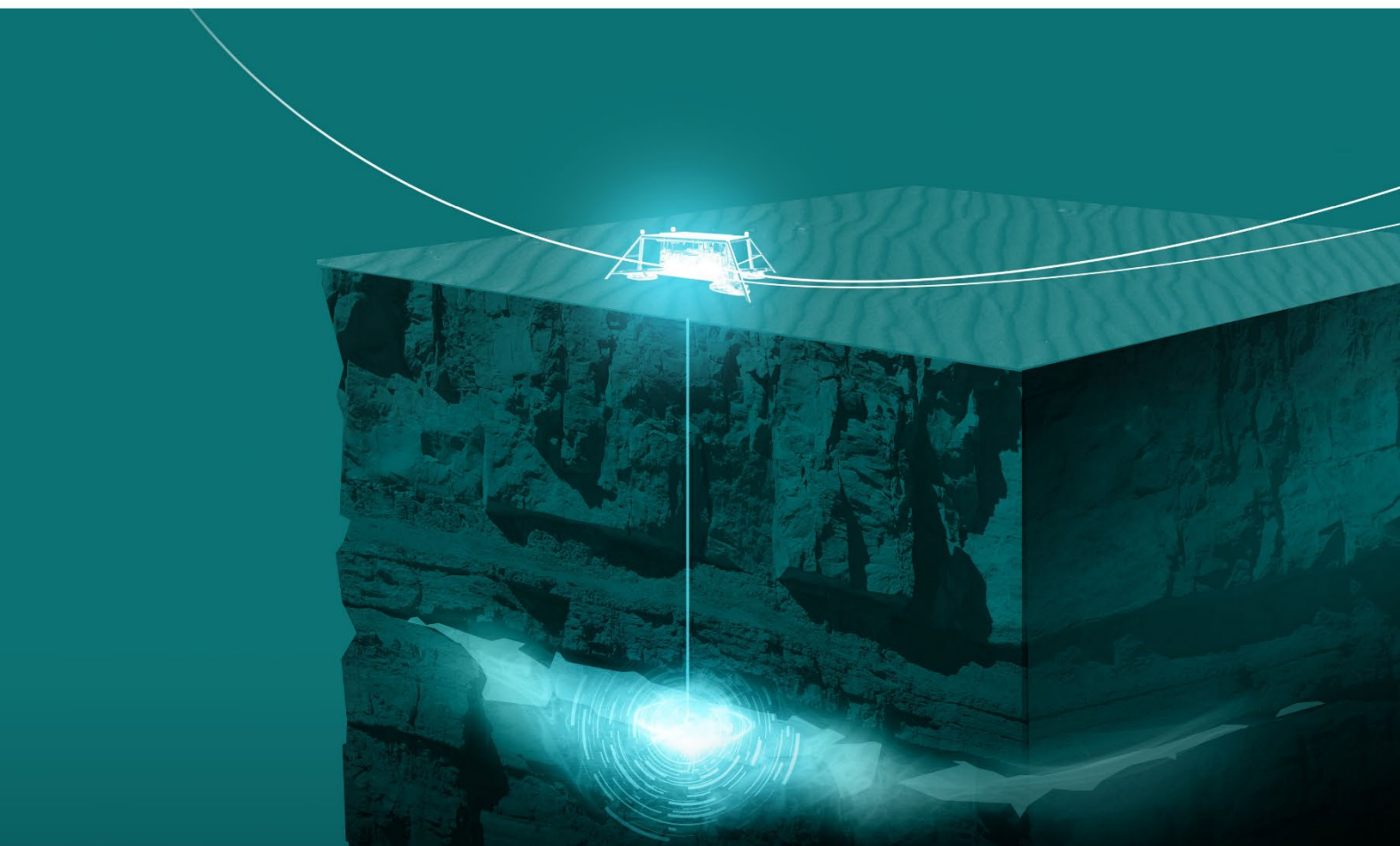


Guidelines for application of license



Award of area for storage of CO₂-2 on the
Norwegian continental shelf 2021



NORWEGIAN PETROLEUM
DIRECTORATE

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General application information

Submission of application

Each application must be submitted to both the Ministry of Petroleum and Energy and the Norwegian Petroleum Directorate. Upon sending via L2S Authority Communication, both the Ministry of Petroleum and Energy and the Norwegian Petroleum Directorate can be added as recipients in the same submission.

