

Standard Operating Procedure

For

Declaration of Commerciality (DoC)
Field Development Plan(FDP) &
Revised Field Development Plan (RFDP).



हाईड्रोकार्बन महानिदेशालय

पेट्रोलियम एवं प्राकृतिक गैस मंत्रालय
भारत सरकार

DIRECTORATE GENERAL OF HYDROCARBONS

Ministry of Petroleum & Natural Gas
Government of India

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NOTICE

Subject: Standard Operating Procedure (SOP) for streamlining submission and evaluation process of Declaration of Commerciality (DOC), Field Development Plan (FDP) and Revised Field Development Plan (RFDP).

DGH has formulated the Standard Operating Procedure (SOP) for streamlining the submission and evaluation process for Declaration of Commerciality (DOC), Field Development Plan (FDP) and Revised Field Development Plan (RFDP) along with the timelines for evaluation of such proposals in DGH.

This Standard Operating procedure inter-alia includes detailed technical requirements of DGH (domain wise), formats for acceptance or return of proposal, list of chapters in DOC, FDP and RFDP proposal along with the format for disclosures. It is applicable to hydrocarbon discoveries made in PSC regime, DSF bid round, HELP regime and in line with respective contracts.

This has the approval of competent authority and is applicable with immediate effect.

(Mahendra Pratap)

Deputy Director General

Directorate General of Hydrocarbons

- Copy for all operators/contractors working in the Indian E&P sector- vide hosting on www.dghindia.gov.in : HOD (IT)
- Copy for information and necessary action (within DGH):
HOD (PSC) / HOD (PF) / HOD (Production) / HOD (Contract Finance) / HOD (Drilling)/ HOD (DSF) / HOD (G&G) / HOD (Reservoir) / HOD (HELP) / HOD (AE)
- All the Nodal officers to send this notice to the contractors of all the blocks/ fields being handled by them through an official letter.



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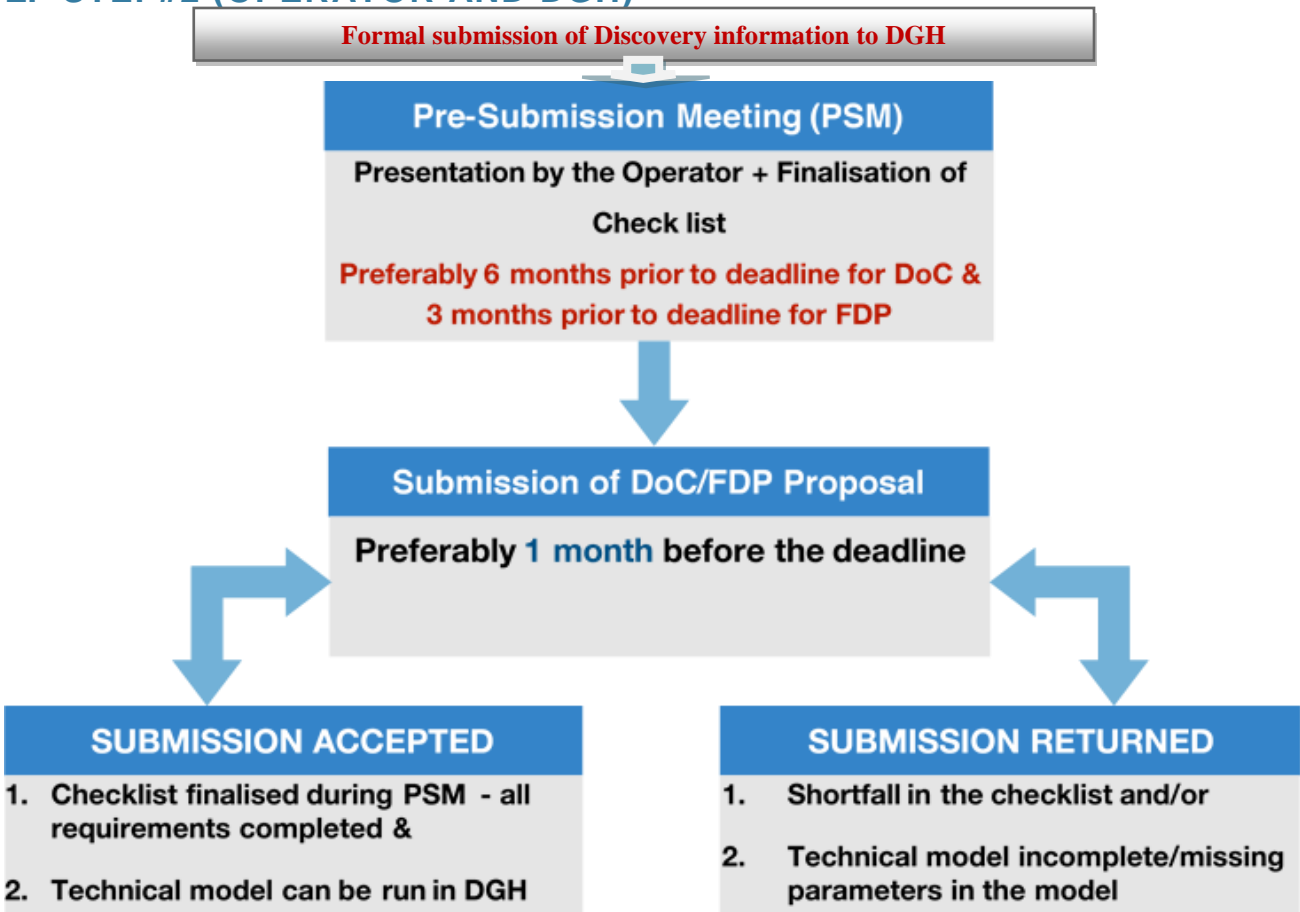
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STANDARD OPERATING PROCEDURE (SOP) FOR DECLARATION OF COMMERCIALITY (DOC), FIELD DEVELOPMENT PLAN (FDP) AND REVISED FIELD DEVELOPMENT PLAN (RFDP)

