Norwegian regulatory requirements to well Integrity for CO2 injection wells and legacy well assessment

NINA RINGØEN

Drilling & Well technology

Havtil Norwegian Ocean Industry Authority

Norwegian Ocean Industry Authority

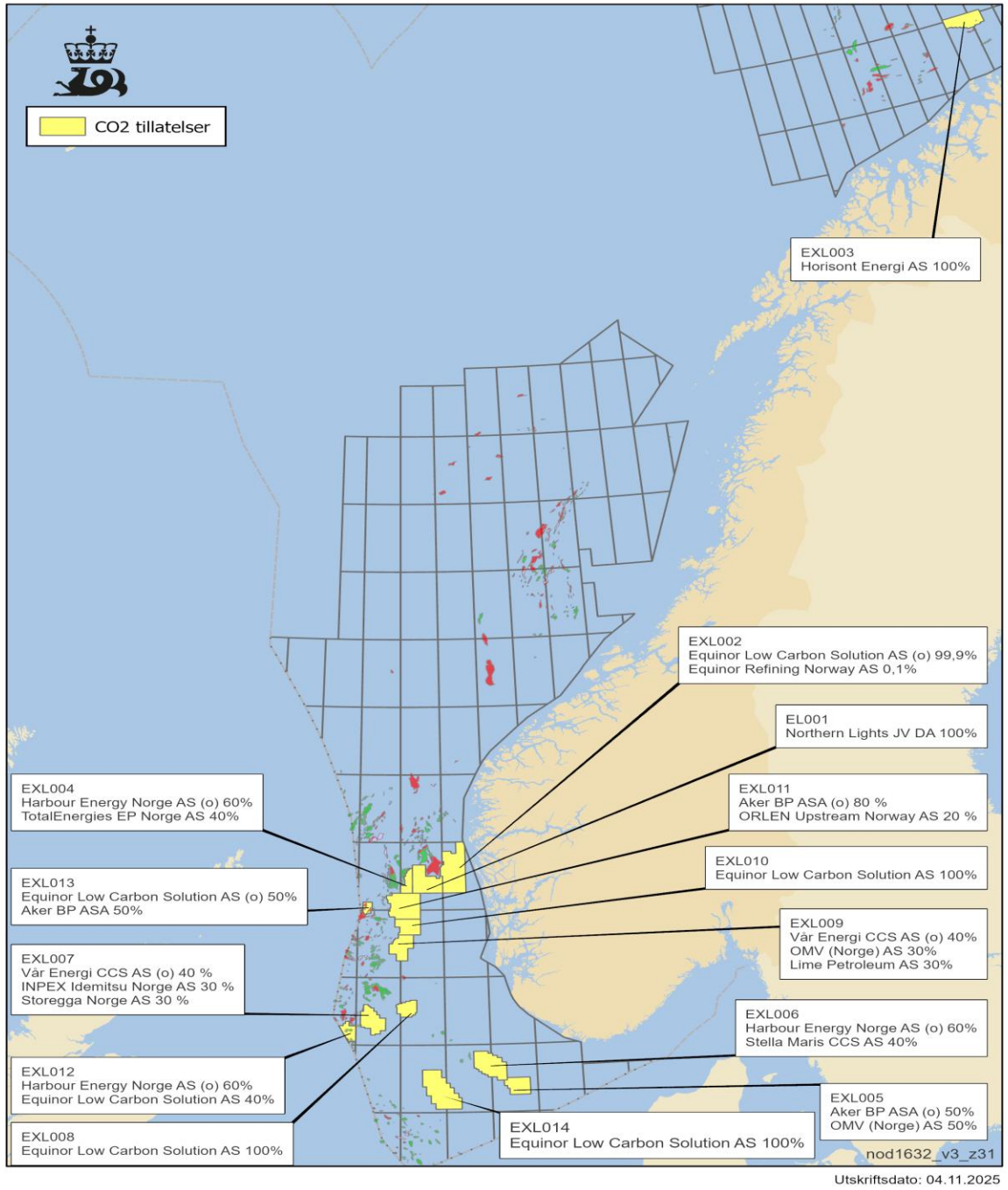
HAVTIL

Regulatory responsibility for

- safety,
- working environment,
- emergency preparedness and
- security

in Norway's ocean industry.

