

TECHNICAL INFORMATION (APPENDIX B, INCLUDING TECHNICAL COMPETENCE) FOR SEAWARD LICENSING ROUNDS JULY 2019

The applicant presents technical information in a part of the application called Appendix B, which: (a) outlines the information already used to arrive at the current understanding of the acreage; and (b) proposes a Work Programme for the Initial Term of a licence.

Technical understanding and the proposed *Work Programme*, as presented in the Appendix B, will be assessed against a *marks scheme* which will largely form the basis of the decision as to who will be offered licences (see '*How Decisions Are Reached*' in the General Guidance). For applications where it is proposed to start the licence in Phase C of the Initial Term or with no Initial Term at all (i.e. straight to Second Term), the applicant also submits information demonstrating its financial capacity and the proposed operator's competence (see *Operator Competence*). All Applications for Seaward Production Licences will also be determined against the safety and environmental capability requirements of the Offshore Safety Directive (OSD), as detailed in the guidance available at <http://www.hse.gov.uk/osdr/guidance/consultation.htm>

1) In Appendix B the Applicant should:

- demonstrate the quality of its technical evaluation and understanding of the geology and geophysics;
- identify prospectivity and/or development options;
- explain the exploration and/or exploitation rationale;
- propose a detailed Work Programme with timings and decision points, as well as detailing the resources necessary.

Appendix B Technical information

2) The Applicant should present information (via the electronic LARRY system) in whatever form it considers best illustrates its plans for the acreage and the rationale behind them. The Oil and Gas Authority (OGA) doesn't wish to be prescriptive, but a fit-for-purpose application should be a report at most 50 pages long, including relevant maps and seismic sections indicating well ties, where appropriate.

3) Note that this Guidance is designed to cater for Applications in any area, whether under-explored ("Frontier") or better-explored ("Mature"); the level of detail provided in an application will reflect the amount of information available and utilised by the Applicant.

4) It is the opportunity for Applicants to describe how they have analysed the area(s) and selected the Block(s) applied for, and should include a brief description of that methodology. Any previously documented studies which have been utilised in the evaluation should be referred to and a short summary given. A Bibliography of Consultants and/or Contractors Reports utilised would be helpful. Information provided as part of the Appendix B (technical work done and work programme) will be marked in accordance with the **Marks Scheme** detailed at Annexe 2.

5) Even though the OGA will not combine geographically separate areas into a single licence award, the LARRY system allows an applicant to apply for separate areas in a single application (paying only a single application fee). In order that the OGA can consider these areas separately, the application must present discrete information for **each geographically separate area**.

6) The application should include:

6.1 A brief summary of the Exploration/Exploitation Rationale for that area, including an account of the Regional Geology, the overall hydrocarbon system, and potential plays.

6.2 A description of the data coverage (seismic, wells and any other data), with an explanation of how this was utilised in the analysis.

Applicants must identify and detail all available geophysical data (whether publicly or commercially available) and justify the use of the datasets chosen for the analysis from a technical perspective. The OGA encourages the use of the best available datasets wherever possible (see Asset Stewardship Expectation SE03 on the OGA website).

For seismic data please enclose maps showing the Regional and Block specific areas of seismic coverage (full fold) used in the interpretation, indicating the type of seismic, key survey acquisition and processing parameters, and whether it has been specifically acquired (whether shot or purchased) or reprocessed for the assessment.

Likewise, wells specifically interpreted for the assessment should be annotated on a map, listing wells where any detailed or specialist analysis was carried out.

6.3 The analysis performed by play (source rock and reservoir-seal pair), and the overall prospectivity potential (or lack of) identified within the block(s) and its relationship to the regional geology of the area.

6.4 The identity and analysis of undeveloped discoveries, [prospects](#), [leads](#), plays/part-plays and common risk segment analyses and/or [new play concepts](#) in the acreage, together with predicted reservoir performance, reservoir and fluid properties, and resource/reserve information (including risk/chance of success) using analogues and play statistics. Play chance (shared chance factors) should be separated from prospect chance (local chance factors), and risk dependencies identified.

6.5 For the main prospect/group of prospects/leads: two interpreted seismic and geological profiles in crossing directions (dip and strike lines); reservoir horizon time maps and depth maps presented at identical horizontal scales showing the position of the seismic and the geological profiles. For discoveries, the applicant should also provide reasonable detail and similar documentation to that for prospects.

6.6 Where appropriate, include consideration of potential commercial, infrastructure and outline economic analysis if *existing* discoveries and/or *potential re-developments* are being considered for further appraisal or development

6.7 For a group of Blocks where there is multiple prospectivity, please provide a summary Map showing the prospectivity at all levels.

6.8 A summary Table should also be provided:

Prospect Lead Discovery Name ¹	P L D ²	Reservoir		Unrisked recoverable resources (untruncated) ⁴								Geologica l Chance of Success ⁵
		Stratigraphic level ³	Reservoir Depth (m MSL)	Oil MMbbls ⁴				Gas BCF ⁴				
				Low (P90)	Central (P50)	Mean	High (P10)	Low (P90)	Central (P50)	Mean	High (P10)	
15/27 Venus	P	Palaeocene	2640	8	12		16	90	130		160	0.45
15/27 Pluto	P	Piper	3500	11	17		25					0.39
15/27 Mars	L	Cretaceous	3100	3	14		27					0.15
15/27 Earth	D	Palaeocene	2500	4	7		11					100

¹ The name is informal. Ensure the name is used consistently throughout the entire application document.

² D = Discovery; P = Prospect; L = Lead

³ Formal nomenclatures should be used where they exist.

⁴ Calculation methods should be explained in the technical assessment. Low and high value should equate to P90 and P10. Volumes and probability need not be stated for leads.

⁵ Estimation of the likelihood of making a discovery should be explained in the geological assessment. This should be the chance of finding a minimum flowable volume of oil or gas. The assumption offshore is that this P99 recoverable volume should approximate 1 MMboe.

