TENDER DOCUMENT - ANNEX 1

Acquisition and processing in 2013 of 2D seismic data on the Norwegian Continental Shelf – Barents Sea

(Ref no 2012/1166)

NORWEGIAN PETROLEUM DIRECTORATE

Contents

1 Seismic acquisition programme

The NPD acquisition programme planned for 2013 is as follows:

The seismic survey size will range from 6.000 - 12.000 km. The NPD will revert with details of the specific survey areas as soon as possible after the decision has been made in this respect.

Due to the nature of fishing activities and/or changes to the extend of the ice-edge - the survey programme may be modified / changed during the cruise - in agreement with the NPD and the Contractor.

The line length (average) is anticipated to range between 130 km and 370 km. (See Section 7.2).

2 Project timing and funding

2.1 Project timing

The timing of the seismic acquisition programme is critical due to ice-edge extend, weather conditions and fishing activities. The NPD will therefore in our evaluation give preference to bidders who can carry out the seismic surveys in the time window from 1st August to late September / early October 2013, ref. award criteria Availability of seismic vessel.

In order to accommodate for this situation – we require:

- The bidder must give a Brief & Clear statement whether it is possible to mobilize for this survey on or about August 1st, 2013
- Quotations reflecting Maximum data volumes (Scope of Work) of 6.000, 9.000 & 12.000 Km 2D (table below to be completed)

2.2 Project funding

This project is dependent on funding from the Norwegian Government. At this point in time, we cannot be sure to have all funds secured to cover the full data volume as indicated in Section 1, on the previous page.

The first 6000 Km of 2D data acquisition should be considered as firm work. The next 6000 Km should be considered optional work.

Use of the ‘option’ depends of necessary additional funding from the Norwegian Government. The NPD assumes that the question of funding will be clarified and resolved before the signing of the contract.

As a consequence of the above funding – reservation, we require the bid to be structured in two ways:

- The first 6.000 Km of 2D data acquisition will be quoted as “firm work” and the next 6.000 Km as “optional work”.
- All 12.000 Km to be quoted as “firm work” (table below to be completed)

Price-table 1 (reflecting Section 2.1 & 2.2, above)

Maximum 2D Data Volume (Km):			
6 000	9 000	12 000	Alternative 1: First 6.000 Km "Firm" next 6.000 Km "Optional"

6 000	9 000	12 000	Alternative 2: All 12.000 Km "Firm"
Price (NOK) per Km			

3 Technical specifications

3.1 Data acquisition

The acquisition of the 2D seismic streamer data should be performed with the highest quality industry equipment and geometry.

As it is likely that we wish to survey in northern waters - we will require the bidder to provide an accurate description of the survey vessel's Ice Classification and the vessels ability to survey in such northern waters. (This applies both to the Seismic Vessel as well as eventual Support Vessels)

Bidders are required to provide documentation with a proper description and particulars of the geophysical benefits of their streamer system, as well as a description of other attributes and benefits of such system. In particular, towing and towing depth, hereby weather (productivity) impact should be described.

Survey parameters:

Shot (pop) interval:	25 m (depending on selected recording length)
Source depth:	6.0 m or 7.0 m
Streamer active length:	8 km
Streamer depth:	7.0 m (nominal) – 9.0 m (nominal) / and dependent on pre-survey geophysical evaluation & streamer technology
Record length:	9 - 11 Sec. (to be evaluated)
Sampling rate:	2 ms

Available options for the acquisition geometry and source configurations shall be specified. The bid should contain a detailed technical description of proposed equipment.

In addition, a table of possible pop intervals referenced to recording length(s) and vessel production speed shall be included.

3.2 Navigation specifications

The bidder should make use of an industry standard navigation system.

The bidder shall specify in detail the navigation system which will be applied for the 2D seismic acquisition.

The bidder is responsible for navigation supply. Navigation data shall be processed by bidder in order to produce final positions for each source and trace.

The centre of sources shall at all times be determined better than +/- 5 m. Receivers shall at all times be determined better than +/- 10 m. Both figures shall refer to a confidence level of 95%.

3.3 Additional services

Provision of one support/ work boat for the planned survey shall be quoted or included in the prices specified in Section 7 of the tender.

NPD may consider other geophysical measurements to be made simultaneously. The bidder is requested to specify arrangements and costs for inclusion of the following additional geophysical equipment:

- Gravity field data
- Magnetic field data

4 Data quality

The bidder shall provide Quality Control during the acquisition and processing of the data.

For the seismic acquisition programme, vessels shall be used that are constructed, equipped and operated in accordance with relevant requirements from the competent Authorities in the country of registration and from a first class international classification bureau approved by IACS.

