CLARIFICATION#3 AGAINST TENDER # PROC-SERVICES/CB/RMD-4725/2020 KPD & TAY INTEGRATED RESERVOIR SIMULATION STUDY & NETWORK MODELING

Following Clarification has been made in the subject tender.

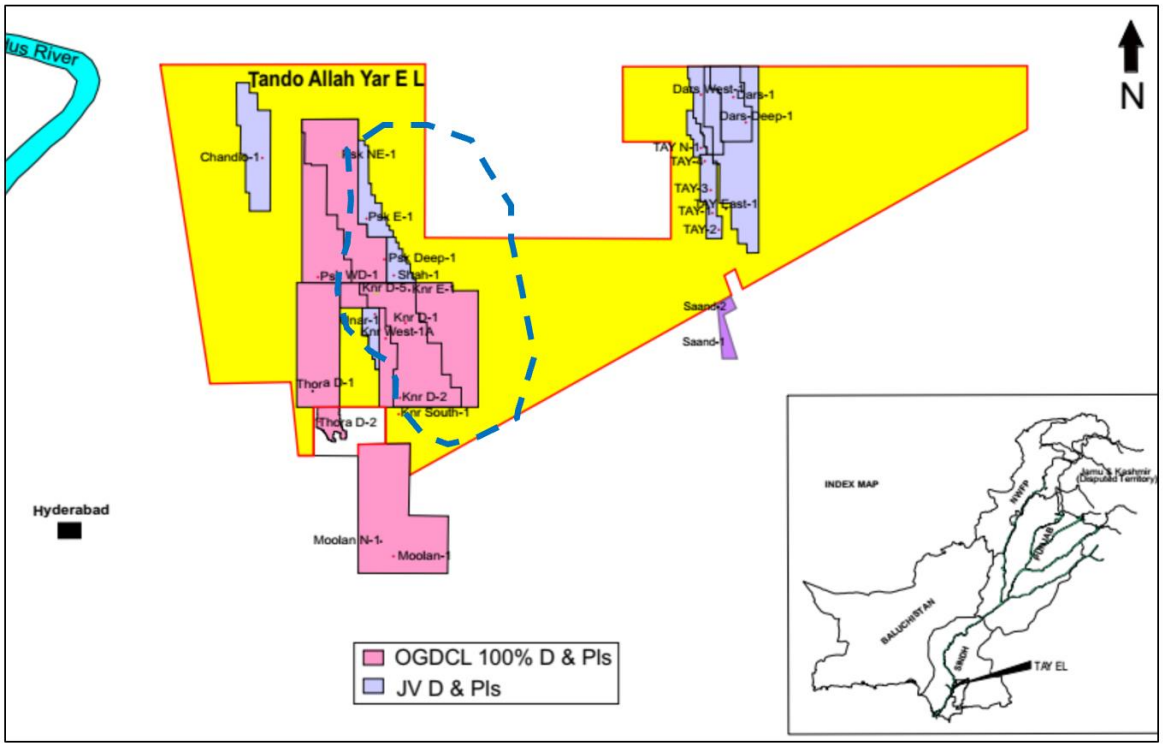
S. No.	Clarifications	OGDCL Reply
1	Could you provide a summary of wells with the following data available: - PVT Samples - Core analysis (RCA and SCAL) - RFT / MDT Note: Ideally we would like the attached table in sheet "Well Information" completed	Approximately 10 - 15 PVT samples RCA 18 - SCAL 1-2 3-4 MDTs
2	Have PLTs been conducted in the fields. If so, could you provide an indication of how many would be available? Note: Ideally we would like the attached table in sheet "Well Information" completed	One PSP is available whereas 8-10 PSPs are in progress, which will be completed before the start of study.
3	How many wells have downhole and wellhead P,T gauges deployed and functioning? How many of those wells with downhole gauges measure commingled flow from more than one reservoir? Note: Ideally we would like the attached table in sheet "Well Information" completed	All Wells have wellhead gauges but none has downhole gauge. None
4	Could you confirm how many different equations of state are you currently using to characterise the reservoir fluids?	This is the part of IRS.
5	We have identified a total of some 45 DSTs completed, based on the information provided. Could you confirm whether this figure is correct?	Overall about 50 Well tests (DSTs) will be analyzed as a number of DSTs will not be valid (for any reason like different sand or dry test etc.)
6	The scope of work make several references to delivering Reserves and Resources estimates. We note that RMD-4699 relates to the completion	4725 is an independent study and has no relation with 4699

	of a Reserves Evaluation study. Are there any dependencies between these two initiatives that you believe could impact our resourcing and timing?	
7	Regarding compression studies, could you provide an indication as to the maturity of these initiatives at present (e.g. concept select, FEED, FID) as it may impact project scope and resourcing?	As we understand from your question, you want to know about the indication for compression requirements in these fields. Yes, some fields need immediate compression indicative by their feed & pressure while some fields may require compression within few years based on the in-house working.
8	he Tender Enquiry mentions "investigate flow assurance issues". Could you please clarify what sort of flow assurance issues currently encountered in the filed? Which of the following flow assurance studies have been conducted so far: erosion, slugging, hydrates. If any, are these likely to be applicable for the future operation conditions?	No Flow Assurance study has been carried out yet. However, in Chandio-1 flow line sluggish behavior of fluid flow is observed.
9	As a follow up from question above, could you please elaborate on the requirements regarding flow assurance for this study? For example if slugging/stability analysis is expected, do we expect recommendation for facility designs such as slug-catchers, processing unit sizing and design? If yes are these inputs required for pre-FEED, FEED or FID studies?	The sizing and designing of the slug catcher & processing unit is not the part of this study. Consultant will only work on size and design of flow lines to feed the gas in existing plant and requirement of equipment to handle & process this gas. Detailed bottlenecks in the existing system will be shared with the winning bidder.
10	How is rate from each well available (measured or allocated)? Where are the measurement points in gathering system?	Most of the Wells are directly monitored to SCADA system at plant. Only, gas froma few wells back allocated where the system is not installed yet.
11	How often are well production tests conducted? How many well tests are	Usually on yearly basis; Atleast 2-3 for each well depending upon