Reports to the Ministry of Energy



CO2 storage on the NCS

EL 001: Northern Lights JV DA (Aurora/2019)

EXL 002: Equinor LCS (Smeaheia / 2022)
EXL 003: Horisont Energi AS (Polaris/2022)
EXL 004: Harbour Energy, Total Energies (Luna/2022)
EXL 005: Aker BP and OMV (Poseidon/2023),
EXL 006: Harbour Energi and Stella Maris CCS (Havstjerne/2023)
EXL 007: Vår Energi, INPEX Idemitsu, Storegga (Trudvang/2023)
EXL 008: Equinor LCS AS (Albondigas/2024)
EXL 009: Vår Energi, OMV, Lime Petroleum (Iroko/2024)
EXL 010: Equinor LCS AS (Kinno/2024)
EXL 011: Aker BP/ ORLEN Upstream (Atlas/2024)
EXL 012: Harbour Energy / Equinor LCS, (Kaupang/2024)
EXL 013: Equinor LCS / Aker BP (Forsete/2024)
EXL 014: Equinor LCS (Fritos/2025)

As of 06.11.2025 www.sodir.no
EL: Exploitation license
EXL: Exploration license

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Legislation for *CO2-transport and injection*

European Union

Directive 2009/31/EC

- Geological storage of carbon dioxide

Ministry of Energy

Regulation for CO_2 storage and transport

- Regulations relating to exploitation of subsea reservoirs on the continental shelf for storage of CO_2 and transport of CO_2