SUBMITTING INFORMATION IN THE LARRY “OPPORTUNITY DETAILS” SCREENS

7) The template for submitting Prospect details has been modified for the 30th and subsequent Rounds to include more information, in particular around resources and risking.

8) Information submitted via licence rounds is used to populate the OGA’s prospect inventory, maintained by the British Geological Survey. This is a key National repository of the UK’s prospective resources, their geological distribution, type and location. The inventory drives yet-to-find estimation, and provides a focus for OGA activity including licence rounds. An accurate inventory also allows the tracking of work programme delivery; volumes, success rates and value, and thereby allows the OGA to facilitate continuous learning and improvement.

9) The importance of robust risk and resource estimates is now reflected in the Marks Scheme (Annexe 2).

10) In order to improve the data held in the inventory, a number of modifications have been made:

- Full guidance is provided within the screens by hovering over the blue “i” buttons. *It is important to read this guidance carefully.*
- Definitions have been provided as part of this guidance, and are repeated in Annexe 1 for ease of reference.
- ESRI® Shapefile uploads have been requested to avoid unnecessary digitising, with a centre of interest to locate the prospect in the OGA database.
- Hydrocarbon fluid cases are clearly distinguished, and provision is made for multiple cases including those with gas-caps and oil rims (mixed oil and gas).
- Volumetric input and output parameters are distinguished, and the probabilities associated with each estimate made clear. Note that it is not mandatory to complete all the volumetric parameters; the options are there to cater for a variety of assessment methodologies. Please read the guidance carefully on this section.
- The OGA recognises that all volumetric permutations cannot be catered for, and a balance has been struck. Please make the submission as representative as possible and use the comments to describe the approach taken.
- As general guidance, complex multi-component (multi-segment) prospects should be “rolled up” before entering the data. One exception is where multiple Plays are involved, and these should be entered as separate prospects so that they can be assigned to the appropriate play in our databases.
- Although not mandatory, please specify P99 and P1 volumetric output estimates wherever possible, in line with good practice.
- Geological chance of success (COS) factors have been explicitly requested, distinguishing dependent Play risk, and using a widely-adopted scheme of COS elements. Note that if the play is proven, then Play COS is 100%.
- Supplementary information is requested for Firm E&A wells (i.e. start phase is Phase C), FDPs and field re-developments (i.e. straight to Second Term), with reference to the Appendix B.

SEAWARD INNOVATE LICENCE

The OGA introduced a new variant of the Seaward Production Licence, known as “Innovate”, which replaced all previous Seaward Production Licence sub-types (previously Traditional, Frontier, and Promote) in the 29th Round. Those licence sub-types will no longer be available, but the flexible Seaward Innovate Licence structure allows for licences with similar clauses to be applied for.

The advantages of this single type of Licence are that it applies to any offshore area, and is flexible, the Licence and Phase duration being proposed by the Applicant, with a Stage-Gate process that can be designed to accommodate the optimal Work Programme.

11) The Seaward Innovate Licence comprises three terms or periods (an Initial Term for carrying out the Exploration Work Programme, a Second Term for appraisal leading to approval of a Field Development Plan, and a Third Term, for development and production). What is new in the Innovate concept is that the Initial Term is divided into one or

more Phases, each with its own part of the Work Programme, and the durations of these Phases and of the Initial and Second Terms are flexible.

As a consequence of this flexibility available at the time of Application, where Applicants devise the lengths of each Term in accordance with their proposed programme of work within the framework of the Innovate Licence identified in paragraphs 12 to 16 below, the OGA would not envisage having to vary (extend) the durations of individual Phases or Terms, although requests will continue to be considered on a case by case basis.

NOTE: that the OGA will charge for processing requests for Extensions (applicable from 6th April 2017).

12) For the areas included in the 32nd Round, the OGA expects that applicants will request Initial Term durations of no longer than 6 years as the areas are considered to be relatively mature.

13) The standard duration for the Second Term will usually be 4 years, although up to a maximum of 6 years for example where technical challenges apply (e.g. HPHT or Heavy Oil). Applicants should specify the length of the Second Term requested, in the Application Form and in Appendix B.

14) For the Third Term, 18 years is the standard duration but the extent can normally be varied if the Field is still in Production.

15) The Initial Term may comprise three Phases:

- Phase A: For carrying out Geotechnical Studies and Geophysical Data Purchase and Reprocessing;
- Phase B: For Shooting New Seismic and acquiring other Geophysical Data (i.e. proprietary data);
- Phase C: For Drilling Exploration and/or Appraisal wells.

There will be a maximum of four years available for any single Phase within the overall duration of the Initial Term. Applicants should note that all Work Programmes must be realistic and achievable, with the target of drilling one or more exploration wells within Phase C, although shorter Work Programmes are preferred and will be preferentially rewarded by the Marks Scheme.

Applicants may propose the Phase combination, whether all three Phases, straight to Phase B followed by Phase C, straight to Phase C, or Phase A direct to Phase C.

Phase A and Phase B are not mandatory and may not be appropriate in particular circumstances, but every application must propose a Phase C for drilling a well, except where the applicant doesn't think any exploration is needed and proposes to go straight to development (i.e. 'straight to Second Term'; see paragraph 23 below).

For example, an Applicant may wish to Reprocess seismic in Phase A with a duration of 2 years, followed by a Phase B with a proposed duration of 3 years for Contingent seismic in case the results of the Phase A reprocessing are not clear, then Phase C would be a Drill or Drop commitment, with the well drilled in the last year of the Initial Term.

A firm commitment to drill a well (a "Firm well") can only be considered where the drilling decision does not require any further work, analysis etc, and so is unlikely to be considered where there is either a Phase A or a Phase B proposed. The Work Programme would commence with Phase C, with a maximum duration of 4 years, but where the first year or two would be solely for well planning, ordering long lead items and site surveying.

