

Invitation to market dialogue

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Regarding the modification of the program for preliminary geotechnical investigations at the Energy Island in the North Sea

Discussion Paper

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1 Introduction

Based on political agreements on location and site investigations, Energinet is – on behalf of the Danish Energy Agency (DEA) and the Ministry of Climate, Energy and Utilities – undertaking site investigations for the energy islands in the North Sea. The results from the site investigations are expected to inform future tenders of energy islands, and decrease risk.

The DEA conducted a market dialogue for potential tenderers and relevant market operators on the geophysical, geotechnical and environmental site investigations for the Energy Islands in the North Sea and the Baltic Sea in 2021. The main findings from the marked dialog was published October 2021 and can be found here: [Summary of main findings](#)

The North Sea project has an increased focus on the risk for settlements of the soil layers in the area of investigation for the artificial island in the North Sea.

The Danish Energy Agency (DEA) invites potential tenderers and relevant market operators to participate in the written market dialogue on modification of the program for preliminary geotechnical investigations at the Energy Island in the North Sea.

This market dialogue will be an opportunity for the market and potential tenderers to provide feedback, input and recommendations on this matter.

Whilst the DEA is confident in describing the principal outline of the coming project and processes, it must be recognised that the project remains a work in progress and that changes may occur.

For more information on the DEA tender, please visit our website: <https://ens.dk/en/our-responsibilities/wind-power/energy-islands> .

We look forward to receiving your feedback.

Danish Energy Agency

2 About the Energy Islands

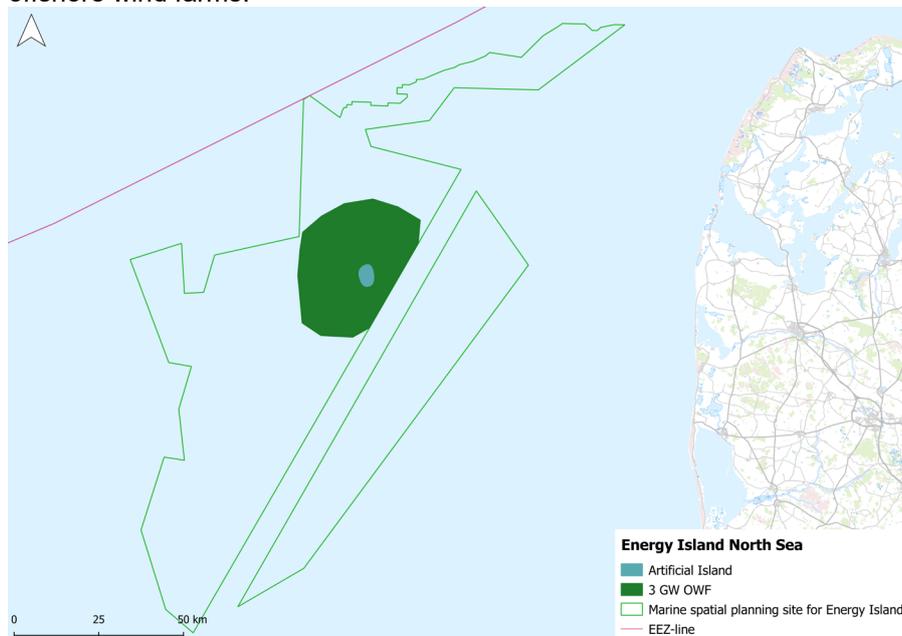
With the Climate Agreement for Energy and Industry of 22 June 2020¹, a broad majority of the Danish Parliament decided to initiate the realisation of an artificial island in the North Sea (in the following the “Energy Island”). The Energy Island will be the beginning of a new era for future development of Danish offshore wind.

Where the designation “Energy Island Project” is used, it refers to the project as a whole, including the artificial island, the power transmission network, the offshore wind farms and other potential activities.