Ministry of Climate and the Environment

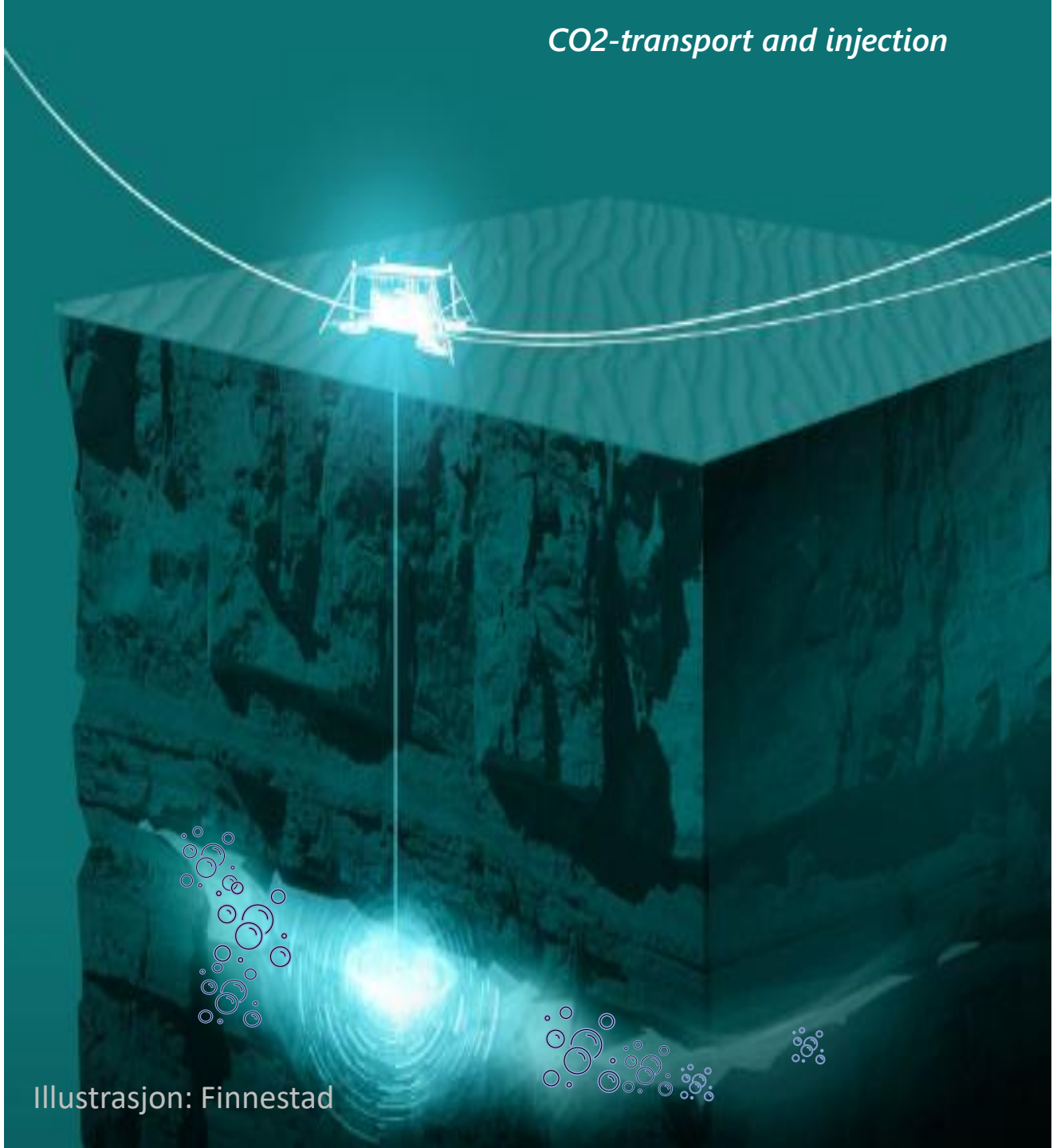
Pollutions Regulations

- Part 7A / chapter 35 in existing Pollutions Regulations

Norwegian Ocean Industry Authority (Havtil)

CO_2 safety regulations

- Regulations relating to safety and working environment for transport and injection of CO_2



CO_2 safety regulations

CO2 safety regulations

Regulations relating to safety and working environment for transport and injection of CO_2 on the continental shelf

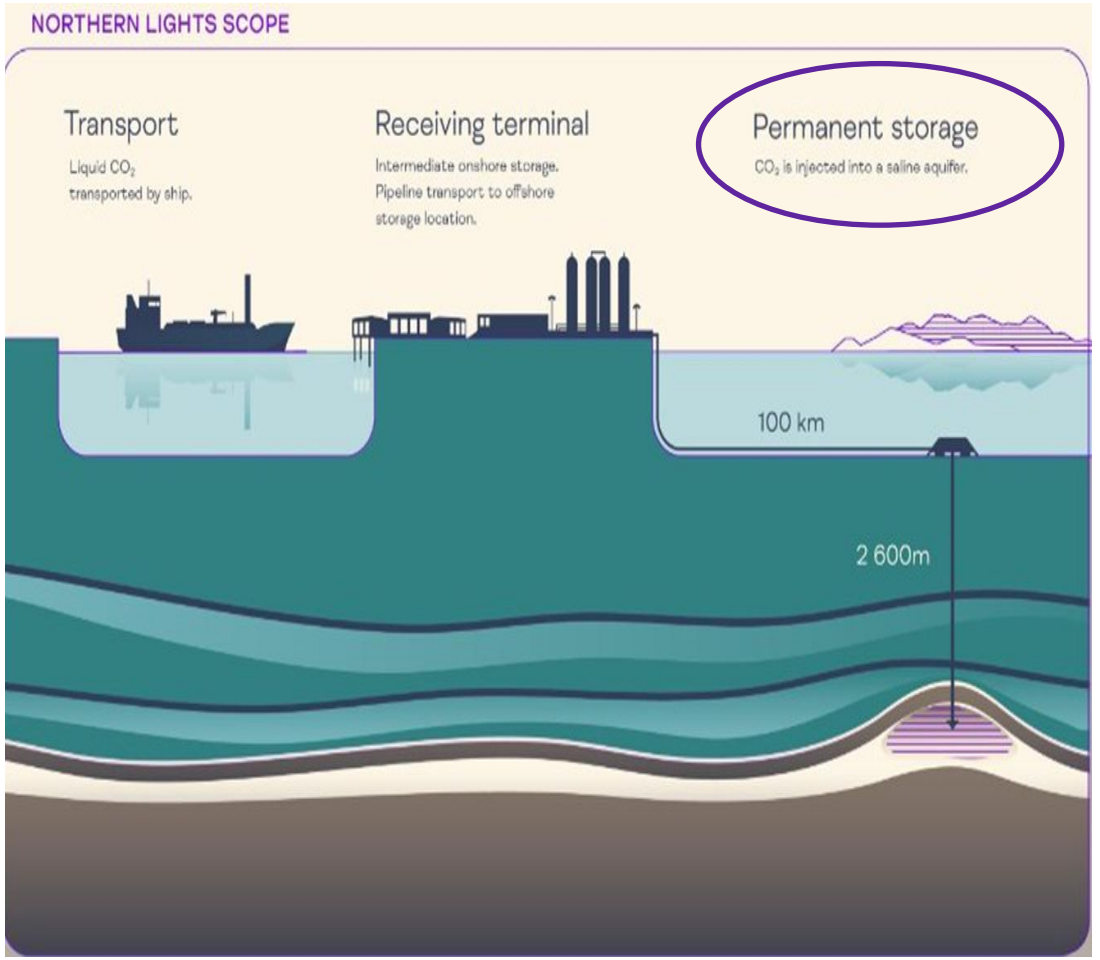
§ 17 Drilling and well systems and drilling and well activities

Share link

The requirements that apply to drilling and well systems in **Chapter VIII of the Facilities Regulations** and to drilling and well activities in **Chapter XV of the Activities Regulations**, apply correspondingly to the scope of these regulations.