	to be reviewed for each well on average? Any multi-rate tests conducted?	availability
12	Scope 3.4.1.1 "VLP for future wells" & scope "2.2.1 review all relevant data of current and proposed wells" – these future wells refer to wells that are already in decided by the operator to be drilled or the in-fill drilled opportunities we obtain from this study? If the former, could you provide an indication as to how many future wells are planned?	At present OGDCL does not have any plan to drill any in-fill well before this study. Consultant will provide VLP for future wells based on this study.
13	Scope 2.2.11 (page 38 of OGDCL Tender Enquiry No. PROC-SERVICES/CB/RMD-4725/2020) – "This study will be completed in 3 phases". This is different from 5 phases proposed in other section. Please clarify. Our assumption is project will be completed in 5 phases.	Assumption is right. Scope in 2.2.11 actually is related to TAY & Satellite fields' pre-integrated network scope.
14	Tender request states (section 2.2.14) that "Production forecasts against suction pressures i.e. 1200, 1000, 800, 600, 400, 200 & 50 psi". Given that an integrated model will be built, suction pressure will be calculated for each compression scenario. Is there a requirement to perform separate studies flowing against a fixed suction pressure?	Yes, for flexible compression design purpose and sensitivity analysis.
15	Please clarify whether the seismic data of all fields will be 3D or are there any fields for which it is not available?	3D seismic data for all fields
16	Referring to clause 2.2.5, which states "The Consultant will build a new Geological Model (Static Model) for complete Lower Goru package including Sembar formation in Petrel software using the Geophysical, Geological and Petrophysical interpretations for all the fields"	Static model will be prepared for Lower Goru (Massive sands). However, siesmic interpretation and petrophysical evaluation to be carried out for Whole Lower Goru formation (top-bottom), Sembar & Chiltan Formations for Prospect generation of

	Could you elaborate on what sort of data will be available for the Sembar Formation? (Geophysical, Geological and Petrophysical). Our assumption is that no dynamic studies will be required for the Sembar Formation. Can you please confirm?	conventional/unconventional resources.
17	Regarding Section 2 - 2.2.9, which states "Consultant will develop a representative 3D black oil reservoir dynamic model for all the reservoir levels/Sands in Petrel as interface and Intersect as simulator. Consultant shall properly initialize and history match the fine scaled model in order to generate reliable predictions" Could you please clarify if OGCDL expects the final fully integrated model to include: all three main fine scale reservoir dynamic models run separately or as one combined dynamic model? Running models separately will require having 3 separate Intersect licenses. Downside of combining is added scope and possible slow run-time.	OGDCL expects one fine scale static model of KPD to be converted to single dynamic model, history match and prediction generated. For TAY and Satellite fields no Static of dynamic modeling is required.
18	Referring to TOR clause 3.1.2.11(e) which states that "Based on bio-stratigraphy, SCAL and log data, reservoir characterization of all reservoir units will be established" Please indicate the availability of bio-stratigraphy data and reports for all horizons to be studied.	A few initial level studies available for few samples.
19	Referring to Clause 3.3.2 about radial model. Could you give as an indication as to how many wells OGDCL expects to require a radial model?	At least 4 – 5 wells, which will be selected after discussion between OGDCL & the consultant.
	<u>Note: Detailed data requested for each field will be provided to the winning bidder.</u>	

G&G Clarifications



	Static Model	
1	As per Figure 4, Static Model needs to be constructed for KPD Fields along with Pasakhi East, Shah Unnar and Kunnar South fields (Area within blue dashed polygon), please confirm.	Yes
2	What's the total 3d seismic volume of KPD fields along with Pasakhi East, Shah Unnar and Kunnar South fields?	Approximately 80 Sq.Km area to be used for static model. However, total 3D seismic volume to be interpreted is approximately 330 Sq.Km including all above mentioned along with Moolan, Chandio and Thora Deep.
3	Detailed seismic data interpretation of the 3D cube of area of interest (KPD and surrounding fields) will be required at the Upper sands (TLG, B or C Sand), Middle, Basal & Massive sand levels. Or OGDC wants contractor to interpret Ranikot, Sembar & Chiltan as	Detailed seismic data interpretation of the 3D cube of area of interest (KPD and surrounding fields) will be required at the Upper sands (TLG, B or C Sand), Middle, Basal & Massive sand levels as well as Ranikot, Sembar & Chiltan.

	well? Please confirm.	
4	Static model will be constructed from only for Lower Goru or TLG Top to Sembar Base? Please confirm	Static model will be built for Lower Goru (Massive sand).
5	Will OGDC share the existing seismic interpretation (horizons/faults)?	Some data may be provided for reference only, however, it is expected that contractor will carry out independent interpretation of the seismic data.
	G&G Work	
1	G&G work needs to be done for the TAY-Nim blocks (Chandio, Dars, Dars West, Dars Deep, TAY, TAY North, TAY SW, and Saand) & KPD Satellites fields (Thora Deep & Moolan). As per our understanding of scope, G&G work includes; seismic interpretation, velocity modeling, depth conversion, time maps & depth maps construction. No static model needs to be constructed. Please confirm	Yes
2	What's the total 3d seismic volume of TAY-Nim blocks & KPD Satellite fields?	OGDCL will provide two cropped sub-volumes from Nim-TAY Merged 3D volume. OGDCL had acquired the seismic data through number of campaigns via dynamite mode from Year 1999 onward. Various 3D surveys were pre-stack merged and reprocessed recently. PSTM data will be provided, with RAP processing. Advanced CRS technique was applied pre-stack. Reports may be provided to qualified bidder.
3	Seismic interpretation needs to be done in TAY-Nim Blocks & KPD satellite fields at TLG, Middle, Basal, Massive & Sembar level? Please confirm	Detailed seismic data interpretation of the 3D cube of area of interest (TAY-Nim Blocks & KPD satellite fields) will be required at the Upper sands (TLG, B or C Sand), Middle, Basal & Massive sand levels as well as Ranikot, Sembar

		& Chiltan.
4	Will OGDC share the existing seismic interpretation (horizons/faults)?	Yes
	General	
1	On how many wells VSP data is available?	10 wells
	Reservoir Engineering Clarifications	
1	**Figure-1:** Please share a clearer map with clear color coding of KPD, TAY and NIM along with the satellite fields?	We think, fields are clearly mentioned by boundaries of all fields in the map placed in Figure-1.
2	Please share the location of CPF on the map.	CPF is in Kunnar Deep Field.
3	**General:** What is the processing capacity and the turn-down capacity of the KPD-TAY Integrated plant?	250 MMCFD and 75 MMCFD.
4	**General:** Please share an existing network diagram of the flowlines, trunk lines, processing facilities and equipment, to get an understanding of the effort required for network modeling? Also, the injection points of various wells in the network and delivery points are to be marked on this diagram?	No, it will be shared with the bidder who will win the bid because of confidentiality. Location map is already attached for bidder's estimates and number of wells and fields list along with its briefs is already given for understanding.
5	Please confirm if OGDCL needs a separate network model for each category (KPD, TAY & Nim and Satellite fields) or one integrated network will serve the purpose?	Yes, Separate models for each Category as well as one integrated network model including all the satellite fields.
6	Is there any compression going on in any of the fields currently? If yes, please provide the type, location in network and details?	Two well head compressors are available for Chandio and Moolan where as one nodal compressor is installed at TAY-1 long string.

