Tender Name: Modelling hydraulic connectivity within the Central and Northern North Sea Tertiary Fan Systems

Tender Reference: TRN494-11-2023

1. **Area of Interest (AOI):** What is the size of the study area? How many Tertiary fans are to be included?

It is anticipated that that AOI includes the full extent of the Tertiary Fan systems across the NNS and CNS areas. This is a very large area and should account for the proximal and distal extents of the fans within the stratigraphic interval Top Chalk to Top Lista (Maureen, Balmoral, Andrew, Forties, Cromarty Members as a minimum; please include in your proposal any additional fan bodies considered to significantly impact how the system is connected). Please consider publicly available material to define the extent of the fans to the north and south but the Mid North Sea High could be considered a southern limit and the “End of the World” fault could be a northern limit to the AOI.

1. **Scenarios**. Is real world Tertiary fan mapping to be used or are hypothetical scenarios possible/preferred?

The NSTA would anticipate that a “close to real world” representation of the fans are used to build the model and can provide technical materials to help achieve this. Given that the AOI is very regional, we would encourage applicants to consider how you would propose a fit for purpose model that would achieve the objectives stated in the ITT at this scale.

1. **Wells**: How many wells will be included in the initial model, and what data will be provided (logs, core, maps, etc.)?

The NSTA anticipates that the number of wells required to be included in the model will be determined through scoping with the successful applicant. Please describe your approach to identifying relevant wells and required information from those wells in the tender application.

1. **Structure**: Have Tertiary fans been mapped (structure, aerial extent, thickness, connectivity), and if so what information will be provided?

The NSTA will provide regional depth grids representing the top and extent of each interval described in answer 1 as well as first order faults capturing the regional structure. A thickness database can be provided alongside the integration of publicly available material. The NSTA can provide access to pressure data and would encourage publicly available material to be used to help define the inferred connectivity of the system. Where respondents identify data or information that can be supplied as part of a solution, the NSTA will take this into consideration (in line with the criteria included in the ITT) during our assessment.

1. **Petrophysical Properties**: Will porosity and permeability data be provided, and if so, in what format/quantity? (SCAL, standard core data, raw/interpreted .las)

Porosity and permeability data will be made available most likely in excel spreadsheet format. The number and distribution of poroperm data required are to be determined based on what is deemed necessary to capture fit for purpose detail. Access to proprietary report material is available. Again, where respondents identify publicly available or additional data or information that can be supplied as part of a solution, the NSTA will take this into consideration (in line with the criteria included in the ITT) during our assessment.

1. **Facies Modelling**: Has there been any detailed facies interpretation/mapping for the area, and will it be provided?

The NSTA will provide access to some facies interpretation but would welcome recommendations as part of the tender submissions relating to the level of detail required. Please reference public domain materials to determine representative facies models that should be incorporated. Proprietary materials will also be made available to supplement certain scenarios.

1. **Fault Modelling**: Have first and second order faults been mapped within the AOI? Does fault mapping include connectivity to seabed/onshore?

First order faults based on publicly available data will be made available. Connectivity across these faults and their connectivity to seabed and onshore can be discussed during the modelling process.

1. **Rock & Fluid Properties**: What information is available for fluid properties (reservoir temperature, pressure, water salinity variations, water viscosities, rock compressibility, core floods or info on CO2-water real-perm, etc.)

Temperature, pressure, salinity and some core information will be made available (or can be found publicly) most likely in excel spreadsheet format. The number and distribution of this data required are to be determined based on what is deemed necessary to capture fit for purpose detail. Access to proprietary report material is also available. Again, where respondents identify additional data or information that can be supplied as part of a solution, the NSTA will take this into consideration (in line with the criteria included in the ITT) during our assessment.

1. **CCS Targets**: Are injection targets available for each storage site? Any injectivity & pressure constraints (technical & regulatory constraints) imposed on these licensed storage sites?

The NSTA will work with the successful bidder to ensure appropriate injectivity and pressure input assumptions are used. These will likely include technical material from licence development plans where necessary.

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1. What is the size of the area of interest (AOI)?

It is anticipated that that AOI includes the full extent of the Tertiary Fan systems across the NNS and CNS areas. This is a very large area and should account for the proximal and distal extents of the fans within the stratigraphic interval Top Chalk to Top Lista. Please consider publicly available material to define the extent of the fans to the north and south but the Mid North Sea High could be considered a southern limit and the “End of the World” fault could be a northern limit to the AOI.

1. Where is the area of interest located?
   * If possible, please provide a map of the study AOI.Please see answer above regarding regional AOI and consider how you would propose a fit for purpose model that would achieve the objectives stated in the ITT at this scale.
2. Does the entire Tertiary Fan system in the CNS and NNS need to be evaluated or a particular subarea of interest?

The intent of the model is to investigate the regional connectivity of the Tertiary Fan system using this model as a starting point. With that in mind, it is intended to be the entire fan system (Maureen, Balmoral, Andrew, Forties, Cromarty Members as a minimum; please include in your proposal the additional fan bodies considered to significantly impact how the sand packages are connected).

1. Does the model used to assess PPP in the Tertiary Fan systems need to be in one single model or can this be subdivided into several AOI models?

The NSTA would strongly encourage submitted tender applications to propose their recommended approach to capturing the objectives outlined in the ITT document. A single large model is one way to achieve this.