- A. The objective of this document is to develop a Standard Operating Procedure (SOP) regarding DOC/FDP/RFDP submission by the Operator and examination at DGH in a bid to fast track the entire process by bringing uniformity and simplicity. This SOP overrides all earlier orders/ notifications in regard to data requirements/ process flow for the DOC/FDP/RFDP proposals. However; specific provisions of any other rules / guidelines / notification issued by competent authority will prevail. This SOP would be applicable to hydrocarbon discoveries made / existing in PSC regime, DSF bid round, HELP regime and in line with respective contracts, with immediate effect.
- B. The Nodal Officer of the block / field at DGH would be responsible for the entire process under this SOP, regarding coordination, examination and approval, starting from submission of proposal till signing of Management Committee Resolution (MCR). The Nodal officer concerned will provide all relevant information regarding such proposals at all times to DOC & FDP group.
- C. The DOC & FDP group of DGH would be responsible for maintaining the data base of discoveries being dealt through this SOP, monitoring the progress of discovery from notification to monetization and flagging the issues to HOD - PSC / PF / DSF / HELP/NOC (as the case may be), issuing monthly reports and other related work.
- D. STEP#1 (WITHIN DGH)**
- 1.1 The information regarding new discoveries made and accepted in DGH (approval of Format-A / other documents) under PSC / PF / DSF / HELP regime and Nomination regime by NOCs will be provided to DOC & FDP group for the purpose of up-gradation of discovery database, by the Nodal Officers/ HODs concerned.

1.2 DOC & FDP group will intimate the upcoming DOC submission deadlines (wherever applicable) to HOD – PSC / PF / DSF / HELP around nine months in advance. DGH (PSC/PF/DSF/HELP Group), on behalf of GOI, will intimate the Operator eight months in advance for scheduling Pre-Submission Meeting (PSM) six months prior to the due date of DOC submission. In case of FDP, the above schedule will be compressed within 6 months of the due date of submission.

E. STEP#2 (OPERATOR AND DGH)



2.1 Operator has to submit the requirements as finalized in PSM before the deadline of submission to the satisfaction of DGH. The competent authority to accept or return the proposals will be HOD - PSC / PF / DSF / HELP, as the case may be. The guiding principle for acceptance / return will be availability / non-availability, of the minimum required information in the proposal for techno-economic evaluation at DGH, prior to the deadline of submission. Proposal returned may be resubmitted with incorporation of required data/ information as per note 2.1.5 below.

Notes:

2.1.1 The nodal officer concerned will coordinate to schedule PSM as per above timeframe. The Operator will have to schedule a Pre-Submission Meeting (PSM) at DGH preferably six months prior to the due date of DOC submission and three months prior to deadline for FDP submission. PSM shall be held in case of RFDP also.

2.1.2 During PSM, the Operator will essentially make a presentation about the DOC / FDP / RFDP about to be submitted covering its assessment of the data/ information sought by DGH (**Annexure-1(a) to 1(f)**). It is recommended that the domain experts of G&G, Reservoir, Production, Drilling and Finance from the Operator as well as DGH side are present in PSM.

In case of revised FDP/ supplementary FDP, incremental facility, incremental year-wise production profile, incremental investment should be identified by Operator.

Specific data / information / documents requirement list will be firmed up from Annexure-1(a) to 1(f) and signed by the Operator and DGH's technical team in view of upcoming DOC / FDP /RFDP proposal in the format **Annexure – 2 (Part-I)**.

2.1.3 The Operator needs to submit all the data within the deadline as per SOP and the Nodal Officer to ensure the compliance. In case of any deviation, action may be initiated as per PSC provisions/ SOP guidelines.

2.1.4 On the day of submission of DOC / FDP / RFDP proposal, the Operator will hand-over the complete data set and make a presentation to the technical team of DGH. The technical models / data handed over by the Operator will be loaded in DGH workstation.

The Operator will also submit a list of data submitted in the DOC/ FDP/ RFDP proposal. HODs of the sections concerned in DGH will sign the receipt of the data for DOC / FDP/ RFDP proposal within two working days of submission. DGH will acknowledge the receipt to Operator and circulate the proposal with data, among

groups concerned, within one week. This whole process will be coordinated by the nodal officer of the block / field.

2.1.5 It is expected that the DOC / FDP / RFDP shall be submitted around one month prior to the last date of submission, so as to enable sorting out any discrepancy. In case of improper/in-complete data (to the full satisfaction of DGH) and other requirements jointly agreed in PSM, DGH will return the DOC / FDP / RFDP (Annexure-2, Part-III). The implication of such return will solely rest with the Operator. If the Operator is unable to submit the required DOC / FDP / RFDP proposal or data as per Annexure 2 of this SOP (as sought by DGH) within the deadline and desires for extension in DOC or FDP submission timelines, Ministry of Petroleum and Natural Gas (MoPNG) “Policy framework for relaxations, extensions and clarifications at the development and production stage under the PSC regime for early monetization of Hydrocarbon discoveries” vide OM no O-22013/27/2012-ONG-D-V dated 10th November, 2014 will become applicable (namely sl. no.1 &/or 2).

2.1.6 A list of chapters in proposal of DOC / FDP / RFDP has been attached as **Annexure- 3**. The data / information finalized in the Pre-Submission Meeting shall be well covered in the DOC / FDP /RFDP document.

2.1.7 Mere submission of a letter or proposal by post / hand without all the required data will not be considered as a valid submission before the deadline and would run the risk of outshooting the deadline and its consequences. The communication with the contractor would be in the form of annexure -2.

F. STEP#3

3.1 Post submission, the evaluation of the DOC / FDP would be carried out in DGH.

3.2 Any queries raised by DGH regarding the proposal, have to be replied comprehensively by Operator within 30 days from issue of letter/mail. No reply from Operator will be considered, as if the Operator has nothing to add and DGH would proceed ahead with suitable course of action including return of FDP/DOC.