Last changed: 25 February 2020

Guidelines and audit reports with nonconformities related to the section →



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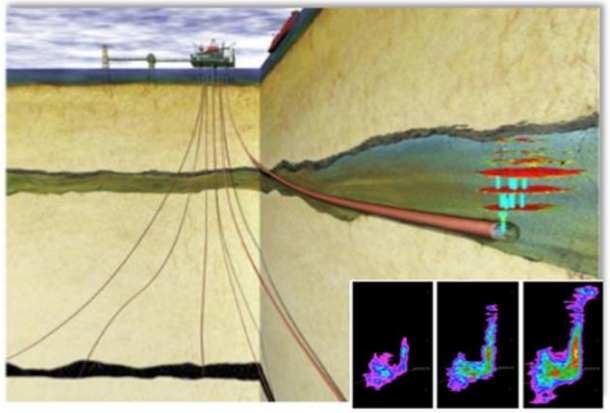
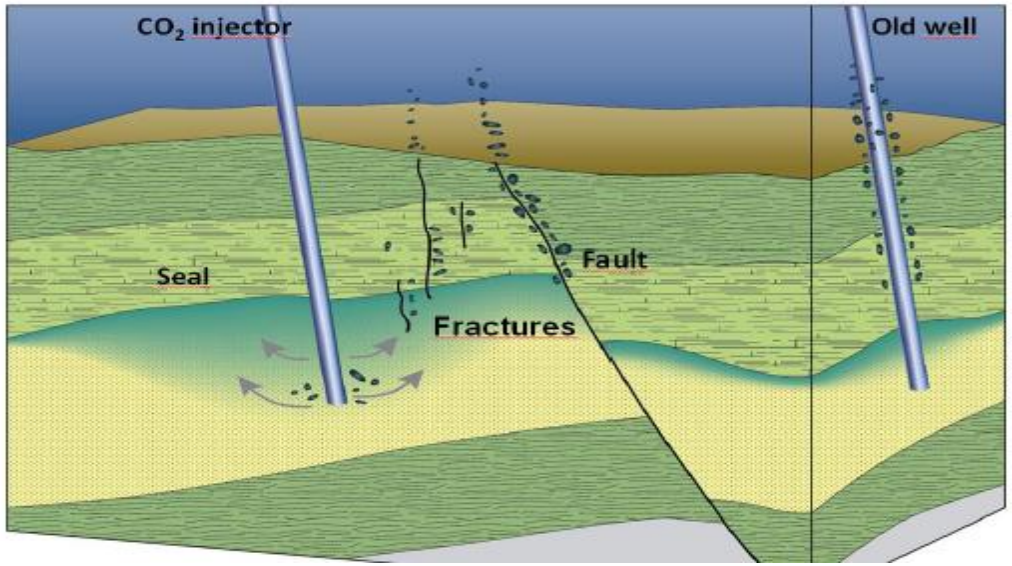
CO2 Safety Regulation § 11



CO_2 SAFETY REGULATION §11

- The consequences for the well barriers of existing wells in the CO_2 storage complex shall be accounted for.



GUIDANCE LEVEL

- *By existing wells is meant wells that are in use and temporarily or permanently abandoned wells.*
- *To assess the well barriers to existing wells when storing CO_2, DNVGL-RP-J203 Section 7*
- *and ISO 27914 Chapter 7.6 should be used.*