7	**General**: Please provide a data availability list covering the following: How many production logs available (PLT, PSP etc.). Are there reports available?	One PSP is available whereas 8-10 PSPs are in progress, which will be completed before the start of study.
8	How many PVT samples? And what reservoir levels have been sampled?	10-15 PVTs are available including upper sands & Massive sand of Lower Goru Formation.
9	What is the fluid type of each reservoir? How many detailed laboratory PVT reports exists?	Wet Gas in KPD & all Massive sand reservoir fields of TAY. Whereas upper sand reservoirs are mostly gas condensate.
10	Also, please confirm if the reports are in digital format or provided in hard form?	Both digital and hard copies.
11	How many well tests report available in digital and hard form? Will any digitization be required?	More than 50 well test reports are available. Some may require digitization.
12	How many BHP (static / flowing) are available?	15-20
13	How many PTAs are to be interpreted? Can existing valid interpretations results be accepted following review?	About 50 PTAs are to be interpreted.
14	Is core analysis and interpretations (Conventional & SCAL) available for all reservoirs?	Yes, for all Reservoirs (Only RCA is available)
15	**Figure-4**: In technical approach (figure 4), it is mentioned that static and dynamic simulation modeling is required for KPD fields along with some of fields from TAY/Nim JV fields (Pasakhi East, Shah, Unnar, Kunnar South Fields). Please confirm if OGDCL need them to be included in the same	It will be included in same model.

	model or a separate model will be required since they are part of a separate JV?	
16	**Section, Technical approach, 2.6, point (ii):** Is RTA must for all the wells? Please provide maximum number of wells that can be selected for RTA.	Yes. To be performed on all the wells.
17	**Section 2.2, Scope of Work, point (2.2.9):** It has been mentioned that fine scale should be initialized and history matched; although this can be done but various upscaled realizations can also be run in order to enhance performance of the simulation runs and the best one can be selected to proceed with in consultation with OGDCL	Yes.
18	**General:** Does OGDCL see proper fluid characterization as one of objectives of this integrated simulation study?	Yes.
19	**General:** Will a black oil approximation of compositional (gas/condensate) fluid system (if PVT concludes so) be acceptable to OGDCL as this may have significant impact on results?	Preferably, it will be a black oil model, however, compositional model can also be built based on the if PVT concludes.
20	**General:** Is consultant right in understanding that the simulation type (black oil or compositional) will be decided based on basic RE analysis & PVT findings	Yes.
21	**General:** Please clarify, if tight gas potential evaluation is only required for Kunnar-Pasakhi Deep field?	Such potential evaluation includes both KPD & TAY fields.
22	**2.2.9.4:** Wellhead compression is to be compared with "Front	They are separate scenarios and OGDCL will let the contractor know during the

	end/Nodal" compression. Will Front end and nodal be separate scenarios, or will OGDCL let us know which one to compare with wellhead compression?	study.
23	3.4.1.1: Pipesim may be used for creating wellbore hydraulic models. Is this acceptable to OGDCL?	Yes.
24	How many samples of CCAL and SCAL data are available? What SCAL experiments have been carried out?	RCAL /CCAL is available for all available cores (approximately 18 in numbers). 1-2 SCAL are available.
25	PVT: How many samples with complete PVT experiments (CCE, CVD, Composition, or Sep Test) are available? Please differentiate between those that just have compositional data and those that have more detailed PVT tests. Please provide the numbers on a well-by-well or field-by-field basis.	10-15 PVT reports are available for KPD and TAY Block fields. Composition reports are also available for most fields.
26	MDT: Does the study require re-analysis of MDT data or just an audit and quality control? Please provide the number of reservoir layers that have been pressure-tested in the wells (using MDT). Please provide the numbers on a well-by-well basis.	MDT data will be required only audit & quality control. MDT is available in 2-3 wells. Two reservoirs have been pressure tested using MDT.
27	Please provide the number DST/Build-up tests that require interpretation. Please provide the numbers on a well-by-well basis. Have the data already been quality-controlled and cleaned up (possibly for in-house interpretation)? If yes, will the clean data be provided?	About 50 tests require interpretation. Clean data will be provided, where available.
28	Does a complete OFM database exist or must be completed or created from scratch?	OFM data exists.

29	How many of the reservoir formations are unconsolidated with sever sand production?	Two reservoirs encountered unconsolidated sand in Dars deep.
30	What is the (approximate) values of initial pressure, temperature and depth? A range suffices.	Upper sands reservoir of Lower Goru pressure ranges from 1850-3000 Psi, Temperature ranges from 150-180 Degree F and Depth ranges 1900-2300m. Deeper sands reservoir of Lower Goru pressure ranges from 4800-5500 Psi, Temperature ranges from 250-270 Degree F and Depth ranges 2800-3500m.
31	Flow assurance: Have there been any flow assurance problems already? If yes, please explain.	No such study has been carried out yet.
32	Surface facilities: Could you provide a schematic of the gathering system and surface facilities, and what portion should be included in the study?	No, it will be shared with the bidder who will win the bid because of confidentiality. Location map is already attached for bidder's estimates and number of wells and fields list along with its briefs is already given for understanding. All flow lines from well to plant including small gathering facilities to be the part of network modelling. Plant input parameters will only be used for compression design and flow assurance. Plant design is not included in scope of work.
33	History-matching: It is our understanding that the data up to start of the project will be history-matched. Any additional data during the execution of the project (which is up to one year) will NOT be history-matched. Please confirm.	Production data till the start of dynamic modeling should be included in history match.
34	Reserve estimate: our estimates on the reserve cannot be certified by	Yes, It's acceptable.