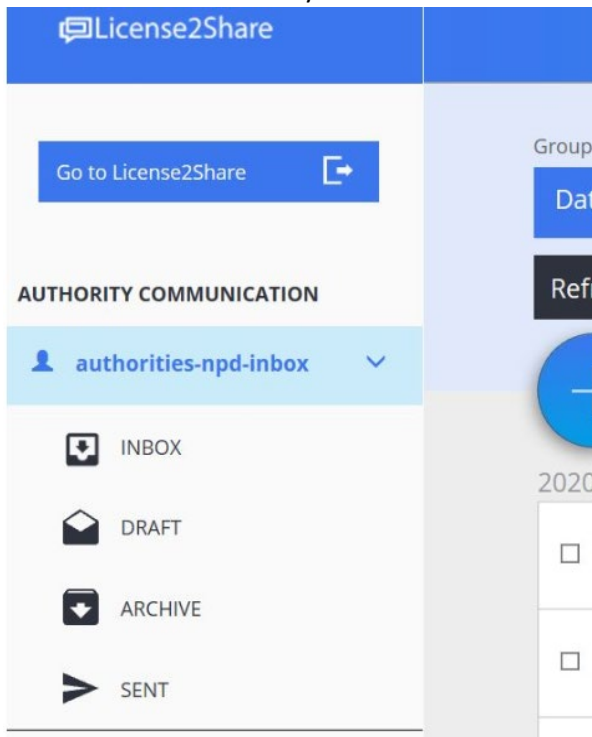
The Norwegian Petroleum Directorate (NPD)

The application(s) including attachments must be saved in a folder labelled CO2-2-"*companyname*"-"*applicationnumber*"of"*totalnumber*" and the folder must subsequently be compressed ("zipped"). "Total number" represents the number of applications your company actually, submits via L2S or Altinn. The folder must not contain subfolders and the file must not be protected by password

The submission must be named CO2-2-"*companyname*"-"*applicationnumber*"of"*totalnumber*" and submitted via L2S Authority Communication or Altinn.

Example for company "Energy AS" submitting one application: CO2-2-EnergyAS-1of1.zip

The inbox in L2S Authority Communication looks like this:



The Ministry of Petroleum and Energy (MPE)

One copy of the application shall be sent to (MPE) via L2S Authority Communication or Altinn.

The deadline for submission is 12:00 noon on Thursday, 9 December 2021.

Applicants are encouraged to submit well before the deadline.

Overview of submissions to the MPE and the NPD

- Application letter
- Company information
- Application(s) including attachments

The total size of the application **should not exceed 600 MB.**

Forms

The forms requested for the applications can be found in the Excel workbooks:

1. ApplicationData
 - a. Table 1: Application summary
 - b. Table 2: Quantities Stored (potential)
 - c. Table 3: Work program and duration
2. Geological Storage location and Quantities Stored potential data
 - a. Table 4: Geological Storage location and potential capacity for Quantities Stored
3. Company Information
 - a. Table 5: Application list from company
 - b. Table 6: Size and experience related to petroleum and CCS
 - c. Table 7: Financial status
 - d. Table 8: Projected cash flow (only for companies without an international credit rating)

Overview and naming of the content in each application

Appendices:

1. Application
2. ApplicationData
3. Geological Storage location and Quantities Stored, potential data
4. CompanyInformation
5. Map of area applied for

- Files must be named as indicated below:

Name of file	Format	Description
<i>Application_ "block number"</i>	.pdf	Application
<i>"Block number" _ ApplicationData</i>	.xlsx	Completed Excel workbook "ApplicationData" One Excel workbook per application
<i>"Block number" _ "Storage locations and storage options name" _ Geological Storage location and Quantities Stored potential data</i>	.xlsx	Completed Excel workbook «Geological Storage location and potential capacity for Quantities Stored" One Excel-workbook per Storage locations and Storage options
<i>"Block number" _ "company name" _ CompanyInformation</i>	.xlsx	Completed Excel workbook "CompanyInformation", One Excel workbook per application
<i>"Block number" _ "company name"</i>	.jpg	Map of area applied for with Storage locations and Storage options, max. 200 kb

Guidelines for maximum number of pages and number of figures/tables are listed under the various chapters of the application. A reason must be stated if there is a need to exceed the maximum total pages and number of figures/tables. Use a font size corresponding to Times New Roman 12 and single/standard spacing. All information in figures and maps must be legible. All maps must contain coordinates, as well as a scale.