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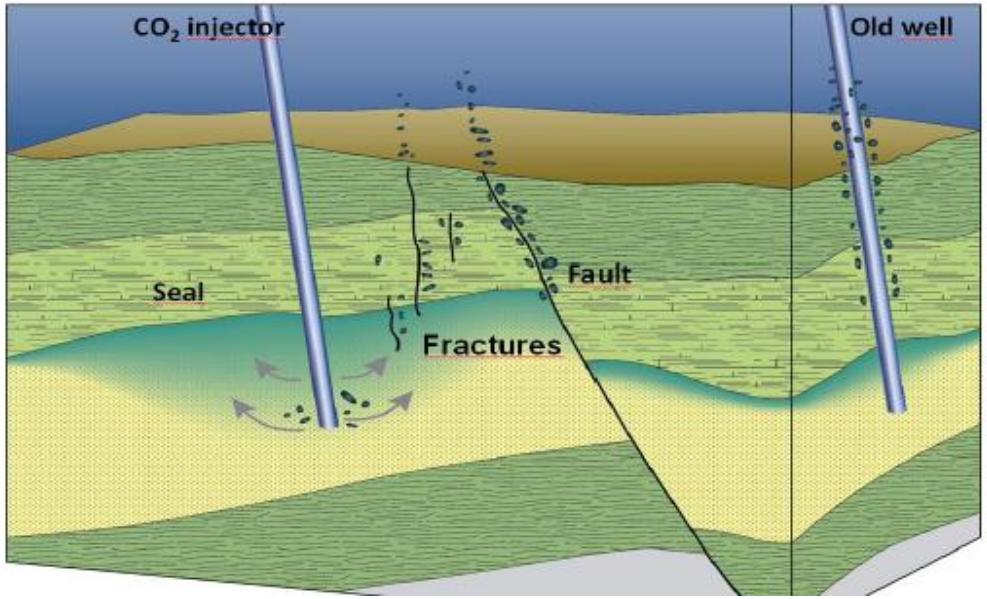
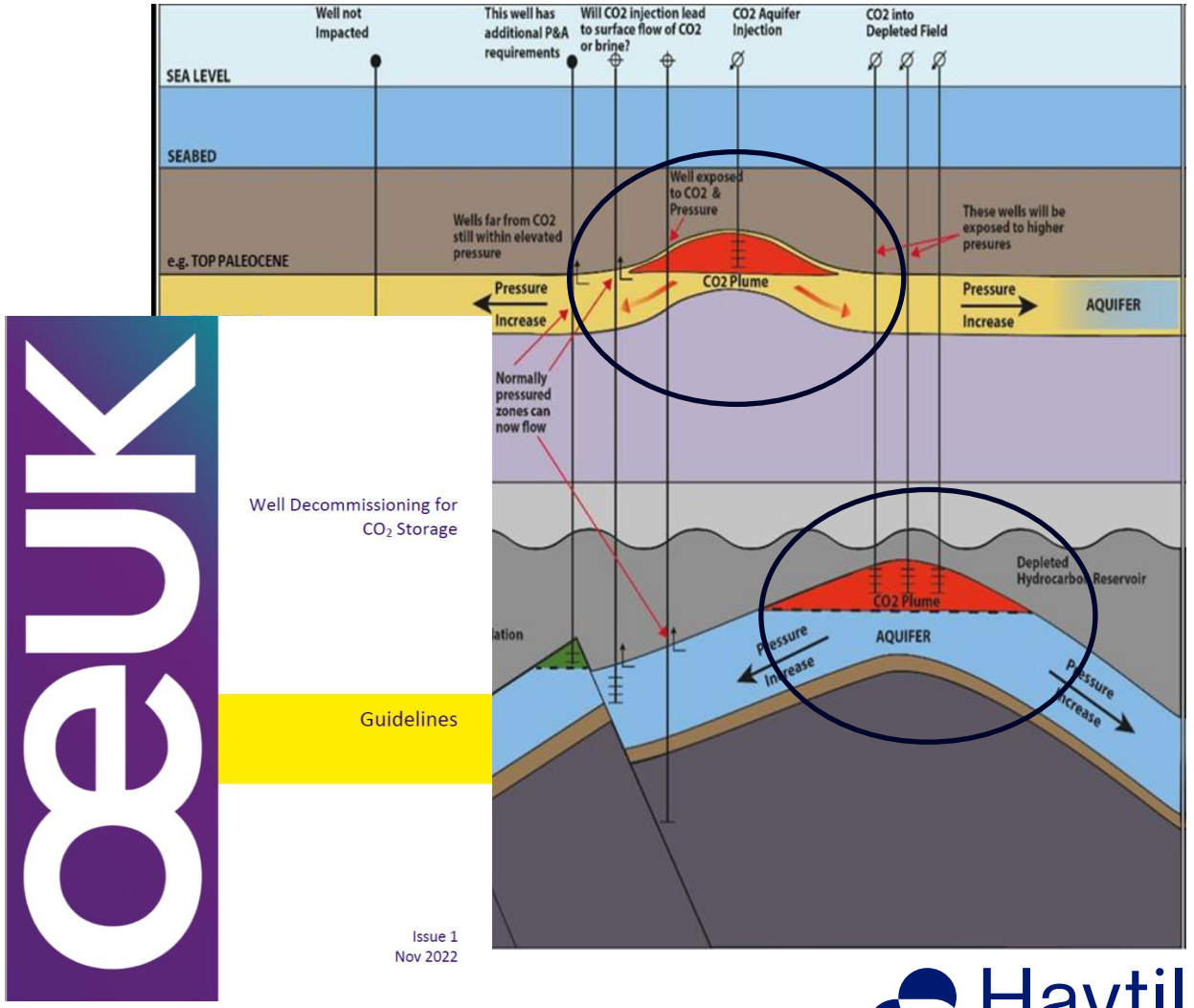
Assessment of wells in storage complex

Legacy wells*: A well that has already been decommissioned according to legacy standards and inherited by the CO2 storage operator.