16) Please see paragraphs 35-38 for information on operatorship requirements. The durations and proposed work for each Phase should be completed on the Application Form in LARRY, with any explanation supplied in the Appendix B.

17) The requested duration of the Second Term should be indicated (normally 4 years for Developments or Re-Developments in mature areas but with a maximum duration of 6 years). The duration of the Second Term must be specified in the Application Form in LARRY, with additional explanation in the Appendix B.

18) There is no restriction on the number of Blocks that can be applied for, but there are limits to the amount of acreage that OGA will award in a single licence. In Seaward areas, the limit is ten contiguous blocks per licence, but with no aggregate limit across several licences.

19) If the Licensee no longer proposes to drill a well due to the findings made before Phase C, then the Licence should be relinquished or it will determine at the end of Phase B (or at the end of Phase A if no new shoot seismic is proposed, and the licensee elects not to enter Phase B).

20) Where a Work Programme contains more than one Phase, the Licence will provide that it will not progress from the earlier Phase to the later unless the earlier Phase's Work Programme has been completed and the Licensee has committed to carry out the later Phase's Work Programme, and having demonstrated the technical and financial capacity to do so (or unless the OGA exceptionally directs that it should continue).

21) There is no mandatory surrender of any of the licensed area when transitioning into a subsequent Phase. However, OGA will seek to discuss the licensee's progress at that time and will request the surrender of acreage other than that actively being worked.

22) Applicants must decide **at the LARRY Application stage** whether they require Phases A or B; or whether the Application is to drill a Firm well, in which case the Application should be submitted as a Phase C start phase.

23) An Applicant that proposes to move straight to (re)development (e.g. for development of an existing discovery or re-development of an existing field where production has ceased – “straight to Second Term”) should also apply as Phase C start phase, but make it clear in the application that a Second Term start for the licence is being requested. If OGA agrees, then neither an Initial Term nor a formal Exploration and Appraisal Work Programme will be needed. Nevertheless, the applicant should propose a Work Programme to firm up its plans or analysis in case the OGA does not agree that it is realistic to move straight to (re)development.

THE ELEMENTS OF A WORK PROGRAMME

For each Block the Applicant must propose a Work Programme, which is the minimum amount of exploration and/or appraisal work that the Applicant will carry out if it should be awarded a licence.

The Work Programme must be appropriate to the acreage applied for. Its overall duration, the length of individual Phases (see above) and relevance to the Prospectivity identified should be indicated.

The agreed Work Programme will form an important part of the Licence itself; the Licence will expire at the end of the Initial Term (or earlier where there are timed commitments) if the Work Programme has not been completed by then unless the Term has been extended (see paragraphs 11 & 12 which explain timed commitments for Phase A/B applicants).

The **Work Programme** is part of any Production Licence awarded, and it consists of one or more elements of exploration/appraisal work. Its principal function is to define the minimum amount of work that the Licensee must carry out if the licence is not to expire at the end of its Initial Term. In addition, the Licensee may make commitments to the OGA to carry out some or all of these elements. Work Programmes should be specified *by Block*, but where the Applicant hopes to be awarded two or more Blocks to form a single Licence, a *joint* Work Programme should be indicated *as well*.

24) The Applicant proposes a Work Programme as part of its application. It may be discussed and clarified at interview. The duration of the Individual Phases (see Seaward Innovate Licence) should be clearly stated within Appendix B, and highlighted in the Comments box of the Work Programme part of the Application Form. Work Programmes normally comprise well commitments, seismic acquisition (existing or new shoot) and ‘other’ work (Electro-magnetic, gravity and magnetic, geoscientific studies, etc.).

25) Previously the elements of a Work Programme were associated with particular levels of well commitment: a firm commitment, a contingent commitment or a drill-or-drop commitment. This still exists to some extent under the Innovate concept, but the degree of commitment is reflected to a much greater degree by the pattern of Phases that the Work Programme has been divided into.

26) The work in the first Phase of the Initial Term will always be associated with a Firm Work Commitment of some variety, whether it is studies, reprocessing, geophysical data acquisition, a well, etc.; that will be part of the justification for awarding a licence.

27) OGA views Firm Commitments (including, but not limited to, drilling, seismic/geophysical and geotechnical work) as a core part of the licensing regime. The OGA reserves the right to characterise any failure to meet a Firm Commitment as poor performance, which we may take into account in future decisions; for example, in the marks awarded for commitments offered in future licensing rounds or even a refusal to consider any further applications at all, where justified.

28) A Work Programme for the Seaward Innovate Licence must contain at least one drilling commitment (with horizon and approximate depth) within the Initial Term, whether it be Firm, Contingent or Drill-or-Drop. (Applications covering *existing* Discoveries, or where plans are to re-develop Fields where Production has ceased, should indicate an appropriate Pre-Development Programme which would be discussed at interview.)

29) Seismic data: Where applicable, the amount of seismic data (whether 2D (in full fold line kilometres) or 3D seismic (area of full fold migration, in square kilometres)) to be acquired over the Block should be stated, distinguishing between *shooting* (i.e. Phase B) of new data and *obtaining* existing data (whether by purchase or other means). A description of any further acquisition of data outside the area should be supplied, noting how it relates to the acreage applied for. Indicate whether the new data will be proprietary, speculative (and the degree to which underwritten), purchased or traded. Include an outline of any reprocessing programme. Indicate the timing of the proposed activity after award of licence. Make clear where any seismic that has been used for the interpretation has not yet been purchased, and, if reprocessing is to be carried out, whether access rights to readable, verified or re-mastered field tapes have been secured.

- Contingent new shoot seismic bids will be accepted for Seaward Innovate Licences where Phase A involves Reprocessing of existing seismic and it is not clear whether that work will provide sufficient uplift to identify prospectivity. Marks will be limited to a maximum of 5 so that any such commitment will not be a deciding factor for Award.