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- 3.3 Adequate Technical Meeting(s) (TM) and/or workstation requirements sought by DGH would be addressed by the Operator (within a week from request); to extensively evaluate the proposal before it is put-up to Management Committee (MC). All the TMs will be recorded and notified by the nodal officer. Any queries / requirements have to be submitted by Operator within 7 working days of TM.
- 3.4 Generally, it will be the endeavor of the Operator / DGH / MoPNG to conduct the Management Committee Meeting (MCM) and sign the Management Committee Resolution (MCR), giving its decision on the DOC / FDP / RFDP proposal within 90 (Ninety) days of the submission deadline.
- In case the Operator is not willing to conduct / attend the MCM, after direction from DGH / MoPNG for MCM, it would be considered as a deliberate act of omission on the part of the Operator and action for relinquishment of the discovery area will be initiated.
- 3.5 The SOP will be made binding on the Operator at the time of MCM for approval of appraisal programme for DOC and at the time of review of DOC for FDP; and will be recorded as a MC decision in the MCR for appraisal / DOC.
- 3.6 Operator shall examine and specifically declare whether the reservoir being developed, extends beyond contract area or not. In the event reservoir extends beyond the contract area, the contractor shall furnish all relevant information (DGH may add information that may be required) while submitting Development Plan. In this regard Annexure-3(b) of this document and relevant PSC provisions/ other notifications may be referred.

List of probable requirements

Annexure – 1(a)

**G&G DATA / INFORMATION REQUIRED FOR EVALUATION OF
DOC / FDP / RFDP**

A	DoC	FDP / RFDP
	<p>1. Location/Base map posted with discovery well(s) and 2D seismic lines/3D coverage area/block.</p>	<p>1. Location/Base map posted with discovery well(s) and 2D seismic lines/3D coverage area/block.</p>
	<p>2. (a) Interpreted seismic sections annotated with horizon names, formation tops and target zones at the wells of an Inline and a Cross-line passing through the discovery well and the appraisal well/ well's. In case of 2D, preferably a dip and a strike line.</p> <p>(b) Interpreted seismic section (Random Line) passing through both discovery and appraisal wells with all the tested zones and targeted zones marked respectively.</p> <p>(c) Well-to-seismic tie used to identify key horizons in seismic data</p>	<p>2. (a) Interpreted seismic sections annotated with horizon names, formation tops and target zones at the wells of an Inline and a Cross-line passing through the discovery well and the appraisal well/ well's. In case of 2D, preferably a dip and a strike line.</p> <p>(b) Interpreted seismic section (Random Line) passing through both discovery and appraisal wells with all the tested zones and targeted zones marked respectively.</p> <p>(c) Well-to-seismic tie used to identify key horizons in seismic data</p>

	3. Interpreted well log correlation amongst all the wells with proper annotations showing key markers (stratigraphic tops/ seismic horizons/ fluid contacts), tested zones and fluid types.	3. Interpreted well log correlation amongst all the wells with proper annotations showing key markers (stratigraphic tops/ seismic horizons/ fluid contacts), tested zones and fluid types.
	4. Annotated time and depth structure maps at key horizons with all the boundaries (block, discovery/ development area, 1P/ 2P/ 3P reserves, fluid contacts etc.) and all wells marked and plotted on a suitable scale (preferably 1: 20000 scale).	4. Annotated time and depth structure maps at key horizons with all the boundaries (block, discovery/ development area, 1P/ 2P/ 3P reserves, fluid contacts etc.) and all wells marked and plotted on a suitable scale (preferably 1: 20000 scale).
	5. Information on workflow/method used for velocity modeling and time-to-depth conversion for generating depth structure maps. Should include any VSP/check-shot or sonic data used in depth conversion.	5. Information on workflow/method used for velocity modeling and time-to-depth conversion for generating depth structure maps. Should include any VSP/check-shot or sonic data used depth conversion.
	6. Reservoir top structure and net pay maps for Low, Medium and High cases with boundaries (block, discovery/ development area, 1P/ 2P/ 3P reserves, fluid contacts etc.) and all wells marked and plotted on a suitable scale (preferably 1: 20000 scale or larger).	6. Reservoir top structure and net pay maps for Low, Medium and High cases with boundaries (block, discovery/ development area, 1P/ 2P/ 3P reserves, fluid contacts etc.) and all wells marked and plotted on a suitable scale (preferably 1: 20000 scale or larger).

	7. Well information sheet showing well static parameters (depths, elevations, formation/ reservoir/ zone tops, perforations, test results, fluid types etc.). Well deviation surveys for each inclined well.	7. Well information sheet showing well static parameters (depths, elevations, formation/ reservoir/ zone tops, perforations, test results, fluid types etc.). Well deviation surveys for each inclined well.
	8. RMS amplitude or any other relevant attribute maps (in appropriate scale) used for delineating reservoir. Well sections showing key seismic attributes and cross-plots of related attribute parameters used for characterizing reservoirs facies and fluids with suitable annotations.	8. RMS amplitude or any other relevant attribute maps (in appropriate scale) used for delineating reservoir. Well sections showing key seismic attributes and cross-plots of related attribute parameters used for characterizing reservoirs facies and fluids with suitable annotations.
	9. In-place volume estimate under various uncertainty scenarios (Low, Medium, and High).	9. In-place volume re-estimates, if any under various uncertainty scenarios (Low, Medium, High) with appropriate justification as compared to DoC approved in-place volume
	10. Comprehensive table of petro- physical parameters of reservoir units along with estimated hydrocarbon volume (like formation evaluation report of the well).	10. Comprehensive table of petro- physical parameters of reservoirs along with estimated hydrocarbon volume.
	11. Core reports (conventional and side wall core)	11. Core reports (conventional and side wall core)
	12. Other interpretation reports on basin geology, depositional environment, stratigraphy, petroleum system, geochemical analysis, seismic/ gravity/ magnetic/ MT studies etc. of the block	12. Other interpretation reports on basin geology, depositional environment, stratigraphy, petroleum system, geochemical analysis, seismic/ gravity/ magnetic/ MT studies of the block

	13. Well completion report of each drilled well along with composite log	13. Well completion report of each drilled well along with composite log
	14. Detailed work flow of geo-cellular model.	14. Detailed work flow of geo-cellular model including any revision in model parameters of earlier approved DoC. Reason/justification of revision of in-place volume from DoC to proposed FDP.
	15. Discovery/ appraisal well(s) construction diagram.	15. Discovery/ appraisal well(s) construction diagram.
	16. Any special seismic study, viz, AVO/ inversion/ attribute/ rock physics study used in reservoir characterization and building geo-cellular models.	16. Any special seismic study, viz, AVO/ inversion/ attribute/ rock physics study used in reservoir characterization and building geo-cellular models.
B	DoC in Petrel-compatible project with defined CRS	FDP in Petrel-compatible project with defined CRS:
	1. Complete 3D SEG Y (PSTM/PSDM) volume along with the horizons and faults in ASCII format covering the entire DoC area	1. Complete 3D SEG Y (PSTM + PSDM) volume along with the horizons and faults in ASCII format covering the entire FDP area.
	2. Net pay map in ASCII format	2. Net pay map in ASCII format
	3. Seismic velocity cube data (if used for time to depth conversion for depth maps) along with depth conversion procedure.	3. Seismic velocity cube data (if used for time to depth conversion for depth maps) along with depth conversion procedure.