	reserve evaluators according to relevant regulatory filing requirements. Is this ok w the operator?	
35	Any rock mechanical property data available? For example, porosity/permeability and its changes with the changing in-situ stress condition.	No
36	This project consists of nineteen small to medium sized fields and a total of 43 wells. Please confirm if: • the 19 fields and all Jurassic and Cretaceous intervals are included in the Scope of Work • Are all the reservoirs involved independent from each other, other than sharing the common surface network? • Are the reservoirs with no oil production considered as gas reservoirs with condensate at surface? • What is the approximate size of the reservoirs?	1. Yes all 19 fields. Producing sands are main focus for modeling whereas all Jurassic & Cretaceous intervals to be evaluated for prospective resources & Unconventionals 2. Mostly reservoirs are independent from each othe, however fields included in KPD Static and Dynamic modeling are most likely have common reservoir with fault compartments. 3. So far Yes; Fluid Typing will confirm this further. 4. Size varies between 20 Bscf to over 1000 Bscf
37	This deeper set of fields consist of four gas fields namely Kunnar Deep, Kunnar West, Pasakhi Deep and Pasakhi West Deep, some of which appear to be in hydrodynamic communication. Please confirm the bases of the assumption about hydrodynamic communication. Or if it is still a matter of study	1. It is suggested in separate reservoir studies of Kunnar Deep and Pasakhi Deep. Pressure data also dictates so. Now it has been decided to carry out IRSS by merging Kunnar Deep, Pasakhi Deep, Kunnar West alongwith Pasakhi West Deep, Kunnar South, Unnar, Shah & Pasakhi East which have the same reservoir i.e. Massive Sands but have different fault compartments (these fields were not part of previous studies) to make this study fruitful.
38	Please confirm the historical production period and number of producing wells in each reservoir aimed to dynamic modeling	1. Fields/ Reservoirs aimed for dynamic modeling have been producing since 2012. No. of wells are about 28; Not all the wells have been producing since 2012, A few yet to start producing.

39	Please confirm if economic analysis will be based as per reservoir or as per net share	1. It will be carried out on three levels (Gross) i.e. Project, Block and field. For JV fields; Net to individual JV should also be reported.
40	Please clarify if there is a network model available. Also, please confirm the available information related to the network model	1. No Network model is available currently. Reasonable information regarding Network is available i.e. lay outs, pipeline sizes, lengths, facilities etc.
41	A static model of Kunnar Deep, Pasakhi Deep, Kunnar West, Pasakhi West Deep, Pasakhi North East, Pasakhi East, Shah, Kunnar South and Unnar fields leading to Integrated Surface Network Model KPD Surface Network Model Well Models of KPD wells Simulation Models of KPD Fields along with Pasakhi East, Shah, Unnar, Kunnar South Fields Material Balance Models of KPD Fields along with Pasakhi East, Shah, Unnar, Kunnar South Fields Static Model of KPD Fields along with Pasakhi East, Shah, Unnar & Kunnar South Fields leading to properly history matched dynamic & network models shall be built. Material balance models for individual fields shall also be built. Please confirm if the scope of work described in Section 2.6 includes all the required tasks in Sections 2.1 to 2.5	Yes
42	Scope of Work: Consultant's Interpretation/ analysis/ working shall be vetted by OGDCL's before proceeding further. Please confirm time period and mode of the requested review and approval.	At the end of each phase and vetted by OGDCL relevant professionals participating in the study. Moreover, a presentation will be given to OGDCL after completing each phase and next phase will be started after having agreement on that work. Approximately two (02) weeks' time is planned for draft review, presentation

		and amendments in model if required.
43	Scope of Work: Consultant will analyze the available geophysical, geological, core data, well logs, well structure and stratigraphic correlations/ cross sections, well tests data, BHP data (incl. MDTs), PVT data, production data, completion histories and all other relevant data related to the current or proposed well(s). Please confirm formats of the data and database availability	1. Majority of data is available in file formats commonly used in oil industry , some data is in hard format.
44	Scope of Work: Consultant will carry out detailed seismic data interpretation of the 3D cube • Please confirm that seismic processing is out of scope. Also, please confirm if velocity and formation tops models are available. • What are the areas/fields required seismic interpretation, and what is the available seismic data (3D or 2D) and what is surface area, how many horizons are required for seismic interpretation?	1. Interpretation Only. No Processing 2. All the fields, Its 3D, about 350 Sq Km. Required Horizons are Ranikot, Lower Goru (TLG, B Sand, C&D Sand, Middle Sands, Basal Sands, Massive Sands), Sembar, & Chiltan.
45	Scope of Work: Consultant should identify new conventional & unconventional prospects throughout Lower Goru Sequence. Please indicate number of intervals and thickness of stratigraphy column included in the scope of work	For prospecting purpose only. Lower Goru ~1250 m Sembar ~500 m
46	Scope of Work: The Consultant will build a new Geological Model (Static Model) for complete Lower Goru package including Sembar formation in Petrel software using the Geophysical, Geological and Petrophysical interpretations for all the fields. Please confirm if Decision Space is one of the software options for the study	Please note that Static model is required only for Lower Goru (Massive Sands) till Top of Sembar. Yes, DS may be an option; if its output stays compatible with PETREL (Currently available software for static modeling); Consultant to confirm/ assure that there will be no error or glitch or missing items in data export process to PETREL

