

Part-3
SECTION - II
TERMS OF REFERENCE / TECHNICAL SPECIFICATIONS

1.0 INTRODUCTION:

OIL INDIA LIMITED, (OIL), an integrated National E&P Company has been carrying out oil exploration & development activities since early fifties. Also it is engaged in production & transportation of crude oil & natural gas. OIL has major share of its E&P activities in Assam & Arunachal Pradesh besides activities in rest of India.

In order to boost up production level of crude oil OIL intends to hire :

- One set of SDMM + Directional Gamma tools + Jar for 17. ½” hole section alongwith MWD surface Unit.
- Two sets of SDMM + Directional Gamma tools + Jar for 12. ¼” hole section alongwith MWD surface Unit
- Two sets of SDMM + Directional Gamma tools + Jar for 8. ½” hole section alongwith MWD surface Unit

All the above services are meant for PEL / ML areas for High-Tech Deviation drilling activity (i.e. Directional Drilling, Side Track well etc.)

2.0 AREA OF OPERATION:

2.1 The area of operation planned is predominantly in OIL’s operational states of Assam and Arunachal Pradesh. However, OIL may depute these services to any other States within India as per OIL’s requirement.

3.0 BROAD SCOPE OF WORK:

The Contractor shall provide the services along with all necessary equipment/tools and personnel and carryout directional drilling operations in accordance with the approved directional well plan. The approved well plan may be amended from time to time by reasonable modification as deemed fit by the company. However, the contractor shall be wholly responsible for rendering the services as per scope of work under this contract.

Under the service, the contractor shall have to provide the following services with their tools & equipments:

- 3.1 MWD tools with Positive Mud Pulse Telemetry system shall be provided under this service. The bidder should categorically confirm to this effect.
- 3.2 SDMM & MWD tools should comply with the followings:-
- a) All down hole tools and equipments must not be more than 5 (five) years old as on bid closing date counted from the year of manufacture. Bidder must submit copies of purchase documents of the tools and equipments in this respect as documentary evidence.

In case, all or some of the supplied tools and equipments are more than 5 years old as on bid closing date, then the tools and equipments should be completely redressed with new parts prior to mobilization and contractor shall guarantee its performance. Bidders must submit maintenance schedule/certificates against such redressed tools and equipments indicating the redressed parts and certified by third party inspection agencies to confirm their vintage.

This will be monitored by OIL and bidder shall replace tools/equipment that fails to meet the above criteria.

Note: Part no /identification no must be mentioned in both the reports as mentioned above.

- b) The bidder should provide the technical literature/catalogue for the offered SDMM + MWD + Jar.
- c) The bidder shall provide Calibration certificate of MWD tool before mobilization showing Inclination, Azimuth, Tool face & Dip angle accuracies as applicable. Calibration certificates for accuracy of Measurement should not be more than 6 months old. Bidder needs to confirm the same.

3.3 **Tools and Equipments :**

SDMM + MWD with accessories to be provided for drilling directional well using directional and Gamma ray tool in the system as a complete package. System should be capable of building, holding and dropping well angle(DLS not less than 3 deg). System to be complete with one surface unit with necessary computers, monitors printers, plotters , Internet connection for reporting well reports directly from well site etc and other equipments as necessary to execute the job.

- i. One set of tools & equipment shall consists of one surface unit, 1 string of SDMM with Stabilizers & Accessories + Directional MWD with Gamma Ray tool + Drilling Jars for all hole sizes. MWD with other accessories like Drilling jar and other directional tubular required for the Section (i.e. NMDC, UBHO, Float Sub etc.). BIDDER has to bring sufficient number of back up tools for uninterrupted operations. Servicing of tools will be allowed at no workload period.
- ii. Service of SDMM Directional Drillers and MWD Engineers are to be provided for execution of drilling program as per plans of OIL. Minimum two directional drillers and minimum two MWD Engineers are required to be provided always against each set.
- iii. All section hole will be planned and drilled by the Contractor with the help of SDMM in consultation with OIL.

NOTE: Without back up of tools/equipment in working condition, OIL may not

permit to run contractor's tools/ equipment. However, in case of operational urgency of well, OIL may permit to run directional tools/equipment, but under this condition particular tools/equipment without backup shall be paid 1/4th of the quoted operating charges of that particular tools/equipment. Bidders to confirm the same

4.0 **WORK SCHEDULE :**

The Work schedule will consist of the following steps:

Contractor shall confirm to provide the following services for drilling of directional well:

- I) Directional Drilling Service.
- II) SDMM Equipment with Stabilizer & Service.
- III) MWD Equipment & Service for Directional & Gamma Measurement.
- IV) Drilling Jar with services.
- V) MWD surface unit

NOTE :

- i. The kick-off point will be decided by OIL in consultation with the Contractor. Thereafter, it shall be the responsibility of the Contractor to drill the curve section of hole till target depth is achieved.
- iii. Contractor should have adequate maintenance facility for their tools & equipment .
- iv. Drill String available with "OIL" for Drilling in 17. ½", 12. ¼" & 8. ½". These details are furnished in **Annexure-B**.