	<p>4. If worked in Petrel, Operator is requested to provide project back-up of the geo-cellular model (preferably in Petrel 2015 version) along with all the input data (seismic data, well data, interpreted horizons, interpreted faults, seismic attribute cubes etc.). If the Operator has worked in any other software then the Operator is requested to provide the 'rescue' format back up of the project.</p>	<p>4. If worked in Petrel, Operator is requested to provide project back-up of the geo-cellular model (preferably in Petrel 2015 version) along with all the input data (seismic data, well data, interpreted horizons, interpreted faults, seismic attribute cubes etc.). If the Operator has worked in any other software then the Operator is requested to provide the 'rescue' format back up of the project.</p>
	<p>5. All considered boundary polygons (including proposed development area) along with suitably marked well trajectory for deviated wells.</p>	<p>5. All considered boundary polygons (including proposed development area) along with suitably marked well trajectory for deviated wells.</p>
	<p>6. All basic logs (spliced)</p>	<p>6. All basic logs (spliced)</p>
	<p>7. Original well logs used for facies/ rock-type classification</p>	<p>7. Original well logs used for facies/ rock-type classification</p>
	<p>8. Original/ updated facies log (Interpreted)</p>	<p>8. Original/ updated facies log (Interpreted)</p>
	<p>9. Processed logs (used in petro-physical modeling)</p>	<p>9. Processed logs (used in petro-physical modeling)</p>
	<p>10. Original and final updated well tops (used in modeling)</p>	<p>10. Original and final updated well tops (used in modeling)</p>
	<p>11. Original time and depth surfaces/ interpretation along with time-to-depth conversion methodologies/workflow.</p>	<p>11. Original time and depth surfaces/ interpretation along with time-to-depth conversion methodologies/workflow.</p>
	<p>12. Interpreted faults (polygons/ sticks/ surfaces) used in structural modeling</p>	<p>12. Interpreted faults (polygons/ sticks/ surfaces) used in structural modeling</p>

	13. Original petro-physical model (porosity, permeability, water saturation, net-to-gross)	13. Original petro-physical model (porosity, permeability, water saturation, net-to-gross)
	14. Seismic attributes/inversion used for facies/property modeling: probability cube, 1D or 2D trend, re-sampled seismic	14. Seismic attributes/inversion used for facies/property modeling: probability cube, 1D or 2D trend, re-sampled seismic
	15. Variogram maps (used to detect anisotropy direction)	15. Variogram maps (used to detect anisotropy direction)
	16. All other well logs (not used directly)	16. All other well logs (not used directly)
	17. Facies proportion map	17. Facies proportion map
	18. Isochore surfaces/ isochore points/ additional input like dip data, trend etc. (If used)	18. Isochore surfaces/ isochore points/ additional input like dip data, trend etc. (If used)
	19. Well correlation with basic spliced electro log, facies log, property logs etc.	19. Well correlation with basic spliced electro log, facies log, property logs etc.
	20. All the input parameters may be intact in the modeling work flows.	20. All the input parameters may be intact in the modeling work flows.
	21. Basis for saturation and porosity models should be precisely available through modeling workflows.	21. Basis for saturation and porosity models should be precisely available through modeling workflows.

	<p>22. For deterministic approach of in-place estimates, given horizon, zone and segment may clearly be brought into the model.</p> <p>23. All calculated parameters (direct or update) of property variables (porosity, saturation, facies etc.) need to be imperatively shown with implicit expressions. Similarly all functional templates of parameter characterization should be available in the model.</p> <p>24. Conceptual development area polygon</p>	<p>22. For deterministic approach of in-place estimates, given horizon, zone and segment may clearly be brought into the model.</p> <p>23. All calculated parameters (direct or update) of property variables (porosity, saturation, facies etc.) need to be imperatively shown with implicit expressions. Similarly all functional templates of parameter characterization should be available in the model.</p> <p>24. Development area polygon</p>
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Note: Specific queries may arise after assessment of Operator’s proposal and the same can be requested subsequently.

**PETROPHYSICAL DATA REQUIRED FOR EVALUATION OF
DOC / FDP / RFDP**

	DOC	FDP / RFDP
	<p>A. Log Data:</p> <ol style="list-style-type: none"> 1. Well log data in DLIS/LIS format for all the suites recorded in different borehole sections. 2. Merged & depth matched log data of different runs in LAS format comprising of standard log curves (GR, caliper, SP, Deep-Shallow-Medium resistivity, neutron, density, sonic log) for complete recorded interval. 3. Well log data in PDF/ PDS format with complete header information (1:200 scale). 4. Hi-Tech Log data (raw and processed) like NMR logs, borehole-image logs, Elemental spectroscopy logs (like ECS, GEM, FLeX etc.), advanced sonic, tri-axial resistivity (Vertical & Horizontal Resistivity) logs etc in DLIS/LAS and PDF/PDS formats (if recorded). 5. Wireline Formation Tester (WFT) e.g. MDT, RDT, RCI etc in DLIS/Spreadsheet (if recorded). 6. Well deviation survey data (if any). 	<p>Same as for DOC</p>

	<p>B. Reports:</p> <ol style="list-style-type: none"> 1. Well Completion Report (as in Annexure-1a). Table-A 2. Petrophysical analysis report containing the following: <ol style="list-style-type: none"> a) Pay summary table with zone top & bottom, gross thickness, net pay thickness in MD & TVD/TVDSS, average effective porosity and average water saturation. (As in Sr. no. 10, Annexure-1a, Table-A) b) Cut off values for Vcl, PHIE, Sw used to estimate pay summary. c) Petrophysical model used d) Rw, a, m, n values and mud parameters (Rm, Rmf, Rmc with temperature, mud density etc.) e) Fluid contacts/limits (GOC, OWC, GWC, OSC, GSC etc) from well log data. f) Processed logs in LAS & PDF/PDS format. 3. Wireline Formation Tester (WFT) report e.g. MDT, RDT, RCI etc. (if recorded). 4. Petrophysical core analysis reports and data (if any). 5. Special Log analysis reports like NMR logs, borehole-image logs, Elemental spectroscopy logs (like ECS, GEM, FLeX etc.), advanced sonic logs etc. (if any) 	<p>Same as for DOC</p> <p>a) Interpretation/Re-interpretation report , if any, subsequent to review of DOC.</p>
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Note: Specific queries may arise after studying the Operator's report. The above list may be read with Annexure-1a, Table A & B to avoid commonality in data.

