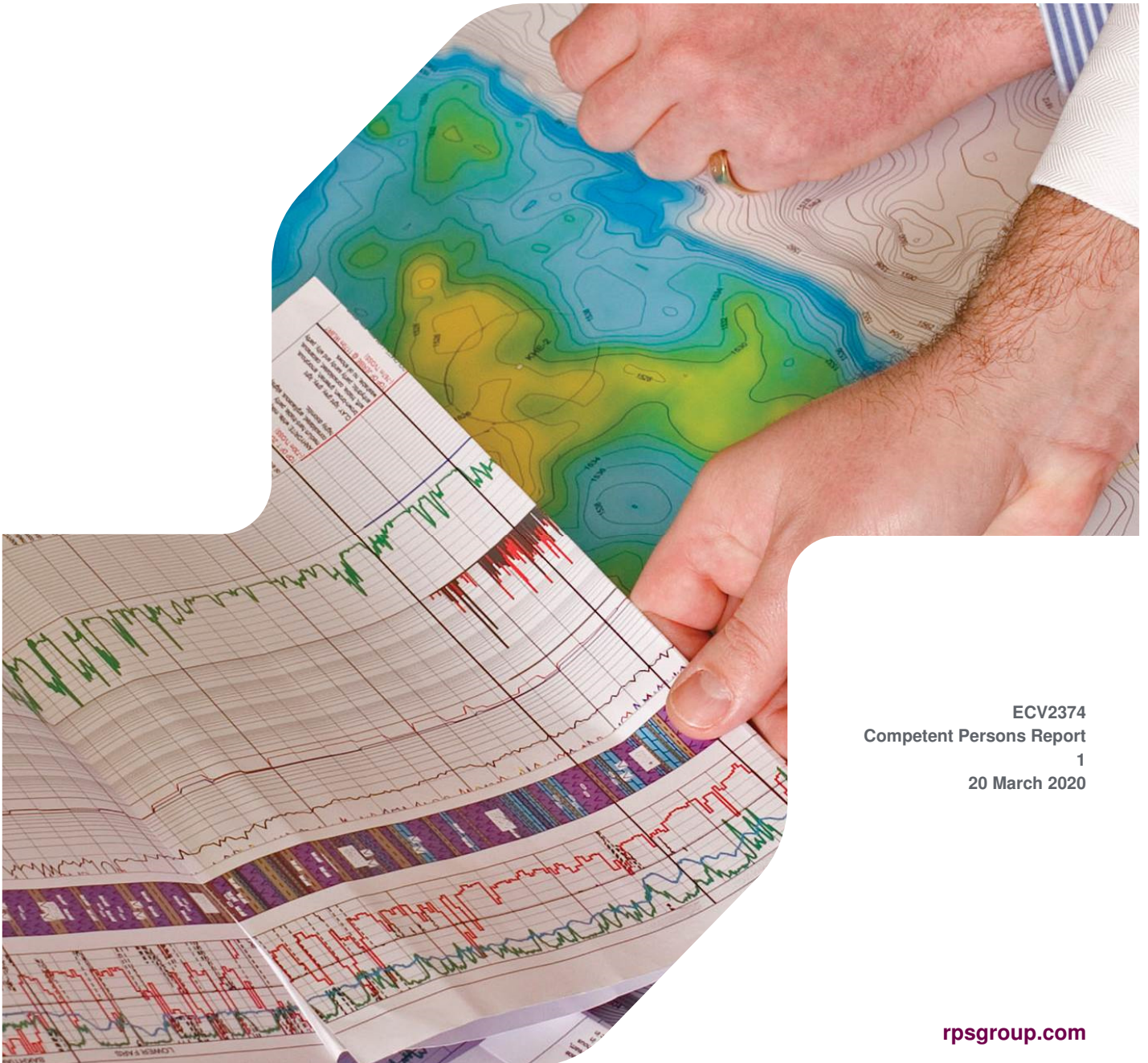


# COMPETENT PERSON'S REPORT

Recoverable Volumes for Shrek Discovery, Block 6507/5



ECV2374  
Competent Persons Report  
1  
20 March 2020

## COMPETENT PERSON'S REPORT

### Document status

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### Approval for issue

Gordon Taylor



20 March 2020

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## **EVALUATION OF ASSET RESERVES**

In response to a request by Lime Petroleum AS (“Lime”), and the Letter of Engagement dated 03 February 2020 with Lime (the “Agreement”), RPS Energy Consultants Ltd (“RPS”) has completed an independent evaluation of the Shrek Discovery, Block 6507/5, Norway.

A full report was issued by RPS under the appointment by Lime and is produced as part of the Services detailed therein and subject to the terms and conditions of the Agreement. This report is a summary of the full report.

As per Phase 1 of the Agreement, we have generated Low-Mid-High ranges of both Hydrocarbons-Initially-In-Place (HIIP) and recoverable hydrocarbon volumes based on the 2018 Petroleum Resource Management System of SPE/WPC/AAPG/SPEE/SEG/SPWLA/EAGE (“PRMS”) and Norwegian Petroleum Directorate’s resource classification system 2016 (2018). The report has also been prepared in accordance with the disclosure requirements in Practice Note 4C of the Catalyst Rules of the Singapore Stock Exchange.

The work was undertaken by a team of petroleum engineers and geoscientists and is based on data supplied by Lime. Our approach has been to audit PGNiG Upstream Norway AS (PGNiG) estimates of recoverable volumes, based on the 2019 SPE Reserves Auditing Standards. PGNiG will be the Operator of the field until March 2020 when AkerBP will assume Operatorship thereafter.

In estimating recoverable volumes, we have used standard petroleum engineering techniques. We have estimated the degree of uncertainty inherent in the measurements and interpretation of the data and have calculated a range of recoverable volumes, based on a notional predicted field performance.

We have taken the working interest that Lime has in the discovery as presented by Lime. We have not investigated, nor do we make any warranty as to Lime interest in the Assets.

No site visit was conducted as part of this study. No economic assessment was conducted as part of this study. Shrek is a discovered accumulation where project development activities are being considered but where there is no agreed development plan. Clearly, the volumes cannot be screened for commerciality at this stage. RPS recognises that an appropriate project may have potential for eventual commercial development, but further development planning is ongoing to clarify the potential for eventual commercial development. Assessment of the eventually agreed plan and estimate of Contingent Resources delivered by that project is Phase 2 of RPS work. In this initial report, to conform with SGX requirements, RPS has notionally classified recoverable volumes as Contingent Resources – Development Unclassified. The contingent resources for oil and gas are summarised in Table 1-3 in the Executive Summary.

## **QUALIFICATIONS**

RPS is an independent consultancy specialising in petroleum reservoir evaluation and economic analysis. The provision of professional services has been solely on a fee basis. Gordon Taylor, Director has supervised this evaluation. Mr Taylor is a Chartered Geologist and Chartered Engineer with over 40 years’

experience in upstream oil and gas. The project has been managed by Clare Wilson, who has 24 years' experience in upstream oil and gas. Other RPS employees involved in this work hold at least a degree in geology, geophysics, petroleum engineering or a related subject or have at least five years of relevant experience in the practice of geology, geophysics or petroleum engineering.

## BASIS OF OPINION

The evaluation presented in this report reflects our informed judgment, based on accepted standards of professional investigation, but is subject to generally recognized uncertainties associated with the interpretation of geological, geophysical and engineering data. The evaluation has been conducted within our understanding of petroleum legislation, taxation and other regulations that currently apply to these interests. However, RPS is not in a position to attest to the property title, financial interest relationships or encumbrances related to the property. Our estimates of Reserves are based on data provided by Lime. We have accepted, without independent verification, the accuracy and completeness of this data. RPS accepts no responsibility for any documents or information supplied to RPS by Lime or others.

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Yours sincerely,  
for RPS Energy Consultants Ltd



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# 1 EXECUTIVE SUMMARY

In response to a request by Lime Petroleum AS ("Lime"), and the Letter of Engagement dated 03 February 2020 with Lime (the "Agreement"), RPS Energy Consultants Ltd ("RPS") has completed an Independent Audit of the recoverable hydrocarbon volumes in the Shrek Discovery, Block 6507/5, Norway. A full report was issued by RPS under the appointment by Lime and is produced as part of the Services detailed therein and subject to the terms and conditions of the Agreement. This report is a summary of the full report.