30) Other Work: A description of any other work planned – surveys, research, technological development or studies relevant to the evaluation of the block (e.g. geotechnical studies, gravity or magnetic surveys, electromagnetic seabed logging, environmental studies, etc), appraisal/development potential of *existing* discoveries or re-developments of decommissioned fields. This should include the Applicant's plans and approach to secure the resources needed to complete the Initial Term Work Programme, if they have not already been secured.

31) There is a more detailed description of the UK's licensing framework, and the different types of Licence on our website: (<https://www.ogauthority.co.uk/licensing-consents/>).

INTERVIEWS

The decision process usually involves an interview covering the geotechnical work already carried out, and the proposed Work Programme.

32) The Exploration personnel at OGA will normally interview all applicants (certainly where there is competition for the same acreage) before awarding licences. Interviews will take place in London or Aberdeen. We aim to hold the first interview within a short time frame following receipt of Applications (*applicants should be prepared for this*), but we can't predict when the last one will occur – that depends on the total number of applications received.

33) The main purpose of the interview is to enable the Applicant to present the technical rationale for the application, assess the applicant's technical capability and competence, and for OGA to ask questions and seek clarifications. It is expected that personnel attending interview are able to answer technical questions on the application i.e. persons involved in the preparation of Appendix B should be at the interview. The interview is likely to focus on:

- the Applicant's geotechnical data coverage (including an evaluation of all datasets that are publicly and commercially available) and work completed to date;
- identified prospectivity at play, lead and prospect level, and how this would be explored and appraised;
- the potential for appraisal or development (exploitation) of *existing* discoveries and/or re-development of decommissioned fields that the Applicant has identified (this should include an evaluation of opportunities for cluster developments);
- the project plan associated with the work programme, detail around its timing and its timely delivery within the appropriate phase of the Initial Term;
- how these opportunities relate to the Work Programme offered, and how the Work Programme supports the Central Obligation and Supporting Obligations as defined in the MER UK Strategy (<https://www.ogauthority.co.uk/regulatory-framework/mer-uk-strategy/>).

34) OGA may request additional meetings after the interview if further clarification or understanding is felt necessary. The interview will *not* address safety, financial or environmental aspects.

All the applications for any particular Block will be evaluated by the same lead technical assessor for consistency of approach.

OPERATOR COMPETENCE

35) The Offshore Petroleum Licensing (Offshore Safety Directive) Regulations 2015 introduced new types of operator. Further details on OSD operator appointment are available in Appendix C – Safety and Environmental Issues Licensing and Operatorship Guidance <http://www.hse.gov.uk/osdr/assets/docs/appendix-c.pdf> . The OSD requires operations to be carried out by such an operator, but the appointment is not a requirement for the award of a licence. **The OGA strongly recommend that successful applicants apply for well operatorship or appoint a well operator for approval as soon as practically possible on award of a licence in the Initial Term with a Firm drilling work programme.**

36) The older concept of operator, as defined in the Model Clauses, still exists and is now referred to as Licence Operator (or Exploration Operator or Production Operator in particular circumstances) to distinguish it. An applicant need not submit any evidence of competence to act as Licence Operator if applying for a licence with a Work Programme with a Phase A and/or a Phase B at the application stage, but Licence Operator competence must be proven before a licensee can progress to Phase C. However, if applying for a licence with a Phase C-only Work Programme, or one that goes straight to the Second Term, the applicant must upload the necessary documentation at the Appendix B screens in LARRY.

37) The Oil and Gas Authority accepts that some elements of the Applicant's competence may not be in place at the application stage. For example, some posts may not be filled at the moment of application, which may occur months or even years ahead of any need for them. Nevertheless, the Applicant will have to convince the OGA that it knows what structure and skills are needed and that it has a management team capable of delivering it. Also, further regulatory consents that are required for work such as drilling will not be provided until all elements of the Applicant's competence are proven. Please see the General Guidance for other requirements placed on Applicants.

38) The Technical Competence aspects (organisation charts and Curriculum Vitae (Resumes) of key personnel) should be uploaded as a separate file into the Appendix B area of LARRY where necessary (Phase C Applications). The OGA will hold such personal data in accordance with its Privacy statement - <https://www.ogauthority.co.uk/site-tools/privacy-statement/>

39) For further guidance contact:

Licensing_Round@ogauthority.co.uk for seaward licence applications.

ANNEXE 1: DEFINITIONS

- 1) A **prospect** is a robust structural, stratigraphic or combination trap that has been mapped with a high degree of confidence using good quality seismic and other key data.
- 2) A **lead** is a possible structural, stratigraphic or combination trap that requires additional seismic analysis/acquisition or other key data in order to progress to a prospect.
- 3) A **new play concept** is an unproven concept in the area (e.g. deeper potential, additional reservoirs, new source-reservoir-seal combination, etc).
- 4) To **shoot** seismic data (in the context of a Work Programme commitment) means to carry out a new seismic survey. It must be stated whether this will be by commissioning a proprietary survey, or underwriting speculative acquisition. The *total* area of the survey the Applicant proposes to participate in should be specified, but with the amount over the potential Licence highlighted for the Work Programme.
- 5) To **obtain** seismic data (in the context of a Work Programme commitment) means purchasing or otherwise getting the use of existing data. It is for the licensee to decide how.
- 6) The **Hydrocarbon System** includes the following evaluation:

Stratigraphic Interpretation:

Including palaeo-geographies, plate reconstructions, depositional environment, facies description & distribution, use of core data, use of log data, reservoir characterisation (N:G, porosity/permeability), biostratigraphy, provenance, analogues (outcrop and producing field)

Structural Interpretation:

Validated geometric models, dynamic structural evolution and geomechanical models. This may include QA/QC of the interpretation using statistics, rules and analogues, 2D or 3D restoration, finite element or other modelling of discrete fracture networks

Charge & Migration History:

Source rock quality and richness, Source rock thickness and distribution, thermal regime/maturation history (calibrated using Vitrinite Reflectance, Fission Track and other techniques), thermal regime, migration pathways and history

Seal & Preservation:

Top Seal quality-thickness & distribution, Lateral Seal evaluation (including fault juxtaposition and fault seal, including shale gouge, clay smear and other mechanisms), Seal breach, Biodegradation, Over-Pressure and Effective Stress regime and history.