RESERVOIR INFORMATION/DATA REQUIRED FOR EVALUATION OF DOC/FDP/RFDP

All these studies are required for DOC and FDP documents; however, at DOC stage some of these studies / data may not be available. DOC should cover conceptual field development plan and that should be based on simulation study (analytical / numerical) incorporating all rock & fluid data available at that point of time.

I. On Well Test/ DST: Data Requirements

- * Well Test/ DST: Initial Pressure Measurement, Multi Bean Study, Pressure Build Up (PBU), Drawdown Test, Influx Study, Interference Test, Flow after Flow test & Modified Isochronal Test as case (s) may be relevant to oil & gas wells. All these tests should be performed as per standard design and together with by production tests.

Interpretation & Analysis for test types - Standard & Interference, Interpretation models - Analytical & Numerical, Options - Standard, Changing well-model & External using Industry Standard Softwares namely Kappa, PanSystem etc. along with Reports are to be provided.

- * Acquire MDT data early in the life of the reservoir. It affects in-place volume and reserves directly. MDT/ RDT/ XPT Interpretation & Analysis are to be provided.

II. Laboratory Studies as performed during course of studies

For small fields some of these special studies may be considered from correlation or analogue field data.

Routine PVT analysis:

- * Réservoir fluid composition
- * Physical recombination (if separator samples)
- * Constant Composition Expansion (CCE)
- * Constant Volume Depletion
- * Differential Liberation (DL)
- * Viscosity
- * Separator tests

Special PVT:

Phase Diagram, EOS (multi-component fluid characterization for compositional fluid), Slim-tube test, swelling test etc.

- i. Routine Core Analysis (Porosity, Permeability, Saturation & other electrical properties)
- ii. Special Core Analysis:
 Relative Permeability (for simulation): Obtain water-oil and gas-oil rel. perm., Data using fresh representative cores. Plugs should be selected to represent the reservoir rock types.
 Drainage Capillary Pressure: Obtain capillary pressure data using fresh cores. Plugs should be selected to represent the reservoir rock types.
- iii. Any other special Lab studies for fluid or on core.

III. In-Place Volume

Make sure in-place volume estimate from geoscience takes into account the possible range of variability and the P50 in-place value is comparable with independent estimates from material balance or/and 3D Full Field Reservoir Model.

IV. Simulation Studies to be performed (Analytical / Numerical)

SI No.	Description	2P/OIIP/STOIIP (MMbbl) / GIIP (Bscm) Field/ Reservoir	2P Reserves MMBbl (O+ OEG)	Required/ Preferred
1	a Decline Curve Analysis (DCA): Well wise reserves estimate of existing wells & total reservoir based on past sustained performance and extending the DCA parameters on new development wells in 2P STOIIP area (Not applicable in case of 1st time/Initial development)	Oil: <80 Gas: <5		Required/ (Sr. No. 2&3 Preferred but not Binding) (1a. is not applicable for Initial Development Case)
	b Material Balance Studies (using well model preferred) and FORGAS & P/Z vs. Gp (for gas reservoirs) is to be performed in conjunction with DCA			
	The above studies need to be supported by Bubble Maps. Maximum three new development wells per reservoir/hydro-dynamically connected reservoirs in the field can be considered based on the these studies provided there is an improvement in Exploitation Index & Recovery Factor; otherwise Sr. No. 3 is to be followed			

SI No.	Description	2P/OIIP/STOIIP (MMbbl) / GIIP (Bscm) Field/ Reservoir	2P Reserves MMBbl (O+ OEG)	Required/ Preferred
2	2D Geological Maps based 3D-3Phase Reservoir Model, History Matched (in new reservoir there will be no history) 3D-3Phase Numerical Simulation Study & Forecast for reservoir/ hydro-dynamically connected reservoirs	Oil: 80 to 120 Gas: 5 to 7.5		Required/ (Sr. No. 3 Preferred but not Binding)
3	Full Field Geo-Cellular Model (FFGM), Full Field Reservoir Model (FFRM), History Matched (in new reservoir there will be no history) 3D-3Phase Numerical Simulation Study & Forecast for reservoir/ hydro-dynamically connected reservoirs The above statements assumes that: FFRM scale-up is valid and preserves the pore volume, internal architecture, and the effects of heterogeneity <ul style="list-style-type: none"> • Aquifer influx and gas cap size are modeled correctly • PVT properties are characterized and represented correctly • SCAL data is used to enhance and validate model predictions, where applicable • There are no errors in reported production history 	Oil : > 120 Gas : > 7.5		Required
4	For offshore semi-deep, deep & ultra-deep-water fields, new and redevelopment of the reservoir will be strictly based: Full Field Geo-Cellular Model (FFGM), Full Field Reservoir Model (FFRM), History Matched (in new reservoir there will be no history) 3D-3Phase Numerical Simulation Study & Forecast for reservoir/ hydro-dynamically connected reservoirs			Required

Note:

- i. The Initial Field Development Plan/Redevelopment Plan should meet all the points from Sr. No. 1 to 4 as case(s) may be applicable.
- ii. Naming of first FDP and subsequent FDP documents should be in number order, such as Field Development Plan and then FDP Rev1, FDP Rev2 -----.
- iii. The above criteria are in addition to the G&G and other data requirements.
- iv. Industry standard software commonly used namely, Petrel/ Petrel RE, Eclipse, CMG, VIP, MBal, FORGAS, OFM, Kappa, PanSystem, Prosper, PipeSim etc. are recommended for Reservoir Engineering & Petroleum Engineering Studies.
- v. All data relating to above studies including FFGM and FFRM, History Matched & Forecast models should be made available to DGH as & when required.