We have audited the interpretation generated by PGNiG Upstream Norway AS ("PGNiG"). RPS has then evaluated low (P90), base (P50) and high (P10) recoverable hydrocarbon volumes based on statistical ranges of hydrocarbon-initially-in-place (HIIP) estimates.

All definitions and estimates shown in this report are based on the 2018 Petroleum Resource Management System of SPE/WPC/AAPG/SPEE/SEG/SPWLA/EAGE ("PRMS") and the Norwegian Petroleum Directorate's resource classification system 2016 (2018). The work was undertaken by a team of petroleum engineers and geoscientists and is based on data supplied by Lime. Our approach has been to audit PGNiG's estimates of recoverable resources, based on the 2019 SPE Reserves Auditing Standards.

No site visit was conducted as part of this study.

No economic assessment was conducted as part of this study.

## 1.1 Overview of Asset

The PL838 licence (125.3 km<sup>2</sup>) was awarded in February 2016 and straddles blocks 6507/5 and 6507/6 in the Norwegian Sea. The initial licence period was for seven years.

The Shrek discovery is located approximately 4 km southeast of the Skarv Field in water depths of approximately 350 metres. The discovery was made in 2019 and contains both oil and gas.

Shrek is a rotated, Jurassic, fault block in the lower part of the Ravfallet Fault Complex. It is located in the lower part of the hinge zone, just updip, and on the spill route, from the Skarv and Idun fields.

## 1.2 Subsurface and Resource Evaluation

RPS audited the latest seismic interpretation generated by PGNiG and provided by Lime, and found it to be acceptable. An independent petrophysical interpretation was made on the 6507/5-9S and 6507/5-9A wells. RPS used the geological and geophysical data in the static model to estimate statistical ranges of low, mid and high case stock-tank-oil-initially-in-place (STOIIP) (Table 1-1), gas-initially-in-place (GIIP) (Table 1-2).

| STOIIP    |            |            |           |            |            |
|-----------|------------|------------|-----------|------------|------------|
| (MMcm)    |            |            | (MMstb)   |            |            |
| Low (P90) | Best (P50) | High (P10) | Low (P90) | Best (P50) | High (P10) |
| 4.46      | 6.36       | 9.04       | 28        | 40         | 57         |

Note: Totals set out above are summed statistically. An arithmetic summation of individual P90, P50 and P10 quantities will not produce a total P90, P50 and P10. Statistical aggregation takes into account all outcomes. The process of statistical addition will, as a result of the central limit theorem, produce a P90 that is greater than the arithmetic sum of all P90 quantities and a P10 that is less than the arithmetic sum of all P10 quantities and do not add arithmetically.

**Table 1-1: Gross STOIIP**

GIIP

| (Bcm)     |            |            | (Bscf)    |            |            |
|-----------|------------|------------|-----------|------------|------------|
| Low (P90) | Best (P50) | High (P10) | Low (P90) | Best (P50) | High (P10) |
| 0.76      | 1.07       | 1.48       | 27        | 38         | 52         |

Note: Totals set out above are summed statistically. An arithmetic summation of individual P90, P50 and P10 quantities will not produce a total P90, P50 and P10. Statistical aggregation takes into account all outcomes. The process of statistical addition will, as a result of the central limit theorem, produce a P90 that is greater than the arithmetic sum of all P90 quantities and a P10 that is less than the arithmetic sum of all P10 quantities and do not add arithmetically.

**Table 1-2: Gross GIIP**

Phase 1 of RPS work was to audit recoverable volumes. Phase 2 is to estimate Contingent Resources once a field development plan has been agreed. Shrek is a discovered accumulation where project development activities are being considered but where there is no agreed development plan although Lime has advised the field is likely to be tied-in to the Skarv Field. Furthermore, the recent change of operator may delay assessment further. Clearly, the volumes cannot be screened for commerciality at this stage. RPS recognises that an appropriate project may have potential for eventual commercial development, but further development planning is ongoing to clarify the potential for eventual commercial development. Assessment of the eventually agreed plan and estimate of Contingent Resources delivered by that project is Phase 2 of RPS work. In this initial report, to conform with SGX requirements, RPS has notionally classified recoverable volumes as Contingent Resources – Development Unclassified.

The recoverable volume estimates have been made in this report assuming typical recovery factors for similar offshore oil developments. Full field gross and Lime working interest contingent resources are summarised in Table 1-3.

## COMPETENT PERSON'S REPORT

| Category  | Gross Attributable to Licence |         | Lime's 30% Working Interest |                                 |      | Risk Factors <sup>1</sup> | Remarks |
|---|-------------------------------|---------|-----------------------------|---------------------------------|------|---------------------------|---------|
|   | Contingent Resources          |         | Contingent Resources        | Change From Previous Update (%) |      |                           |         |
| <b>Contingent Resources - Oil <sup>2</sup></b>    |                               |         |                             |                                 |      |                           |         |
|   | (MMcm)                        | (MMstb) | (MMcm)                      | (MMstb)                         |      |                           |         |
| 1C  | 1.65                          | 10      | 0.50                        | 3.1                             | N.A. | N.A.                      | -       |
| 2C  | 2.24                          | 15      | 0.73                        | 4.6                             | N.A. | N.A.                      | -       |
| 3C  | 3.55                          | 22      | 1.07                        | 6.7                             | N.A. | N.A.                      | -       |
| <b>Contingent Resources - Gas <sup>2, 3</sup></b> |                               |         |                             |                                 |      |                           |         |
|   | (Bcm)                         | (Bscf)  | (Bcm)                       | (Bscf)                          |      |                           |         |
| 1C  | 0.68                          | 24      | 0.20                        | 7.2                             | N.A. | N.A.                      | -       |
| 2C  | 0.97                          | 34      | 0.29                        | 10                              | N.A. | N.A.                      | -       |
| 3C  | 1.57                          | 50      | 0.42                        | 15                              | N.A. | N.A.                      | -       |

### Notes

- Given the early stage of assessment of development options and the recent change of operator, RPS does not deem it appropriate to assign a chance of development.
- Total of individual reservoirs summed statistically. An arithmetic summation of individual 1C, 2C and 3C quantities will not produce a total 1C, 2C and 3C. Statistical aggregation takes into account all outcomes. The process of statistical addition will, as a result of the central limit theorem, produce a 1C that is greater than the arithmetic sum of all 1C quantities and a 3C that is less than the arithmetic sum of all 3C quantities and do not add arithmetically.
- Volumes include Free and Associated gas.

**Table 1-3: Shrek Discovery Contingent Resources – Development Unclarified**



## 2 INTRODUCTION

RPS has undertaken an audit of recoverable hydrocarbon volumes in the Shrek Discovery, Block 6507/5, Norway (Figure 2-1). The Shrek discovery is located approximately 4 km southeast of the Skarv Field in water depths of approximately 350 metres. The discovery was made in 2019 and contains both oil and gas. Shrek is a rotated Jurassic fault block identified in the lower part of the Ravfallet Fault Complex. It is located in the lower part of the hinge zone, just updip, and in the spill route, of the Skarv and Idun fields.

Block 6507/5 is part of the PL838 licence awarded in 2016. The initial licence period was for seven years (Table 2-1). Wells 6507/5-9S and 6507/5-9A were drilled in 2019 and are the first exploration wells on the licence. The obligations of the licence holders and current status as listed on the Norwegian Petroleum Directorate website is given in Table 2-2. RPS has been advised by Lime that all financial obligations and work commitments associated with the licence have been fulfilled. The Joint venture is working towards a decision to commercialise the project.

| Asset/<br>Country                   | Lime's<br>Working<br>Interest | Development<br>Status                             | Licence<br>Expiry<br>Date | Licence<br>Area<br>(sq. km) | Type of<br>deposit | Partners   |
|-------------------------------------|-------------------------------|---|---------------------------|-----------------------------|--------------------|--|
| Shrek<br>Licence<br>PL838<br>Norway | 30%                           | (BoK)<br>Decision to<br>concretise in<br>progress | 5 August<br>2023          | 125.362                     | Oil and<br>gas     | <ul style="list-style-type: none"> <li>• AkerBP (Operator, pending governmental approval <sup>1</sup>) (35%)</li> <li>• PGNiG (35%)</li> <li>• Lime Petroleum (30%)</li> </ul> |

Note

1. AkerBP will assume Operatorship from PGNiG when government approval is gained following an arrangement between PGNiG and AkerBP announced in March 2020.