5.0 The contractor is required to comply with following specified requirements:

- i) To provide all X-over subs required in between Contractor's drill string to Company's drill string and any other X-over required for MWD assembly is to be identified and furnished by the Contractor.
- ii) To provide the backup tools/equipment with sufficient spares & consumables to keep the tools in good working condition for smooth operation all the time.
- iii) To provide detailed specification of equipment/sensors along with catalogue and also all the features available in their MWD system. The Contractor should also indicate the limitations of their tools/sensors such as temperature, pressure and discharge limitations with ability to pump LCM materials in Mud Loss conditions through the tool; the equipment & sensor must perform accordingly.
- iv) The Contractor shall keep fishing tools including spares required for Contractor's non standard equipment/ tools, if any.

- v) The minimum drift diameter of Hydro-Mechanical Jar for 8.1/2" Hole should be 2.5" - 2.75".
- vi) Specialized Tools: All crossover subs required from operator's drill string to Contractor's drill string and any other special crossover etc. including Non magnetic drill collar are to be identified and furnished by the Contractor. Any other specialized tools, required for smooth execution of the Contract shall be responsibility of the Contractor.
- vii) Any bidder not quoting for all the services as per the Scope of work will be considered non responsive.

6.0 DETAILS OF EQUIPMENT & SERVICES REQUIREMENT DETAILS :

The Contractor shall confirm to provide the following services:

(i) Well Planning Services:

OIL will designed the well plan and share the same along with other data. Contractor shall accept the plan prior to start of directional drilling. However, contractor may suggest anticipated Torque & Drag, hydraulics and anti-collision for such plan.

If required, well plan may be re-viewed in consultation with the contractor to sort out any kind of well trajectory issues. In that case, the re-viewed plan must be accepted by the contractor.

(ii) MWD equipment along with Surface Equipment and Services :

The contractor shall confirm to provide one complete set of MWD (Measurement While Drilling) System. MWD tools should be collar specific, i.e. for different collar sizes, outside diameter of sensors are different except of directional sensor. All sensors (except Directional Sensor) of MWD tool should be shrink fitted or part of the collar. The bore must be empty with no probe except for the directional part. Mud must be able to pass through the inserts (i.e. Battery pack, Gamma pack, Electronics, etc.) at respective flow rates. MWD tools with same size of probe fixed mechanically (fixed collar/collar mounted) for different collar sizes are not to be considered as collar based tools. Probe based tools are not acceptable. MWD system should be based on positive pulse, mud telemetry for drilling (17. ½"/12. ¼", 8.1/2") hole as per requirement of OIL provided in the MWD specifications at **Annexure # C**, along with cross-over subs, Non Magnetic Drill Collars, Float Subs with all sets of electronic packages, surface computers and other accessories along with sufficient spares required for continuous real time monitoring of tool face, inclination, direction (azimuth) and Gamma while drilling (17. ½"/12. ¼", 8.1/2"). The Contractor shall provide the expert operating personnel along with the equipment for actual job execution. Contractor shall maintain enough back up tools to meet contingent situation like Lost in Hole etc. The Contractor shall be required to maintain sufficient number of "Back - up Tool / Equipment" along with spares for (17. ½"/12. ¼", 8.1/2") hole at well site / base office so as to ensure uninterrupted directional drilling activity considering logistic constraints in the Northeast.

NOTE:

- 1) Contractor shall provide MWD (Measurement While Drilling) System, Directional based on mud pulse telemetry, Positive Pulse system, with MTBF (Mean-time Between Failure) exceeding 1000 hrs. However, in case of brand new (Un-used) MWD tool proposed to be deployed by the Contractor against this contract, the MTBF certificate is then not relevant.
- 2) Contractor to provide additional NMDC if required for MWD survey accuracy.
- 3) To this effect, bidder should provide documentary evidence in the technical bid, literature of MWD showing all specifications listed in this TOR (Terms of Reference) and Schematic diagram showing each component.

