

# EXPLORATION OPPORTUNITIES OFFSHORE LEBANON

## UPDATE, DATA LIBRARY AND LICENSING

Appex

**Lebanese Petroleum Administration**

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March 4<sup>th</sup>, 2020



# REGIONAL GEOLOGY

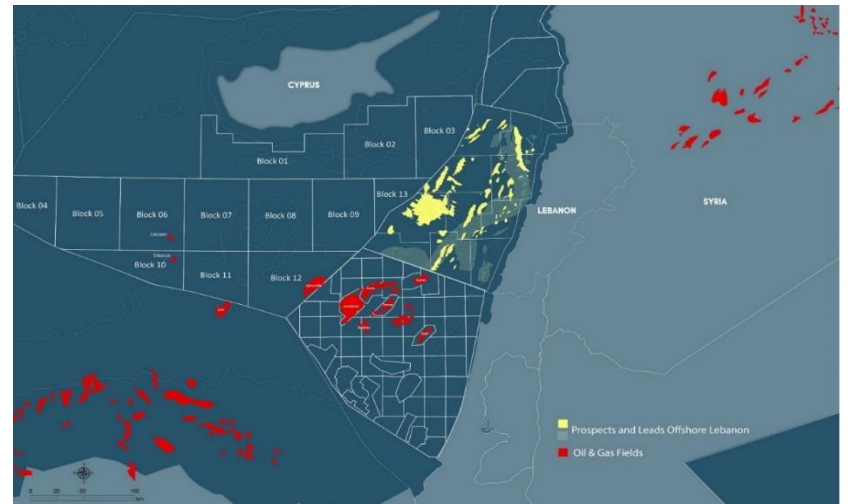
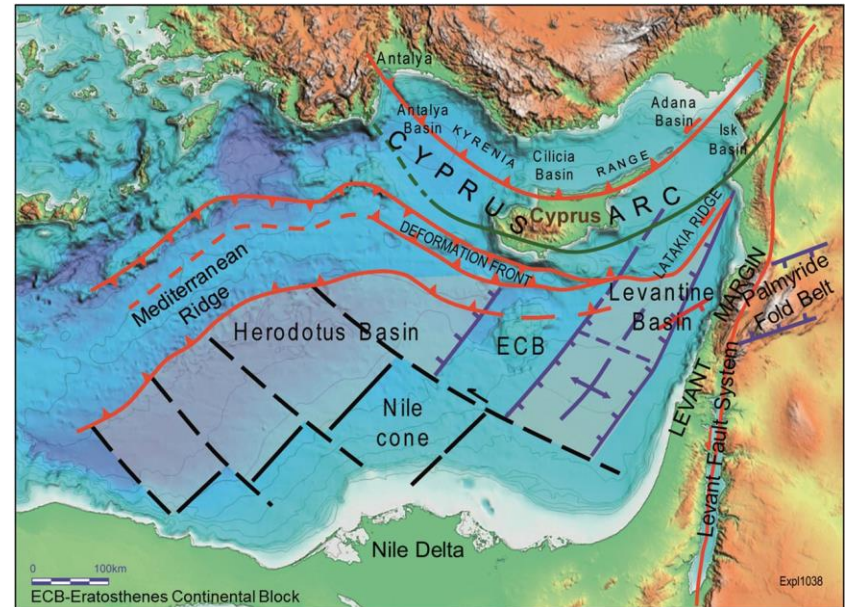
Lebanon extends along the eastern coast of the Mediterranean Sea and covers a surface area of 10,452 km<sup>2</sup>.

Lebanon occupies an area corresponding to:

- South of the Cyprus Arc
- East of Eratosthenes Continental block
- The SW margin of the inverted Palmyra Basin
- NE of the Nile Delta Cone

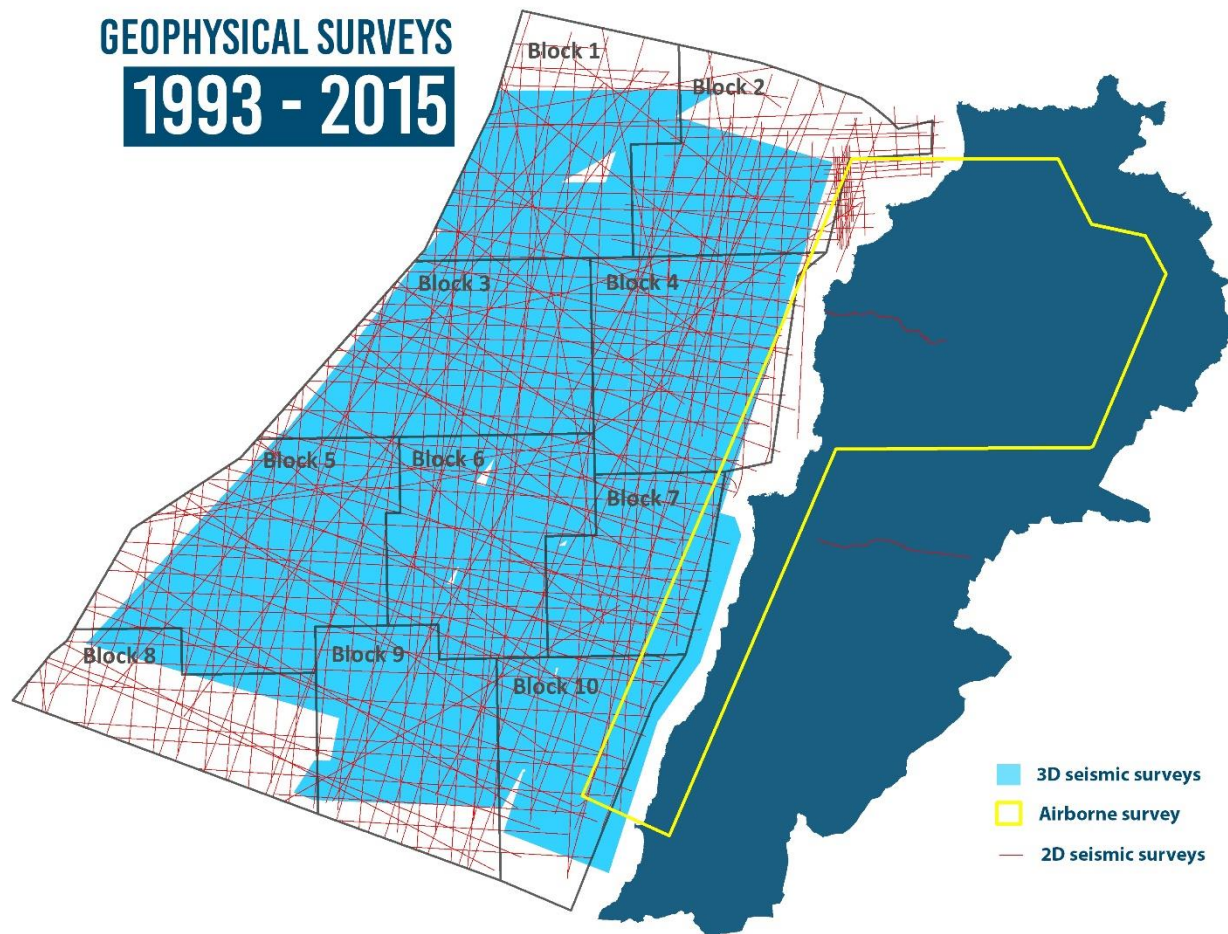
This margin is defined by the Dead Sea Transform Fault, a left lateral strike slip fault zone which separates the Arabian plate from the African plate.

Map all of these prospects offshore Lebanon which share the same trends as nearby discoveries.



# GEOPHYSICAL DATA COVERAGE OFFSHORE LEBANON

**GEOPHYSICAL SURVEYS**  
**1993 - 2015**



**Offshore EEZ:**

22,700 km<sup>2</sup>

**Total Area of the Blocks:**

17,506 km<sup>2</sup>

**2D Seismic Acquisition:**

> 14,000 km

**3D Acquisition:**

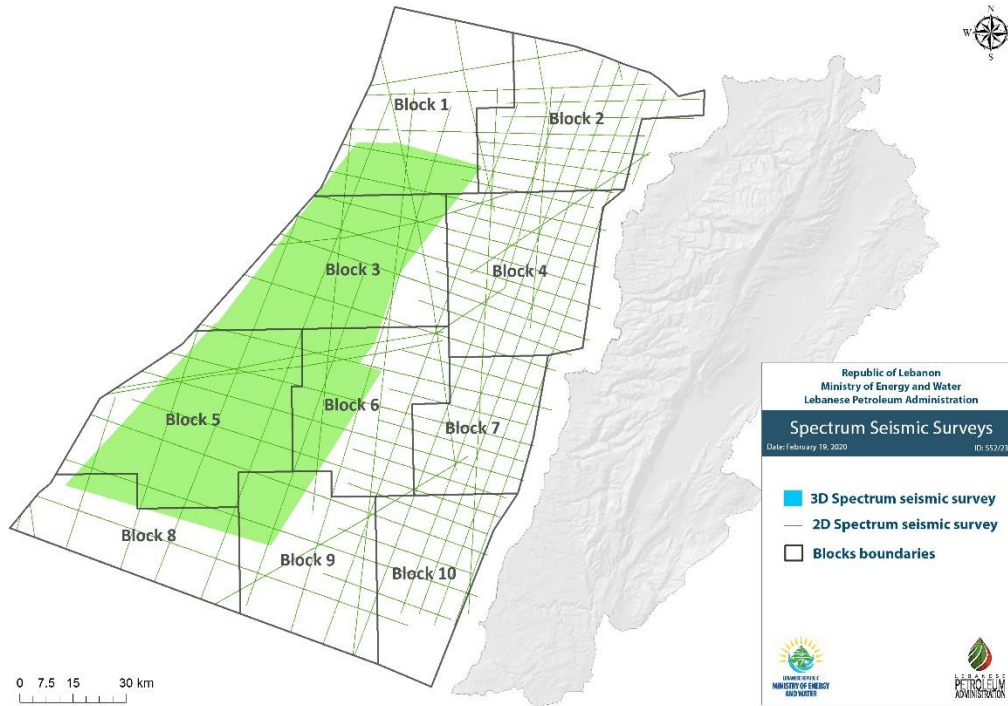
> 15,000 km<sup>2</sup>

**Airborne:**

> 6,000 km<sup>2</sup>

Data viewing request can be made via email: [datacenter@lpa.gov.lb](mailto:datacenter@lpa.gov.lb)

