

## Peer Review Report

# Review Report on Regional exploration and characterisation of CO<sub>2</sub> storage prospects in the Utsira-Skade Aquifer, North Viking Graben, North Sea

Original Research, Earth Sci. Syst. Soc.

Reviewer: Tiago Alves

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### EVALUATION

#### **Q 1** Please summarize the main findings of the study.

These findings are robust, and I liked to read this work. I have pointed out some minor/moderate comments that need to be clarified in a future draft. The findings are clear and indicate that the Utsira-Skide aquifer may be considered as an area for future CCS.

#### **Q 2** Please highlight the limitations and strengths.

The paper is hard to read at times. I am concerned with some assumptions regarding the seal competence above the target reservoirs and an overall tendency to overlook updip migration of gas in what is a structurally complex prospect.

#### **Q 3** Please comment on the methods, results and data interpretation. If there are any objective errors, or if the conclusions are not supported, you should detail your concerns.

Good.

#### **Q 4** Check List

Is the English language of sufficient quality?

Yes.

Is the quality of the figures and tables satisfactory?

Yes.

Does the reference list cover the relevant literature adequately and in an unbiased manner?

Yes.

Are the statistical methods valid and correctly applied? (e.g. sample size, choice of test)

Yes.

If relevant, are the methods sufficiently documented to allow replication studies?

Yes.

Are the data underlying the study available in either the article, supplement, or deposited in a repository? (Sequence/expression data, protein/molecule characterizations, annotations, and taxonomy data are required to be deposited in public repositories prior to publication)

Yes.

Does the study adhere to ethical standards including ethics committee approval and consent procedure?

Yes.

If relevant, have standard biosecurity and institutional safety procedures been adhered to?

Yes.

**Q 5** Please provide your detailed review report to the editor and authors (including any comments on the Q4 Check List):

Please, see .pdf provided to the editor. Corrections include the following aspects:

1. Real storage capacity is a fraction of this property (Effective Storage Capacity) as known from Sleipner and other fields. Please, see lines 270 to 280.
2. To consider thin seal intervals as poor may be an oversimplification, as a 50-m thick overcompacted, 'tight' shale or mudstone can seal CO<sub>2</sub> and other gases very effectively in many a prospect? why did you consider the 50 m as a threshold thickness value?
3. Storage capacity of key structural and stratigraphic traps?

I tend to find the word 'closure' as relating to the geometry of a trap, and its detailed shape and geometry at a local scale of analysis.

4. Your seismic profiles made very concerned with updip migration towards the west (See Figure 5). Is this a problem/issue that needs to be discussed? I think it is.

**QUALITY ASSESSMENT**

|   |                                     |                                     |                                     |                                     |                          |
|---|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|--------------------------|
| <b>Q 6</b> Originality                    | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| <b>Q 7</b> Rigor                          | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| <b>Q 8</b> Significance to the field      | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| <b>Q 9</b> Interest to a general audience | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| <b>Q 10</b> quality of the writing        | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| <b>Q 11</b> overall quality of the study  | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |

**REVISION LEVEL**

**Q 12** what is the level of revision required based on your comments:

Moderate revisions.