SURFACE EQUIPMENT:

Surface MWD unit with computers/printers accessories to record and print real time data with necessary transducers and connections to work with rig power supply 220 volts, 50 Hz. AC as per requirement of OIL as stated in **Annexure # A** (Bidder to fill up the Annexure). System should also have following features:

- (a) Record data like angle, azimuth and tool face and transmit it to surface with rig floor display. System should have features for dynamic tool face recording when drilling with motors.
 - (b) System should be able to record stand pipe pressure, weight on bit, rotary RPM and Rate of penetration with depth counter facility.
- (iii) **SDMM equipment along with Services** : MWD equipment along with Surface Equipment and Services: -

The Contractor shall provide Steerable Downhole Positive Displacement Mud motors with all accessories e.g. stabilizers etc as per **Annexure-D** for 17.1/2", 12.1/4" & 8.1/2" hole sizes. The directional drillers are required to operate the motors and drill the hole as per plans, which would be provided by the Contractor for contract execution. The motors should be with built-in/screw-on bearing Stabilizer housing & adjustable bent housing with suitable build up rates & straight drilling in rotary mode. The steerable downhole mud motors should be with mud lubricated bearing assembly. The motors should have API rotary shoulder connections. SDMM should be equipped with rotor catcher feature.

The Contractor shall be required to maintain sufficient number of "Back-up Tool/Equipment" along with spares for 17.1/2", 12.1/4" & 8.1/2" hole at well site/base office so as to ensure un-interrupted directional drilling activity considering logistic constraints of the Northeast.

NOTE:

To this effect, bidder should provide documentary evidence in the technical bid, literature of SDMM showing all specifications listed in this TOR (Terms of Reference) and Schematic diagram showing each component.

SDMMs should be high torque, low to medium speed & stabilized positive displacement steerable multi-lobe mud motor for high angle drilling. Near bit stabilizer (Screw on stab) fitted on motor shall be 1/8" under-gauge for all type of motor size.

Sizes of String stabilizer :

• **Stabilizers for 17. ½" Hole section:**

1 no of each 17. ½", 17. ¼" and 17" string stabilizer with 7⁵/₈ / 6⁵/₈" API Reg box-pin connection, 8"-9. 5/8" OD fishing neck X 2. 13/16"/3" ID

• **Stabilizers for 12. ¼" Hole section (Each Set) :**

1 no of each 12. ¼", 12" and 11. ¾" string stabilizer with 6⁵/₈" API Reg box-pin connection, 7. ¾"/8" OD fishing neck X 2. 13/16"/3" ID

• **Stabilizers for 8. ½" Hole section (Each Set) :**

1 no of each 8. ½", 8" and 7. ¾" string stabilizer with 4" IF box-pin connection, 6. ½"/6. ¾" OD fishing neck X 2. 13/16"/3" ID

iv) **Drilling Jars and Services :-**

The Contractor shall confirm to provide Hydro-mechanical/Hydraulic Drilling jars to withstand the rugged abuse and demanding application with up/down stroke mechanism, minimum stroke length as per requirement of OIL provided in **Annexure-E** , for (17. ½",12. ¼" and 8.1/2" hole sizes).The Contractor shall be required to maintain sufficient number of "Back - up Tool / Equipment" along with spares for (17. ½", 12. ¼", 8.1/2" hole size) at well site/ base office so as to ensure un-interrupted directional drilling activity.

NOTE: To this effect the bidder should provide documentary evidence in the technical bid, literature of Drilling Jar showing all specifications listed in this TOR and Schematic diagram showing each component

SPECIAL NOTE:

- a) Bidder to provide maintenance certificates/ schedule and third party inspection report of all the tools/equipment including vintage as stated under clause no.3.0.2 of scope of Work above.
- b) Calibration certificates for accuracy of Measurement should not be older than 6 months. Contractor shall provide Calibration certificate of each down-hole tool (MWD, Gamma, Resistivity) showing Inclination, Tool face, Dip angle and accuracies.
- c) SDMM/ MWD/Jar/Resistivity tool provided by the Contractor shall be supported with spares and service during the duration of the

Contract. Bidder would provide relevant test certificates of the drilling jar. All test certificates has to be provided before mobilization.

d) All tools/equipment and consumables deployed by the Contractor should meet OIL's specified requirement.

v) **DIRECTIONAL DRILLER'S EXPERIENCE :**

Bidders to confirm that minimum 02 no. of qualified Directional Drillers having minimum 3 years experience will be deputed per set and will be working independently (12- hour shift) on a suitable ON/OFF day rotation basis at the Rig site. Directional Drillers should be able to execute the job of high angle-high displacement/side track wells (open/cased hole) or any other well from kick off to target on continuous basis. They should have complete knowledge of the job from planning to execution along with associated calculations and decision making so that they can perform the job independently. However, in case of operational problems, OIL's decision will be final.