# DATA LIBRARY



## Survey: 2D

- Acquisition Year: 2000
- Completion of Processing: 2017
- Reprocessed: Yes
- Products Available:

AVO Attributes – PSDM/PSTM Gathers – PSDM/PSTM Volumes - PSDM/PSTM Velocity Models

## Survey: 2D

- Acquisition Year: 2002
- Completion of Processing: 2017
- Reprocessed: Yes
- Products Available:

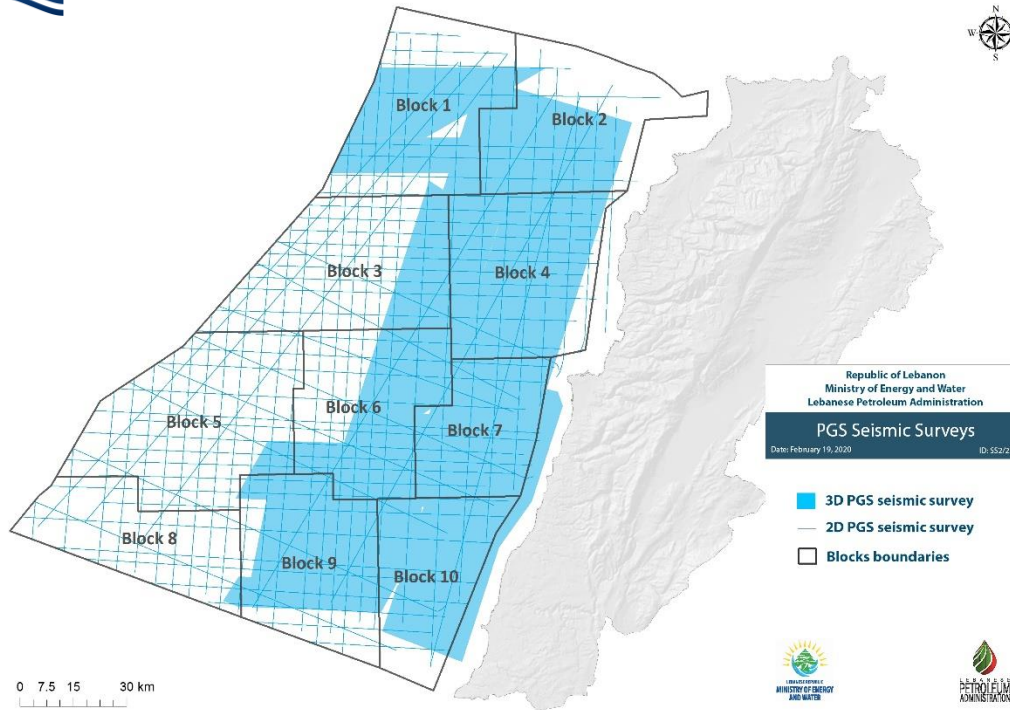
Angle Stacks – Gathers – Migration – Velocity

## Survey: 3D

- Acquisition Year: 2013
- Completion of Processing: 2014
- Reprocessed: Yes
- Products Available:

Time - Angle Stacks – Gathers - Velocity Model

# DATA LIBRARY



## Survey: 2D

- **Acquisition Year:** 2008 – 2011
- **Completion of Processing:** 2017
- **Reprocessed:** Yes
- **Products Available:**

Depth – Time - Angle Stacks - Migration Velocity models

- **Additional Products:** Gravity and Magnetics

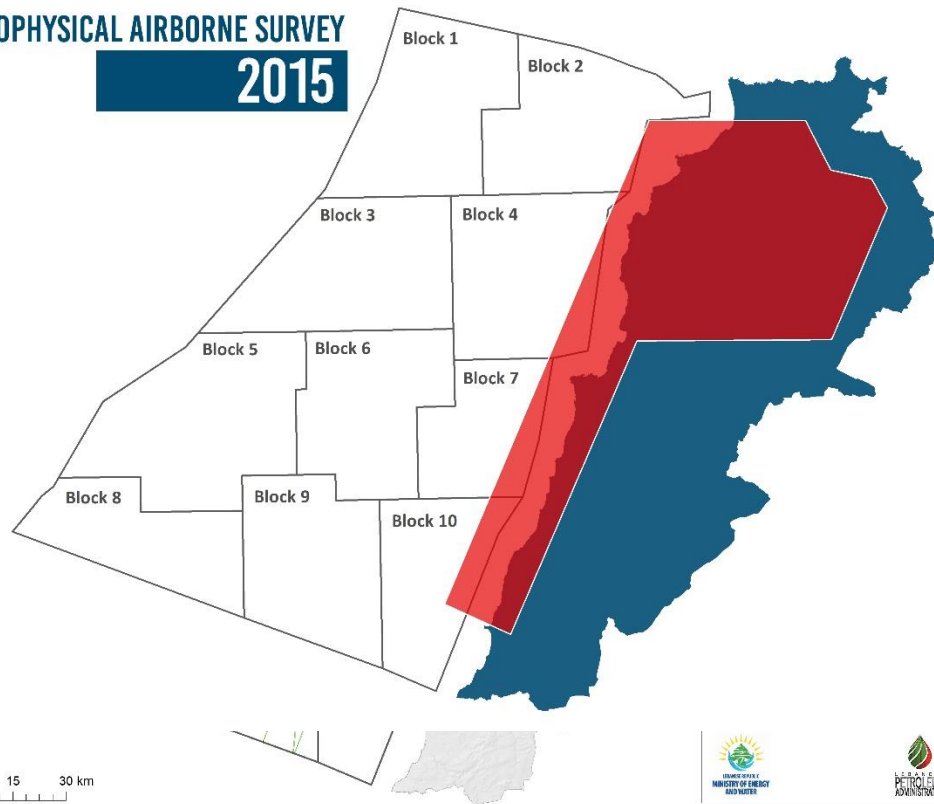
## Survey: 3D

- **Acquisition Year:** 2006 - 2013
- **Completion of Processing:** 2014
- **Reprocessed:** Yes
- **Products Available:**

Final Kirchhoff PSDM stack – Final beam PSDM stack – PSDM angle stacks – PSDM/PSTM gathers – Velocity model

# DATA LIBRARY

## GEOPHYSICAL AIRBORNE SURVEY 2015



### Survey: Airborne

- Acquisition Year: 2015
- Products Available:  
Magnetic – Electromagnetic – Gravitational –  
Radiometric – Hyperspectral – Magnetotelluric