**Proforma for submission of information on
Oil/Gas Inplace and Reserves/Resources**

Company:

Block/Asset:

Field:

Reservoir:

Period:

Units: Oil: MMbbl (One cubic meter = 6.2898 bbl)

Gas: Bscm/MMscm or Bscf/MMscf (One cubic meter = 35.3198 cubic ft)

P1	: Proved	1C	: Low Case
P2	: Probable	2C	: Best Case Estimated
P3	: Possible	3C	: High Case

1P	: Proved
2P	: Proved + Probable
3P	: Proved + Probable + Possible

**Cumulative Production: ----- MMbbl 2P Ultimate Reserves: -----
MMbbl**

Total Recoverable Reserves/Resources	Discovered	Commercial	RESERVES/RESOURCE CATEGORY			Project Category	Comments
			PRODUCED TO DATE				
			DEVELOPED RESERVES			On Production	
			1P	2P	3P		
			UNDEVELOPED RESERVES			FDP Status	
		1P	2P	3P	Under Development		
					Planned for Development		
			Development Pending				
		Constraints/Sub-commercial	CONTINGENT RESOURCES			Development on Hold	
			Low	Best Estimate	High		
						Development not Viable	

Cumulative Production: ----- MMscm 2P Inplace volume: -----
MMscm

Total Inplace	Discovered	Commercial	OIIP (STOIIP) & GIIP CATEGORY			Project Category	Comments
			DEVELOPED INPLACE				
			1P	2P	3P		
			UNDEVELOPED INPLACE				
			1P	2P	3P		
		Constraints/ Sub-commercial	CONTINGENT INPLACE			Project Category	Comments
			Low	Best Estimate	High		

Note:

- i. Associated Gas (solution gas) and Gas Cap gas & Free Gas (both non-associated gas) volumes should be mentioned categorically.
- ii. For presentation/comparison/reference, 2P Inplace and 2P Reserves can be considered.

V. Action plan for maximization of recovery

The Operator has to evaluate all the different techniques/ technologies/ processes, under the umbrella of Improved Oil Recovery (**IOR**) and Enhanced Oil Recovery (**EOR**) (similarly for gas reservoirs), with the overarching objective of having a structured plan to be implemented over field life (either from start or in mid-course) which intends to extract maximum possible hydrocarbons from the target reservoirs.

The recovery factors envisaged should be comparable or above global standards for similar reservoirs and utilize the continuously improving state-of-art methods.

The cost estimates of such action plan should be incorporated in the overall techno-economics of the proposal, to ensure continuous focus on production maximization during field development.

It is incumbent upon the Operator to bring about a proposal, which has components to achieve best-in-class recoveries.

The techniques / technologies / processes that need to be considered are as under, but not limited to:

-
- a) Adequate well density to achieve optimum reservoir drainage.
 - b) Drilling inclined / horizontal / multi-lateral wells for maximum reservoir contact.
 - c) Deployment of suitable artificial lift methods.
 - d) Hydro-fracking of tight/Low permeability reservoirs; Multi Stage / Segment hydro-fracking in Vertical / Horizontal well.
 - e) Pressure maintenance / improving volumetric displacement efficiency (vertical & areal sweep efficiencies in the reservoir by water flooding (treated water or water added with special chemicals to improve its effectiveness).
 - f) Low salinity water flooding.
 - g) Alkaline/Surfactant/Polymer/ASP flooding.
 - h) Miscible or immiscible gas injection like CO₂/ Hydrocarbon/ Nitrogen/ Flue.
 - i) Thermal Processes: Steam Stimulation Processes / Hot Water Injection/ Steam Drive Processes/ In Situ Combustion
 - j) Microbial Enhanced Oil Recovery (MEOR).
 - k) Application of Nano-technologies and other innovative methods.

Proposals with sub-optimal recovery factors are liable to be subject to stringent terms and conditions, during the course of review / approval by MC.

There will be requirement for the Operators to justify why such processes are not being used or are not planned to be utilized.

Annexure-1(d)

**PRODUCTION DATA/INFORMATION REQUIRED FOR
EVALUATION OF DOC / FDP / RFDP**

	DOC	FDP
	<ol style="list-style-type: none"> 1. Basis of establishing “sustainable production levels”. Projections based on production tests, drill-stem or extended well tests (wherever applicable) along with data and analysis of data obtained in accordance with GIPIP 2. Estimated Production profile, field life and project schedule. 3. Brief Description of the proposed well types and well completion design. 4. Details of field development alternatives with reasons for selection of the best alternative. 5. Description and adequacy of the production facilities and pipelines with statement of reasons for selecting the type of facility and pipelines. 6. Brief of Delivery Point 	<ol style="list-style-type: none"> 1. Basis of establishing sustainable production levels-projections based on drill stem or extended well tests, where applicable. 2. Development concept and reason for choice of development concept. 3. Flow chart for the main process, with capacity indications and a description of the arrangement of main areas. 4. Productivity: The assumptions used in the Field Development Plan for the productivity and injectivity of development wells should be briefly stated. 5. Flow Assurance: The potential for scaling, waxing, corrosion, sand production or other production problems should be noted and suitable provision made in the FDP. 6. Well Completion and Design <ol style="list-style-type: none"> a. General Well construction design. b. Upper and Lower completion designs as applicable for all the wells proposed c. Measures proposed for sand/water ingress if any along with justification d. Measures proposed for prevention of scaling, waxing and other causes of flow hindrances. 7. Production Facilities <ol style="list-style-type: none"> a. Parameters used for the basis of Facility design. b. Well pads/wells to be developed c. For offshore, type of production facility like FPSO, Jacket platforms, Tension leg platforms etc. and their details. d. In case of Offshore Jacket platform, estimated jacket and topside weights for platform developments. e. Details of system limitations which may

