

Peer Review Report

Review Report on Role of subsurface geo-energy pilot and demonstration sites in delivering net zero

Review, Earth Sci. Syst. Soc.

Reviewer: Ingrid Stober

Submitted on: 17 Aug 2021

Article DOI: 10.3389/esss.2022.10045

EVALUATION

Q 1 Please summarize the main theme of the review.

given in the detailed review

Q 2 Please highlight the limitations and strengths.

given in the detailed review

Q 3 Does the review include a balanced, comprehensive and critical view of the research area?

given in the detailed review

Q 4 Check List

Is the English language of sufficient quality?

Yes.

Is the quality of the figures and/or tables satisfactory?

Yes.

Does this manuscript refer predominantly to published research? (unpublished or original research is non-standard for a review article, and should be properly contextualised by the author)

Yes.

Does the manuscript cover the topic in an objective and analytical manner

Yes.

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

Yes.

Does the manuscript include recent developments?

No.

Does the review add new insights to the scholarly literature with respect to previously published reviews?

Yes.

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

Review of the manuscript , Role of subsurface geo-energy pilot and demonstration sites in delivering net zero' submitted by Stephenson et al. for publication in Earth Science, Systems and Society.

General comments

The authors present a wealth of –to a lot of people– new and very interesting information. Additionally, the topic is well summarized, discussed and the usefulness of the different technologies well evaluated. Thus, the manuscript is well suited for this journal and should be published.

However, for readers' better understanding, I think it is necessary to present a list of the abbreviations used in the text right at the beginning.

It should be mentioned that concerning geothermal energy the paper is focusing exclusively on deep geothermal energy, ignoring near surface geothermal energy possibilities.

Before starting with chapter 'Importance of subsurface geo-energy test sites' a short overview of different geothermal applications (heating and power systems) would be most helpful including how these systems work and a citation of important literature (e.g. Stober & Bucher 2021). In addition, possible environmental impact and induced seismicity are discussed ther in detail, which are maybe helpful in the other chapters.

Special comments (given by line numbers):

I.126: Before starting with chapter 'Importance of subsurface geo-energy test sites' an overview of different geothermal applications (heating and power systems) would be most helpful (e.g. Stober & Bucher 2021).

I.132: A pilot plant for CO₂-sequestration e.g. in Hellisheidi, Iceland, exists and should be mentioned. A short overview is given in the above cited book. Else, readers of the paper will get the impression that no pilot or demonstration plants exist.

I.169: Most fundamental is as well geological structure and hydrochemistry (chemical properties of the fluid) and hydraulic properties (e.g. permeability of the rock), and should be included in the text.

I.254: Additional test sites should be shortly mentioned, like e.g. the Snøhvit Field LNG and CO₂ Storage Project, Norway, or the Ketzin pilot site in Germany.

I.351: Test sites in Switzerland of the nagra for nuclear waste should be mentioned here as well. The two international sites are in granitic rocks (Grimsel) and in clays (Mont Terri).

I.366: Test sites using mine water thermal energy and which are used as heat storage are as well e.g. in Germany (e.g. Bochum) and should be shortly mentioned (see e.g. in Stober & Bucher 2021).

I.399 ff: Legal regulations concerning damages are missing, and as well possible insurances concerning the productivity of a borehole.

I.497–514: The benefits of site development for local engagement and acceptance are described for the Otway CCS test site. Similar engagement is carried out e.g. of nagra for radioactive waste sites and of the geothermal industry in France and Germany for deep geothermal plants. I think it is worth to mention these activities concerning public acceptance as well.

I.596: Within this context the role of faults in deep fluid circulation systems are important and worth to mention, providing under certain conditions the upwelling of hot waters to the surface (e.g. Stober et al. 2016).

Cited literature

Stober, I. & Bucher, K. (2021): Geothermal Energy, from House Heating Applications to Electrical Power Production.– 2nd ed., Springer, 390 p.

Stober, I., Zhong, J., Zhang, L., Bucher, K. (2016): Deep hydrothermal fluid-rock interaction: the thermal springs of Da Qaidam, China.– Geofluids, 16, 711–728, doi: 10.1111/gfl.12190.

QUALITY ASSESSMENT

Q 6	Quality of generalization and summary	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Q 7	Significance to the field	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Q 8	Interest to a general audience	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Q 9	Quality of the writing	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

REVISION LEVEL

Q 10 What is the level of revision required based on your comments:

Moderate revisions.