**Table 2-1: Summary of Lime Assets**

| Obligation                            | Decision   | Task<br>status     | Expiry date | Well<br>if drilled |
|---------------------------------------|--|--------------------|-------------|--------------------|
| Reprocessing of 3D seismic            |  | Approved           |             |                    |
|                                       | Decision to drill                                | Will be<br>drilled | 05/08/2018  |                    |
| Drill exploration well                |  | Approved           |             | Well 6507/5-9 S    |
|                                       | (BoK) Decision to concretise                     | In process         | 05/08/2020  |                    |
| Conceptual studies                    |  | In process         |             |                    |
|                                       | (BoV) Decision to continue                       | In process         | 05/08/2020  |                    |
| (PDO) Prepare plan for<br>development |  | In process         |             |                    |
|                                       | (PDO) Decision to submit plan<br>for development | In process         | 05/08/2022  |                    |
|                                       | (PDO) Submit plan for<br>development             | In process         | 05/08/2022  |                    |
|                                       | Decision to enter extension<br>period            | In process         | 05/08/2022  |                    |

**Table 2-2: Status of Activity on Licence PL838**

The PL838 licence covers parts of Blocks 6507/5 and 6507/6 and covers 125.4 sq. km as shown in Figure 2-1.

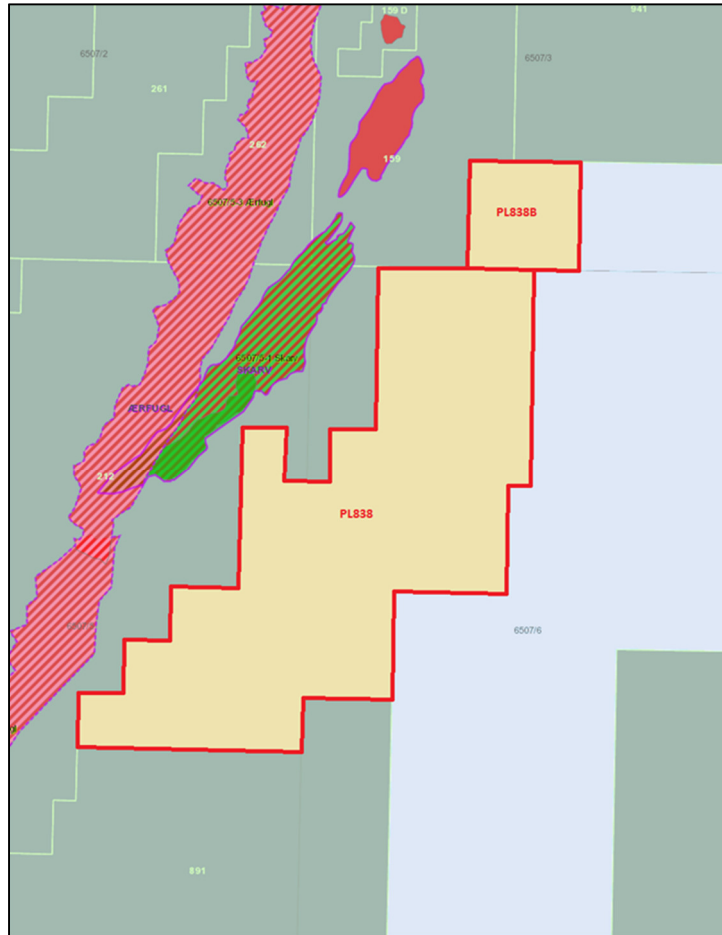


Figure 2-1: PL838 Licence Area (after PGNiG)

This report is issued by RPS under the appointment by Lime and is produced as part of the Services detailed therein and subject to the terms and conditions of the Agreement. Under the Agreement, the aim of Phase 1 of the study is to provide an audit of PGNiG's estimates of in-place and recoverable volumes in the Shrek discovery. This report is a summary of the full report on Phase 1. The second phase of work, which is to review the field development plans when they become available and perform a commercial evaluation will be documented in a subsequent report. This report is based on data and interpretations made by PGNiG that were provided by Lime. RPS has audited the interpretation used by PGNiG and has then evaluated low, base and high recoverable volumes based on a statistical range of in-place numbers calculated based on the available data.

All definitions and estimates shown in this report are based on the 2018 Petroleum Resource Management System of SPE/WPC/AAPG/SPEE/SEG/SPWLA/EAGE ("PRMS") and Norwegian Petroleum Directorate's resource classification system 2016 (2018). The work was undertaken by a team of petroleum engineers and geoscientists. The audit is based on the 2019 SPE Reserves Auditing Standards.

No site visit was conducted as part of this study.

No economic assessment was conducted as part of this study.

Mr Gordon Taylor, CEng, CGeol has supervised this evaluation which was project managed by Ms Clare Wilson. Mr Taylor meets the requirements of the Singapore Stock Exchange as an independent qualified person. Full details are given in Section 5. Work has been undertaken solely on a fee basis. Neither Mr Taylor nor RPS has any interest in Lime.

### 3 BASIS OF OPINION

The evaluation presented in this report reflects our informed judgment, based on accepted standards of professional investigation, but is subject to generally recognised uncertainties associated with the interpretation of geological, geophysical and engineering data. The evaluation has been conducted within our understanding of petroleum legislation, taxation and other regulations that currently apply to these interests. However, RPS is not in a position to attest to the property title, financial interest relationships or encumbrances related to the property. Our estimates of Reserves and Resources are based on data provided by Lime. We have accepted, without independent verification, the accuracy and completeness of these data.

The report represents RPS' best professional judgment and should not be considered a guarantee or prediction of results. It should be understood that any evaluation, particularly one involving future performance and development activities may be subject to significant variations over short periods of time as new information becomes available. This report relates specifically and solely to the subject assets and is conditional upon various assumptions that are described herein. This report must, therefore, be read in its entirety. This report was provided for the sole use of Lime and their corporate advisors on a fee basis.

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This report is issued by RPS under the appointment by Lime and is produced as part of the Services detailed therein and subject to the terms and conditions of the Agreement. To be included in this section, adaptable to specifics of client:

#### 3.1 Audit Methodology

As noted above, our approach has been to audit PGNiG's estimates of recoverable volumes, based on the 2019 SPE Reserves Auditing Standards, which describe an audit as follows:

*A Reserves Audit is the process of reviewing certain of the pertinent facts interpreted and assumptions made that have resulted in an estimate of reserves and/or Reserves Information prepared by others and the rendering of an opinion about:*

- (1) the appropriateness of the methodologies employed,*
- (2) the adequacy and quality of the data relied upon,*
- (3) the depth and thoroughness of the reserves estimation process,*
- (4) the classification of reserves appropriate to the relevant definitions used, and*
- (5) the reasonableness of the estimated reserves quantities and/or the Reserves Information.*

*The term "reasonableness" cannot be defined with precision but should reflect a quantity and/or value difference of not more than plus or minus 10%, or the subject Reserves Information does not meet minimum recommended audit standards.*

*This tolerance can be applied to any level of reserves or Reserves Information aggregation, depending upon the nature of the assignment, but is most often limited to Proved Reserves Information. A separate predetermined and disclosed tolerance may be appropriate for other reserves classifications. Often a reserves audit includes a detailed review of certain critical assumptions and independent assessments with acceptance of other information less critical to the reserves estimation. Typically, a reserves audit letter or report is prepared, clearly stating the assumptions made. A reserves audit should be of sufficient rigor to determine the appropriate reserves classification for all reserves in the property set evaluated and to clearly state the reserves classification system being utilised. In contrast to the term "audit" as used in a financial sense, a reserves audit is generally less rigorous than a reserves report.*

## 4 SHREK DISCOVERY

### 4.1 Data Provision

Lime provided a Petrel project containing seismic data volumes, well data, latest Top Reservoir two-way time (TWT) and depth maps. Provisional well tops were provided in a spreadsheet, pending biostratigraphical work. Numerous reports, meeting minutes and presentations were also provided.

No petrophysical interpretation was provided so RPS undertook its own petrophysical analysis and RPS revised the presented formation tops.