The Directional Drillers will work in close liaison with OIL Engineers on the Rig/base. They should be fluent in speaking and writing English language. Field Engineers should be conversant with the job assigned and should have complete knowledge of the equipment. OIL reserves the right to modify its requirement of on-site Directional Drillers anytime.

NOTE: Particulars of directional driller must be submitted in the format **ANNEXURE – BB** to OIL for approval prior to deployment at wellsite.

(vi) **MWD Engineers Experiences :**

Bidders to confirm that qualified and experienced MWD Engineers (Minimum of 3years of experience) for the operation will be deputed. The personnel will be required to work on a suitable ON/OFF-day rotation. The engineers must be fluent in written and spoken English. The MWD Engineer will be responsible including but not limited to the following:

Particulars of MWD engineer must be submitted in the format **ANNEXURE – BB** to OIL for approval prior to deployment at wellsite.

NOTE:

- Company reserves the right to instruct for removal of any Contractor's personnel who in the opinion of Company is technically not competent or not rendering the services faithfully, or due to other reasons. The replacement of such personnel will also be fully at cost of the Contractor and the Contractor shall have to replace this/these personnel within Ten (10) days of such instruction. The replacement personnel must have the requisite qualification and experience as indicated in the contract and their credentials along with recent photographs must be submitted to Company for approval prior to their engagement.

- All charges for personnel are included in Tool Operating & Stand by charges. No. separate charges shall be payable for the personnel deployed.
- The Bidder should submit the Bio-Data of personnel proposed to be deployed for all the services mentioned under scope of work prior to deployment for OIL's approval.

(vii) **ORGANISATIONAL STRUCTURE:** Contractor shall provide the organizational structure for executing the project. Composition of the team & number of personnel will be reviewed by OIL and modified as per requirement.

Contractor shall depute base coordinator at company's base, for the entire contract period. Base Manager should have good knowledge of equipment or services being offered by the contractor and should visit Company's office regularly. Base coordinator shall be nominated before commencement of contract and subsequent replacement shall be informed in advance. Suitable replacement should be provided if he is absent for more than 3 days. Base coordinator shall be well informed about status of contractor's equipment and any other subject relevant to agreement of the contract. Company may seek for replacement in short notice if any deficiency is observed on his part. Company shall not be responsible for delay in processing invoices on time, if Base coordinator is inefficient or absent for long period. He shall also be responsible for keeping contractor's equipment and tool in good working condition with the help of other office/ repair facilities.

- (viii) Bidder shall submit end of Well Report after completion of the Section/Well in hard as well soft copies(.pdf format).
- (ix) Contractor shall share Torque & Drag, Hydraulics, Anti-collision, proposed BHA for any particular hole section of a directional well during actual drilling with their latest directional software.

7.0 **Approved list for Tools / Equipment & Services :**

The Contractor should provide Tools / Equipment & Services (mentioned above) from the approved list as shown in the table below :

APPROVED LIST :

A. Mud Motor :

- Schlumberger,
- Halliburton,
- Weatherford,
- Baker Hughes,
- Bico,
- National Oil Well Varco
- APS Technology Inc.

B. Drilling Jar:

- Houston Engineers,
- Weatherford,
- National Oil Well varco(Griffith)

- iv) Bowen,
- v) Bico,
- vi) Schlumberger
- vii) Halliburton Sledgehammer.
- viii) ITS
- ix) APS Technology Inc.

8.0 Geology & Reservoir Information :-

Geological and reservoir information of the field where the proposed directional wells shall be drilled is furnished below.

Makum and North-Hapjan Barail 4th+5th Sand

- a) Formation: Barail fluvio-deltaic clastic sediments of Oligocene age(Tertiary)
- b) Lithology: The reservoir is located in the arenaceous section of the Barail Formation which consists predominantly of sandstones with minor laterally impersistent shale interbeds and is overlain by an argillaceous section (about 100m).
- c) Reservoir pressure #
 - i) Initial: 265.5 ksc at 2544.56 m SS (2636 m bd, Datum: 91.445 m asl).
 - ii) Current: 255 ksc at 2544.56 m SS (2636 m bd, Datum: 91.445 m asl)
- d) Bottom hole temperature = 72-102° C
- e) Pore Pressure: In the sedimentary column above the target reservoir is hydrostatic.
- f) Average depth to reservoir = 2546.1 m SS (2637.5 mbd, Datum: 91.44 masl)
- g) Original oil-water contact = 2568.6 m SS (2660.0 m bd, Datum: 91.44 masl)
- h) Original gas-oil contact = 2523.6 m SS (2615.0 m bd, Datum: 91.44 m asl)
 - i) Net thickness of oil zone expected to be encountered: 25m (approx)
 - j) Presence of gas cap encountered in the crestal part of the structure.(Not tested)
 - k) Weighted average porosity = (Makum -25%, North Hapjan -20%).
 - l) Horizontal section length = 400 m.
 - m) Average ground level elevation = 125 m asl.
 - n) Marker Bed = Barail Top which is approximately 130 ± 20 m above the target reservoir.
- o) Stratigraphic column encountered in the area: As given below