Saline Aquifers: CO2 storage in aquifers is likely to be accompanied by a long-term pressure increase, above initial formation fluid pressures.





(*OEUK – Guideline for Well Decomissioning for CO2 storage)

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The European Commission Guidance Documents to the CCS Directive 2024

Guidance documents

- Guidance Document 1: CO_2 Storage Life Cycle and Risk Management Framework
- Guidance Document 2: Characterisation of the Storage Complex, CO_2 Stream Composition, Monitoring and Corrective Measures
- Guidance Document 3: Criteria for Transfer of Responsibility to the Competent Authority
- Guidance Document 4: Financial Security and Financial Contribution

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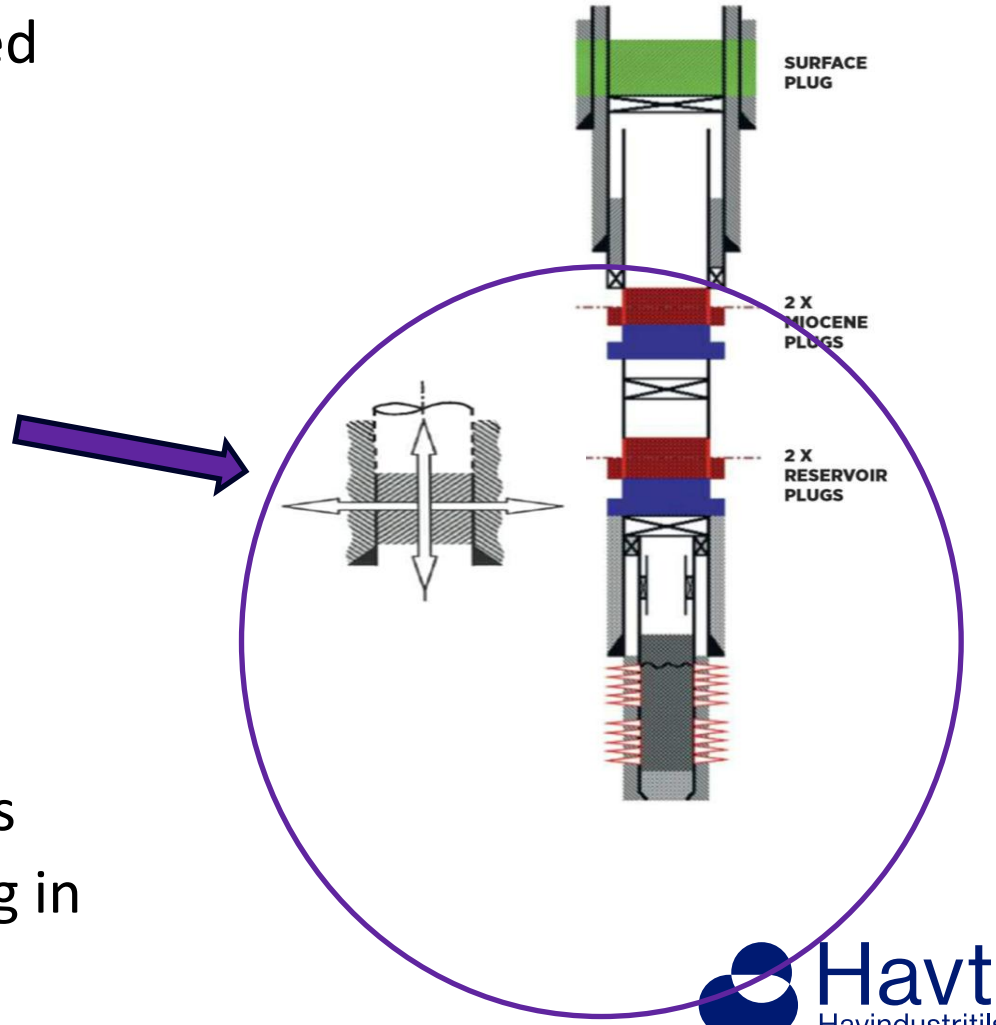
Legacy well assessment and CO2 exploration wells

- CO2 storage in aquifers is likely to be accompanied by a long-term pressure increase, above initial formation fluid pressures.
- Exploration well barriers that were designed assuming initial formation pressure should be evaluated carefully.
- Legacy well barriers will have to be located in competent formation.
- Well data across aquifers or geological formations without HC is typically limited (exploration drilling in overburden).