The Excel-workbooks to be used in the applications can be found on the NPD's website together with these guidelines at: <https://www.npd.no/en/permits-for-carbon-storage/>. The format of the Excel forms must not be changed. Exceptions are adding new rows in Tables 1, 2, 3 and 4.

All units (depth, area, volume, etc.) must be provided in metric units.

Application for stratigraphic area

If a stratigraphic application, the interval applied for must be specified in Chapter 1 (Application summary).

Application for areas that contain discoveries/fields with ceased production

If the area applied for includes petroleum discoveries and / or fields with ceased production, information must be provided on geological, reservoirs and potential resource-related connections. Impacts from previous or existing petroleum activity must be described.

Geographic layout of the area

- Acreage without plan for further maturation is not normally awarded
- Acreage with only location option(s) without plan for further maturation are not normally awarded

Application content

1. Application summary

The application summary must be included as the first part of the application. The application summary should be approximately three pages and must contain:

- A. Overview of applicants and the area applied for indicating the block number in completed form "Table 1: Application summary"
(Table 1 must also be in the Excel workbook "ApplicationData")
 - B. Area description with completed form "Table 2: Quantities Stored potential "
(Table 2 must also be in the Excel workbook "ApplicationData")
 - C. Map with geographical coordinates, block number and scale which shows the area applied for with an outline of the discoveries and prospects that are specified in the form "Table 2: Quantities Storage potential" and presented in the application.
(The map must also be included as a separate .jpg file)
 - D. Completed form "Table 3: Work program and duration"
(Table 3 must also be in the Excel workbook "ApplicationData")
-

A. Overview

Give a brief description of applicants and the area applied for. For applications for additional acreage, the interval must be specified. The form "Table 1: Application summary" is to be completed with the necessary data.

B. Potential for CO₂ storage

Give a brief summary of the potential for CO₂ storage in the applied area. The storage locations and storage options must be outlined on a map, described in the application and be listed on the form "Table 2: Quantities Stored potential".

Any petroleum discoveries / fields with ceased production in the area where CO₂ storage is applied for must be included. Use different colors to show different stratigraphic levels. Key data for storage locations, -prospects, discoveries and fields described in the application must be listed in the form "Table 2: Quantities Stored potential".

C. Map

Show on a map the area applied for and the outline of the storage location and storage options, discoveries and fields that are relevant for CO₂ storage. The map contains geographical coordinates, block numbers and scales. In the summary, the potential of the storage locations must be described. For application for stratigraphic licence, please fill the area with simple hatch.

D. Work program and duration

The applicant's proposed work program and duration of the injection must be listed in the form "Table 3: Work program and duration". Examples of/suggested work program, and decisions that will be used, are provided below the form. Other activities can also be entered. A more detailed description of the work program should be provided in Chapter 3 of the application.

2. Geological and technological assessment

In their description, the applicant should generally apply what is described in Appendix I of the Storage Regulations - 'Criteria for description and assessment of the possible storage location and surrounding area'.

Definitions shall, as far as possible, also be in accordance with international standards. Unless the applicant states otherwise, it is assumed that specifications and definitions are in accordance with the UN classification system:

https://unece.org/fileadmin/DAM/energy/se/pdfs/UNFC/UNFC_specs/UNFC.IP_e.pdf

2.1 Database and data utilisation

Seismic, wells and other data types, used in the evaluation of the area and the potential for CO₂ storage. How data has been utilised will be emphasised, as well as to what extent new and own interpretations and analyses were performed by the applicant.