Horizon Age Lithology Thickness (m)

Alluvium Pleistocene to Recent Medium to coarse grained unconsolidated sands with occasional bands of clay 1825

Girujan

Pliocene

Buff, red and green mottled clay with bands of fine-grained sandstone

150

Tipam Miocene Medium grained sandstone with bands of bluish-gray to bluish shale 550

Barail

Argillaceous Oligocene Mainly mudstone and occasional fine grained argillaceous sandstone with thin bands of carbonaceous shale and coal 120

Barail

Arenaceous Mainly consists of sandstone interbedded with streaks of laterally impersistent shales 650

BAREKURI FIELD

The hydrocarbon prospects of the Barekuri field are confined to Paleocene/Lower Eocene and average depth of the reservoir is around 3740 m below MSL. So far, OIL has drilled nine wells in this structure of which 8 are oil producers and the current rate of production is approximately 1000 m³/day with very negligible water cut. The initial reservoir pressure is 428.5 kg/cm² and the current reservoir pressure is around 428.0 kg/cm².

BAGHJAN FIELD

The main multi-stacked hydrocarbon bearing horizons are confined to the Palaeocene / Lower Eocene sandstone reservoirs. So far, drilling has been completed in 12 wells in the Baghjan structure. The reservoir pressure was found to be around 422.6 Ksc which is 50 Ksc above hydrostatic. The depth to Basement in the Baghjan area is around 3910 m below MSL and average depth of the reservoir is around 3700 - 3800 m below MSL. The area has been covered by 3D seismic survey.

DEOHAL-LAHOI STRUCTURE:

The Deohal –Laholi structures at the Barail level is a composite faulted anticlinal structure which is compartmentalized into three fault blocks viz. Lohali, Deohal and East Deohal by two north-south trending faults and is bounded by a common major EW to ENE-WSW trending fault towards the south.

The Deohal and the East Deohal blocks are the central and eastern fault blocks of the area with an aerial extent of around 19 sq km at Barail Third Sand level. The Barail Third Sand is the primary reservoir within the Barail formation of the area and has been established as NAG reservoir. The average depth of the reservoir is around 2600m below MSL. A total of 7 wells have been drilled in this area but only 2 wells were completed as a gas producer in Barail Third Sand. Currently only one well is producing gas @ 0.1 MMSCMD. The initial reservoir pressure was 250.7 kg/cm² and the current reservoir pressure is around 240 kg/cm². A horizontal gas well is planned to be drilled in the pay sand to produce gas at higher rates.

Lohali Block is the westernmost fault block of the area with an areal extent of around 6 sq km at Barail Third Sand level. Well Lohali-1 has been completed as a gas producer at Barail Third Sand level and it is producing gas @ 0.18 MMSCMD.

Projection Parameters:

Reference spheroid for local projection = Everest 1830 Pak

Projection system: Lambert Tangential.

9.0 **PERSONNEL FOR DIFFERENT SERVICES_:**

Contractor shall confirm to provide the following category personnel for running the well operation on the round the clock basis.

- i) Directional Driller for SDMM.
- ii) MWD Engineer/Operator.
- iii) Base Manager

All the personnel as described above should be employee of the prime Bidder.

10.0 **GENERAL CONDITIONS :**

Contractor should provide the following :

- i) Drill Pipe Strainer for 5" OD Grade-G/Grade S .
- ii) Quantity & Units and tools as indicated in the scope of work.
- iii) MWD initially mobilized by the Contractor and any replacement thereof, should be accompanied by Calibration sheets, approved by Contractors QA/QC engineers which will be certified by OIL's designated team.

11.0 **FIELD VERIFICATION & CALIBRATION TOOL & SERVICES :**

- i) Contractor is required to produce documentary evidence of "Calibration of MWD Tool" prior to shipping the same for mobilization before it is deployed in the first well..

- ii) If any other MWD tool is mobilized by the contractor during the contract period, documentary evidence of "Calibration Check" of MWD tool prior to shipping to Duliajan shall be produced by the contractor before the same is deployed in any well.

END OF SECTION – II

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