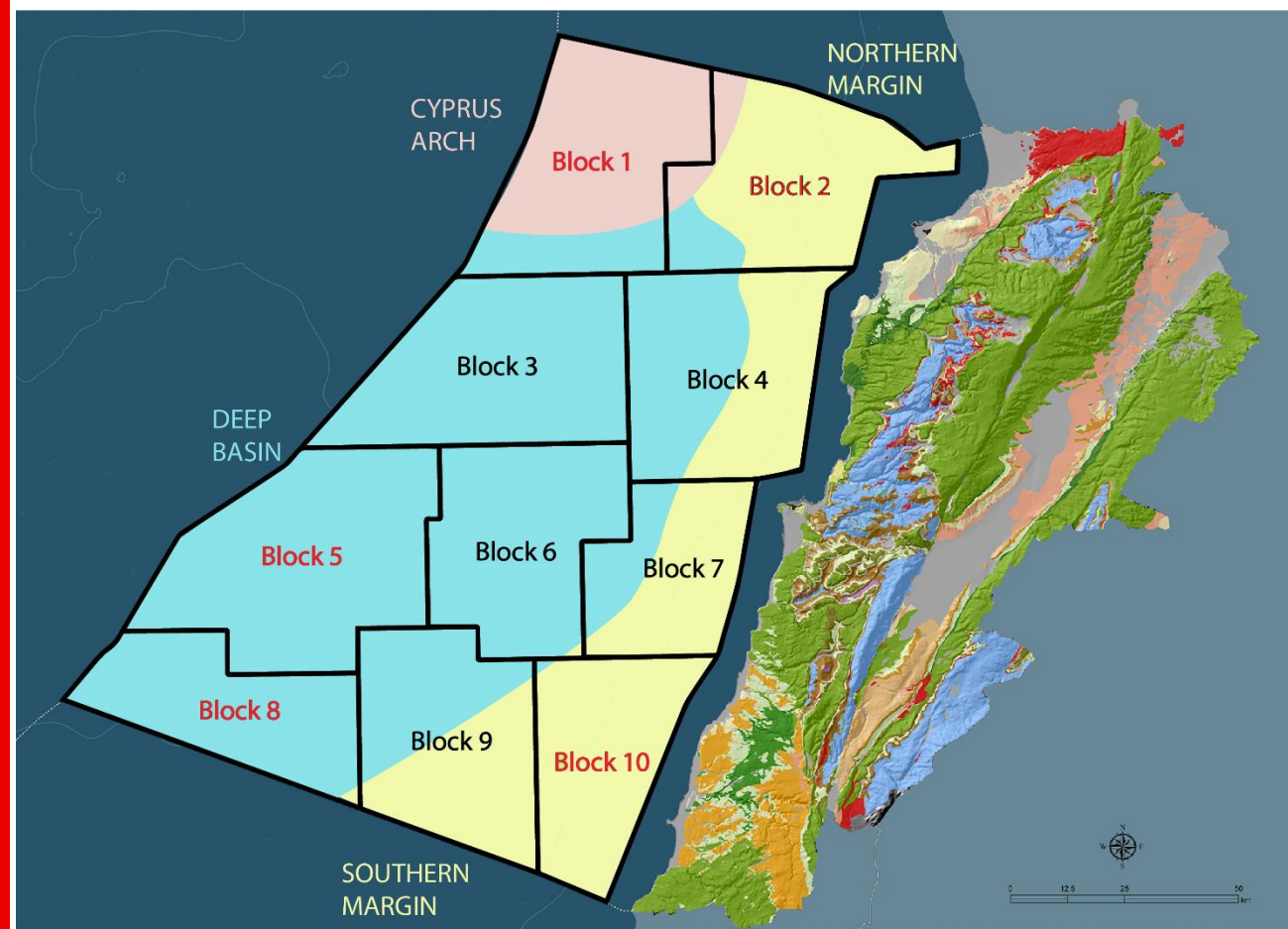


# **OPEN BLOCKS PROSPECTIVITY – HIGHLIGHTS**



# MAIN GEOLOGICAL ZONES

- ❖ Study of the regional framework and the interpretation of the profiles allowed defining the main geological domains Offshore Lebanon.
- ❖ Each geological domain is characterized by specific structural and sedimentological features:



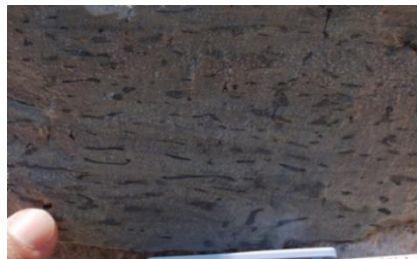
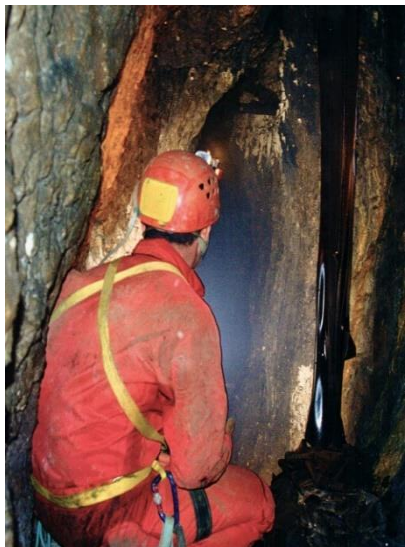
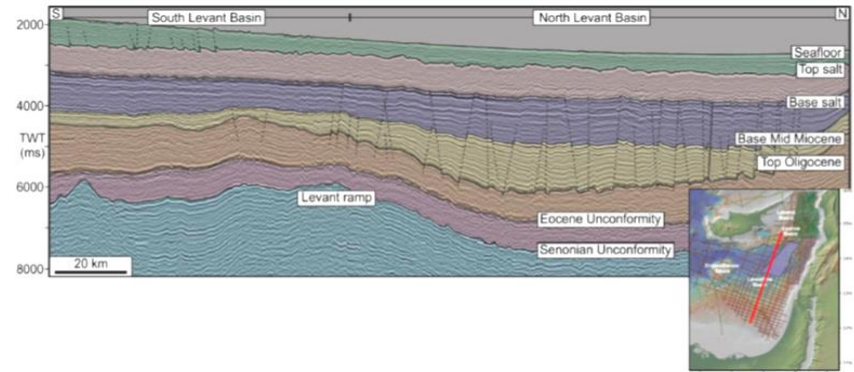
- ❖ Deep Basin – Numerous elongated faulted anticlines / fault blocks
- ❖ Latakia Ridge – Large SW-NE compressional structures
- ❖ Levant Margin – Carbonate platform, buildups & stratigraphic traps



# TYPES OF HYDROCARBONS

- ❖ Levant basin and the region has a proven presence of biogenic and thermogenic source rocks.
- ❖ Stratigraphy is continuous from South Levant to North Levant Basin.

Biogenic SR	Analogue	Kerogen
Pliocene	Egypt, Gaza	III
Miocene	Tamar and nearby Fields	II - III
Oligocene	Tamar and nearby fields	II



Thermogenic SR	Analogue	Kerogen
Oligocene	Karish, Amasthusa and Onasagoras	II
Eocene	Egypt	II – III
Campanian (Upper Cretaceous)	Onshore Lebanon, Palestine and Egypt	II
Oxfordian (Upper Jurassic)	S. Levant Offshore and Onshore	II – III
Callovian (Middle Jurassic)	S. Levant Offshore and Onshore	II – III
Triassic	Syria	II - III

Example of Active seeps from Campanian SR onshore Lebanon

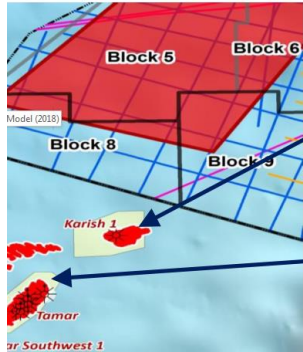
# THE OIL PLAY OFFSHORE LEBANON

- ❖ All discoveries prior to 2012 in the Levant Basin were gas discoveries: *Noa (1999)*, *Mari-B (2000)*, *Gaza Marine (2000)*, *Dalit (2009)*, *Tamar (2009)*, *Leviathan (2010)* & *Aphrodite (2011)*.
- ❖ Post 2012 discoveries in the Levant Basin, specifically *Tanin (2012)* & *Karish (2013)* fields reported a higher liquid/gas ratio, suggesting at least in part a thermogenic source.
- ❖ Post the Messinian event, oil has been generated from the Oligocene/Eocene interval, charging the overlying Early Miocene sands in structures which formed pre-Messinian.

**Both Oil and Gas expected Offshore Lebanon!**



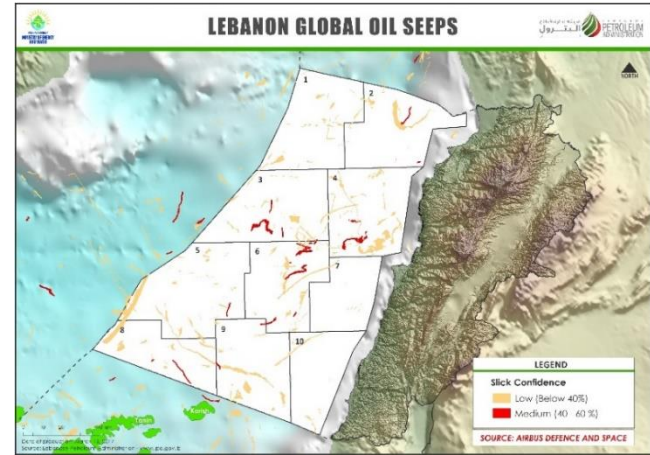
# THE OIL PLAY OFFSHORE LEBANON



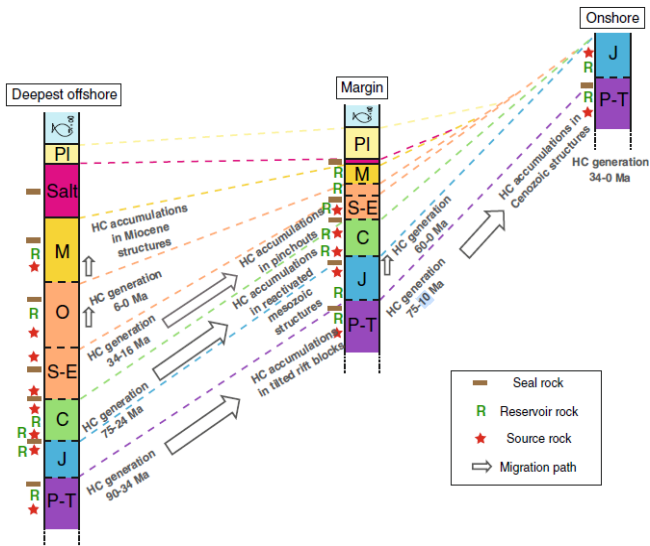
**Q: Where is the thermogenic light oil in Karish coming from?**

**Karish**  
 2013 Gas Discovery  
 180ft net Lower Miocene sands  
 Reserves mean 2-3 TCF  
 \* Producing thermogenic light oil

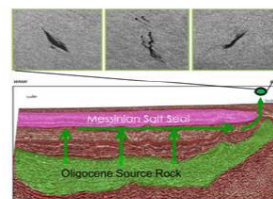
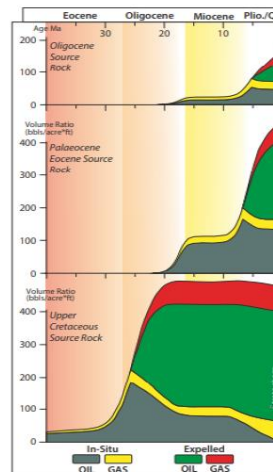
**Tamar**  
 2009 Gas Discovery 2012  
 onstream. 460ft net Mid- Lower  
 Miocene sands  
 Reserves Mean 9 TCF



Over 200 Oil Slicks and Seeps observed on SAR Radar (1984-2011)