### 4.2 Subsurface Evaluation

#### 4.2.1 Geology

The Shrek structure and adjacent structural culminations were formed above a large westerly dipping extensional fault system, the Ravfallet Fault Complex, which shows variable displacement, complexity and substantial geometric variability along its length. The extension, affecting the reservoirs, is of Jurassic and Cretaceous age and there is also inherited Triassic rift geometry below the reservoir intervals.

Shrek comprises four Middle Jurassic reservoir intervals; the Garn, Not, Ile and Tilje Formations. The Garn Formation contains shallow marine to marginal marine sandstones and is separated from the Ile by the Not Formation shale. The Ile sandstones were deposited in coastal plain and shallow-marine environments. The deeper Tilje is dominated by sandstones with subordinate mudstones which were deposited in a complex sequence of alternating fluvial, tidal, lagoonal and shelfal environments.

Reservoir quality is generally good. The Garn Formation has extremely good reservoir quality, with porosities up to 33% and an average net-to-gross ratio (NTG) of 0.89. The Ile and Tilje formations are more heterogeneous. However, the net-to-gross ratios remain high at 0.92 and 0.80, respectively, and porosities are up to 29%. The Not Formation regionally is a shale, however in the discovery it does contain net reservoir and has a NTG of ~0.5 and porosity up to 23%.

RPS has reviewed the preliminary tops supplied by PGNiG. The Garn Formation is 13 m thinner in the 6507/5-9S well than in the 6507/5-9A well. A difference in the log character at the top of the Garn Formation suggests that the top of the formation may be eroded in well 6507/5-9S. The deeper formations are very similar in thickness in the two wells.

#### 4.2.2 Geophysics

RPS has reviewed the Top Reservoir TWT interpretation and depth mapping for the Shrek Discovery. Two horizons were provided, the Top Garn and Base Cretaceous Unconformity (BCU), The BCU is close to or truncates the Top Garn Formation in the wider area and so PGNiG uses Top Reservoir to indicate Top Garn Formation or Top Garn/BCU over the Shrek area.

Lime provided the latest TWT and depth maps from PGNiG. Faults were not provided although fault polygons are present in the Petrel project. These data are considered interim since the interpretation and depth conversion are being reviewed by PGNiG post-well. This work, however, had not been finished at the time of this report.

The Shrek Discovery is a tilted fault block. Complex faulting within the block generates two terraces at the well locations and a small, horst to the north. The seismic data are generally good quality over the main part of the field. The Top Reservoir is a bright, consistent reflector and can be picked with confidence. However, to the north along the horst, the character of the Top Reservoir reflector is less distinct, less bright and there is uncertainty whether it is the Top Garn Formation or overlying, unconformable, non-reservoir reflectors. In the area downthrown from the horst to the east, the reflector shows a very different character to the discovery area and PGNiG has not included it in its closure. RPS has also not included this area in the closure.

## COMPETENT PERSON'S REPORT

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RPS has reviewed the TWT mapping and finds PGNiG's TWT map to be reasonable. There are uncertainties in the horizon to the north and faulting also segments the Top Reservoir.

RPS was not provided with any velocity data. However, the TWT and depth maps were provided so RPS calculated average velocity across the field. It varies very little from the mean of 2060 m/s. Using reasonable velocity variations leads to an uncertainty in depth of up to 40m.

RPS audited PGNiG's Top Reservoir depth map and finds it appropriate to use for volumetrics. However, the map is too shallow and misties the Top Garn Formation by 12.5 m true vertical depth sub-sea surface (TVDSS) and 24 m TVDSS for 6507/5-9A and -S respectively. The map was adjusted by bulk shifting it the average of the misties in the wells and then locally tying to well tops.

PGNiG has undertaken AVO and spectral enhancement of the seismic data. Amplitude extractions and fluid factor anomalies both show the Shrek Discovery clearly. The amplitude anomaly compares well to the response at the nearby Skarv Field, which is analogous to the Shrek Discovery. The fluid factor anomaly corresponds well to the depth contours and contacts (see Section 4.2.3) seen in the wells.

### 4.2.3 Petrophysics

No petrophysical computer-processed interpretation (CPI) curve data were provided as part of the study. RPS undertook its own petrophysical analysis.

The wells have modern well logs including conventional and combinable magnetic resonance (CMR) logs, well 6507/5-9S also has core analysis data. Log quality is good, and no large washouts are seen over the reservoir interval.

The RPS analysis of the wells mainly followed the approach and analysis described in the documents provided by Lime. RPS made adjustments based on formation properties, log availability and quality etc. CMR logs were not used in the analysis.

The reservoir formations contain thin beds. RPS, therefore, used the minimum value of VCL calculated from the GR (Iarionov tertiary) and Density/Neutron (D/N) cross plot methods. The GR (Iarionov tertiary) alone was used in thick, clean, gas sandstones due to gas effects on the D/N logs. Formation porosity was derived from the sonic log (Raymer Hunt Formula) to avoid the gas affected D/N logs. The log derived porosity was calibrated to core porosity. A surface hole temperature of 60 °F and formation temperature gradient of 10.5 °F/1000ft were applied based on RPS experience of the region. Formation water resistivity (Rw) was derived from a Pickett Plot of clean water-bearing sandstones in the Tilje Formation, and was calculated as 0.06 Ohm-m at reservoir temperature.

RPS used the Archie equation to calculate formation water saturation Sw

$$Sw = (a \times R_w / (RT \times PHI^m))^{1/n}$$

where RT was from RDEP log; a=1, m=1.75 and n=2. These inputs are from the presentation material supplied by Lime.

The gas-oil contacts (GOC) and oil-water contacts (OWC) for the two wells were derived from formation pressure gradients (from documents provided by Lime). OWC contacts identified from logs are generally in agreement with the pressure derived contacts. A difference was observed in the GOC (2029.2 m TVDSS from logs vs. 2034.4 m TVDSS from pressures) in well 6507/5-9S. RPS applied a range of contacts in the volumetric calculation to account for this uncertainty.

RPS calculated petrophysical parameter zonal summaries for input into the volumetric calculations using two different cutoff sets in order to show the possible ranges: The cutoffs used were VCL<=0.45; PHIE>=0.18; SW<=0.45 and VCL<=0.50; PHIE>=0.18; SW<=0.5.

## 4.3 Estimate of GIIP

### 4.3.1 Input Parameters

RPS used PGNiG's Top Reservoir depth map to estimate the range of gross rock volume (GRV) for the Shrek Discovery. PGNiG, limited the volumetric area to a polygon which does not include the northern end of the horst block. RPS included this area in the uncertainty range.

To account for depth uncertainty, alternative depth maps were used as velocity variation leads to a depth uncertainty away from well control of up to 40 m. and GRVs using both the fault polygons and no fault polygons were calculated to estimate the impact of the simple model that was provided, with no faults. The difference in GRV between the high/low cases and the mid-case map are incorporated in the range of area uncertainty in the input parameters discussed below.

PGNiG's reported volumes averaged all the reservoir formations together as a simple post-well update to the volumes, before additional more detailed work is completed. PGNiG used average saturation parameters. This overestimates average oil saturation and underestimates gas saturation. Additionally, the Garn Formation reservoir is typically the best reservoir in the Fangst Group and is the shallowest reservoir encountered at Shrek. It is underlain by the Not Formation, which in other fields in the area is shale only, acts as a barrier or baffle to vertical flow, and has poorer reservoir quality than the other formations. As the field is gas and oil, with gas present predominantly in the Garn Formation, there may also be a parameter bias. RPS has estimated a range of volumes for the Garn, Not, and the combined Ile to Tilje formations interval.

Reservoir thickness inputs are based on the thicknesses encountered in the wells. For the estimate of volumes in the Not Formation and Ile-Tilje Formations a bulk shift based on the overlying reservoir thickness from the Top Reservoir was applied.

RPS used petrophysical averages by formation based on the RPS petrophysical interpretation and range of NTG, porosity and saturation from wells 6507/5-9A and -S. Engineering results of the well PVT analysis were used for the oil formation volume factor, gas expansion factor and gas-oil-ratio.