The Energy Island located in the North Sea must have an area large enough to handle an initial capacity of 3 GW offshore wind power. As the construction of new international connections to neighbouring countries develop, the size of the island may be expanded in order to increase the scaled offshore wind power. By the end of 2040, the island should be able to receive and transmit up to 10 GW offshore wind power. In February² 2021 the parties behind the Climate Agreement decided that the Energy Island in the North Sea should be an artificial island that will connect and distribute power from the surrounding offshore wind farms.

2.1 Location and preliminary site investigations

In November 2020 the parties behind the Climate Agreement designated an area for the location of the artificial island and offshore wind farms in the North Sea, and they have agreed to begin the preliminary site investigations for the Energy Island and offshore wind farms.



¹ [https://en.kefm.dk/Media/C/B/faktaark-klimaaftale%20\(English%20august%202014\).pdf](https://en.kefm.dk/Media/C/B/faktaark-klimaaftale%20(English%20august%202014).pdf)

² [Aftaletekst - Energigøer - Ejerskab og konstruktion af energigøer mv.pdf \(kefm.dk\)](#) – only available in Danish

The water depth in the designated area is approximately 35 meters and the pre-Quaternary layer of chalk is present in a depth of 700 to a 1000 meters.

The Danish transmission system operator (TSO), Energinet³ are conducting the preliminary site investigations of the area in the North Sea. The preliminary site investigations are the first steps towards the realisation of the Energy Island and include geophysical (e.g. sonar studies where the seabed is screened) and geotechnical studies (e.g. drillings into the seabed) as well as environmental studies (e.g. fish, birds and benthic animals) and metocean investigations.

3 About the preliminary geotechnical site investigations

For the project, Energy islands, a location for an artificial island in the Danish North Sea, is investigated. Energinet expects to receive (preliminary) results from site investigations based on geophysical activities during spring 2022. The results include among other, geotechnical boreholes to 120m below seabed and interpretation of archived seismic data with penetration to ca. 1200m below seabed together with recent (2021) acquired 2D UHRS seismic data to ca. 150m to 200m below seabed.

The results are assumed to be available by summer 2022 and could form basis of an evaluation of geotechnical aspects in response to structural loading. If the data is concluded to be insufficient, then a new drilling program with deeper target depths may be initiated. The program for geotechnical investigations was updated in February 2022 and this marked dialog has the aim to investigate if the updated geotechnical site investigation program is sufficient.

3.1 Area of investigation

The area of investigation for the artificial island spans a 2.5 x 2.5km project site and is located in the North Sea west of Denmark as illustrated in Figure 2-1. Coordinates of the project site is listed in Table 2-1.

³ [About Energinet | Energinet](#)

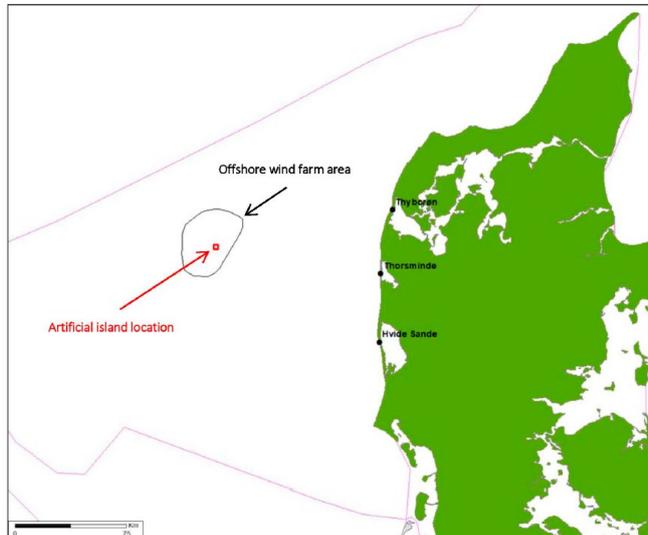


Figure 2-1

RED ARROW/ANNOTATION: Area of investigation for artificial island approx. 65 NM off the west coast of Jutland, Denmark.