Bou Daher et al 2015

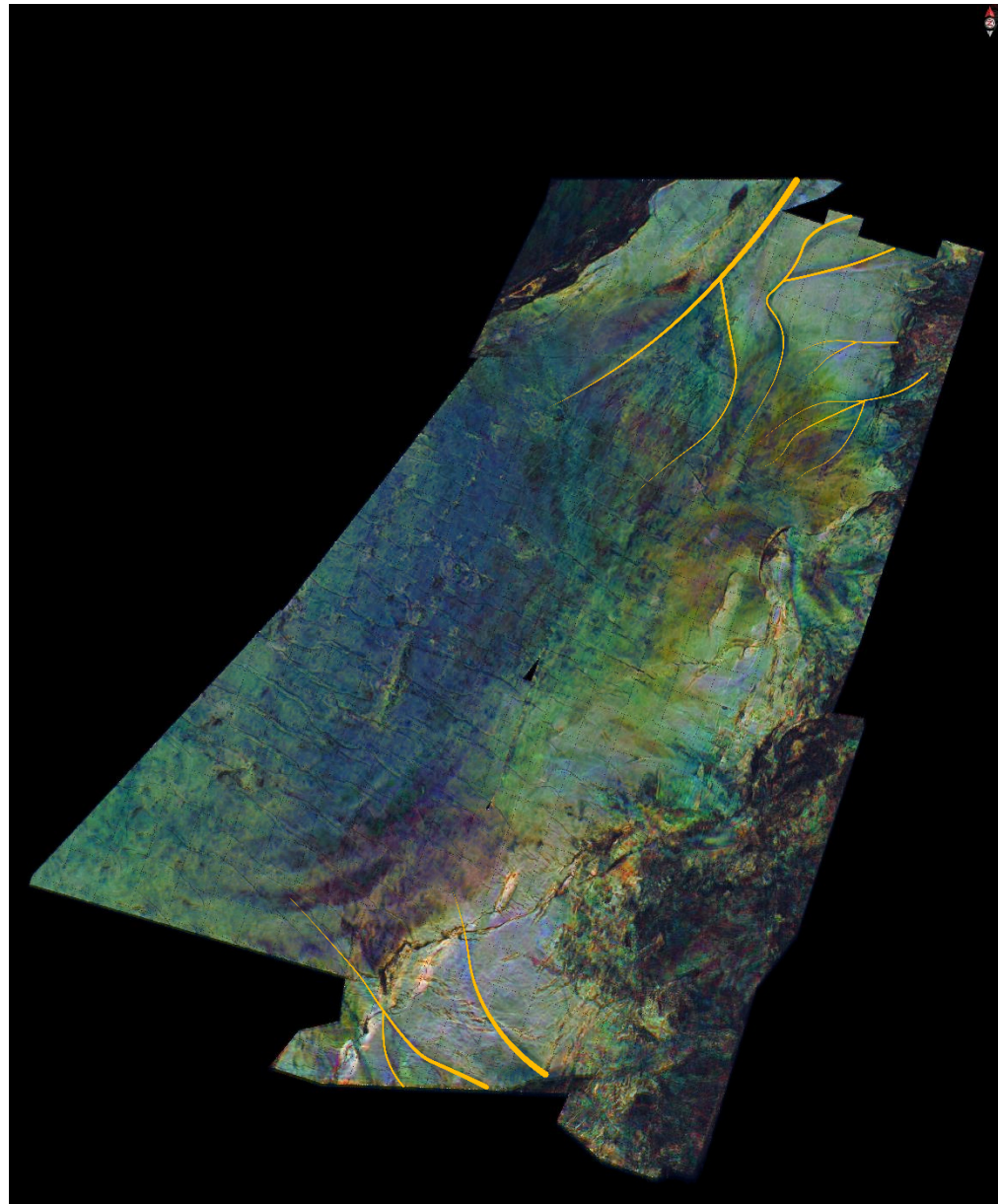


Levant Basin 20°C/km  
 Oligocene Source generating oil  
 Hodgson et al 2018

London, 4 November 2019 Energy Oil and Gas plc (LSE: ENOG, TASE: אנאנ), the oil and gas producer focused on the Mediterranean, is pleased to announce the successful appraisal of the Karish North Discovery, confirming best estimate recoverable resources of 0.9 Tcf (25 BCM) plus 34 million barrels of light oil / condensate<sup>1,2</sup> (combined c.190 mmboe) significantly enhancing Energy's discovered resource volumes across its Karish and Tanin leases.

<https://www.energean.com/media/3527/20191104-successful-karish-north-appraisal.pdf>

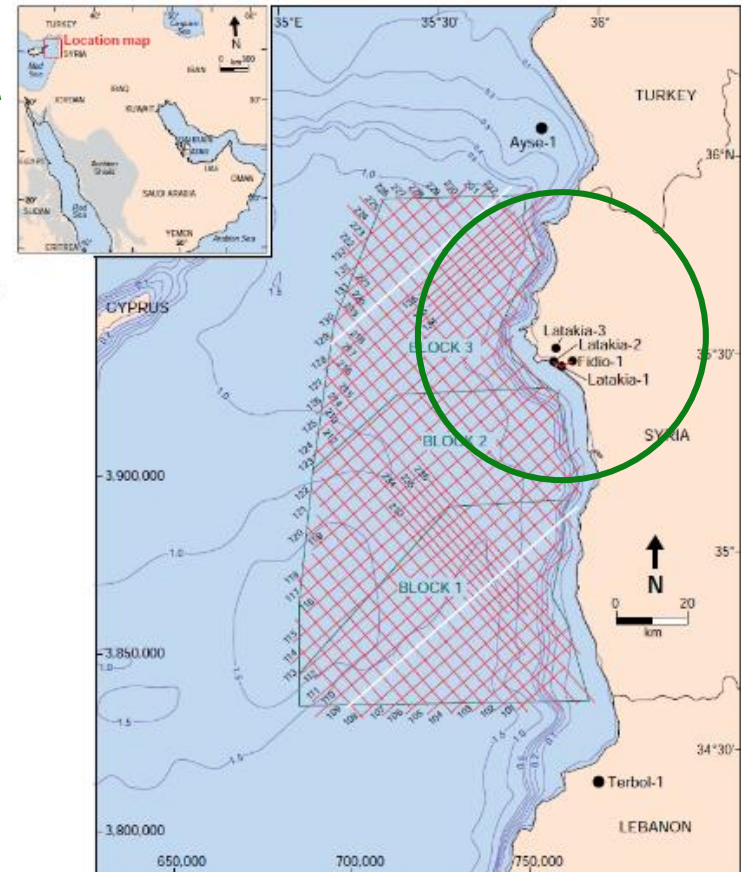
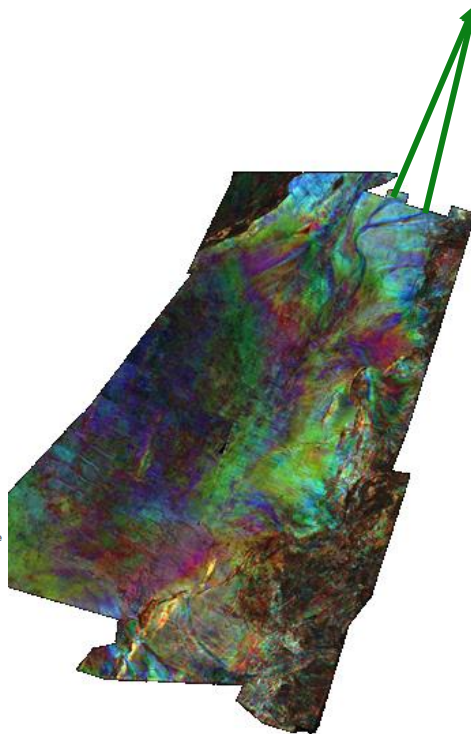
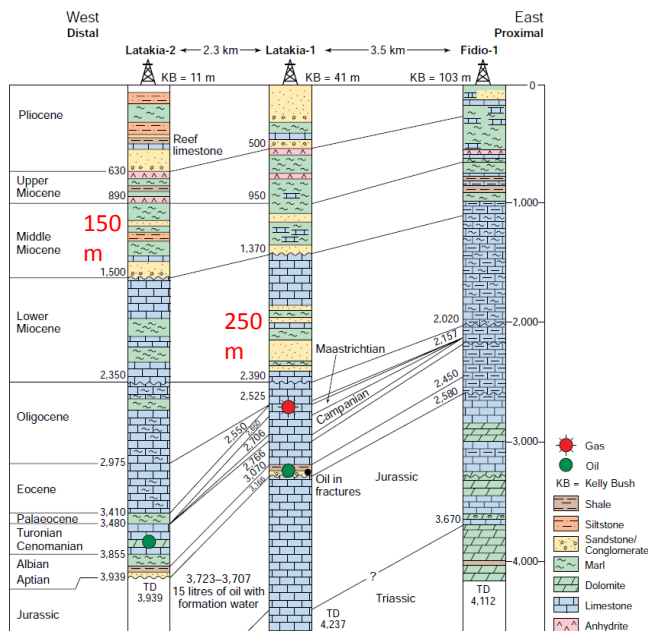
# DIVERSITY OF SEDIMENTARY PATHWAYS



# NATURE OF SEDIMENTARY PATHWAYS

❖ RMS amplitude extractions and spectral decomposition identify:

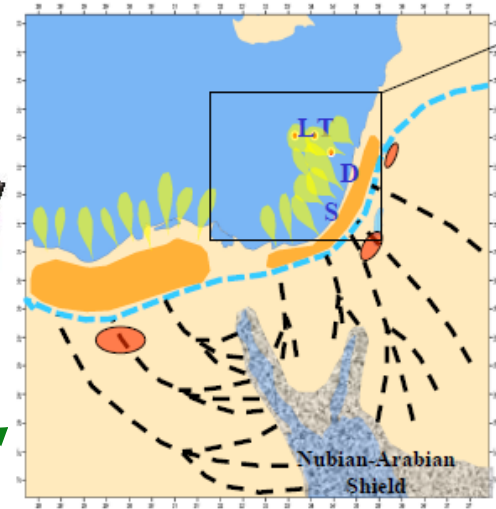
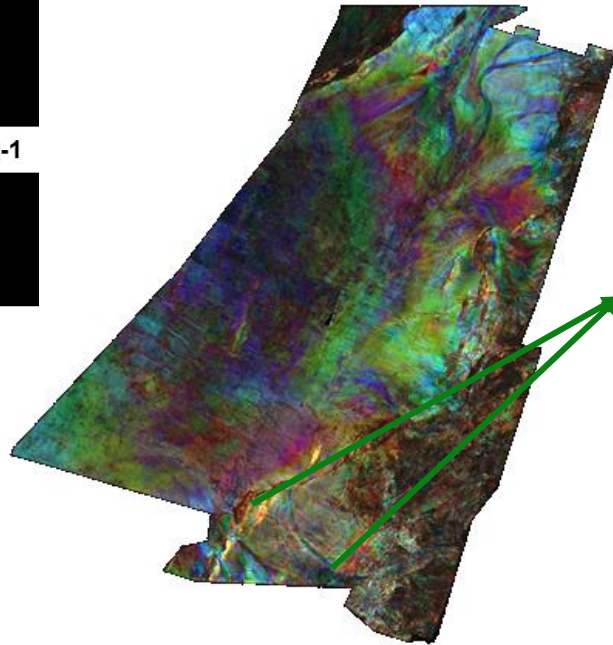
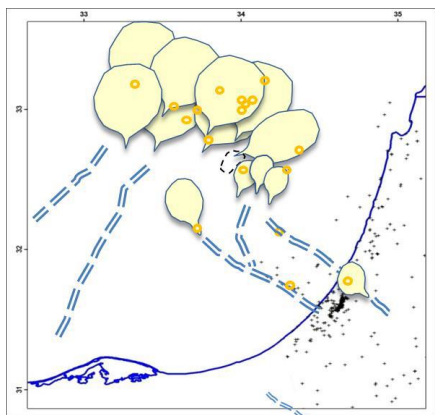
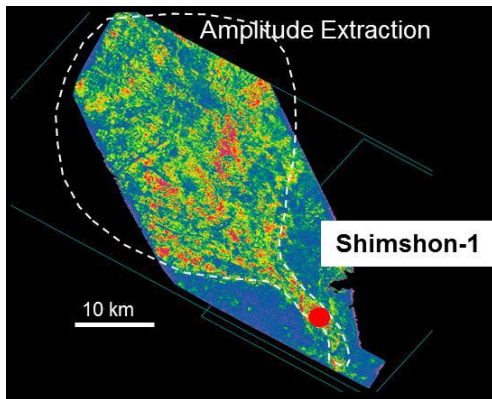
❖ North, North East and East West Source: Interpreted Miocene seismic packages of the Latakia and northern Lebanese offshore includes the presence of distal turbidite lobes and channels.



# NATURE OF SEDIMENTARY PATHWAYS

❖ RMS amplitude extractions and spectral decomposition identify:

- ❖ North, North East and East West Source: Interpreted Miocene seismic packages of the Latakia and northern Lebanese offshore includes the presence of distal turbidite lobes and channels.
- ❖ South and South Eastern Source: The 'Tamar' Sands were deposited in a series submarine ,turbidite lobes and fans. The source of the coarse grained strata is from the Levant margin to the SE and the Nile drainage system to the SW.



Porosity:

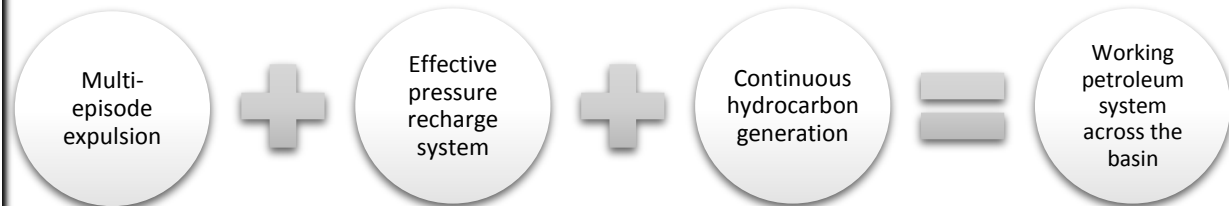
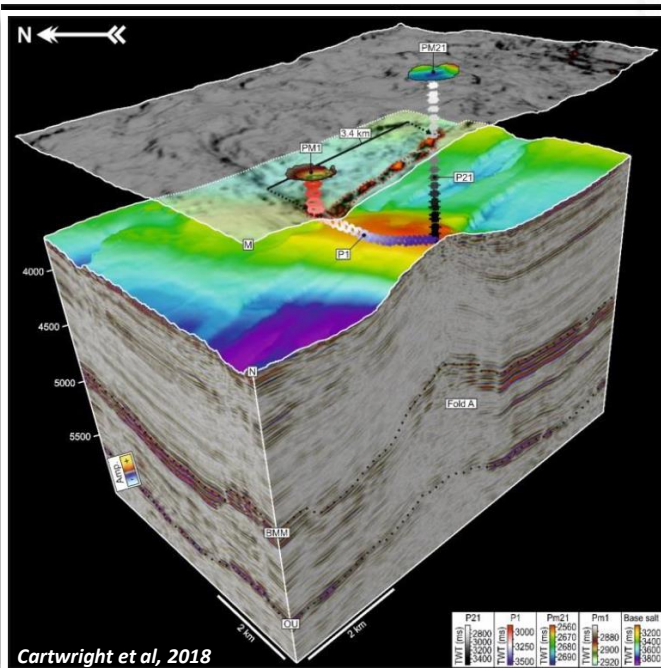
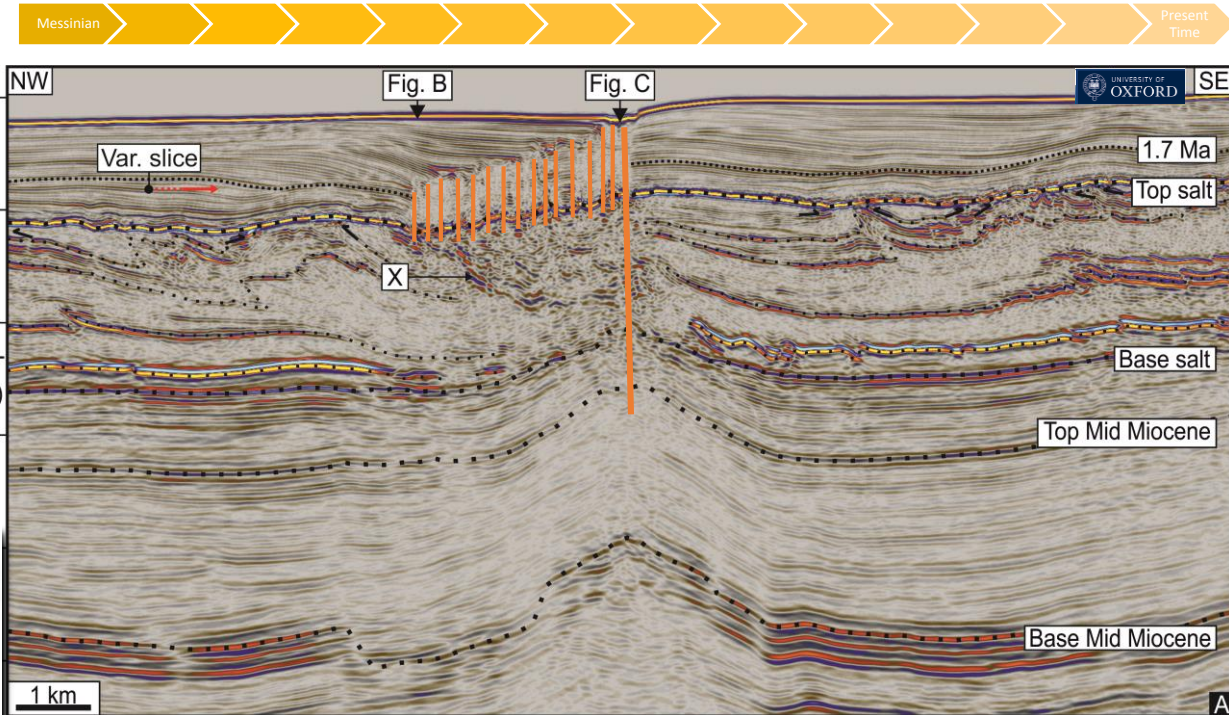
- Karish
  - A. 15.1 %
  - B. 19.5 %
  - C. 19.8 %
  - D. 17.6 %