The bidder shall describe his routines for quality control of the data, using acceptable, industry standards such as “Procedures and Specifications for Field Operations and Data Processing” as an appendix to the response to tender.

The bidder shall:

- Give details of the vessel to be used and all its maritime equipment (sources, streamers, navigation and positioning system). The vessel and the equipment shall satisfy the highest industry standards.
- Give a description of the vessel and relevant equipment for carrying out the assignment and copies of relevant certifications

The bidder shall describe his seismic QC system for recording, monitoring and analysis of seismic and navigation data.

All equipment, instruments and other materials supplied by the bidder are subject to approval by the NPD before commencement of the survey acquisition.

A representative of the NPD shall be onboard the survey vessel at all times for quality control. This does not, however, exempt the bidder from his responsibility of delivering all products to the specified acceptable standard / quality. In addition, a fisheries representative will also be required to be onboard (this cost will be covered by the NPD), and NPD personnel (if decided by the NPD) - will be onboard during the acquisition.

5 Seismic data processing

Algorithms and parameters used at each step in the processing sequence are subject to agreement with the NPD in writing prior to the production processing. Deviations from the basic sequence are also subject to agreement with the NPD.

The basic processing rate shall be based on the following estimated processing sequence:

- Reformat from SEG-D to contractor’s own data format. Static shift correction for source/receiver depth. Bad shot and channel edits. Gain recovery
- Spherical divergence correction
- Merging the seismic traces to the navigation
- Resample to 4 ms
- Noise attenuation. The data will be searched for spikes, spurious high amplitudes and swell noise
- Deterministic signature de-convolution (zero phasing / minimum phasing) which shall be applied, using an operator designed to transform the modelled far field source signature to its zero phase equivalent. This process shall also take care of source and receiver ghost as well as the air gun bubble pulse
- Anti alias K-filter
- Linear noise attenuation in shot and receiver domain, focused on direct arrivals and refractions, contractor to specify methods

- SRME de-multiple
- SWD (Shallow Water De-multiple)
- Tau-p de-convolution in shot and receiver domain
- Diffracted multiple attenuation
- First pass velocity analysis every 2 km. All velocity picking shall be performed in agreement/cooperation with NPD staff. The data shall be muted (and properly pre-conditioned) prior to all velocity analyses
- FX de-convolution on common offsets
- Common offset linear noise-attenuation (FK filter), as appropriate
- Hi-Resolution Radon de-multiple with appropriate interpolation
- Second pass velocity analysis every 1 km. Input to pre-stack time migration (PSTM)
- Full 2D Kirchoff pre-stack time migration (PSTM)
- Third pass velocity analysis every 1 km x 1 km grid. Final velocities which have to be exported to EssoV2 and diskos98.1 format
- Second pass Hi-Resolution Radon De-multiple
- NMO correction. Pre-stack scaling, inner trace mute and outer trace mute. CDP stack
- Relevant post stack signal enhancement procedures
- Post stack scaling
- SEG-Y output

Optional extra processing (stipulated with individual rates):

- Wave Equation Multiple Attenuation

The NPD see it as necessary that processing parameters shall be tested on two or three parts from different lines and confirmed on two more lines before being applied in production. The test data should be available via FTP-server in SEG-Y format.

6 Data delivery and final products

6.1 General

Raw 2D seismic data:

The bidder shall deliver raw 2D acquired seismic data on 3592 tapes as standard SEG-D. All navigation data shall be delivered on a suitable medium in standard UKOOA P1&P2 format.

All raw seismic data and all navigation data shall with no undue delay, and in any case no later than three weeks after survey completion, be shipped to the NPD offices in Stavanger.

6.2 Data delivery

The following list of data shall be delivered to the NPD:

- Two copies of seismic field data on 3592 tapes in SEG-D format.
- Navigation data, UKOOA P2/94 and P1/90 on 3592 tapes.
- TOC files including tape-, acquisition- and FFID logs on CD-ROM.
- CMP map on CD-ROM and one paper copy.