Information must be provided on consultant reports, purchased studies and other information that is not publicly available and that has been used in the application.

Section 2.1 should not exceed 5 pages including maps and tables

Seismic database	Seismic used in the evaluation is listed with the survey name and type of seismic, and is shown clearly in a database map of the applied for area. Data quality and measures to improve data can also be mentioned here.
Well database	Well data that has been used in the evaluation is listed by name and shown clearly in a database map of the applied for area. Key wells are marked and commented/discussed.
Studies	Provide information on internal or purchased relevant technical studies with clear references, e.g. reprocessing/geophysical special studies, geochemistry studies, sealing analyses / leakage studies etc.

2.2 Geological overview

The documentation in this section shall describe seismic mapping and reservoir conditions that are considered critical for evaluating mapped storage potential. A description of critical factors for the integrity of the storage location, such as porosity and permeability, distribution and sealing conditions, possible high pressure and / or high temperature (HTHT) in the actual area and at any depth and mapped storage options.

The documentation under Section 2.2 should not exceed 5 pages of text in addition to a maximum of 20 figures.

Seismic mapping	Describe which horizons are interpreted, "well tie" and the depth conversion method. The following figures must be included as a minimum: <ul style="list-style-type: none"> • Synthetic seismogram which documents "well tie" • Seismic line which shows calibration of seismic interpretation vis-à-vis well(s)
Regional geology	Briefly describe the stratigraphic, sedimentological and structural characteristics of the area. The following figures must be included as a minimum: <ul style="list-style-type: none"> • Chronostratigraphic and lithostratigraphic column showing levels for identified storage location(s) and -options • Palaeogeographic map which illustrates the extent of the main reservoir for mapped storage options • Map showing structural framework in the area
Sealing / leakage	Describe the seal and integrity of the storage complex. Factors that may be critical for safe storage over time must be described and a plan for handling or monitoring of potential leaks presented. At nearby petroleum fields and / or petroleum wells, any leakage to or impact on these existing installations must be described.

2.3 Storage capacity evaluation

Mapping and evaluation of the storage capacity for the storage location and storage options in the area applied for. This can also include discoveries and fields with ceased production.

The main storage location is described in detail, while secondary sites and options are described in less detail. The main site in the application is defined as the prospect with the greatest risk-weighted capacity. In areas where several possible storage locations are mapped within the same concept and area, an overall description of mapping, capacities and uncertainty analysis is provided.

If the primary focus in the application is a petroleum discovery, the content of the evaluation must be adjusted. More emphasis will be placed on injection properties, sealing and development plan, and less emphasis on other topics such as regional geological conditions.

The documentation under Section 2.3 should not exceed 10 pages of text, in addition to about 10 figures, including:

- a maximum of 5 pages for the storage location(s), in addition to relevant figures/maps
- maximum 1 page of text in addition to figures for each storage location
- In cases where both previous petroleum discoveries and new mapped storage locations are mentioned, documentation may exceed the number of pages and the number of figures if appropriate.

The form "Table 4 Geological Storage location and potential capacity for Quantities Stored" must be filled in with data/parameters used in the evaluation of the mapped storage location and / -options. Data / parameters related to discoveries and fields with ceased production in the area applied for must also be filled in. For storage options, fill in the table with as much data as possible.

Concerning pore volume, fill in the expected pore water volume in relevant reservoirs within the area applied for. Give P10, P50 and P90 values, alternatively a low, medium and high value.

In the lower rows, there is only supposed to be a commentary field. The comment should not exceed one line and usually only a few words are necessary (for example: Good, satisfactory, uncertain, needs further study).

Concerning the data base it is sufficient to fill in the type of seismic the applicant has access to (2D/3D), and also if the applicant has access to well data beyond what is released in the area. For all these items, more details will be provided in the application text.

Mapping

For the primary storage location or groups of locations, petroleum discoveries/ fields with ceased production, a description of how they are mapped, the type of trap and seal, expected reservoir properties, capacity and estimated migration path ways for the injected CO₂.

The evaluation must in particular explain factors considered critical to the Injected volume over time, pressure build up etc.