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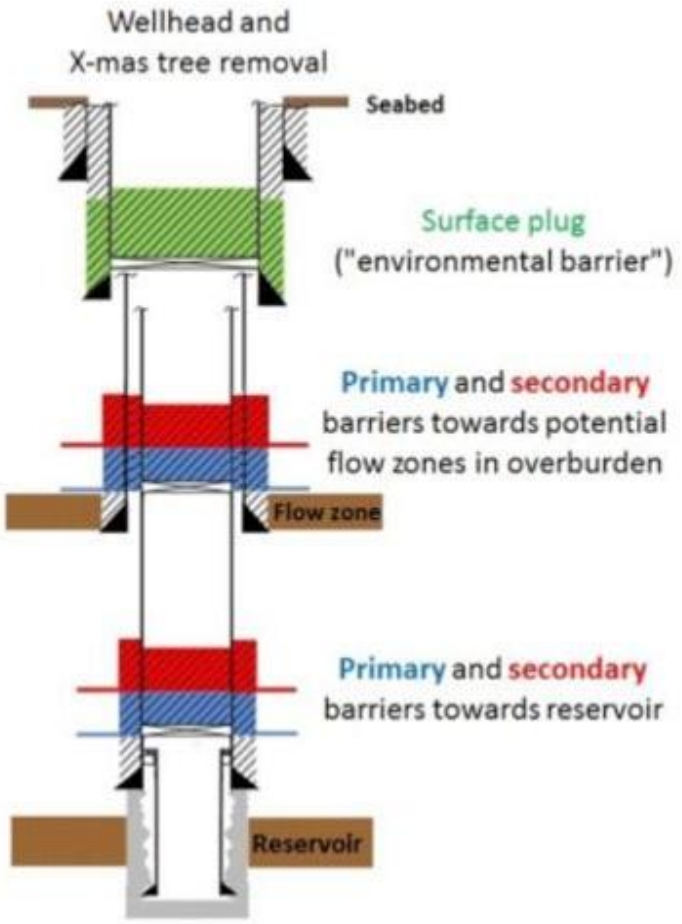
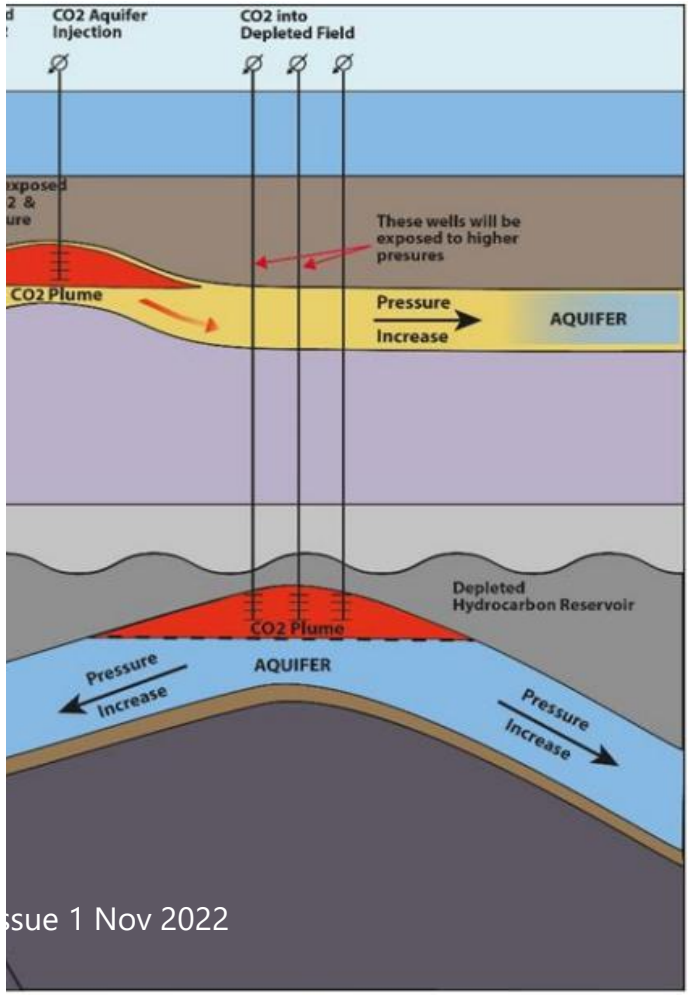
Legacy well assessment in storage complex





ssue 1 Nov 2022

- Long term pressure increase, above initial formation fluid pressure
  - Minimum depth of integrity
- CO2 as supercritical fluid
  - Carbonic acid and corrosion in well materials and cement in aquifers
- Cyclic pressure and temperature effects can affect well integrity if discontinuous injection
- CO2 migration with time and trapping mechanisms to be evaluated