• Karish N  
Reported high  
quality reservoir  
in B & C sands

**2 km from  
Lebanese  
border!**

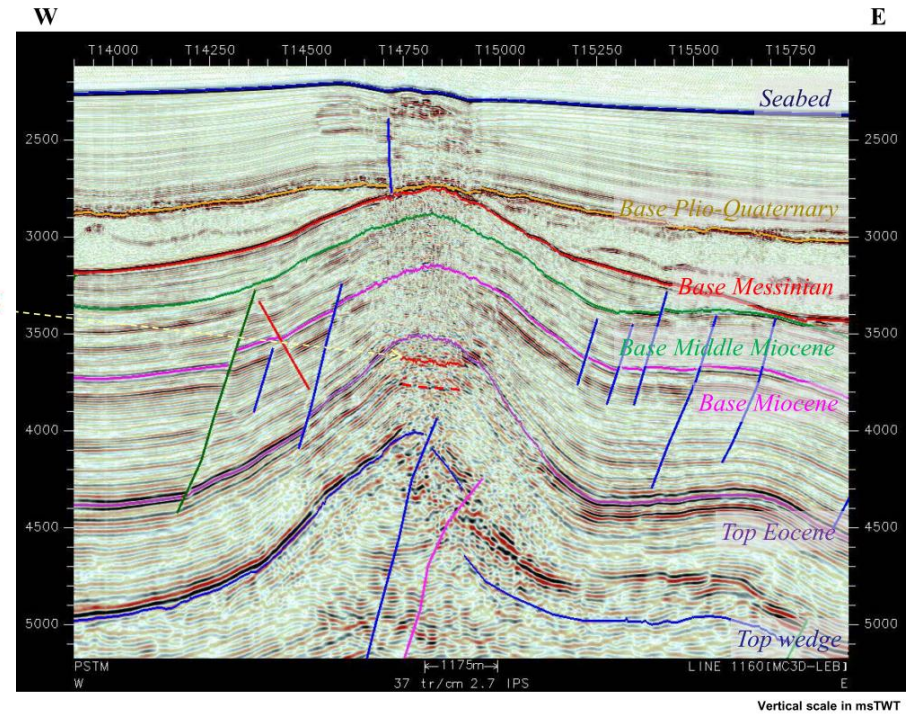
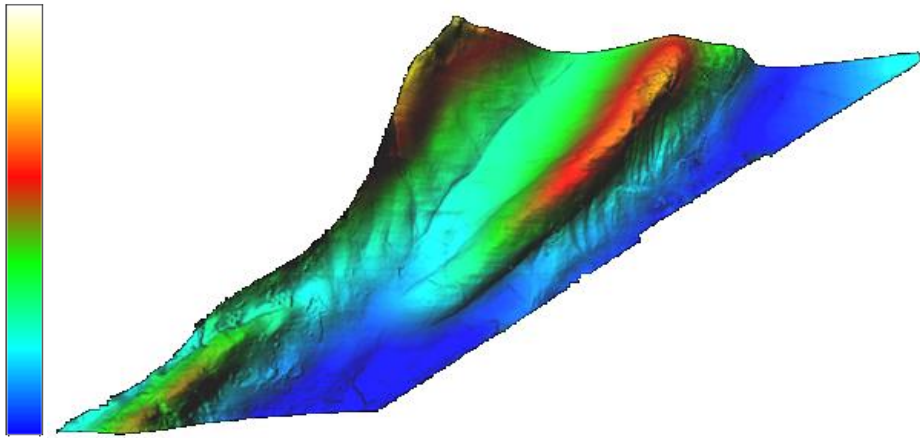
# WORKING PETROLEUM SYSTEM ACROSS THE BASIN

- ❖ Trail of 21 pipes and pockmarks.
- ❖ First pockmark is dated at 1.7 Ma.
- ❖ Reservoir pressure charged to fracture gradient 21 times.



# OPEN BLOCKS PROSPECTIVITY

## ❖ Block 1



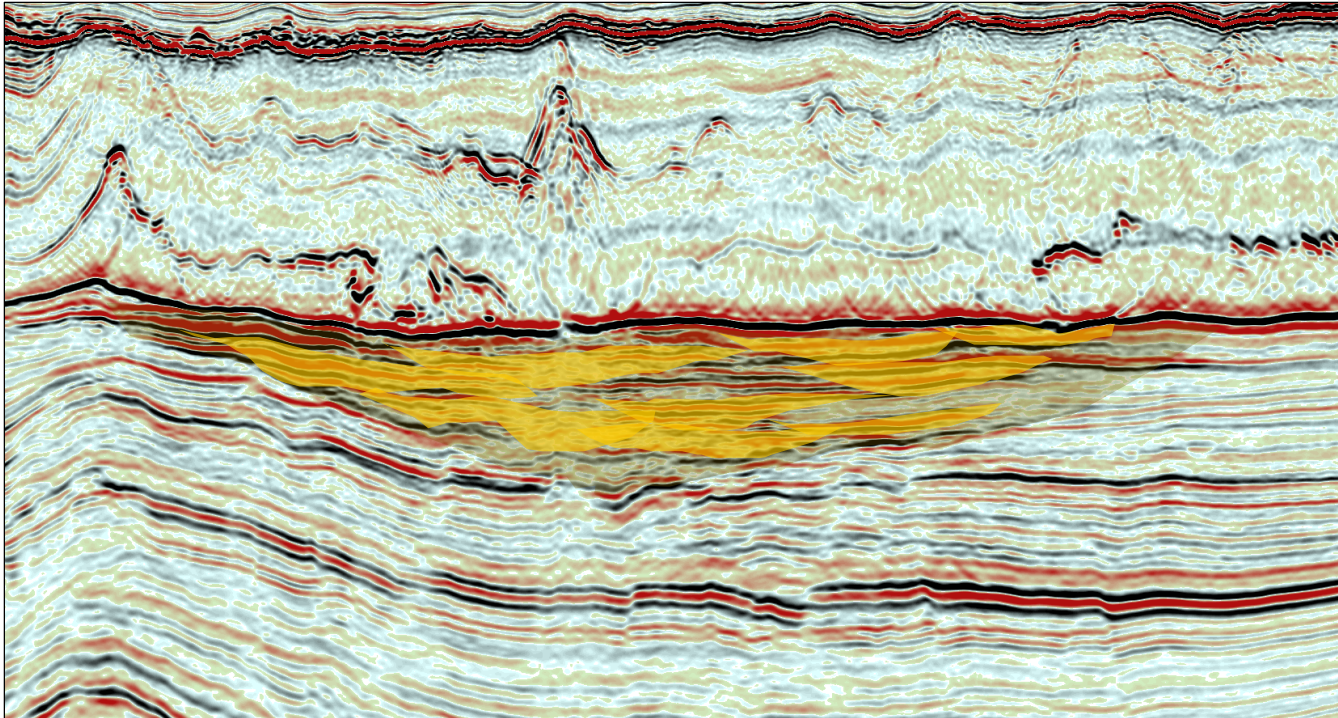
- ❖ Long NE trending anticline
- ❖ Vertical stacked prospects
- ❖ Symmetrical closure





# OPEN BLOCKS PROSPECTIVITY

- ❖ Block 1 and 2



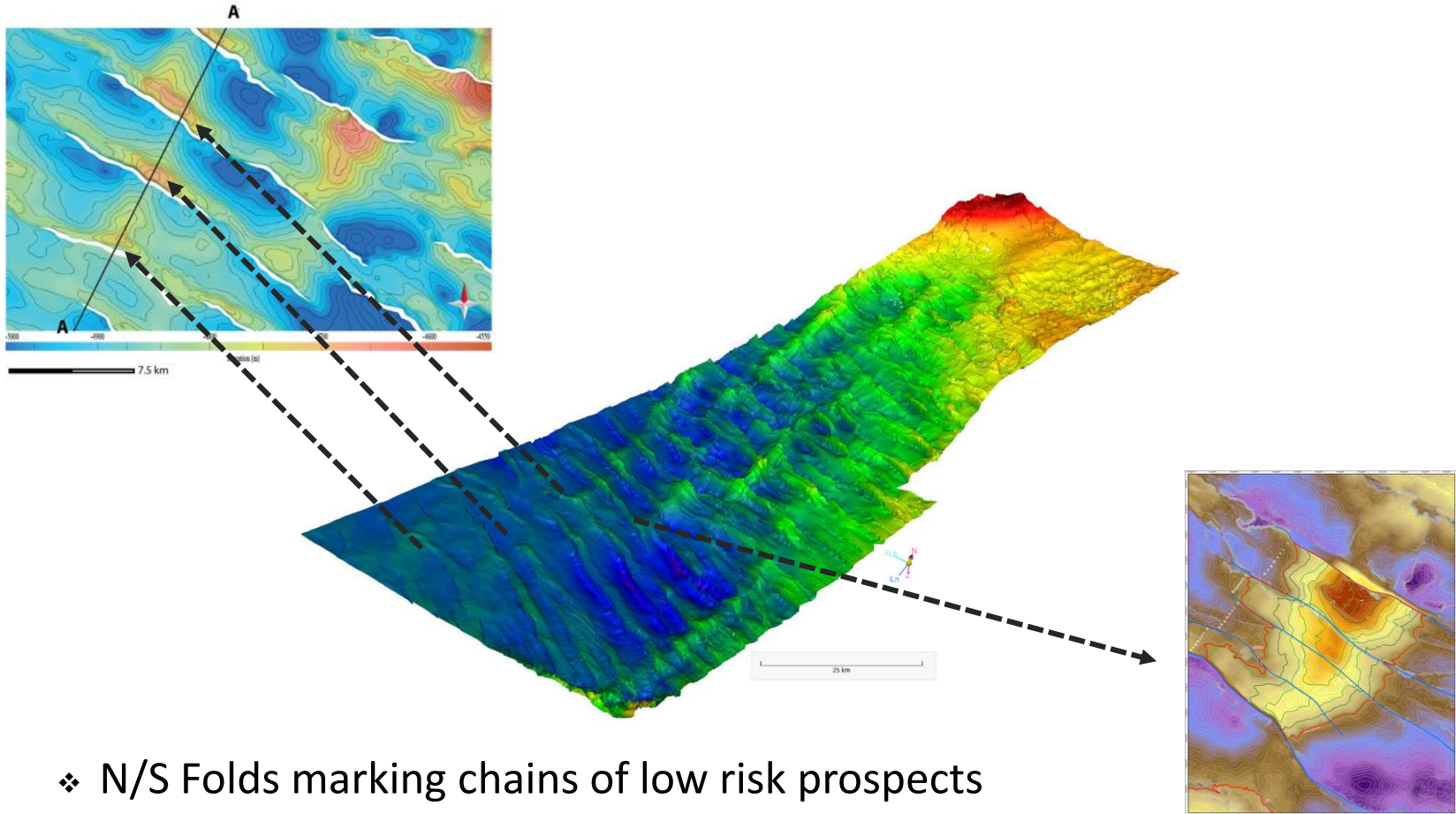
*PGS*

- ❖ Pre salt fan geometry
- ❖ Schematic sand packages within the fan system
- ❖ Stratigraphic potential