The following documentation must be included for the storage location or groups of locations:

- One overview map with coordinates and outline of the storage location, as well as position of seismic lines and geological profiles
- Two seismic and geological profiles in intersecting directions
- Time map and depth map in equal scale for reservoir horizon(s)
 - o A time map is not necessary if the mapping is based on depth converted seismic
- Seismic attribute map/time slices, if applicable
- NPD can request geological and dynamic models of the storage location(s)

Other figures can be included to the extent they are relevant for the description of the storage locations. For discoveries/ fields with ceased production, we expect well correlations and interpreted well logs, reservoir zonation as well as illustrations from static reservoir models.

Storage capacity

For the primary storage location (s) "Table 4: Geological Storage location and potential capacity for Quantities Stored " describe the method for calculating the following:

- rock volume with uncertainty range
- volume for storage capacity with uncertainty range

The description shall include the method for uncertainty calculation, and explanation for the chosen reservoir- and fluid parameters, as well as storage capacity.

Storage capacity with spread must be listed in the form "Table 4: Geological Storage location and potential capacity for Quantities Stored " for all storage location(s), discoveries/shutdown fields. For storage options, fill in the table in as much detail as possible.

If only parts of the mapped storage location(s), petroleum discoveries/ fields with ceased production are in the applied for area, the form "Table 2: Quantities Stored potential" must clearly indicate the percentage this constitutes, as well as total storage capacity.

Discovery probability

Discovery probabilities and associated sub-probabilities listed for storage options in the form "Table 4: Geological Storage location and potential capacity for Quantities Stored " are addressed and explained with regard to the critical factors for the storage location.

Technical reservoir Conditions

For the storage location(s), there must be a brief description of the expected injection schedule with the planned injection strategy, and the most important reservoir uncertainties and challenges that can be expected. An injection profile is included.

A more detailed description, including an injection profile, must be provided if an existing petroleum discovery/ field with ceased production is the primary focus in the application. Reservoir data (SCAL, PVT etc.) that is of significance for selecting the injection strategy must be presented. Explain how uncertainties such as reservoir communication, aquifer support and pressure development can affect the planned injection profile and how the challenges can be managed.

Leakage risk

Describe possible leakage paths that have been assessed with the associated data basis, including risk in relation to existing wells (active / closed / abandoned).

2.4 Technological assumptions and development plan

For the mapped primary storage location or groups of locations, there must be a description of what is assumed to provide the most optimal and feasible development solution for the area. Relevant alternative solutions can also be discussed.

The description should be limited to about three pages including illustrations.

In the case of planned use of facilities that are in use in other activities on the shelf, a more detailed description of options, technical or commercial challenges, life time o.l. Relevant development alternatives must be presented and compared. Injection strategy, wells, facilities, transport solutions and possible cooperation with other companies should be included in the description.

Profitability calculations with assumptions should be presented for the various concepts, with plans and status of any agreements for access to CO₂ for storage. Brief discussions should be provided for challenges/risks and plans for potential commercial negotiations. Particular attention should be devoted to new solutions/new technology.

2.5 Monitoring

A plan for monitoring the injection facilities and the storage complex, including the CO₂ distribution, shall be outlined in the application, and it shall be described how this is expected to be established in any later phases of the project, cf. the Storage Regulations § 5.4 and § 5.7, and Appendix II.

3. Work program

Information about the work program for the applied area, provided in the form "Table 3: Work program and duration" in the application summary, must be discussed and explained. The entire work program must be described, with primary emphasis on the first phase.

Reference is made to examples and formulations in the form "Table 3: Work program and duration".

Comment briefly:

- relevant seismic surveys considered/intended to be used
- the time frame for the various phases of exploration, exploitation and/or development plans for the storage location.

If the application includes storage options, describe how they will be matured to a storage location.

If significant parts of the storage location, groups of storage options, or discoveries/ fields in the applied for area extend into an already existing production licence, the impact this will have for the plans must be discussed.

The description should be limited to about two pages of text

4. Environmental conditions

Comment on any special environmental regulations related to the applied area, and how these will be safeguarded during the exploration, exploitation-, development- and injection phase.

5. References

References to reports, studies, publications used in the evaluation work.