- 7) **Hydrocarbon Risk Evaluation** (Geological Chance of Success) included the following evaluation:

Source Rock Presence and Maturity:

The chance of finding mature source rock in the drainage area of the prospect of sufficient richness and volume to expel hydrocarbons associated with the P99 case

Source Effectiveness (migration and timing):

The chance that viable migration pathways and distances exist, including consideration of migration losses, together with suitable timing of closure formation in relation to migration

Reservoir Presence:

The chance of finding pore volume above the P99 volume case, including consideration of parameters such as thickness, facies and extent

Reservoir Effectiveness:

The ability of the predicted reservoir to flow hydrocarbons to surface at a minimal rate

Trap Presence (geometry):

Confidence that the minimum trapping geometry exists, including consideration of factors such as seismic picking and depth-conversion

Trap Effectiveness (seal, preservation):

The ability of the local sealing elements to retain a minimum volume including factors such as continuity, integrity including pore-pressure/fracture-gradient, stratigraphic-trap surfaces e.g. coastal vs. marine onlap, top/bottom/side and fault seal. The ability of the trap to subsequently preserve hydrocarbons from factors such as bacterial/thermal alteration, restructuration, breaching, tilt & spill, flushing and depletion.

ANNEXE 2: THE MARKS SCHEME

1) The Marks Scheme is designed to reward applicants for the use of relevant, high-quality, available technical data (wells, seismic, etc), the quality of the work already done, the technical understanding demonstrated in the generation of valid prospectivity (over the whole block area and throughout the full stratigraphic column), and the proposed Work Programme.

THE SEAWARD MARKS SCHEME

2) The Seaward Marks Scheme will be used to mark applications largely on a block-by-block basis. The Marks Scheme consists of multiple sections (a marks scheme summary is presented at the end):

- **Geotechnical database** Marks will be available for the coverage (including newly-gathered data) and use of relevant, high quality, existing geotechnical data appropriate to the prospectivity of that area. OGA will consider the quality of the data utilised compared with what we know to be available in the area, and applicants must demonstrate that they have evaluated all publicly and commercially available datasets that are relevant to the application, with a justification of the choice of dataset. Data from outside the Block (to provide regional context) will be rewarded where it has been utilised to demonstrate improved understanding of prospectivity (or lack of potential) on the Block itself. Applicants should refer to the Guide on Asset Stewardship Expectation SE03, covering Optimal Use of Subsurface data, which can be found in the OGA website.

- **Geotechnical evaluation (both Regional & Block specific)** Marks will be available for the quality and understanding demonstrated in the generation and definition of realistic prospectivity and new play potential on the Block or area as a whole. This work should assess the potential both by area and stratigraphically. Play Fairway Maps and Common Risk Segment maps should demonstrate that all aspects of a Petroleum System have a reasonable chance of being present. Where appropriate, the Applicant's description of various risk elements associated with risk and volumetric assessment will be evaluated by the OGA.

Applicants should not expect to be rewarded for speculative, overly optimistic or unsupported analysis, and where appropriate they should explain the rationale for a lack of prospectivity at particular levels within the acreage applied for.

- **Specific Technical Assessments (including existing and undeveloped discoveries).** Marks will be available for what the Oil and Gas Authority understand and consider as valid *leads* and *prospects* on the Block(s) that will be progressed either through a technical Work Programme or which are ready to drill, or *discoveries* that can be progressed through further appraisal or through field development planning. OGA will categorise and mark leads and prospects within three ranges (leads, prospects, or fully evaluated prospects) depending on consideration of validity/derisking and the degree to which further work is necessary before they are fully evaluated and ready to drill. Marks within the ranges will also consider the quality of interpretation and understanding demonstrated in the lead or prospect generation or definition of the discovery.

- **Speculative Leads.** Few, if any, marks will be awarded to leads that are based on speculative geotechnical arguments, are so small as to have limited commercial potential, or where OGA takes the view that prospectivity has been effectively disproved.

- **Leads and Prospects.** Applicants should include volumetric estimates of leads and prospects with associated risk analysis where possible. A series of leads or prospects identified at a similar reservoir level on a block may be marked as one where information from a single well would effectively condemn the other leads. Where leads or prospects straddle block boundaries, OGA may split marks (for both prospectivity identified and associated work programmes) between blocks in a manner that best reflects where the bulk of the lead or prospect exists, and/or in a manner that helps preserve the integrity of the lead or prospect if competed. The OGA may split blocks depending on the geotechnical work focus of competing applications.

- **Undeveloped Discoveries or Re-Developments.** Marks will be available for work that demonstrates the quality and understanding of the appraisal/development potential of *existing* (undeveloped) discoveries or re-developments of decommissioned fields, including an assessment of extent and reserve potential, an economic evaluation, understanding of commercial aspects and what infrastructure would be necessary for optimal timely development or further appraisal. Evidence for appropriate infrastructure availability, ullage and access should be demonstrated if possible. A brief description of possible Improved Oil Recovery/Enhanced Oil Recovery IOR/EOR may be included if applicable. Forward plans with associated timelines should be presented. Conceptual development options for *exploration* prospects other than firm well commitments are

not required and will not be marked, although potential offtake routes and dependencies with existing infrastructure should be detailed.