# OPEN BLOCKS PROSPECTIVITY

## ❖ Block 5 and 8

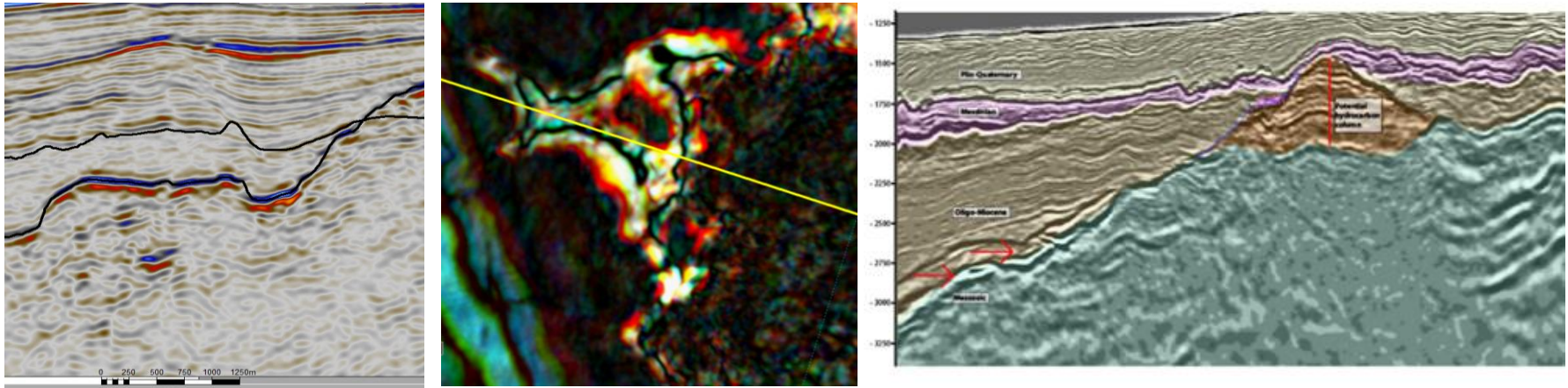


- ❖ N/S Folds marking chains of low risk prospects
- ❖ Continuously charged structures



# OPEN BLOCKS PROSPECTIVITY

## ❖ Block 2 and 10



- ❖ Seismic profiles indicate the presence of carbonate platforms and encouraging buildups of the same nature
- ❖ Interesting targets for future exploration activities

# VIRTUAL DATA ROOM



- Accessible through a Web Browser
- 24 / 7 Access
- 3,200 km of 2D Seismic Data Available
- Actual SEG – Y Viewing
- Integrated Seismic Interpretation Tool
- Technical Documents & Presentations Available
- Framework GIS Geopackage Available

**Showcased at our Booth – Stand 15**



# **RESULTS OF THE 1<sup>ST</sup> OFFSHORE LICENSING ROUND**



# THE FIRST LICENSING ROUND RESULTED IN THE AWARD OF BLOCKS 4 AND 9 IN DEC. 2017

## Technical Offer

4200 –  
4400 m

Depth of  
exploration  
wells

2 wells  
per  
Block

Minimum no.  
of exploration  
wells

2020

Date of first  
drilling

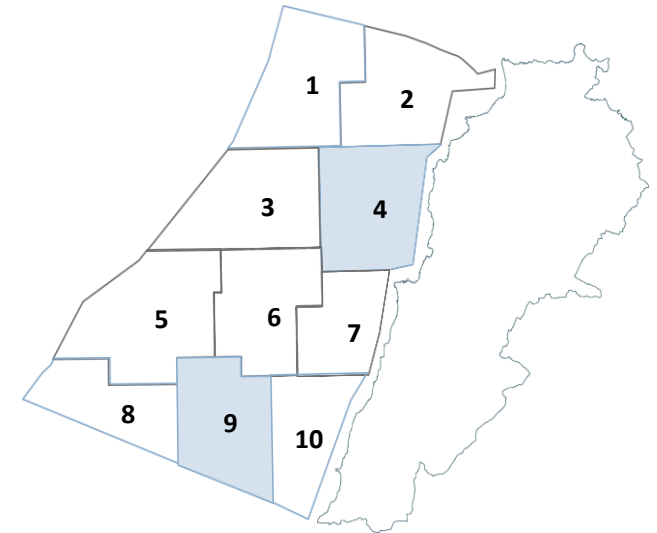
## Total Government Take %

65%  
71%

Block 4

55%  
63%

Block 9



## Participating Interests



40%



40%



20%

## Commercial Offer

# COMPLETED, ONGOING AND PLANNED OPERATIONS IN BLOCKS 4 AND 9

2018

- Signature of EPAs ✓
- Approval of Exploration Plans ✓
- Seismic Data Reprocessing ✓
- G&G Studies and Prospect Maturation ✓

2019

- Designation and Preparation of the Supply Base ✓
- Well Engineering, Equipment Procurement and Well Location (Block 4) ✓
- Rig and Service Contracts (Block 4) ✓
- Approval of Application of Drilling Permit (Block 4) ✓

2020

- HSE Permitting (EIA, ESBS) (Block 4) ✓
- Drilling in Block 4 (Feb 2020)



# COMPLETED, ONGOING AND PLANNED OPERATIONS IN BLOCKS 4 AND 9

2020

- **Assessment of Results of First Well (Block 4)**
- **Prospect Maturation (Block 9)**
- **Rig and Service Contracts (Block 9)**
- **Well Engineering, Equipment Procurement and Well Location (Block 9)**
- **Approval of Application of Drilling Permit (Block 9)**
- **Approval of EIA (Block 9)**
- **Drilling in Block 9 (Q4 2020 *exp.*)**