47	Scope of Work: Prospective resources should also be assigned to all the possible leads/ prospects in compliance with SPE PRMS. Please confirm if prospects and leads definition and number are included in the scope of work	Yes they are;
48	Scope of Work: The Consultant will carry out basic Reservoir Engineering analysis including Rock & fluid properties for utilization in Tank & Simulation models. The consultant will use properly matched RTA (Rate Transient Analysis i.e. Fetkovich, Blasingame, FMB etc.) & PTA (Pressure Transient Analysis) to model reservoir behavior and calibrate material balance & well (IPR) models. Please confirm if all mentioned analysis are required: Fetkovich, Blasingame, FMB & PTA	PTA is a must alongwith at least one of the suitable RTA.
49	Scope of Work: Consultant will develop a representative 3D black oil reservoir dynamic model for all the reservoir levels/Sands in Petrel as interface and Intersect as simulator. Please confirm if Decision Space including Nexus is one of the software options	Yes they may be. With regards to NEXUS; OGDCL's aim is to build a fine scale simulation model to capture heterogeneity taking advantage of Intersect's better algos and OGDCL's parallel processing capacity. If NEXUS can deliver as per the aim described and final model can be delivered in both OFFICE and INTERSECT format; they may be an option. BUT OGDCL prefers that models be built in PETREL and simulated in INTERSECT as much of the time exporting and importing doesnot work properly. In such case responsibility will be on consultant.
50	Scope of Work: The consultant will submit techno-economical evaluation of the prediction scenarios along with recommendations. Please confirm if actual economic data will be provided by OGDCL	OGDCL will provide all the input required for economic model (Costs, taxation, prices etc.) Consultant to run economics in EXCEL in such away that it can be easily imported in PEEP.
51	Scope of Work: Consultant shall	4 - 5 Wells

	select, in consultation with OGDCL's Reservoir Engineers assigned for this project, key wells for radial modeling to assess water coning phenomenon and define threshold(s) for future operation. Please confirm the number of radial models in the scope of work	
52	Scope of Work: 3D volumes/Horizon Seismic attribute analysis would be carried out to establish relationship with Petrophysical parameters of the subsurface. The relationship so established would be used to reinforce future drilling/EOR opportunities. Please confirm if the attributes are limited to amplitude as indicated in 2.2.2. or clarify the maximum number of attributes	Seismic attributes are not limited to amplitide only. It refers to all applicable attributes.
53	The seismic interpretation should be carried out with complete involvement of OGDCL Geophysicist and all the aspects of seismic interpretation shall be approved by OGDCL Geophysicist before moving ahead. Please clarify the OGDCL professionals participation time (10%, 50%, …)	30 - 50 %
54	All logs will be analyzed independently. Please confirm if all well logs analysis as well as the petrophysical model are to be built from scratch	Yes
55	Review the PVT laboratory analysis reports on fluid samples. Please confirm number of PVT reports	10 -15 Reports
56	Pressure & Rate Transient Analyses Please confirm available static pressure, formation tester, & transient pressure tests and number	About 50
57	The aquifer should be represented by proper cells in all directions. After the	At this stage it cannot be confirmed.

	completion of the Static Model, the consultant will propose the X-Y grid of the reservoirs, the number of cells to represent the reservoir and number of model layers. Please confirm type of aquifer model to be used: numerical, analytical or combination	
58	The model will be initialized and History matched on "Fine Grid". However, if needed, grid may be upscaled if the results of both the fine grid and upscaled grid are reasonably matched & run time reduced significantly. Please confirm definition of "fine grid"	Fine Grid = Geological Grid without upscaling In order to take advantage of IX & Parallel processing and to capture the heterogeneity of reservoir which will help in predicting future development wells.
59	Local Grid Refinement (LGRs) should be used around the wellbore region or away from the wells where we have no control on reservoir properties in case of upscaled model. Please confirm if LGR is required independently of grid size sensitivity analysis	Yes it can be used if required.
60	Full Field History Match Please confirm the meaning of full field history match: it is related of a field dynamic model per field or a field dynamic model for all fields, or a field dynamic model for a set of field and which field are included	For a set of fields but having same reservoir which includes Kunnar Deep, Pasakhi Deep, Kunnar West, Pasakhi West Deep, Kunnar South, Unnar, Shah and Pasakhi East. History Match will include: Full field History Match including all fields, Field wise History Match and well wise history match.
61	Well Hydraulics Models (IPR/ OPR) Please confirm number of wells with nodal information for VFP modeling as well as approach for well with no data	Almost All wells; Nearby offset wells may be used as type wells
62	Network Models Please confirm availability of network maps and input nodal data and formats. Also confirm if network transient or steady-state modeling is	All the data is available. Steady State modeling is required

	required.	
63	Production Forecasting Through Integrated Network Model Please confirm if modeling of processing plant is required and type or modeling will be limited to a sensitivity analysis based on plant operating variables	Modeling of processing plant is not required Plant operating variable sensitivity analysis will only be used for compression requirement and network model design accordingly.
64	Economic Analysis Please confirm availability of compressor and any other equipment information specs and economic database or if it possible to use any proprietorship or commercial database	Required information of capex including compressors and any other equipment will be provided. However, for missing information any proprietorship or commercial database can be used after having approval of OGDCL.
65	Terms & Conditions: It is highly preferred to have all phases of the study being conducted at one location. Please confirm if any of bidder's technical center location is acceptable	Yes, any of bidder's technical center location is acceptable provided that it has facilities to complete all the phases at that location. However, in current Pandemic situation, consultant must avoid locations with major outbreak like Europe & North America. Participation of OGDCL & JV professionals at that location will also be responsibility of Bidder as per TORs.
66	Terms & Conditions: All phases will have to be accomplished in association with OGDCL Reservoir Engineer/ Simulation Professionals, Reservoir Geologists, Geophysicist, Facility Engineer & Petrophysicist assigned with the consultants. The responsibility of the accomplishment of all kind of work/ studies will be on the consultant's part. However, the OGDCL/JV professionals in different disciplines will be attached from time to time for necessary inputs/ training. Please confirm: • The participation dedication of OGDCL professionals • Regarding 7 OGDCL persons over a year duration, Is OGCDL is bearing their cost.	1. Time period will be communicated after awarding the contract. 2. OGDCL will bear all the cost of international travelling and accomodation. Contractor will facilitate for Visa processing, office space, computer, internet, telephone and local trasportation as mentioned in the TORs.