1. Are the regional sub-surface maps of main stratigraphic units (basement to surface including main aquifers and aquitards) available to define model geometries? The input data (e.g. depth grids)

anticipated to be required are available from the NSTA or can be sourced publicly. Where respondents identify data or information that can be supplied as part of a solution, the NSTA will take this into consideration (in line with the criteria included in the ITT) during our assessment.

1. Will interpretation of faults be provided along with interpreted subsurface maps?

First order faults will be provided and the provision of additional detail discussed throughout the model process.

1. Will these maps and faults be based on 2D-seismic, 3D-seismic or a combination of both? If maps are provided, will the seismic data these maps are based on also be provided or are they available in the NDR?

Both grids and faults are based on publicly available 2D & 3D seismic data accessible via the NDR.

1. Will these faults have information of transmissibility or Shale-Gauge Ratio available or is there a vshale property cube available to assess fault seal behaviour?

The faults will not have transmissibility or SGR information related to them. If this information is required, the NSTA can work with the successful applicant to source and integrate it.

1. Is there a facies model available to be used in the study (in particular of the tertiary fan system aquifer and aquitards of the overburden (digital GDE Maps, digital facies model, property model of Vshale, porosity or similar?))

Please reference public domain materials to determine representative facies models that should be incorporated. Proprietary materials will also be made available to supplement certain scenarios.

1. How many wells with pressure data are available for calibration of the Tertiary Fan System and overburden pressure in the AOI?

The NSTA has access to a regionally extensive and comprehensive pressure data which will be shared during the construction of the model. This amounts to many hundreds of wells worth of information in the Tertiary interval. The number of data points required will be determined during the modelling process.

1. How many wells have porosity/permeability data of the Tertiary Fan system?

The NSTA can access a very large number of wells with porosity and permeability data to facilitate this project. The number of wells that need to be included in the model will be determined through scoping with the successful applicant. Please describe your approach to identifying relevant well numbers and distribution in the tender application.

1. What is the requirement for the format of the report? Is a detailed power point set of slides sufficient?

A detailed, written report describing the approach, assumptions, methodology and results is preferred. An accompanying set of slides could act as an appendix of results.

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1. Section 1 of the ITT notes that the Tertiary Fan Systems of the CNS and NNS are extensively drilled and appraised. Please can the NSTA describe what geological, geophysical and geotechnical data and information will be provided to enable the work including building the geological model? If possible, please can spatial the extent (Basin, region or site scale), resolution and format be provided?

It is anticipated that that AOI includes the full extent of the Tertiary Fan systems across the NNS and CNS areas. This is a very large “regional” area and should account for the proximal and distal extents of the fans within the stratigraphic interval Top Chalk to Top Lista. Please consider publicly available material to define the defined extent of the fans to the north and south but the Mid North Sea High could be considered a southern limit and the “End of the World” fault could be a northern limit to the AOI.

The input data anticipated to be required are available from the NSTA or can be sourced publicly. Where respondents identify data or information that can be supplied as part of a solution, the NSTA will take this into consideration (in line with the criteria included in the ITT) during our assessment. There is no prescribed resolution or format for delivery of the results. Please use your application to outline your recommended approach to achieving the project objectives outlined in the ITT.

The NSTA will provide regional depth grids including Top Balder, Base Paleocene, Base Upper Cretaceous, Base Lower Cretaceous, Base Upper Jurassic, Base Middle Jurassic, Base Lower Jurassic, Base Triassic, Base Rotliegendes, Base Zechstein. NSTA will also provide access to proprietary regional reports which contain pressure, porosity and permeability, net to gross information. First order faults based on publicly available data will be provided and the provision of additional detail discussed throughout the model process.

1. Please can the NSTA confirm the geographic area of the work (the area of interest)

It is anticipated that that AOI includes the full extent of the Tertiary Fan systems across the NNS and CNS areas. Please consider publicly available material to define the extent of the fans to the north and south but the Mid North Sea High could be considered a southern limit and the “End of the World” fault could be a northern limit to the AOI.

1. Declaration 4 is included in the Tender but the required documents for Tender return (Page 6) states only Declarations 1, 2 and 3 should be returned. Please can NSTA confirm if Declaration 4 should be returned?

All declarations have to be completed, signed and returned.

1. Please can NSTA confirm that the form of the model is gridded surfaces rather than, for example, full 3D cubes?

The delivery of gridded surfaces or 3D cubes are examples of ways to meet the project objectives. Please use the tender application to outline your recommended approach to achieving the project objectives outlined in the ITT. The input data anticipated to be required are available from the NSTA (if needed) or can be sourced publicly.

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* Will the contractor get access to the license application documents for the 7 license stores in questions?

The NSTA will work with the successful bidder to ensure appropriate assumptions are used. These can include information and technical material from licence development plans where necessary.

* What other data will NSTA provide as input? Regional maps, faults, consolidated Tertiary wells database etc.

The input data anticipated to be required are available from the NSTA or can be sourced publicly. This may require some compilation of data into coherent database of relevant wells. Where respondents identify data or information that can be supplied as part of a solution, the NSTA will take this into consideration (in line with the criteria included in the ITT) during our assessment.

The NSTA will provide regional depth grids including Top Balder, Base Paleocene, Base Upper Cretaceous, Base Lower Cretaceous, Base Upper Jurassic, Base Middle Jurassic, Base Lower Jurassic, Base Triassic, Base Rotliegendes, Base Zechstein. NSTA will also provide access to proprietary regional reports which contain information related to pressure, porosity and permeability, net to gross. First order faults based on publicly available data will be provided and the provision of additional detail discussed throughout the model process.