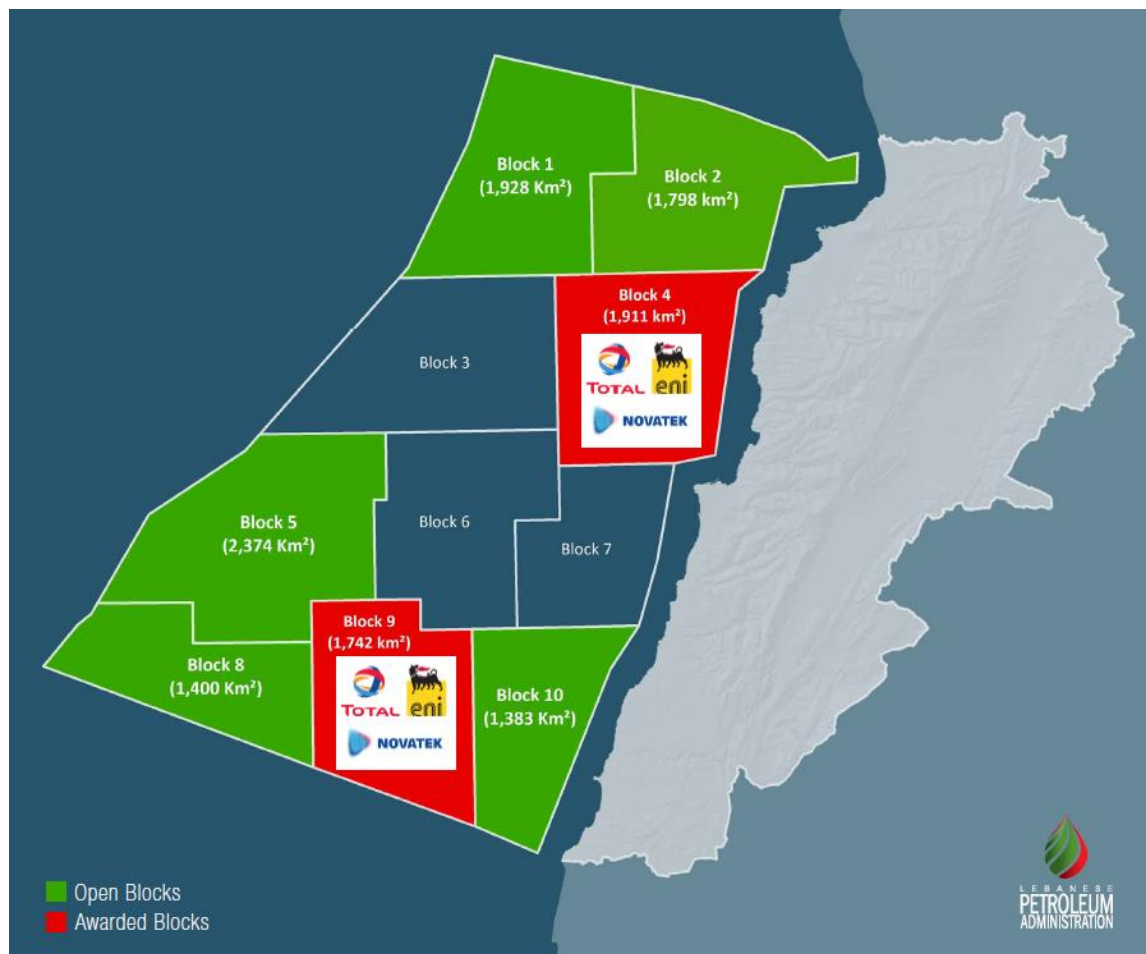


# 2<sup>ND</sup> OFFSHORE LICENSING ROUND



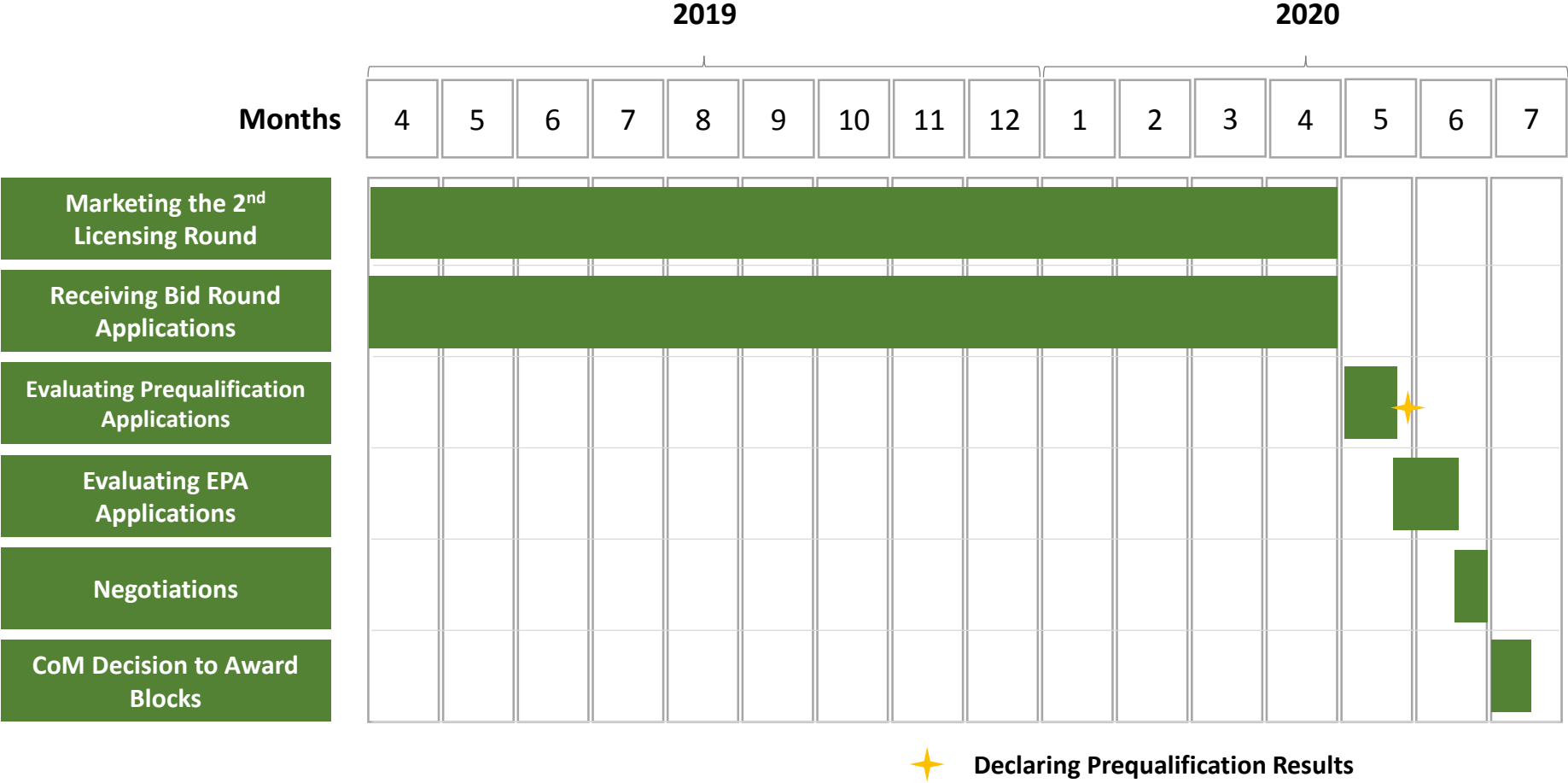
# OPEN BLOCKS OF THE 2ND OFFSHORE LICENSING ROUND IN LEBANON

Five blocks are open for bidding



Water Depth Ranges from: 33 to 2,119 meters

# BID ROUND TIMELINE



**The deadline for submitting Bid Round Applications is 30 April 2020.**



# ELIGIBILITY CRITERIA: OPERATOR

An Applicant shall be composed of **no fewer than 3 prequalified companies** of which:

- **1** prequalified as a Right Holder-Operator holding a **minimum (35%) participating interest** and,
- **At least 2** prequalified as Right Holder – Operator or a Right Holder – Non Operator holding a **minimum of (10%) participating interest**.

## PREQUALIFICATION CRITERIA: **RIGHT HOLDER - OPERATOR**

### Legal

- Joint stock company conducting Petroleum Activities

### Financial

- Total assets of USD 10 Billion or more

### Technical

- Experience in exploration drilling in water depths >300m
- With an approved field development plan in water depths >300 m by a competent authority
- With at least one offshore field in the production phase

### QHSE

- Established & implemented QHSEMS

# ELIGIBILITY CRITERIA: NON-OPERATOR

## PREQUALIFICATION CRITERIA: **RIGHT HOLDER – NON-OPERATORS**

### Legal

- Joint stock company conducting Petroleum Activities

### Financial

- Total assets of USD 500 Million or more

### Technical

- Experience in petroleum production

### QHSE

- Established & implemented QHSEMS

# CONDITIONS ON BIDDING FOR BLOCKS

## Sealed Envelope

- (Authorized Representative)
- Copy of Power of Attorney
- Copy of Authorized Representative identification documents

## Lebanon Second Licensing Round Application

Application Number \_\_\_\_\_

Block Bid for \_\_\_\_\_

### Prequalification Application Package

Administrative Materials  
(envelope)

Operator  
Prequalification  
Materials  
(envelope)

Non-Operator  
Prequalification  
Materials  
(envelope)

Non-Operator  
Prequalification  
Materials  
(envelope)

Non-Operator  
Prequalification  
Materials  
(envelope)

### EPA Application Package

Applicant  
Bid Bond

Applicant  
Technical Proposal

Applicant  
Commercial Proposal

## Bidding Conditions

- Applicants are allowed to bid for any or all opened Blocks, and **any given Applicant or Operator may only be awarded a maximum of two (2) Blocks.**
- If an Individual Company is part of an Applicant for any given Block, neither it nor any of its Affiliates may be part of another Applicant bidding for the same Block.
- No Individual Company may join any of its Affiliates within the same Applicant.

Each Bid Bond will be in the amount of US\$5,000,000 or €5,000,000 per Applicant per Block

# TENDER PROTOCOL: TECHNICAL EVALUATION

## Technical Grading Criteria (20 marks):

Number of committed exploration wells (N) in the First exploration period.

$$\begin{aligned} \text{Technical Mark} \\ &= \frac{N - 1}{N_{\max} - 1} \times 20 \end{aligned}$$

**If N = 1**

Technical Mark= 0

**If N = N<sub>max</sub>**

**(given N<sub>max</sub> > 1)**

Technical Mark= 20

**All other Technical Marks are pro-rated.**

- If N ≥ 3, the first exploration period is extended one additional year

# TENDER PROTOCOL: COMMERCIAL EVALUATION

## Commercial Grading Criteria (80 marks):

Discounted Average Total Government Take (TGT) under predefined scenarios.

Commercial Mark

$$= \frac{TGT - TGT_{min}}{TGT_{max} - TGT_{min}} \times 80$$

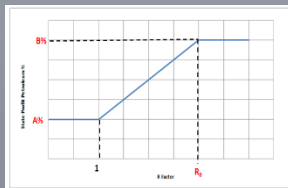
**If  $TGT = TGT_{min}$**

**Commercial Mark= 0**

**TGT<sub>min</sub>** is the average discounted Total Government Take (calculated based on the predefined scenarios) where:

A = B = 30%

CP = 65%



**If  $TGT = TGT_{max}$**

**Commercial Mark= 80**

**TGT<sub>max</sub>** is the highest average discounted Total Government Take (calculated based on the predefined scenarios) among all commercial bids received in a given block.

**All other Commercial Marks are pro-rated.**

- $\$TGT = \text{Royalty} + \text{Gov. Share of Profit Petroleum} + \text{Taxes}$
- Predefined Scenarios: 3 field sizes / 3 price cases / 1 discount rate



# FURTHER QUESTIONS AND CLARIFICATIONS

## Further Questions/Clarifications

- Oil and Gas Companies are invited to register via email ([olr2@lpa.gov.lb](mailto:olr2@lpa.gov.lb)) to obtain a username and password which will allow them access to the **LPA Company Portal** and **LPA Virtual Data Room**.
- Geophysical data viewing request can be made via email: [datacenter@lpa.gov.lb](mailto:datacenter@lpa.gov.lb)
- The Tender Protocol for the 2<sup>nd</sup> offshore licensing round can be found at: [www.lpa.gov.lb/TP\\_LR2.php](http://www.lpa.gov.lb/TP_LR2.php).
- All such questions and requests may be submitted to the LPA by e-mail to [olr2@lpa.gov.lb](mailto:olr2@lpa.gov.lb) up until two (2) weeks prior to the Closing Date.
- The LPA website [www.lpa.gov.lb](http://www.lpa.gov.lb) contains additional information related to the Lebanese upstream oil and gas sector and the 2<sup>nd</sup> Offshore Licensing Round.
- Booth Number 15



**A:** Marfaa 200, First Floor, Georges Akouri Street, Down Town, Beirut , Lebanon

**W:** [www.lpa.gov.lb](http://www.lpa.gov.lb) **E:** [info@lpa.gov.lb](mailto:info@lpa.gov.lb) **T:** +961 1 998780