67	Terms & Conditions Invoicing and Payments schedule; Is it per phase, or after we submit the cost break-down of phases, can we follow the cost breakdown milestones payment schedule.	Payment will be done after completing each phase after having OGDCL agreement on that work.
68	What are the logs available? How many wells have basic triple combo/sonic/spectral GR/other advance logs like NMR, spectroscopy, pressure testing etc. Are any saturation monitoring CH logs available?	All the wells have basic triple combo/sonic logs data against reservoir zones. 20wells have spectral GR data, 2 wells have NMR data, 6wells have FMI/SHDT data, ECS for one well. No CH logs for saturation monitoring was conducted.
69	How many wells have core data? How many have RCA and SCAL ? Which studies have been performed as part of SCAL and in how many wells/samples?	About 16 RCA 14; SCAL 1-2
70	How many fluid sample analysis are available for water/gas?	Water/ Gas analysis for all fields are available
71	Roughly what percentage of data needs to be reconstructed due to presence of bad hole /washouts?	Approximately 10-15% data will be reconstructed due to bad hole.
72	This section mentions that petrophysical work needs to be carried out in TechLog while in other places (3.1.2.2) it is mentioned that other software in OGDCL stable (IP) can be used. Please clarify.	Both software TechLog and IP (Decision-space Petrophysics) are being used.
73	What does analyze mean - is it review or re- interpret?	This has been elaborated against each of the dataset in later points. Review & Re-interpretation of Geophysical, Petrophysical, Geological and Engineering data (well tests etc.)
74	Please provide a legible map showing: 1] the 3D (and 2D if applicable) seismic data coverage 2] study wells 3] expected area of seismic interpretation and 4] expected area of the KPD static/dynamic model	Location map is given 44 wells Given in TORs Approximately 80 sq km
75	Are petrophysical properties to be determined for all oil and gas fields or just all gas fields	Yes, for both oil and gas fields.

76	what is the total thickness of the study interval - the Lower Goru Fm and the Sembar Fm	1. In general, for prospecting purpose ~1250 m Lower Goru ~500 m Sembar 2. For KPD dynamic modeling/ Material balance 350 – 400 m for Massive sands of Lower Goru Formation 3. For TAY/Nim & Satellites Material balance Upper sands, Middle sand, Basal sand & Massive sand) range 50 – 500 m
77	please provide an example well log section showing the thickness an relative proportion of shale units within the Lower Goru	Total thickness of Lower Goru formation from top of Lower Goru to top of Sembar formation is about 1200-1250m meter in the fields under study. Overall the whole lower Goru formation composed of Sand – shale packages in alternate way however there are three major thick shale units are present in it. 1- Upper Shale Unit (~125 – 150 meter), 2- Lower Shale Unit (~250 to 300 meters) and 3- Talhar Shale (~ 50 to 75 meters).
78	A static model is required for 'complete Lower Goru including Sembar' - but document (Fields Information) has focused just on the Massive sand gas play. This seems a misalignment - will additional well information from the Upper Sands (oil play) also be provided. Is this all to be incorporated in the model build.	Main focus will be on Massive sands and secondarily on Sembar Fm. Upper sands (Oil play) of KPD area is not the part of this study. However, For Prospecting/ unconventional resources, Whole Lower Goru, Sembar, & Chiltan Fms. Will be evaluated. Whereas Sembar Static model will be prepared upon evaluation if required with the consent of OGDCL's reservoir geologist
79	is GIIP just for Massive Sands or for all of Goru	Yes, Primarily Massive sands & Sembar Fm. But for unconventional and upside; complete Lower Goru, Sembar, & Chiltan Fm. To be evaluated and prospective resources to be reported.
80	seismic attribute analysis - is this to be conducted for 1) just the Massive	For understanding of conceptual facies within the 3D static model and possibly

	sands to guide conceptual facies within the 3D static model or 2) all Goru and Semabar Sands to assist in the 2D mapping exercise - this needs to be clear	their lateral distribution for Massive sand and Sembar, where Sembar may lack calibration points.
81	seismic attribute analysis - is this to be conducted for 1) just the Massive sands to guide conceptual facies within the 3D static model or 2) all Goru and Semabar Sands to assist in the 2D mapping exercise - this needs to be clear	For understanding of conceptual facies within the 3D static model and possibly their lateral distribution for Massive sand and Sembar, where Sembar may lack calibration points.
82	Static geological modelling is covered in section 3.1.3.. Are the references to 'geological model' in 3.1.1.3, 3.1.1.6 & 3.1.1.7 to a conceptual facies/2D facies models (as later repeated in 3.1.3.3) or to something else.	3.1.3.3 is not the repetition but continuation of SOW guidelines for Static Modeling
83	what is the average (TVD) thickness of the total Lower Goru interval to be evaluated	~1250 m (In general, for prospecting)
84	The petrophysical evaluation outlined follows a conventional reservoir workflow - but evaluation of 'unconventional' reservoir is also required - will this require separate unconventional (TOC) workflow	Conventional reservoir workflow to be used for all wells in all fields for their detailed petrophysical evaluation. Unconventional petrophysical evaluation using separate unconventional workflow to be done on a number of wells from the wells understudy as per availability as well as reliability of data and mutual consent with OGDCL representatives.
85	What is the process for approval of the Geophysical/Geological, petrophysical work? How long should be allowed for this within the project plan?	At the end of each phase and vetted by OGDCL relevant professionals participating in the study. Moreover, a presentation will be given to OGDCL after completing each phase and next phase will be started after having agreement on the work done so far. Approximately two (02) weeks' time is planned for draft review, presentation and amendments in model if required.
86	Does formulation of the depositional model require core input - what	Of course – Available Log and core data

	information will be provided?	
87	"separate models to be prepared for all such prospective horizons" - what does this mean? Is it one 3D geo-model for all the Lower Goru or separate geo-models for separate zones?	Main focus will be on Massive sands and secondarily on Sembar Fm. However, For Prospecting/ unconventional resources, Whole Lower Goru, Sembar, & Chiltan Fms. Will be evaluated. Whereas Sembar Static model will be prepared upon evaluation if required with the approval of OGDCL's reservoir geologist
88	Is use of the Geo-screening plug-in essential?	Yes, it is to the extent that it adds value to the analysis by capturing the heterogeneity of the reservoir in static model
89	how many PVT samples are available for Review	Approximately 10 - 15.
90	How many PVT regions are expected in the dynamic Model	Probably not more than one as KPD is wet gas field; still it will be finalized once consultant has reviewed the data.
91	Under concise Scope of work heading (2.2.9 pg15 & 3.3.1.2) the dynamic model mode is mentioned as black oil and at 3.2.1.3 its mentioned to use compositional. Kindly clarify	It will probably be black oil model as the KPD fluid is wet gas however Choice of simulation type will be made after fluid typing as mentioned in 3.3.1.2 (pg. 23); inference of compositional model from EOS tuning should not be considered as it is need based (condensate banking) and can be finalized upon data review and fluid typing.
92	How many SCAL samples are available for review	1-2
93	Will analogue SCAL data be provided?	Yes, if required and if SCAL data for that reservoir is not available.
94	Laboratory SCAL analysis in Material balance modeling is seldom applicable, usually it is treated as matching parameter while carrying some, relevance to field recovery mechanism and recovery performance. Is this acceptable to OGDCL?	To the extent of material balance (tank model) YES.
95	Are there any previous studies and if	Available study reports can be shared