### 4.3.2 In-Place Volumes for the Shrek Discovery

RPS probabilistic estimates of the range of oil and gas in-place for the Shrek field are given in Table 4-1 and Table 4-2.

|                                      | GIIP        |             |             |           |            |            |
|--------------------------------------|-------------|-------------|-------------|-----------|------------|------------|
|                                      | (Bcm)       |             |             | (MMstb)   |            |            |
|                                      | Low (P90)   | Best (P50)  | High (P10)  | Low (P90) | Best (P50) | High (P10) |
| <b>Garn Formation</b>                | 0.70        | 0.97        | 1.35        | 24        | 34         | 48         |
| <b>Not Formation</b>                 | 0.02        | 0.04        | 0.08        | 0.7       | 1.5        | 2.8        |
| <b>Ile-Tilje Formation</b>           | 0.02        | 0.05        | 0.10        | 0.6       | 1.6        | 3.7        |
| <b>Arithmetic Total<sup>1</sup></b>  | 0.74        | 1.06        | 1.53        | 26        | 37         | 54         |
| <b>Statistical Total<sup>2</sup></b> | <b>0.76</b> | <b>1.07</b> | <b>1.48</b> | <b>27</b> | <b>38</b>  | <b>52</b>  |

<sup>1</sup> Arithmetic sum

<sup>2</sup> Totals summed statistically. An arithmetic summation of individual P90, P50 and P10 quantities will not produce a total P90, P50 and P10. Statistical aggregation takes into account all outcomes. The process of statistical addition will, as a result of the central limit theorem, produce a P90 that is greater than the arithmetic sum of all P90 quantities and a P10 that is less than the arithmetic sum of all P10 quantities and do not add arithmetically

**Table 4-1: Gross GIIP**

|                                      | STOIP       |             |             |           |            |            |
|--------------------------------------|-------------|-------------|-------------|-----------|------------|------------|
|                                      | (MMcm)      |             |             | (MMstb)   |            |            |
|                                      | Low (P90)   | Best (P50)  | High (P10)  | Low (P90) | Best (P50) | High (P10) |
| <b>Garn Formation</b>                | 1.82        | 2.84        | 4.35        | 11        | 18         | 27         |
| <b>Not Formation</b>                 | 0.32        | 0.52        | 0.82        | 2         | 3          | 5          |
| <b>Ile-Tilje Formation</b>           | 1.93        | 2.94        | 4.37        | 12        | 19         | 28         |
| <b>Arithmetic Total<sup>1</sup></b>  | 4.07        | 6.30        | 9.54        | 26        | 40         | 60         |
| <b>Statistical Total<sup>2</sup></b> | <b>4.46</b> | <b>6.36</b> | <b>9.04</b> | <b>28</b> | <b>40</b>  | <b>57</b>  |

<sup>1</sup> Arithmetic sum

<sup>2</sup> Totals summed statistically. An arithmetic summation of individual P90, P50 and P10 quantities will not produce a total P90, P50 and P10. Statistical aggregation takes into account all outcomes. The process of statistical addition will, as a result of the central limit theorem, produce a P90 that is greater than the arithmetic sum of all P90 quantities and a P10 that is less than the arithmetic sum of all P10 quantities and do not add arithmetically

**Table 4-2: Gross STOIP**

## 4.4 Reservoir Engineering

RPS used PVT reports for Well 6507/5-9A and -S provided by Lime to estimate the oil formation volume factor, gas expansion factor and gas-oil-ratio for the Shrek Discovery.

The Shrek Discovery was made in late 2019. PGNiG has yet to review fully the data acquired and only interim revisions to the pre-drill interpretations were made. Although there has been some discussion of development via a tie-in to Skarv, no detailed development plans have been provided, so RPS has estimated a range of recovery factors based on regional knowledge of these reservoirs and of similar offshore developments

The range of recovery factors for the oil has been estimated by reviewing the range of recovery factors in nearby fields which shows a range of 25% to 60% with an average of 44%. This average in nearby fields is consistent with the findings by G. C. Watkins “Characteristics of North Sea oil reserve appreciation” of an average recovery factor of 42% for the Norwegian North Sea. However, the reservoir permeabilities and oil column thicknesses of the nearby analogue fields are larger than in Shrek. Hence, the recovery factor for Shrek is expected to be lower and a range of 25% to 50% is assumed by RPS. For the Garn Formation oil, the low, mid and high estimates have been taken as 30%, 40% and 50%, respectively, while for the slightly poorer Ile-Tilje Formation the assumed range is 25%, 38% and 50%, respectively. The Not Formation is usually non-net so analogue data are less readily available. This interval has poorer reservoir quality, so the Ile-Tilje Formation recovery factors have been reduced by 50% so the assumed range is 12.5%, 19% and 25%.

The gas recovery factor has also been estimated by considering the range in nearby fields which show a range of 65% to 85%. Hence, for Shrek the low, mid and high gas recovery factors have been taken as 65%, 75% and 85% respectively for all intervals.

The associated gas recovery factor has been assumed equal to the oil recovery factor. Hence, the associated gas recoverables are simply the oil recoverable volumes multiplied by the initial solution GOR.

The estimated ultimate recoverable volumes (EUR) for oil and gas by formation are presented in Table 4-3 and Table 4-4 below.

OIL EUR

|                                      | (MMcm)      |             |             | (MMstb)   |            |            |
|--------------------------------------|-------------|-------------|-------------|-----------|------------|------------|
|                                      | Low (P90)   | Best (P50)  | High (P10)  | Low (P90) | Best (P50) | High (P10) |
| <b>Garn Formation</b>                | 0.55        | 1.14        | 2.18        | 3.4       | 7.2        | 14         |
| <b>Not Formation</b>                 | 0.04        | 0.10        | 0.21        | 0.3       | 0.6        | 1.3        |
| <b>Ile-Tilje Formation</b>           | 0.48        | 1.12        | 2.19        | 3.0       | 7.0        | 14         |
| <b>Arithmetic Total<sup>1</sup></b>  | 1.07        | 2.35        | 4.57        | 7         | 15         | 29         |
| <b>Statistical Total<sup>2</sup></b> | <b>1.65</b> | <b>2.42</b> | <b>3.55</b> | <b>10</b> | <b>15</b>  | <b>22</b>  |

<sup>1</sup> Arithmetic sum

<sup>2</sup> Totals summed statistically. An arithmetic summation of individual P90, P50 and P10 quantities will not produce a total P90, P50 and P10. Statistical aggregation takes into account all outcomes. The process of statistical addition will, as a result of the central limit theorem, produce a P90 that is greater than the arithmetic sum of all P90 quantities and a P10 that is less than the arithmetic sum of all P10 quantities and do not add arithmetically.

**Table 4-3: Oil EUR**

Gas EUR<sup>1</sup>

|                                      | (Bcm)       |             |             | (Bscf)    |            |            |
|--------------------------------------|-------------|-------------|-------------|-----------|------------|------------|
|                                      | Low (P90)   | Best (P50)  | High (P10)  | Low (P90) | Best (P50) | High (P10) |
| <b>Garn Formation</b>                | 0.49        | 0.80        | 1.29        | 17        | 28         | 46         |
| <b>Not Formation</b>                 | 0.01        | 0.02        | 0.05        | 0.3       | 0.8        | 1.7        |
| <b>Ile-Tilje Formation</b>           | 0.04        | 0.10        | 0.23        | 1.4       | 3.7        | 8.2        |
| <b>Arithmetic Total<sup>2</sup></b>  | 0.54        | 0.92        | 1.57        | 19        | 33         | 56         |
| <b>Statistical Total<sup>3</sup></b> | <b>0.68</b> | <b>0.97</b> | <b>1.40</b> | <b>24</b> | <b>34</b>  | <b>50</b>  |

<sup>1</sup> Free and Associated Gas

<sup>2</sup> Arithmetic sum

<sup>3</sup> Totals summed statistically. An arithmetic summation of individual P90, P50 and P10 quantities will not produce a total P90, P50 and P10. Statistical aggregation takes into account all outcomes. The process of statistical addition will, as a result of the central limit theorem, produce a P90 that is greater than the arithmetic sum of all P90 quantities and a P10 that is less than the arithmetic sum of all P10 quantities and do not add arithmetically.

**Table 4-4: Gas EUR**

## 4.5 Recoverable Volumes

The Shrek Discovery was made in late 2019. PGNiG has yet to review fully the data acquired and only interim revisions to the pre-drill interpretations were made. RPS has reviewed these data to make the estimate of oil and gas in-place discussed in Section 4.3.2. At this stage no development plans were made available to RPS.