BLACK ARROW/ANNOTATION: Project site for offshore windfarm.

Table 2-1 Area of investigation for the artificial island. Coordinates.

EASTING [meter]	NORTHING [meter]	LATITUDE [DD MM SS.sss]	LONGITUDE [DD MM SS.sss]
ETRS89			
UTM32N			
347 994,3	6 264 624,7	56° 30' 5,230" N	6° 31' 49,393" E
350 494,2	6 264 622,6	56° 30' 8,044"N	6° 34' 15,467" E
350 492,1	6 262 122,7	56° 28' 47,259" N	6° 34' 20,507" E
347 992,2	6 262 124,8	56° 28' 44,448" N	6° 31' 54,520" E

3.2 Overview of geophysical and geotechnical investigations

The program of the planned geophysical and geotechnical investigations for the artificial island project site is listed in Table 2-2

In the context of understanding the deeper soil units (depth > 100 m below seabed), it is in particular relevant to consider the deliverables with item numbers #1303, #1305 and # 1311. These deliverables will be addressed further below.

Table 2-2 Seabed investigations for project site of the artificial island

Item	Deliverable
1303	Geophysical site survey with 2D UHR seismic
1304	Geophysical site survey with 3D UHR seismic
1305	Preliminary geotechnical investigations with boreholes to 120m below seabed
1306 – 1309	UXO survey, ID and clearance and signoff.
1310	Marine archaeology
1311	Desk study. Seismic recordings to 1000m below seabed

3.2.1 #1305: Boreholes to 120m below seabed

It is now clear that the island designs considered by the Danish Energy Agency are likely to have a substantially larger weight than originally anticipated. This has focused the attention towards the risk that even very deep soil layers (> 100m below seabed) may experience significant compression.

For the project site, the Danish Energy Agency and Energinet have decided to modify the program for geotechnical boreholes from originally

- 20 boreholes á 40m depth below seabed to
- 6 boreholes á 120m depth below seabed.

The program still includes a comprehensive scope for CPT testing. See details in item #1305 here \1).

The comprehensive factual reports including laboratory programmes are expected to be available by end of 2022. However, the boreholes are expected to be performed during the spring 2022.

3.2.2 #1311: Desk study - Seismic recordings to 1000m below seabed

Existing archive seismic data with Danish Geological Survey (GEUS) are being evaluated and interpreted together with a set of selected 2D UHR seismic lines from #1303.

The archived seismic data from GEUS were collected as part of historical hydrocarbon exploration and is likely to penetrate to the top of the Chalk expected in ca. 1200m depth below seabed. Figure 2-2 show the location of these seismic lines relatively close the project site of the artificial island.

The results are expected to be available by May 2022.