	they will be provided as information for this project ?	for information only.
	Any particular reason for using Intersect ? - Eclipse also seems to be capable to conduct this type of study	Yes, it is. But as OGDCL is moving towards newer technology, it will be preferable. As we need dynamic model built on fine grid to capture the reservoir heterogeneity which will be helpful for future development wells planning. Moreover, its run time is smaller.
96	If dynamic model is supposed to be integrated with network model and Material balance models - does OGDC has software lic for resolve ? Which version ?	Yes it should be. No OGDCL doesn't have it yet. OGDCL is planning to have this software in near future.
97	What will be the control mode for History matching	The control mode will be Gas rate and WGR, CGR, BHP & THP will be History Matching parameters. However, for Prediction, THP will be control mode with constraints.
98	Radial gridding is not supported in latest versions of petrel ? is Eclipse office suitable to OGDCL	Yes, it is, but this should only be for coning study.
99	Radial grid simulation to capture condensate banking has to be conducted in Compositional mode	See Response to query 27.
100	how many potential candidates are for radial modeling	At least 4 – 5 wells, which will be selected after discussion between OGDCL & the consultant.
101	The dynamics of well producing to ultimate recovery (long term forecast) from a radial grid sector model and full field model will be comparatively different. does OGDCL appreciate that or is there another methodology currently employed by OGDCL	Yes, it is understood. Radial modeling is to capture the water coning and gas condensate banking near the well bore. In full field modeling the same can be captured using LGR in well bore vicinity.
102	What would be the criteria for candidate selection for radial modeling - DCA (WOR analysis),RTA, etc. ? any other methodology that is used or advised by OGDCL	WOR and Condensate banking near well area. Candidate will be selected during study after discussion
103	How many well tests to interpreted - please total mention number of PTA	Kunnar Deep, Kunnar West, Pasakhi Deep and Pasakhi West deep (in total

	and RTA	22 wells & about 44 well tests (Initial & Latest) to cover full field, For TAY and KPD Allied fields, two I.e. Initial & Latest well tests per field will suffice.
104	what is the recommended control mode for History Matching - rate or THP or BHP	Gas rate will be the controlling parameter while WGR, CGR, BHP & THP will be history matching parameters. However for Prediction, THP will be control mode with constraints.
105	If possible kindly share the criterion for your qualification of PTA/RTA for matching in order for us to rightfully time the task.	Nothing special; match should be reasonable considering well geometry Petrophysics, structure and geology
106	1. Will OGDCL share their economic model to conduct techno-economic evaluation or Baker Hughes will build one from scratch? Will the cost input data to economic model be provided by OGDCL or Baker will use its own? 2. Would COMPANY be providing the base PEEP Software model in the first instance, with fiscal regime etc?	OGDCL will provide costing, Taxation and other policy information. Consultant will make economics spreadsheets such that they can be imported to PEEP. No need to build economics model in PEEP.
107	It is recommended to run material balance prediction cases for workover/wellbore intervention, recompletion & stimulation cases in conjunction with Prosper models is it the same understanding of OGDCL or any other analytical technique will be used ?	Consultant is probably referring to 3.2.3.5b on Pg. No.23; For material balance we agree with consultant's approach. For simulation, these will a part of dynamic model. OGDCL expects reasonable agreement in both cases.
108	Software used by OGDCL.	We are using Kappa 5.20 Petrel 2019 ECL 2019 IX 2019 OFM 2018 Techlog DS petrophysics PEEP GEOFRAME
109	Software Licenses for OGDCL and JV	It will Consultant's responsibility if

	partner staff will be provided by OGDCL or it will responsibility of Contractor?	required.
110	what is the sector models, what kind of analysis is required on sector models ?	Once complete model has been built OGDCL requires slicing of the said model for its internal and JV use, (At least 5). No special analysis is required until outputs of sector models stay in agreement with full model.
111	Well Level DST`s will be included for Dynamic Model History Matching ?	Yes
112	history match will be conducted on just 1 geological realization or three ?	Please confirm the clause.
113	how many parallel capacity is operational in OGDCL ?	Hardware 24 threads Software 48 threads
114	Reservoir modeling predictions will be carried out through integrated surface model ?	With and without surface model. However final prediction runs will be with integrated surface network model.
115	it will be beneficial for project timing purpose if OGDCL can advise upfront of number of production forecast scenarios to be included	1. Base Case 2. Compression cases (incorporating given suction pressures) and number of stages 3. Case 2 + Workovers* 4. Case 2 + Infill Wells 5. Case 2 + Workovers* + Infill wells 6. *Workovers include stimulation, Recompletion, Add/ Re-perforations, WSO, & Frac etc. Specific workover type will be mentioned and incorporated in economics accordingly
116	Only latest well test data will be used for wellbore model matching or multiple tests matching ?	Multiple well test matching
117	A high level conceptual reservoir management plan is required or a detailed one ?	Detailed one along with concepts.
118	Production Forecasting through integrated network model and economic analysis is listed as heading	It is part of Network modeling phase as mentioned in 3.5. Forecasts from integrated network model (of KPD, TAY

	3.5 (pg 26). Is it a next "phase" of project structure or is included under network modeling phase, since it is not mentioned in study phases (pg 10)	& KPD Satellites) coupled with respective reservoir models (Simulation or material balance) will be used for economics.
119	Will predictions be carried out on proven probable and possible scenarios in dynamic and Material Balance Models or just 1 realization ?	Yes, predictions will be carried out on proven, probable and possible. However, development options and its economics will be based on 2P (Proven & Probable) case. Rest will however be reported.
120	should new potential prospects be included in dynamic modeling	If within Massive sands then yes it should be included. Rest will be identified on static data and associated resources will be reported.
121	Will sembar will be part of new development scenarios in dynamic modeling phase	No, it will only be evaluated on static data
122	Would COMPANY be providing the base PEEP Software model in the first instance, with fiscal regime etc?	No, OGDCL will provide costing, Taxation and other policy information. Consultant will make economics spreadsheets such that they can be imported to PEEP. No need to build economics model in PEEP
123	BIDDER assumes that a PEEP software license is required and this cost will be the BIDDERs. Is this correct?	YES
124	Will COMPANY provide an existing network model available?	No network model is available. However, pipelines existing layout plan will be shared.
125	Can details of the existing facilities be provided? For example map showing well flowlines & trunk lines, Process Flow Diagram for facilities & plant, so that BIDDER can estimate effort to create the network model.	No, it will be shared with the bidder who will win the bid due confidentiality. Location map is already attached for bidder's estimates and no of wells and field list along with its briefs is also given for understanding.
126	BIDDER assumes that Capex estimates for debottlenecking and new compression facilities will be to AACEi Class 5 level; is this correct?	Yes, and will be finalized having area engineer approval.
127	Can the number of simulation runs and other specifications be specified to allow BIDDER to estimate the	History match case (match should be reasonable; for which consult can use its experience to

