential migration or leakage of CO_2 from or in the vicinity of the well can be detected at an early stage.

The Commission is of the view that the draft permit provisions on the closure of the storage site satisfy the requirements of Directive 2009/31/EC. The closure conditions contained in the draft permit specify that closure shall take place when 2.4 million tonnes of CO_2 are injected. The Commission notes the requirements for closure being that all conditions of the draft permit are met.

The Commission also notes that the Competent Authority may revoke the permit or close the site early in the event of leakage or the occurrence of significant irregularities.

In addition, upon cessation of injection, the preliminary post-closure plan contained in the application includes monitoring and predictive maintenance activities during the period from the end of CO_2 injection until the area is handed back to the authorities. During this period, the intention is to demonstrate that the injected CO_2 has been securely and permanently contained within the storage site and complex. Activities planned for this period include seismic data acquisition, seabed bubble detection and water column chemistry analyses, along with monitoring the injection wells until they are fully decommissioned.

4.2. Environmental requirements

CO_2 storage sites require an environmental impact assessment under Article 5 of Directive 2011/92/EU, except if they are exempted by Member States under Article 2(4) of Directive 2011/92/EU[18]. Applications for storage permits must include relevant environmental impact assessment information under Article 7(9) of Directive 2009/31/EC. The Commission notes that the Competent Authority has referred to this Environmental Impact Assessment extensively in the draft permit and confirmed its adequacy.

The Commission takes note of the conclusions of the Environmental Impact Assessment, prepared by Ramboll, that the construction, operation and closure of the storage site and necessary facilities will have no impact on human health and will have negligible consequences on plankton, benthic fauna, fish, marine mammals, seabirds, and water quality.

The Commission also notes the Competent Authority's assessment, as included in the draft permit, that there will be *"no significant impacts on the environment from the planned activities"*, provided that monitoring programme and noise abatement requirements are met. The Commission welcomes using noise abatement as best practice while undertaking underwater activities, such as acquisition of seismic data, underwater seabed and water column monitoring and diving operations.

4.3. Financial requirements

The Commission notes that the draft permit requires that the operator's parent company guarantee, as approved in the Competent Authority's decision of 21 March 2023, *"shall be maintained until it is required to be amended or supplemented"*[19]. This parent company guarantee is unlimited in time and covers *"all obligations [for the licensee] under both public and private law towards the Danish State"*, including all obligations under Directive 2009/31/EC. The Commission invites the Competent Authority to add a description of the precise terms and conditions of the financial guarantee in the draft permit.

[18] OJ L 26, 28.1.2012, p. 1.

[19] Term 10 of the draft permit.

The draft permit states that *"the guarantor of the operator INEOS E&P A/S is INEOS Holdings AG (registration number: CHR-115 604 963 (Switzerland))"* and that *"the guarantor for the participant Harbour Energy is Harbour Energy PLC (registration number: SC234781 (United Kingdom))"*. The Competent Authority states in the draft permit that the financial capacity of INEOS Holdings AG is *"satisfactory"* and that INEOS E&P A/S *"supported by the guarantee from INEOS Holdings AG, is considered to have the necessary capacity to meet the obligations of this licence"*. The draft permit also states that *"Harbour Energy PLC has the necessary capacity to act as a guarantor"* and that *"with this support, and with Harbour Energy PLC as a reference point due to ultimate ownership, Wintershall Dea International GmbH (Harbour Energy) is deemed to have the necessary financial capacity"*. Finally, the Competent Authority considers that Nordsøfonden has *"the necessary and sufficient financial capacity to meet its obligations under the licence" due to "its state ownership and the resulting financial robustness"*[20].

The Commission notes the Competent Authority's assessment in their application review that there is sufficient confidence that the operator will have the financial resources to carry out the activities under the storage permit *"based on comparing the specific financial obligations and risk profile of the licence, as defined by the project costs (…) against the overall financial strength of the commercial companies and their guarantors"*[21].

This Opinion is addressed to the Kingdom of Denmark.

Done at Brussels, 19.11.2025

For the Commission
Wopke Hoekstra
Member of the Commission

[20] Draft permit – Section 2.8: Economy and organisation / Technical and financial capacity – Financial capacity.

[21] Draft permit – Section 2.8: Economy and organisation / Technical and financial capacity – Financial capacity.