6.3 Products to be delivered after processing

Item	Format	Media
Final processing report	MS Word or PDF format	CD
Raw field data as received from client	SEG-D	3592

Final stacking & migration velocities	EssoV2 & diskos98.1	CD
Raw CDP gather before PSTM	SEG-Y	Hard disk
Raw common image gather (CIG) after PSTM	SEG-Y	Hard disk
Raw migration full-offset stack volume and sub stack volum (near,- mid- and far- angle)	SEG-Y	Hard disk
Final PSTM (unscaled true amplitudes full offset volume)	SEG-Y	Hard disk
Final PSTM (TVS full offset volume)	SEG-Y	Hard disk

- All SEG-Y tapes shall have the navigation data included in the trace header
- Each tape shall be labelled with a detailed list of contents in agreement with the NPD personnel

6.4 Reporting

The following reports shall be delivered to the NPD:

- Observers' Logs, Navigation Logs and Tape Logs on CD-ROM
- Onboard Seismic Processing QC and Calibration Report (delivered on completion of fieldwork) on CD-ROM
- Final acquisition reports on CD-ROM and one paper copy.

7 Costs

7.1 General conditions

- All costs shall be stated in NOK.
- All conventional navigation costs, surface positioning and in-sea positioning shall be included in the acquisition cost.
- Costs related to equipment performance and acceptance tests shall be covered by the bidder.
- The bidder shall allow adequate time, at no cost to the NPD, for checkout by the NPD of all systems (including seismic, navigation/positioning equipment) under operating conditions, i.e. with streamer(s) and energy sources deployed and test shots recorded. A formal start of operations is depended upon a satisfactory checkout.

7.2 Production rate

Production rates shall be stated in 6 ways – in addition to Price-table 1 on page 2.

Kilometer rates:

1. Kilometer rate using average line length of 130 Kilometers
2. Kilometer rate using average line length of 250 Kilometers
3. Kilometer rate using average line length of 370 Kilometers

Daily production rates (24 hours) when doing seismic data acquisition pop-to-pop plus nominal line change time up to 3.0 hours calculated for an 8 Km configuration:

- Daily production rate using average line length of 130 Kilometers
- Daily production rate using average line length of 250 Kilometers
- Daily production rate using average line length of 370 Kilometers

All 6 rates must be quoted. The NPD will reserve its right to choose whichever price model (Kilometer rate OR Daily production rate) to be used for this contract. The following costs shall be included in all rates stated:

- Costs for geophysical survey planning

- Costs for logistical survey planning
- All the specified processing (including post-processing of navigation data to UKOOA P1/90 format), end products and consumables (tapes etc).

7.3 Standby rate

Standby rate shall be stated as rate per day (24 hours)

Standby time is classified as time spent on:

- Waiting on weather
- Waiting due to seismic interference or other circumstances (e.g. fishing activity)
- Waiting due to marine conditions preventing or delaying the seismic operation to go-head, outside control of the contractor – also including time spent on port calls and other steaming on specific request by company
- Waiting due to Force Majeure
- Non-operational periods due to instructions received from the Company to delay the Work

The breakdown of timing regarding production and standby shall, on a daily basis, be agreed between the Party Chief and the NPD representative onboard. The bidder's breakdown standards on this issue must be part of the tender documentation.

Downtime due to technical breakdown and Contractors Crew Change must be covered by the bidder.

7.4 Transit rate

Transit rate classified as steaming and transit to and from survey areas.

Transit rate shall be stated as rate per hour.

7.5 Mobilization and demobilization

The exact position(s) for the survey(s) is to be decided and Contractor shall suggest alternative harbours for mobilization and demobilization for the Barents Sea. The costs shall be stated as Lump Sums.

The mobilization period will be regarded as finished when the equivalent of one prime line in each survey direction has been successfully recorded, and all equipment work correctly as far as it can be reasonably demonstrated to the satisfaction of the NPD's representative onboard. The production time will then be counted from the first accepted shot point on the first accepted line.

7.6 Seismic data processing

Seismic data processing costs shall be stated as:

- Rate per kilometre based on the estimated processing sequence in Section 5.
- Rate per kilometre for optional – extra/additional processing, e.g. Wave Equation Multiple Attenuation, shall be stated individually

Price list should be included for other relevant (optional and alternative) processing methods.

7.7 Early termination fee

See standard contract conditions.

8 Contract conditions

The NPD will use a revised version of the NPD 2010 standard contract - which again is based on IAGC standard contract conditions. These terms and conditions are enclosed to the tender document (annex 2).

The bidder should complete schedules B- G, listed in annex no 3, as appropriate.

Minor reservations with reference to specific contract clauses must be quoted with alternatives.

This type of procedure does not allow for contract negotiations.

Significant reservations by the bidder regarding the terms stipulated in this bidding invitation, in the competition specifications or the contractual terms may affect his chances of being awarded the contract.

We specially refer to the Norwegian public procurement regulations of 7th of April 2006 no 402 § 20-13 d. According to this, an offer must be rejected if the bidder has made significant reservations to the contract conditions.