- **Non-Original Work.** Relatively few marks will be given in situations where the technical analysis (block or specific leads/prospects) draws heavily on non-original work e.g. derived from OGA's Promote publications, Relinquishment Reports, or material derived from data rooms or from other company websites. **New Play Concepts** (where specific leads and prospects cannot yet be identified) will be assessed against the information used, the quality of interpretation in their evolution, and on OGA understanding of their potential validity.
- **Geotechnical Work Programme.** The Work Programme for an Innovate Licence is assessed on the basis of the start Phase. The aim is to reward new activity (particularly drilling and new shoot seismic), at a higher level than e.g. Reprocessing or desk studies. Geotechnical Work Programme marks will only be available for the Work Programme associated with the *first Phase* of the Initial Term, since this is the only Firm element of the work programme. Under the Phase Timing Mark, an application may then attract an additional 5 or 10 Marks depending on the Applicants' proposed duration of that Phase.

NOTE: Applicants should propose the timing and phasing that is most appropriate for their proposed Work Programme. The suggested timing should be realistic and attainable, to be clarified at interview as necessary, and subsequently the OGA will offer and create a suitable licence. The OGA is not defining specific lengths for Phases, apart from a maximum of 4 years per Phase as appropriate within the overall maximum for the Initial Term (of 9 years in total for underexplored areas, or up to 6 years total for better explored areas such as those included in the 32nd Round).

- The Phase A Geotechnical Work Programme can include commitments for obtaining existing seismic data, reprocessing of seismic data and other geotechnical studies e.g. biostratigraphy, geochemistry, petrophysics, fault seal analysis, etc. Work should be linked to identified plays and prospectivity.
- Phase B includes commitments for the shooting of new seismic data and/or other geophysical data types. Higher marks will be given to new shoot seismic surveys and other data acquisition methods, which are considered appropriate to derisking and delineating the area and prospectivity applied for, and which use the most advanced techniques.
- Note that where an Application is for development of an undeveloped discovery or for re-Development of a Field, marks are also applied in the first four categories of the marks scheme (Geotechnical database used and Geotechnical evaluation already performed, Hydrocarbon System analysis and Risk & Resource Evaluation), but will not be added for specific prospectivity unless there are additional, undrilled prospects in the Block(s) applied for.

Seaward marks scheme summary*¹

Geotechnical database used

3D Seismic †:	40 (max)
2D Seismic †:	30 (max)
Seismic Reprocessing:	20 (max)
Well data:	5 (max)
Other:	20 (max)

Geotechnical evaluation already performed over block (*Both Regional & Block-Specific*)

Well Interpretation/ties (eg: synthetics):	5 (max)
Stratigraphy & Sedimentology:	5 (max)
Structural Interpretation:	5 (max)
Depth Interpretation:	5 (max)
Rationale, Plans and Schedule:	5 (max)
Other:	10 (max)

Hydrocarbon System Analysis

Stratigraphic Interpretation & Reservoir Quality:	5 (max)
Structural Interpretation & Validation (Trap Geometry):	5 (max)
Charge & Migration History:	5 (max)
Seal & Preservation:	5 (max)

Risk and Resource Evaluation‡

Risk Assessment:	20 (max)
Volumetrics/Resource Assessment:	20 (max)

Specific Technical Assessments

Undeveloped discoveries and redevelopments:	max 30 each
Fully evaluated prospects (i.e. drill-ready):	21-30 each
Prospects not fully evaluated:	11-20 each
Leads:	up to 10 each
Original Play and Common Risk Segment Analyses:	up to 20 each
New play concepts:	5 each

Geotechnical Work Programme

3D seismic (Purchase) †:	20 (max)
3D seismic (Shoot) †: Includes Broadband, OBC/OBN, Dual/Multi/Wide/Full-Azimuth, etc ...	60 (max)
2D seismic (Purchase) †:	15 (max)
2D seismic (Shoot) †: Includes Broadband, OBC/OBN, Dual/Multi/Wide/Full-Azimuth, etc ...	40 (max)
Seismic reprocessing: Includes novel processing, e.g. Bi-Azimuth, etc	10 (max)
Geotechnical studies*: Includes Grav/Mag, EM	25 (max)

Technology

Technology Plan §	10 (max)
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Above-Ground Evaluation^β

Economics & Cost:	10 (max)
Commercial:	10 (max)
Infrastructure:	10 (max)

Phase Timing Mark (Rewards Faster Work Programmes)

Phase A is Start Phase (i.e. Seismic/Drop or Drill/Drop)	(Duration)
Firm Studies, Seismic Purchase & Reprocessing:	Long 0
.....	Mid 5
.....	Short 10

Phase B is Start Phase (Firm New-Shoot Seismic and Contingent Well)	(Duration)
Firm New-shoot Seismic	Long 20
with Contingent Well based on new seismic (well to be drilled in Phase C):	Mid 30

..... Short 40
Contingent Seismic..... 5 (max)

Phase C is Start Phase (Firm Well)

(Duration)
Firm Well..... Long 60
Includes consideration of depth, technical difficulty and number of wells/sidetracks:..... Mid 80
..... Short 100

Second Term is Start Term

(Duration)
Time to FDP submission and first production, demonstration of secure allocated funding.
Includes consideration of technical difficulty/complexity, dependencies that may impact delivery, organisational capability and demonstrable track-record of work-programme and project delivery.
..... 100 (max)

*1 Where the term (max) is used, Marks will be awarded from zero up to that maximum figure.

† Use of the best available/most-modern/optimum seismic datasets will attract more marks. (This will consider both processing and acquisition parameters; e.g. an Ocean Bottom Node survey will be clearly better at derisking subsalt prospectivity compared to a conventional towed streamer survey). For further information, refer to Asset Stewardship Expectation SE03 on the OGA website. Applicants should demonstrate that they have assessed all publicly and commercially available seismic datasets, and justify their choice/the value of this information in relation to how this data addresses the critical risks and reduces subsurface uncertainty. More advanced seismic technologies committed in the Phase B programme will also attract more marks.