		<p>constrain production; contingency plan to maintain production in case of equipment failure; scalability/spare-capacity for incremental and satellite projects and third party tie-ins; any engineering studies that informed the final selection should be included as an appendix.</p> <ul style="list-style-type: none"> f. Processing terminal description <ul style="list-style-type: none"> i. Summary of the main and standby capacities of major utility and service systems, together with the limitations and restrictions on operation. ii. Summary of the method of measurement of hydrocarbons produced, utilized, flared and sold. iii. Brief description of systems for collecting and treating oil/condensate/gas, water and other discharges. iv. Brief description of any fluid treatment and injection facilities. v. Brief description of the main control systems and their interconnections with other facilities. vi. Special production strategies for high pressure, high temperature and high carbon content fields should be described. g. Design codes, standards etc. followed 8. Production Chemistry, flow assurance and water injection 9. Field Management Plan <ul style="list-style-type: none"> a. Guiding objective of licensee to conduct oil and gas operations to maximize economic recovery. b. Strategy to select production intervals(reservoir zones), criteria for recompletion c. Plan to monitor dynamic performance of field in development and production levels d. Chosen recovery and optimization method, with any technological or locational limitations highlighted.
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		<ul style="list-style-type: none"> e. In case of fluids injection, annual and cumulative injection profiles 10. Evacuation and sales plan <ul style="list-style-type: none"> a. Plans to utilize existing infrastructure b. Plans for new infrastructure c. Usage assumptions basis-expected or contracted demand d. Description of transport system 11. Delivery point details 12. Implementation Schedule 13. Strategic Optionality <ul style="list-style-type: none"> a. Optimize facility and capacity utilization b. Possibility of future tie-in of other deposits c. Possibility of late life IOR/EOR developments to maximize recovery 14. Operational Strategy for well stimulation and fracking, including associated design issues at the well head. If Pilots have been carried out it has to be indicated. 15. On-shore and off-shore Compression requirements for enhanced recovery at the decline phase. 16. Rent vs Own model for services to be analysed and appropriate economic decision taken.
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Annexure – 1(e)

**DATA/INFORMATION REQUIRED FOR ECONOMIC EVALUATION
OF DOC / FDP / RFDP**

	DOC	FDP
	<ol style="list-style-type: none"> 1. Estimates for wells to be provided with detailed well cost sheet (Format 3B) 2. <u>Year wise</u> and <u>facility wise</u> break up of capex to be provided in absolute values (well cost, facility cost etc.) 3. Year wise fixed opex and variable opex to be provided in absolute values with break up 4. Year wise Abandonment cost 5. Economic evaluation, indicating year wise cash flow, NPV, sensitivity analysis. 6. All the estimates should be in USD only. 7. In case of revised DOC/ supplementary DOC, incremental facility, incremental year-wise production profile, incremental investment should be identified by Operator. 8. Map showing Well Locations 9. Simulation model report summary 10.Recovery Factor 11.Influence of existing and/or third party infrastructure on commerciality 	<ol style="list-style-type: none"> 1. Detailed FEED report for facilities to be provided 2. Estimates for wells to be provided with detailed well cost sheet (Format 3B) 3. Year wise and facility wise break up of capex to be provided in absolute values (well cost, facility cost etc.) 4. Year wise fixed opex and variable opex to be provided in absolute values with break up 5. Year wise Abandonment cost 6. Economic evaluation, indicating year wise cash flow, NPV, sensitivity analysis. 7. All the estimates should be in USD only. 8. In case of revised FDP/ supplementary FDP, incremental facility, incremental year-wise production profile, incremental investment should be identified by Operator. 9. Map showing Well Locations 10.Simulation model report summary 11.Recovery Factor 12.Influence of existing and/or third party infrastructure on time to first production 13.Insurance strategy as required, together with appropriate loss of profit insurance to be indicated

**DRILLING DATA/INFORMATION REQUIRED FOR EVALUATION OF
DOC / FDP / RFDP**

FDP/DoC
<ol style="list-style-type: none">1. Broad specification of the drilling package required for development wells2. Additional drilling technology planned to be adopted for the forthcoming wells.3. Well Types and Design4. Drilling Challenges (expected and contingencies proposed)5. Typical well schematic6. Typical well directional plan & well Trajectory7. Casing Policy8. Drilling Fluid Design9. Cementing design10. Completion Design11. Any other aspect planned for Development Wells12. In case of re-entry wells the completion history of the well should be submitted13. Details of previously drilled wells in the block14. Timeline to complete proposed development well (s)

**PART-I: DATA REQUIREMENTS JOINTLY FINALIZED BY
DGH AND OPERATOR**

Block:	
Discovery:	
Operator /Partners:	
Date of PSM:	
Venue:	
Brief of the Proposal:	
G&G (including petro-physics)	1. 2.
Signatures	DGH:
	Operator:
Reservoir	1. 2.
Signatures	DGH:
	Operator:
Production	1. 2.
Signatures	DGH :
	Operator:
Drilling	1. 2.
Signatures	DGH :
	Operator:
Contract Finance	1. 2.
Signatures	DGH :
	Operator:
Others	1. 2.
Signatures	DGH:
	Operator:
Signature of DGH Representative (Nodal Officer/ Coordinator)	Signature of Operator Representative
Date & Venue of signing	Date & Venue of signing

Distribution in original to:

1. DGH copy
2. Operator copy

PART-II: RECEIPT OF THE DOC/ FDP/ RFDP PROPOSAL

G&G (including petro-physics)	Remarks:
Signature DGH (HOD G&G)	
Reservoir	Remarks:
Signature DGH (HOD Reservoir)	
Production	Remarks:
Signature DGH (HOD Production)	
Drilling	Remarks:
Signature DGH (HOD Drilling)	
Contract Finance	Remarks:
Signature DGH (HOD C.F)	
DoC and FDP	Remarks:
Signatures DGH (Coordinator FDP/DoC)	
<p>Signature of DGH representative (Nodal officer/ coordinator)</p>	
Date:	
Venue:	

Part-III: Format of Letter for return of DOC/FDP Proposal on DGH letter head

DGH/PSC/PF/HELP/DSF/YEAR

Date:

To
MC member of Operator,
Postal address
Fax no:
Email id:

Sub: Return of DOC/FDP/ RFDP proposal

Sir/Madam

This is with reference to the DOC/FDP/RFDP proposal submitted by you vide letter no..... dated You are hereby informed that this proposal is being returned in original due to following reasons:

- 1)
- 2)
- 3)

In this context, para 2.1.5 of Standard Operating Procedure (SOP) for DOC / FDP/ RFDP submission, issued vide notice no DGH/FDP/SOP/2017 dated 20.10.2017 may be referred.