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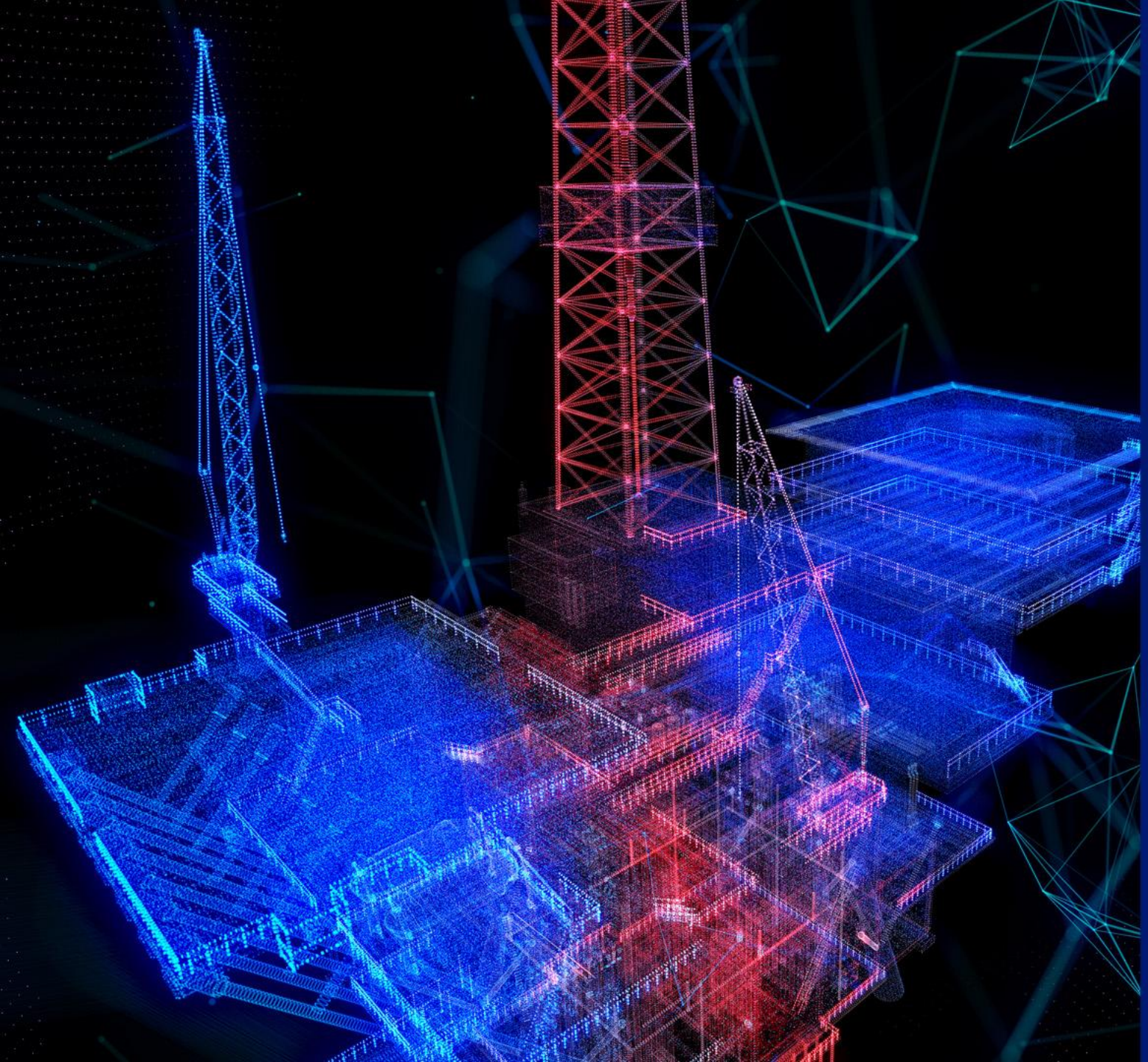
Collaboration with other authorities and industry partners is key

Norwegian
Environment
Agency



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