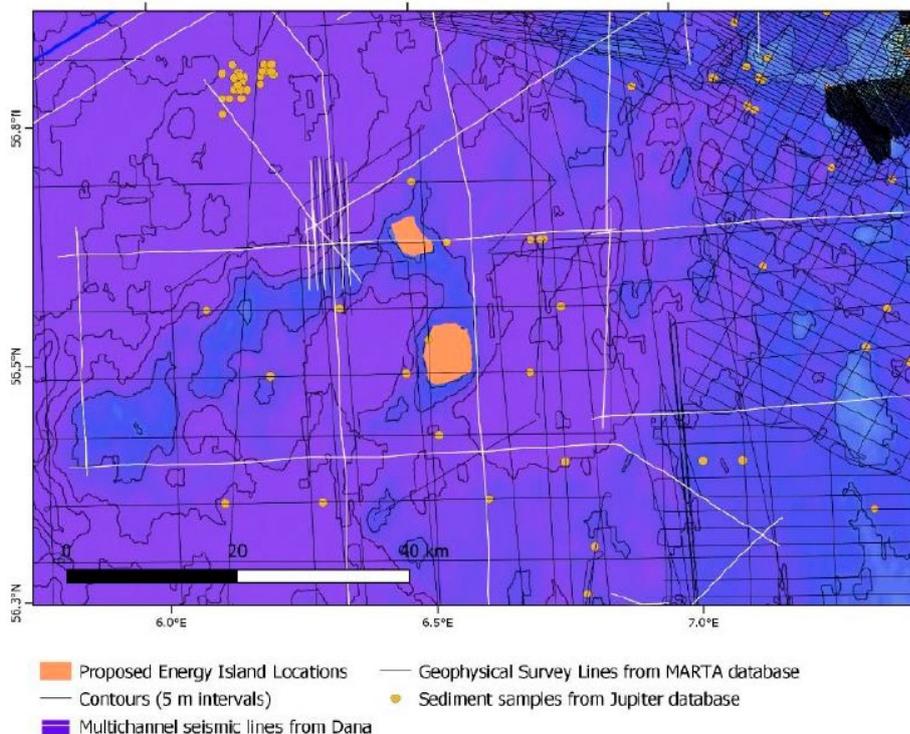


Figure 2-2. Illustration from \2\ showing seismic lines with relatively deep penetration “close to” the planned location of artificial island.

4 Strategy for deeper investigations

Results from the investigations nominated as #1303, #1305 and #1311 are expected during 2022.

Based on this data it is decided if sufficient information have been acquired to sufficiently understand the geology and the potential for settlements in relation to the planned artificial island.

Should the information be considered as insufficient, then boreholes with deeper targets seabed may be considered. However, such drilling investigations is anticipated to require more advanced drillings rigs and a new dedicated procurement process.

5 Participation in the dialogue

The market dialog on modification of the geotechnical site investigations will only be in writing, and there will be no physical meetings or virtual dialogue via Skype.

The DEA encourages all relevant market operators and potential tenderers to submit written recommendations and answers to the questions raised by the DEA in this section “Discussion Paper”. Please be precise and to the point in your written answers. A summary of your main recommendations should be included in your reply.

Written recommendations shall be submitted by e-mail to energyislands@ens.dk. In the answer in the market dialogue, please provide a brief introduction to your business(-es) and state why you are interested in this project.

5.1 Indicative timetable for the market dialogue

25 March 2022	This “Discussion Paper” will be available on Energy island in the North Sea Energistyrelsen (ens.dk)
29 April 2022	Deadline for submission of written answers and recommendations.

If potential tenderers request confidentiality of certain information for competition reasons, the DEA will be able to meet such requests, provided that they do not infringe the obligations of the Freedom of Information Act (Access to Public Administration Files Act), the Danish Public Administration Act and the Environmental Information Act and the Public Procurement rules, in particular the principles of equal treatment and transparency. Information received will under no circumstances be used in any way to provide competitive advantages to a single market player.

6 Questions regarding deeper geotechnical boreholes

The DEA would like to invite the market to comment on the following:

1. *The currently planned seabed investigations map the subsurface to ca. 150m below seabed (geophysical 2D seismic investigations) and 120m below seabed (geotechnical boreholes). With consideration to the anticipated, cumulated gravitational load from the planned artificial island structure would you see the need for site investigations to larger depths below seabed?*
2. *The program for geotechnical boreholes has been updated with fewer geotechnical boreholes than first planned. Is there in your opinion a need for more boreholes?*
3. *Assuming that deeper site investigations (re item 1) indeed is requested – which target depths below seabed would be relevant considering the planned artificial island structure?*

4. *What are the benefits to the process if the Danish Energy Agency initiate and complete the discussed deeper geotechnical boreholes in advance of the concession tender?*
5. *Would you prefer that the discussed deeper geotechnical boreholes are performed by the Danish Energy Agency and made available as part of the concession tender?*

7 References

\1\ Website at Danish Energy Agency:
[Preliminary site 3](#)

\2\ GEUS rapport 2020/24. En geologisk screeningsundersøgelse af potentielle energio områder i Dansk Nordsø. Matthew Owen, Paul Knutz & Lasse T'esik Prins.