	duration of the proposed work.	estimate runs) Prediction cases
128	The scope on "Tando Allah Yar and Nim Block (EL) Fields" (Section 3) does not request a network model to be constructed (like in Section 2); COMPANY to confirm if an existing model is available. If a model is not available, can details of the existing facilities be provided? For example map showing well flowlines & trunk-lines, Process Flow Diagram for facilities & plant, so that BIDDER can estimate effort to create the network model.	Network model will be constructed for TAY and Nim Block fields separately. According to this mentioned clause model will be integrated with KPD Network Model. No, it will be shared with the bidder who will win the bid because of confidentiality. Location map is already attached for bidder's estimates and no of wells and field list along with its briefs is also given for understanding. Note: It should be noted that forecast & economics should be provided for Project, Block (KPD, TAY/Nim & KPD satellites) and field level as mention in TORs.
128	BIDDER assumes that Capex estimates for debottlenecking and new compression facilities will be to AACEi Class 5 level; is this correct?	Yes, and will be finalized having area engineer approval.
129	The scope on "Tando Allah Yar and Nim Block (EL) Fields" (Section 3) and thus "KPD Satellite Fields" (Section 4) does not request a network model to be constructed (like in Section 2); COMPANY to confirm if an existing model is available. If a model is not available, can details of the existing facilities be provided? For example map showing well flowlines & trunk-lines, Process Flow Diagram for facilities & plant, so that BIDDER can estimate effort to create the network model.	Network model will be constructed for KPD Satellite fields separately. According to this mentioned clause; model will be integrated with KPD Network Model. No, it will be shared with the bidder who will win the bid because of confidentiality. Location map is already attached for bidder's estimates and no of wells and field list along with its briefs is also given for understanding. Note: It should be noted that forecast & economics should be provided for Project, Block (KPD, TAY/Nim & KPD satellites) and field level as mention in TORs.
130	It is assumed that "layouts" are for the overall network rather and at system level (as opposed to equipment level since equipment lists will not be generated for a Class V estimate); COMPANY to confirm.	This will be for overall network; consultant will identify bottlenecks and propose modification for enhance flow efficiency; Moreover, modifications for compression will also be proposed. Equipment level list is not required but

		it should be understood that these proposals will serve as basis for future mechanical modification.
131	Following G&G and RE software are available with OGDCL. The consultants/firms will be required to provide all the work on the software listed below: a. Petrel (G&G, RE) b. Geoframe c. Intersect d. Ecrin (Saphir, Topaz) e. PETEX Suite f. OFM g. PEEP h. Techlog/ Interactive Petrophysics Does it mean that we can complete the works with different softwares, but will deliver the final models/results in any of these softwares' formats? OGDCL can use these softwares to access to our results in the future and build on them further.	Yes different softwares can be used with the approval of relevant Professionals from OGDCL; but it will be preferred if work is done on these softwares because sometimes converted files/models cannot run properly and responsibility will be on consultant in that case. The consultant must use the Intersect software for Reservoir Simulation. Optimum case of final data file should also be converted in the "Eclipse Office" format.
132	Can we use other softwares to do the reservoir simulations but will prove to OGDCL that our simulations give the same results as Intersect does? Also will convert our final models/results into the "Eclipse Office" formats.	Our focus is to build dynamic model on fine grid to capture the reservoir heterogeneity, moreover OGDCL is updating its softwares and models accordingly. However if any simulator which can compete Intersect can be used with the approval of OGDCL area Simulation Engineer but models provided to OGDCL should be in Intersect and Eclipse format which can run properly in both softwares, along with comparison of results in all softwares. Software used for Geological, Petrophysical and Economic Analysis should be used as mentioned above."
133	can we use any other softwares, but will convert the final models/results to the formats required by these	Yes it can be used with the approval of relevant Professionals from OGDCL; but it will be preferred if work is done on

	softwares specified in the tender?	these softwares because sometimes converted files/models cannot run properly and responsibility will be on consultant in that case.
134	The reservoirs part of this scope of work are wet-gas reservoirs and not retrograde gas-condensate reservoirs. Please confirm	KPD is a wet gas reservoir. Other wells completed in massive sands are wet gas. Upper sand wells are retrograde gas condensate reservoirs.
135	hypothetical ΔP will be assumed across compressors, however the detailed design of the compressors (including operating envelope and the practical possibility to achieve such ΔP) is not part of the scope of work. Please confirm	Yes
136	The above clarification is also applicable for the wellhead compressors.	Yes
137	"the consultant will submit techno-economical evaluation for the prediction scenarios along with recommendations". OGDCL will provide the appropriate economic parameters to be used in the economic analysis. Please confirm	Yes
138	"Consultant will couple the fully calibrated network model with their corresponding dynamic model for prediction runs". Please clarify what meant by couple? Do you mean that network model to be integrated with dynamic model?	Yes
139	In the light of the previous point, please confirm that network model will be a standalone model and will not be integrated with Material Balance nor dynamic models. However, the outputs of network model will feed other models in order to identify the appropriate reservoir management and production strategy	No. The model will be an integrated.
140	Recommendations regarding production enhancement work such	Yes

	as stimulation, well intervention, etc. will be provided, but not detailed design for each well	
141	"Compressor's liquid handling capacity should also be studied and optimized in the compression design". Please confirm that detailed compressor design is not part of the scope of work. However, technical advices regarding liquid handling will be provided	Yes
142	"Provide field wise certification for reserves". What this means?	Individual reserves assigned to each field separately according to PRMS guidelines.