Phase 1 of RPS work was to audit recoverable volumes. Phase 2 is to estimate Contingent Resources once a field development plan has been agreed. Shrek is a discovered accumulation where project development activities are being considered but where there is no agreed development plan. Clearly, the volumes cannot be screened for commerciality at this stage. RPS recognises that an appropriate project may have potential for eventual commercial development, but further development planning is ongoing to clarify the potential for eventual commercial development. Assessment of the eventually agreed plan and estimate of Contingent Resources delivered by that project is Phase 2 of RPS work. In this initial report, to conform with SGX requirements, RPS has notionally classified recoverable volumes as Contingent Resources – Development



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Unclarified. Given the early stage of assessment of development options and the recent change of operator, RPS does not deem it appropriate to assign a chance of development

As a result, recoverable volume estimates have been made in this report assuming typical recovery factors for similar offshore oil developments as discussed in Section 4.4. Full field gross and Lime working interest contingent resource volumes of oil and gas for the Shrek Discovery are summarised in Table 4-5.

| Category   | Gross Attributable to Licence |         | Lime's 30% Working Interest |         |                                 | Risk Factors <sup>1</sup> | Remarks |
|--|-------------------------------|---------|-----------------------------|---------|---------------------------------|---------------------------|---------|
|  | Contingent Resources          |         | Contingent Resources        |         | Change From Previous Update (%) |                           |         |
| <b>Contingent Resources - Oil <sup>2</sup></b>   |                               |         |                             |         |                                 |                           |         |
|  | (MMcm)                        | (MMstb) | (MMcm)                      | (MMstb) |                                 |                           |         |
| 1C   | 1.65                          | 10      | 0.50                        | 3.1     | N.A.                            | N.A.                      | -       |
| 2C   | 2.24                          | 15      | 0.73                        | 4.6     | N.A.                            | N.A.                      | -       |
| 3C   | 3.55                          | 22      | 1.07                        | 6.7     | N.A.                            | N.A.                      | -       |
| <b>Contingent Resources - Gas <sup>2,3</sup></b> |                               |         |                             |         |                                 |                           |         |
|  | (Bcm)                         | (Bscf)  | (Bcm)                       | (Bscf)  |                                 |                           |         |
| 1C   | 0.68                          | 24      | 0.20                        | 7.2     | N.A.                            | N.A.                      | -       |
| 2C   | 0.97                          | 34      | 0.29                        | 10      | N.A.                            | N.A.                      | -       |
| 3C   | 1.57                          | 50      | 0.42                        | 15      | N.A.                            | N.A.                      | -       |

### Notes

- Given the early stage of assessment of development options and the recent change of operator, RPS does not deem it appropriate to assign a chance of development.
- Total of individual reservoirs summed statistically. An arithmetic summation of individual 1C, 2C and 3C quantities will not produce a total 1C, 2C and 3C. Statistical aggregation takes into account all outcomes. The process of statistical addition will, as a result of the central limit theorem, produce a 1C that is greater than the arithmetic sum of all 1C quantities and a 3C that is less than the arithmetic sum of all 3C quantities and do not add arithmetically.
- Volumes include Free and Associated gas.

**Table 4-5: Shrek Field Contingent Resources – Development Pending**

A full commercial evaluation of the development project and chance of development will be undertaken in Phase 2 of the work for Lime when the detailed development plans and associated capital (capex) and operating (opex) cost estimates become available. The oil and gas production forecasts, capex and opex forecasts derived from the agreed development plan along with RPS independent oil price forecasts will be used to derive net present cash flow and determine commerciality of the project. The field would be developed under the standard Norwegian offshore fiscal terms.

As part of Phase 2, RPS will comment on safety and environmental issues in line with the requirements of PRMS.

## 5 CONSULTANT'S INFORMATION

RPS is an independent consultancy specialising in petroleum reservoir evaluation and economic analysis. The evaluation presented in this report reflects our informed judgment, based on accepted standards of professional investigation, but is subject to generally recognised uncertainties associated with the interpretation of geological, geophysical and engineering data. The evaluation has been conducted within our understanding of petroleum legislation, taxation and other regulations that currently apply to these interests. However, RPS is not in a position to attest to the property title, financial interest relationships or encumbrances related to the property. Our estimates of Resources are based on data provided by Lime. We have accepted, without independent verification, the accuracy and completeness of this data.

The report represents RPS' best professional judgment and should not be considered a guarantee or prediction of results. It should be understood that any evaluation, particularly one involving future performance and development activities may be subject to significant variations over short periods of time as new information becomes available. This report relates specifically and solely to the subject assets and is conditional upon various assumptions that are described herein. This report must, therefore, be read in its entirety. This report was provided for the sole use of Lime, its holding company Rex International Holding Limited and their corporate advisors. The provision of professional services has been solely on a fee basis.

To the best of our knowledge, no conflict of interest has existed in the work conducted as part of this report. Furthermore, RPS nor any of the management and employees involved in the work have any interest in the assets evaluated or related to the analysis carried out as part of this report.

Mr Gordon Taylor, Director, Consulting, has supervised this evaluation. Mr Taylor is a Chartered Geologist and Chartered Engineer with over 40 years' experience in upstream oil and gas. Other RPS employees involved in this work hold at least a Master's degree in geology, geophysics, petroleum engineering or a related subject or have at least five years of relevant experience in the practice of geology, geophysics or petroleum engineering.

Table 5.1 provides a summary of staff involved in this evaluation, their level of experience and professional qualifications.

COMPETENT PERSON'S REPORT

| Name                      | Role                             | Years of Experience | Qualifications   | Professional Memberships   |
|---------------------------|----------------------------------|---------------------|--|--|
| <b>Gordon Taylor</b>      | Supervisor                       | >40                 | BSc. Geological Sciences, Birmingham University<br>MSc. Foundation Engineering, Birmingham University    | Fellow, Geological Society (Chartered Geologist - 1991)<br>Member, Institute of Materials, Minerals and Mining (Chartered Engineer-1983)<br>Member, AAPG Division of Professional Affairs (Certified Geologist-2005)<br>Member, Society of Petroleum Engineers |
| <b>Clare Wilson</b>       | Project Manager /Geophysics Lead | 24                  | BSc Geophysics (Geological), Leicester University<br>MBA, Hull University                                | Geological Society of London (Fellow)<br>PESGB   |
| <b>Helen John</b>         | Geology Lead                     | 28                  | BSc Hons, Geology, University College Wales, Aberystwyth   | Geological Society of London (Fellow)<br>PESGB<br>South East Asia Petroleum Exploration Society (SEAPEX)<br>Norwegian Petroleum Society (NPF)  |
| <b>Jinli Wu</b>           | Petrophysics Lead                | >30                 | BEng Geophysical Well Logging Speciality, Exploration Department, East China Petroleum Institute, China. | Society of Professional Well Log Analysts (SPWLA)  |
| <b>Augustine Ikwumonu</b> | Engineering Lead                 | >35                 | BSc Mechanical Engineering   | Member, Society of Petroleum Engineers, Energy Institute   |

**Table 5-1: Summary of Consultant Personnel**

## 6 DATA SOURCES

Lime provided electronic files of various technical data and presentations, including:

- Slides from OCM/TCM/Technical meetings
- Petrel Project
  - 3D Seismic with Interpretation
  - Operator TWT and Depth maps
  - Provisional Tops
- Well data including:
  - Wireline logs
  - PVT data