Regards,

Nodal officer

Copy to:

- a. JS (E), Shastri Bhawan Ministry of Petroleum and Natural Gas, New Delhi- for information please
- b. MC members of consortium partners

CHAPTERS IN PROPOSAL OF COMMERCIALITY (DOC)

1. Executive summary (along with checklist- Annexure 2 –Part 1 and unconditional Operating Committee Resolution (OCR))
2. Geological, Geophysical and Petro-physical Analysis
3. Reservoir Engineering Analysis
4. Production Facilities & Development Concepts
5. Envisaged drilling and well Completion concept
6. Actions for maximizing hydrocarbon recovery
7. Techno economic analysis
8. Conclusions

Note:

- i. The data/information finalized in the Pre-Submission Meeting shall be well covered in the commerciality document.
- ii. The Proposed DOC will take into account the Good International Petroleum Industry Practices (GIPIP) as notified/ modified by MoPNG.
- iii. The above requirement will also refer to the requirements of the actual contracts signed under PSC / DSF / HELP

CHAPTERS IN PROPOSAL OF FIELD DEVELOPMENT PLAN (FDP)

Section 1. Executive summary (along with checklist- Annexure 2 –Part 1 and unconditional Operating Committee Resolution (OCR))

Section 2. Field description

- 2.1 Seismic Interpretation and Structural Configuration
- 2.2 Geological Interpretation and Reservoir Description
- 2.3 Geological Model
- 2.4 Petro-physics and Reservoir Fluids
- 2.5 Hydrocarbons Initially in Place
- 2.6 Reservoir Modeling Approach
- 2.7 Reservoir Development, Improved and Enhanced Recovery Processes
- 2.8 Wells Design and Production, Technology

Section 3. Development and management plan

- 3.1 Preferred Development Plan, Reserves and Production profiles
- 3.2 Drilling and Production Facilities
- 3.3 Process Facilities
- 3.4 Project Planning
- 3.5 Environment and safety management
- 3.6 Costs
- 3.7 Field Management Plan
- 3.8 Decommissioning: A very brief description of the proposed methods of decommissioning should be included to show the basis for decommissioning expenditure estimates. Steps taken in the design to facilitate eventual decommissioning of the production facilities should be identified.
- 3.9 FDP implementation schedule: Schedule defining key events and decision dates along with expected outcomes to be provided by the Operator. A separate project execution plan should be prepared and submitted along with the FDP

FDP implementation schedule				
	Q1/H1 F.Y.----	Q2/H1 F.Y.-----	Q3/H2 F.Y.-----	Q4/H2 F.Y.-- -----
Envisaged Investment				
Major activities planned				

Section 4. Disclosures

4.1 Regarding technical data

4.2 General disclosure

Figures and tables should be used where appropriate. The FDP should be submitted formally by submitting a hard and digital copy to nodal officer and also as attachment to the FDP portal, as and when available.

Note:

- i. The data/information finalized in the Pre-Submission Meeting shall be well covered in the FDP document.
- ii. Any addition of new data/ information and/or revision in interpretation from DOC to FDP stage should be captured and tabulated.
- iii. The above requirement will also refer to the requirements of the actual contracts signed under PSC / DSF / HELP.
- iv. The Proposed FDP/RFDP will take into account the Good International Petroleum Industry Practices (GIPIP) as notified/ modified by MoPNG.
- v. Since RFDP is a revised submission of previous plan, the reasons for such changes should be summarized at the first instance. Usually RFDP is required to be submitted for chalking out and incorporating simpler and cost-effective strategy, RFDP can also be submitted to come up with a revised development vision based on past field performance. The Operator to provide plan-vs-actual field performance in following format:

Planned vis-a-vis actual performance of the field				
Sr. No.	Parameter	Planned (as approved in FDP by MC)	Actual (Reasons, if any)	Proposed
1	First Oil/Gas date			
2	No. of wells (producer/injector, suspended/abandoned, perforated intervals, reservoir identifier, lift provision should be included)			
3	Facilities			
4	Production Performance			

	(R/P ratio)			
5	In place Volumes		(Reasons for changing in place volumes, if any)	
6	Capital and Operating cost of Field: a) At the start of previous FDP b) Actual till date c) Incremental due to RFDP d) Post RFDP			
7	Reasons for submission of RFDP:			
8	Improved oil recovery: IOR/EOR scheduled in FDP vis-a vis results and new plans in this area			

(On official company letterhead)

Disclosure regarding Technical data during submission of FDP/ RFDP

- i. **Extent of Reservoir:** This is to certify that, based on the G&G, Petrophysical data, Reservoir, Well and Production Engineering data and its interpretation, analysis the reservoir limit(s) of the geological formation which is being developed under this FDP *is or are not extending beyond the block boundary of contract area/ is or are extending beyond the block boundary of contract area and all relevant information is being provided along with this FDP.*
- ii. **Data and Information for technical model:** All data, pertaining to G&G, Reservoir Engineering, drilling, Production engineering which have been used for interpretation, modelling and predictions using application software and relevant models has been provided with this FDP.
- iii. **Estimate of Hydrocarbon:** The methodology for estimating hydrocarbon in place volume and reserves has been adopted (in line with latest PRMS guidelines) and the same is provided herein.
- iv. This is to the best of my knowledge & belief and no information in this regard has been withheld.

(Signature of authorized signatory of the Operator)

(On official company letterhead)

General disclosure during submission of FDP / RFDP

- i. The proposed FDP has been developed fully in house/ by using the services of following consultant(s)/ firm(s) or jointly.
 - a)
 - b)
 - c)
- ii. The Proposed FDP has taken into account the Good International Petroleum Industry Practices (GIPIP) as notified/ modified by MoPNG. The execution of this FDP would be in full conformance of all the prevalent rules, guidelines, notifications etc. of Central/State Government and any statutory authority.
- iii. All information, data, facts connected in any way to this FDP have been submitted vide this proposal and there is nothing that has been purposefully or inadvertently hidden.

(Signature of authorized signatory of the Operator)