‡ The OGA will consider the methods and processes used by applicants to make Risk and Resource evaluations. It is expected that applicants can demonstrate use of a documented methodology (it is expected that this is broadly compliant with the methods outlined by Rose, 2001^{*2}) and an appropriate assurance process. Applicants should be able to clearly articulate what is being risked, the component risks that make up the overall prospect risk, dependencies at play and prospect level, how uncertainties and ranges have been quantified and reality checks, including play statistics and use of appropriate analogues. Prospects and discoveries that rely upon amplitudes/AVO for risking or definition should also demonstrate how risk modifiers have been applied and associated rock physics workflows.

^{*2}Peter R. Rose (2001) *Risk Analysis & Management of Petroleum Exploration Ventures*. ISBN (electronic): 978-1-62981-065-2.

* It would be expected that if a Licence were to be offered, Licensees would undertake and support Higher Education Institution Research (e.g. PhDs / Postdocs) and Collaborative Regional Studies as part of the Geotechnical Studies programme in accordance with the principles of MER UK. Where Research and Studies are relevant to licence activities or furthering the understanding of petroleum plays relating to the licence area marks may be awarded for these.

- HEI Research may be via one of the NERC Centres for Doctoral Training, such as the CDT in Oil and Gas (<http://www.nerc-cdt-oil-and-gas.ac.uk/>) or other individual, recognised, higher education institutions or bodies.
- Collaborative Regional Studies may include participation in and contribution to projects proposed and governed by the MERUK Exploration Board and the "21st Century Roadmap" Technical Steering Committee.
- Applicants can also propose other appropriate study mechanisms.
 - Please indicate the type of Research and/or Project(s) you would expect to support, with appropriate funding and timing, in a separate paragraph within the Appendix B and briefly in the Comments section of the Work Programme Summary Sheet.
 - Equivalent Marks for Studies may also be available where the start Phase is Phase C, provided it is clear these studies will not be associated with the Firm well.

§ Applicants should make clear how all activities, studies and research it proposes (Including Technology Plans) are relevant to:

- i. the way in which the licence activities will be carried out, and/or
- ii. to the applicant's technical capability.

If the OGA feels that such proposals are not relevant to the above, then they will not be awarded marks.

The requirements for a Technology Plan are outlined in Asset Stewardship Expectation SE-08, which is available on the OGA website.

β An 'Above-Ground Evaluation' should be provided for all applications where the Initial Term start phase is Phase C, or the Licence start term is the Second Term. Marks will be awarded per block on which the Phase C or Second Term target resides. Applicants should demonstrate that they have carried out an appropriate and proportionate economic, commercial and infrastructure assessment, and that they have considered the most viable work programme, phasing and plan, compliant with the objectives of the MER UK Strategy. If not provided within the licence application, the OGA may subsequently request cashflow model input assumptions (associated production profiles and cost schedules, to include all necessary inputs required for cashflow analysis [note: economic assumptions such as discount rate and product price are not required]), and in all cases

applicants should provide the full costs associated with their committed work programme. The applicant should not assume that the OGA has fully verified, or in any way approved their economic/commercial models.

LARRY Risk and Resource “Opportunity Template” Guidance

Guidance is available in the portal by “hovering” over the blue information buttons and is repeated here as a consolidated reference.

Note that the Marking Scheme now awards points for Risk and Resource Evaluation.

Opportunity Type

A *new play or trap concept* is defined on the basis of a speculative petroleum system and/or trapping geometry.

A *Lead* is a trapping feature that is associated with a volumetric and risk assessment but requires additional seismic analysis/acquisition or other key data in order to progress to a prospect.

A *Prospect* is a robust trap that has been mapped with a high degree of confidence using good quality seismic and other key data.

A *Drill-ready Prospect* requires no further evaluation, and has an associated well location and plan.

A *Discovery* is a feature that has been penetrated by a well, and contains evidence of a hydrocarbon-bearing reservoir.

Description of opportunity

Provide a short overview description of the Opportunity. Include comments on the trap type, reservoir target and facies, analogue fields etc.

Key technical work required for maturation

The technical work required should be linked directly to the bid work programme, and also to improving the geological chance-of-success elements etc.

Block number(s) starting with the key block first

List the blocks over which the Opportunity extends, with the key block listed first on which any well is most likely to be drilled.

Opportunity outline shape file for the maximum case

This will be used to locate the feature in OGA's databases. If not available then the map illustration below will be used.

Opportunity centre of interest

This single point of reference will be used for spatial database analysis and should represent the core of the opportunity.

UNCONVENTIONAL OPPORTUNITIES

For unconventional prospects, please fill in key attributes and potential resources in this comments field e.g. for CBM, the anticipated number of coals and their thickness, the coal rank, and anticipated gas content and permeability. For shale gas, the attributes of the prospective shale, e.g. estimated thickness (ft), total organic carbon, average vitrinite reflectance, permeability and gas yield. Please provide more complete information in the Appendix B.

CONVENTIONAL OPPORTUNITIES – VOLUMETRICS

Hydrocarbon case

Please provide the probability of the hydrocarbon case and populate the relevant Volumetric parameter sections below.

Volumetric input parameters

For Normal and Lognormal distributions please specify at least the P90, P50, P10. It is considered good practice to also specify P99 and P1. For Beta distributions (and Triangular distributions, which are not recommended for use) please specify at least the Minimum, Mode and Maximum. For rectangular please specify Minimum and Maximum, and for Constant please report the value in the Mean column. Please also specify Mean values where available, as these can be used as a quick QC of the outputs.

There is a strong preference for gross-rock-volume (GRV) and net-to-gross to be quoted, and an expectation that all other relevant rows will be populated. However, the table accommodates Area x Average Net Pay Thickness inputs, in which case GRV and net-to-gross is not required. Note that Average Net Pay includes the geometric shape factor.