## Appendix A Glossary

|                 |   |
|-----------------|---|
| 1C              | The low estimate of Contingent Resources. There is estimated to be a 90% probability that the quantities actually recovered could equal or exceed this estimate                       |
| 2C              | The best estimate of Contingent Resources. There is estimated to be a 50% probability that the quantities actually recovered could equal or exceed this estimate                      |
| 3C              | The high estimate of Contingent Resources. There is estimated to be a 10% probability that the quantities actually recovered could equal or exceed this estimate                      |
| 1P              | The low estimate of Reserves (proved). There is estimated to be a 90% probability that the quantities remaining to be recovered will equal or exceed this estimate                    |
| 2P              | The best estimate of Reserves (proved+probable). There is estimated to be a 50% probability that the quantities remaining to be recovered will equal or exceed this estimate          |
| 3P              | The high estimate of Reserves (proved+probable+possible). There is estimated to be a 10% probability that the quantities remaining to be recovered will equal or exceed this estimate |
| 1U              | The unrisks low estimate of Prospective Resources   |
| 2U              | The unrisks best estimate of Prospective Resources  |
| 3U              | The unrisks high estimate of Prospective Resources  |
| AVO             | Amplitude versus Offset   |
| B               | Billion   |
| bbl(s)          | Barrels   |
| bbls/d          | Barrels per day   |
| Bcm             | Billion cubic metres  |
| B <sub>g</sub>  | Gas formation volume factor   |
| B <sub>gi</sub> | Gas formation volume factor (initial)   |
| B <sub>o</sub>  | Oil formation volume factor   |
| B <sub>oi</sub> | Oil formation volume factor (initial)   |
| B <sub>w</sub>  | Water volume factor   |
| boe             | Barrels of oil equivalent   |
| stb/d           | Barrels of oil per day  |
| BHP             | Bottom hole pressure  |
| Bscf            | Billions of standard cubic feet   |
| bwpd            | Barrels of water per day  |
| condensate      | A mixture of hydrocarbons which exist in gaseous phase at reservoir conditions but are produced as a liquid at surface conditions   |
| cP              | Centipoise  |
| Eclipse         | A reservoir modelling software package  |
| E <sub>gi</sub> | Gas Expansion Factor  |
| EMV             | Expected Monetary Value   |
| EUR             | Estimated Ultimate Recovery   |
| FBHP            | Flowing bottom hole pressure  |
| FTHP            | Flowing tubing head pressure  |
| ft              | Feet  |
| FWHP            | Flowing well head pressure  |
| FWL             | Free Water Level  |
| GDT             | Gas Down To   |

## COMPETENT PERSON'S REPORT

|            |  |
|------------|--|
| GIIP       | Gas Initially in Place   |
| GOC        | Gas oil Contact  |
| GOR        | Gas/oil ratio  |
| GRV        | Gross rock volume  |
| GWC        | Gas water contact  |
| IPR        | Inflow performance relationship  |
| HIIP       | Hydrocarbon Initially in Place   |
| IRR        | Internal rate of return  |
| KB         | Kelly Bushing  |
| $k_a$      | Absolute permeability  |
| $k_h$      | Horizontal permeability  |
| km         | Kilometres   |
| LPG        | Liquefied Petroleum Gases  |
| m          | Metres   |
| $m^3$      | Cubic metres   |
| $m^3/d$    | Cubic metres per day   |
| ma         | Million years  |
| M          | Thousand   |
| M\$        | Thousand US dollars  |
| MBAL       | Material balance software  |
| Mbbls      | Thousand barrels   |
| mD         | Permeability in millidarcies   |
| MD         | Measured depth   |
| MDT        | Modular formation dynamics tester tool   |
| MM         | Million  |
| MMbbls     | Million barrels  |
| MMcm       | Million cubic metres   |
| MMscf/d    | Millions of standard cubic feet per day  |
| MMstb      | Million stock tank barrels (at 14.7 psi and 60° F)   |
| MMt        | Millions of tonnes   |
| MM\$       | Million US dollars   |
| MPa        | Mega pascals   |
| m/s        | Metres per second  |
| msec       | Milliseconds   |
| Mt         | Thousands of tonnes  |
| mV         | Millivolts   |
| NTG or N:G | Net to gross ratio   |
| NGL        | Natural Gas Liquids  |
| NPV        | Net Present Value  |
| OWC        | Oil water contact  |
| P90        | There is estimated to be at least a 90% probability (P90) that this quantity will equal or exceed this low estimate  |
| P50        | There is estimated to be at least a 50% probability (P50) that this quantity will equal or exceed this best estimate |
| P10        | There is estimated to be at least a 10% probability (P10) that this quantity will equal or exceed this high estimate |
| PDR        | Physical data room   |
| Petrel     | A geoscience and reservoir engineering software package  |

## COMPETENT PERSON'S REPORT

|           |   |
|-----------|---|
| petroleum | Naturally occurring mixtures of hydrocarbons which are found beneath the Earth's surface in liquid, solid or gaseous form |
| phi       | Porosity  |
| $p_i$     | Initial reservoir pressure  |
| PI        | Productivity index  |
| ppm       | Parts per million   |
| psi       | Pounds per square inch  |
| psia      | Pounds per square inch (absolute)   |
| psig      | Pounds per square inch (gauge)  |
| $p_{wf}$  | Flowing bottom hole pressure  |
| PSDM      | Pre-stack depth migrated seismic data   |
| PSTM      | Pre-stack time migrated seismic data  |
| PVT       | Pressure volume temperature   |
| rb        | Barrel(s) at reservoir conditions   |
| rcf       | Reservoir cubic feet  |
| REP™      | A Monte Carlo simulation software package   |
| RF        | Recovery factor   |
| RFT       | Repeat formation tester   |
| RKB       | Relative to kelly bushing   |
| $rm^3$    | Reservoir cubic metres  |
| SCADA     | Supervisory control and data acquisition  |
| SCAL      | Special Core Analysis   |
| scf       | Standard cubic feet measured at 14.7 pounds per square inch and 60° F   |
| scf/d     | Standard cubic feet per day   |
| scf/stb   | Standard cubic feet per stock tank barrel   |
| SGS       | Sequential Gaussian Simulation  |
| SIBHP     | Shut in bottom hole pressure  |
| SIS       | Sequential Indicator Simulation   |
| $sm^3$    | Standard cubic metres   |
| $S_o$     | Oil saturation  |
| $S_{oi}$  | Initial oil saturation  |
| $S_{or}$  | Residual oil saturation   |
| $S_{orw}$ | Residual oil saturation relative to water   |
| sq. km    | Square kilometers   |
| stb       | Stock tank barrels measured at 14.7 pounds per square inch and 60° F  |
| stb/d     | Stock tank barrels per day  |
| STOIIP    | Stock tank oil initially in place   |
| $S_w$     | Water saturation  |
| $S_{wc}$  | Vonnate water saturation  |
| \$        | United States Dollars   |
| t         | Tonnes  |
| THP       | Tubing head pressure  |
| Tscf      | Trillion standard cubic feet  |
| TVDSS     | True vertical depth (sub-sea)   |
| TVT       | True vertical thickness   |
| TWT       | Two-way time  |
| US\$      | United States Dollar  |

## COMPETENT PERSON'S REPORT

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|                 |   |
|-----------------|---|
| VDR             | Virtual data room                       |
| VLP             | Vertical lift performance               |
| V <sub>sh</sub> | Shale volume                            |
| VSP             | Vertical Seismic Profile                |
| W/m/K           | Watts/metre/° K                         |
| WC              | Water cut                               |
| WUT             | Water Up To                             |
| Z               | A measure of the “non-idealness” of gas |
| φ               | Porosity                                |
| μ               | Viscosity                               |
| μ <sub>g</sub>  | Viscosity of gas                        |
| μ <sub>o</sub>  | Viscosity of oil                        |
| μ <sub>w</sub>  | Viscosity of water                      |



## Appendix B

# Summary of Reporting Guidelines

PRMS is a fully integrated system that provides the basis for classification and categorization of all petroleum reserves and resources.

### B.1 Basic Principles and Definitions

A classification system of petroleum resources is a fundamental element that provides a common language for communicating both the confidence of a project's resources maturation status and the range of potential outcomes to the various entities. The PRMS provides transparency by requiring the assessment of various criteria that allow for the classification and categorization of a project's resources. The evaluation elements consider the risk of geologic discovery and the technical uncertainties together with a determination of the chance of achieving the commercial maturation status of a petroleum project.

The technical estimation of petroleum resources quantities involves the assessment of quantities and values that have an inherent degree of uncertainty. Quantities of petroleum and associated products can be reported in terms of volumes (e.g., barrels or cubic meters), mass (e.g., metric tonnes) or energy (e.g., Btu or Joule). These quantities are associated with exploration, appraisal, and development projects at various stages of design and implementation. The commercial aspects considered will relate the project's maturity status (e.g., technical, economical, regulatory, and legal) to the chance of project implementation.

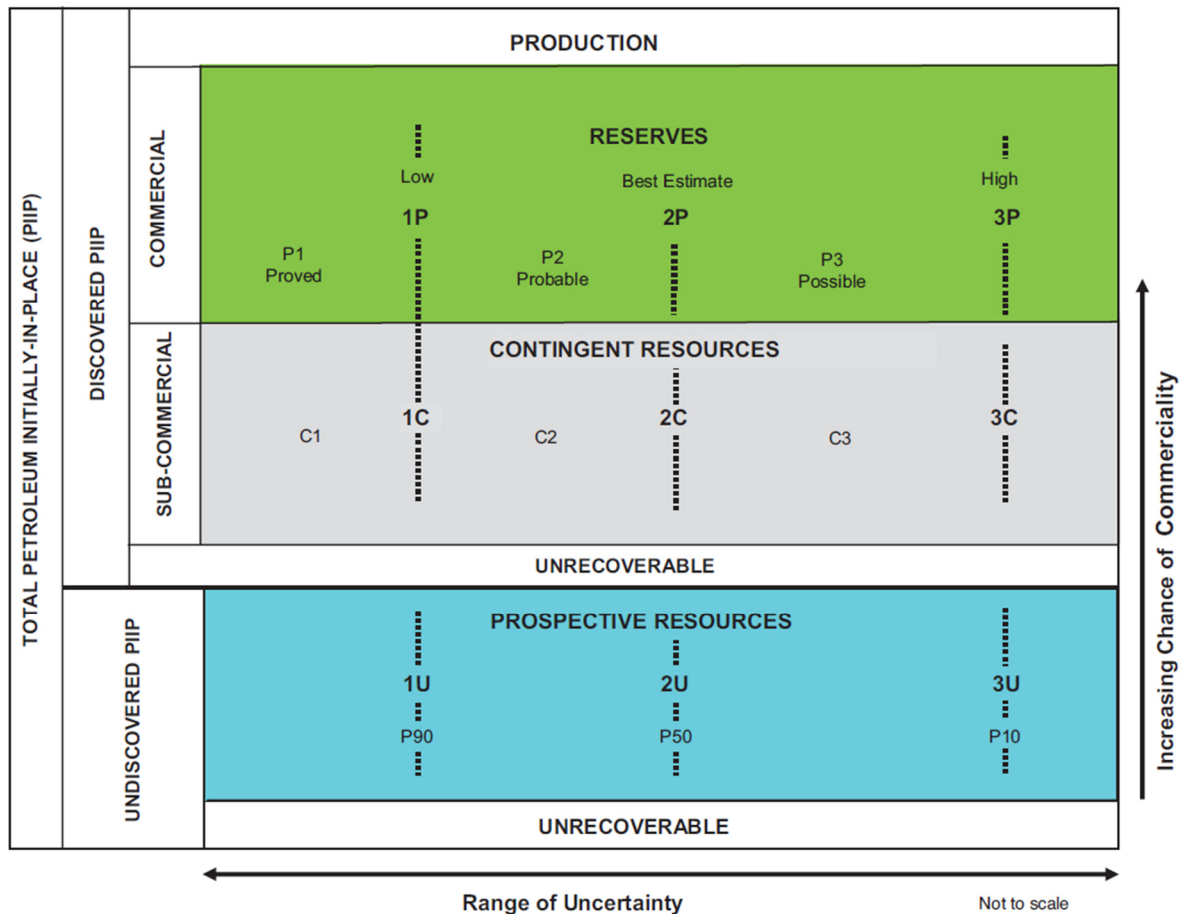
The use of a consistent classification system enhances comparisons between projects, groups of projects, and total company portfolios. The application of PRMS must consider both technical and commercial factors that impact the project's feasibility, its productive life, and its related cash flows.

#### B.1.1 Petroleum Resources Classification Framework

Petroleum is defined as a naturally occurring mixture consisting of hydrocarbons in the gaseous, liquid, or solid state. Petroleum may also contain non-hydrocarbons, common examples of which are carbon dioxide, nitrogen, hydrogen sulfide, and sulfur. In rare cases, non-hydrocarbon content can be greater than 50%.

The term resources as used herein is intended to encompass all quantities of petroleum naturally occurring within the Earth's crust, both discovered and undiscovered (whether recoverable or unrecoverable), plus those quantities already produced. Further, it includes all types of petroleum whether currently considered as conventional or unconventional resources.

Figure B.1 graphically represents the PRMS resources classification system. The system classifies resources into discovered and undiscovered and defines the recoverable resources classes: Production, Reserves, Contingent Resources, and Prospective Resources, as well as Unrecoverable Petroleum.



**Figure B.1: Resources classification framework**

The horizontal axis reflects the range of uncertainty of estimated quantities potentially recoverable from an accumulation by a project, while the vertical axis represents the chance of commerciality,  $P_c$ , which is the chance that a project will be committed for development and reach commercial producing status.

The following definitions apply to the major subdivisions within the resources classification:

- **Total Petroleum Initially-In-Place (PIIP)** is all quantities of petroleum that are estimated to exist originally in naturally occurring accumulations, discovered and undiscovered, before production.
- **Discovered PIIP** is the quantity of petroleum that is estimated, as of a given date, to be contained in known accumulations before production.
- **Production** is the cumulative quantities of petroleum that have been recovered at a given date. While all recoverable resources are estimated, and production is measured in terms of the sales product specifications, raw production (sales plus non-sales) quantities are also measured and required to support engineering analyses based on reservoir voidage (see PRMS 2018 Section 3.2, Production Measurement).

Multiple development projects may be applied to each known or unknown accumulation, and each project will be forecast to recover an estimated portion of the initially-in-place quantities. The projects shall be subdivided into commercial, sub-commercial, and undiscovered, with the estimated recoverable quantities being classified as Reserves, Contingent Resources, or Prospective Resources respectively, as defined below.

- **Reserves** are those quantities of petroleum anticipated to be commercially recoverable by application of development projects to known accumulations from a given date forward under defined conditions.

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Reserves must satisfy four criteria: discovered, recoverable, commercial, and remaining (as of the evaluation's effective date) based on the development project(s) applied.

Reserves are recommended as sales quantities as metered at the reference point. Where the entity also recognizes quantities consumed in operations (CiO) (see PRMS 2018 Section 3.2.2), as Reserves these quantities must be recorded separately. Non-hydrocarbon quantities are recognized as Reserves only when sold together with hydrocarbons or CiO associated with petroleum production. If the non-hydrocarbon is separated before sales, it is excluded from Reserves.

Reserves are further categorized in accordance with the range of uncertainty and should be sub-classified based on project maturity and/or characterized by development and production status.

- **Contingent Resources** are those quantities of petroleum estimated, as of a given date, to be potentially recoverable from known accumulations, by the application of development project(s) not currently considered to be commercial owing to one or more contingencies. Contingent Resources have an associated chance of development. Contingent Resources may include, for example, projects for which there are currently no viable markets, or where commercial recovery is dependent on technology under development, or where evaluation of the accumulation is insufficient to clearly assess commerciality. Contingent Resources are further categorized in accordance with the range of uncertainty associated with the estimates and should be sub-classified based on project maturity and/or economic status.
- **Undiscovered PIIP** is that quantity of petroleum estimated, as of a given date, to be contained within accumulations yet to be discovered.
- **Prospective Resources** are those quantities of petroleum estimated, as of a given date, to be potentially recoverable from undiscovered accumulations by application of future development projects. Prospective Resources have both an associated chance of geologic discovery and a chance of development. Prospective Resources are further categorized in accordance with the range of uncertainty associated with recoverable estimates, assuming discovery and development, and may be sub-classified based on project maturity.
- **Unrecoverable Resources** are that portion of either discovered or undiscovered PIIP evaluated, as of a given date, to be unrecoverable by the currently defined project(s). A portion of these quantities may become recoverable in the future as commercial circumstances change, technology is developed, or additional data are acquired. The remaining portion may never be recovered because of physical/chemical constraints represented by subsurface interaction of fluids and reservoir rocks.

The sum of Reserves, Contingent Resources, and Prospective Resources may be referred to as "remaining recoverable resources." Importantly, these quantities should not be aggregated without due consideration of the technical and commercial risk involved with their classification. When such terms are used, each classification component of the summation must be provided.

Source: Petroleum Resources Management System (revised June 2018), Version 1.01, Society of Petroleum Engineers

Full details and a downloadable copy of the Petroleum Resources Management System can be found on the on the Society of Petroleum Engineers' website [www.spe.org](http://www.spe.org)



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