Please also comment where parameters have not been used or cannot be specified. Please specify in the comments where truncations and/or dependencies have been applied.

Depth to hydrocarbon-water contact

Please comment if and how degree of fill, or column-height distributions have been incorporated

Gross reservoir thickness

Treat stacked reservoirs as separate prospects

Formation volume factor

Higher values should be assigned to the downside cases, decreasing towards the upside

Associated gas-oil ratio and condensate-gas ratio, life-of-field

Please quote life-of-field ratio

Oil equivalent recoverable resources

Default assumption 5,800 scf gas = 1 boe

Volumetric outputs

Please specify where possible the full range of probability values for each output parameter eg. P99, P90, Mode, P50, Mean, P10, P1

Additional volumetric comments

Please comment on any additional elements that may affect the volumetric calculation e.g. use of deterministic rather than probabilistic calculations, correlation of parameters, addition of segments or sands, combination of models or complex traps etc.

CONVENTIONAL OPPORTUNITIES - GEOLOGICAL CHANCE OF SUCCESS

Play

Suggested Play definition: a series of traps, some of which may already be tested, that share a common petroleum system of charge (source/timing/migration) and areal juxtaposition of regionally significant master seal and primary reservoir.

Note that if the play has been successfully proven by one well, then Play chance of success is 100%.

Note that where the play is not proven, Play chance estimation should always be accompanied by play fairway mapping and definition of the play boundary.

Please include comments on knowledge level (e.g. low, moderate, high) and how work programme results could impact the chance of success.

Source - The presence of mature source rocks within the play boundary, with a viable migration pathway to the reservoir.

Reservoir - The presence of reservoir rocks within the play boundary capable of sustaining a minimum flow rate to surface.

Regional Top Seal - The presence of a top seal lithology that is areally juxtaposed with the reservoir.

Total play chance of success - Chance that the hydrocarbon system works; chance of finding at least one discovery in the play or segment.

Prospect-specific

The prospect-specific geological chance of success is conditional on the play success, and is defined as the chance of encountering a minimal recoverable volume (P99 used here). Hence each risk element below should be considered in relation to that minimal volume (P99). For discoveries, the geological chance of success would normally be 100% unless the reservoir is tight.

Include comments on knowledge level (e.g. low, moderate, high) and how work programme results could impact the chance of success.

Source rock presence and maturity - The chance of finding mature source rock in the drainage area of the prospect of sufficient richness and volume to expel hydrocarbons associated with the P99 case. Note: the trapped hydrocarbon type e.g. gas vs oil is captured in the "hydrocarbon case" % quoted above.

Source effectiveness (migration and timing) - The chance that viable migration pathways and distances exist, including consideration of migration losses, together with suitable timing of closure formation in relation to migration.

Reservoir presence - The chance of finding pore volume above the P99 volume case, including consideration of parameters such as thickness, facies and extent.

Reservoir effectiveness - The ability of the predicted reservoir to flow hydrocarbons to surface at a minimal rate.

Trap presence (geometry) - Confidence that the minimum trapping geometry exists, including consideration of factors such as seismic picking and depth-conversion.

Trap effectiveness (seal, preservation) - The ability of the local sealing elements to retain a minimum volume including factors such as continuity, integrity including pore-pressure/fracture-gradient, stratigraphic-trap surfaces e.g. coastal vs. marine onlap, top/bottom/side and fault seal. The ability of the trap to subsequently preserve hydrocarbons from factors such as bacterial/thermal alteration, restructuration, breaching, tilt & spill, flushing and depletion.

Geophysical evidence

Please describe any geophysical evidence used in the volumetric and risk assessment and refer to any additional treatment contained in the Appendix B.

Well location modified Chance of Success

If the COS is being quoted in relation to a specific well location, please quote the modified figure here.

Supplementary information for Firm well commitments, Undeveloped discoveries and Field Re-developments

Where E&A drilling activity is being committed, please provide associated costs and high-level well plan commentary in this section.

Where E&A drilling or FDP activity is being committed, please ensure that conceptual exploration, appraisal and development plans are presented in the Appendix B, together with associated production profiles and cost schedules, to include all necessary inputs required for cashflow analysis (note: economic assumptions such as discount rate and product price are not required).

Please also comment in the Appendix B on why discoveries remain undeveloped including factors such as limited in-place volumes, poor recovery factors and underlying issues such as poor seismic imaging, structural complexity and compartmentalisation, poor reservoir permeability and connectivity, hydrocarbon characteristics, pressure/temperature conditions, drilling/completion and field development technology, offtake routes, commercial constraints, etc.

For Discoveries and Field redevelopments please also provide in the Appendix B information on oil and gas gravity, composition, viscosity, together with anticipated recovery mechanisms including aquifer support, secondary and enhanced recovery.

Additional Information or Comments

Please include commentary on additional factors e.g. HPHT, heavy oil/API, deep-water, inerts, H₂S, windfarm/shipping-lane/military issues, % on-block etc.

Illustration uploads

Location summary map - Map showing the outlines of Opportunities in the bid, how they relate to one another and to fields/discoveries in the area, together with block boundaries and other relevant features such as infrastructure, bathymetry etc. Clearly annotated.

Map of Opportunity - Typically a depth structure map at Top Reservoir with legible contour labels. Clearly annotated with: Maximum outline of the Opportunity, Location of seismic lines, Latitude/longitudes and UTM's suitable for georeferencing, Title box confirming the mapped property, Appropriate scale bars and annotation.

Representative Seismic Section - Typically a reflectivity display, with well ties where available. Title box confirming the seismic property. Appropriate scale bars and annotation including polarity convention.

Geological Cross-section - Based on the seismic section, or alternatively a conceptual illustration of the petroleum system, plays and traps.