



# Exploration News

## ASPO June the 5th 2018

Marc Blaizot

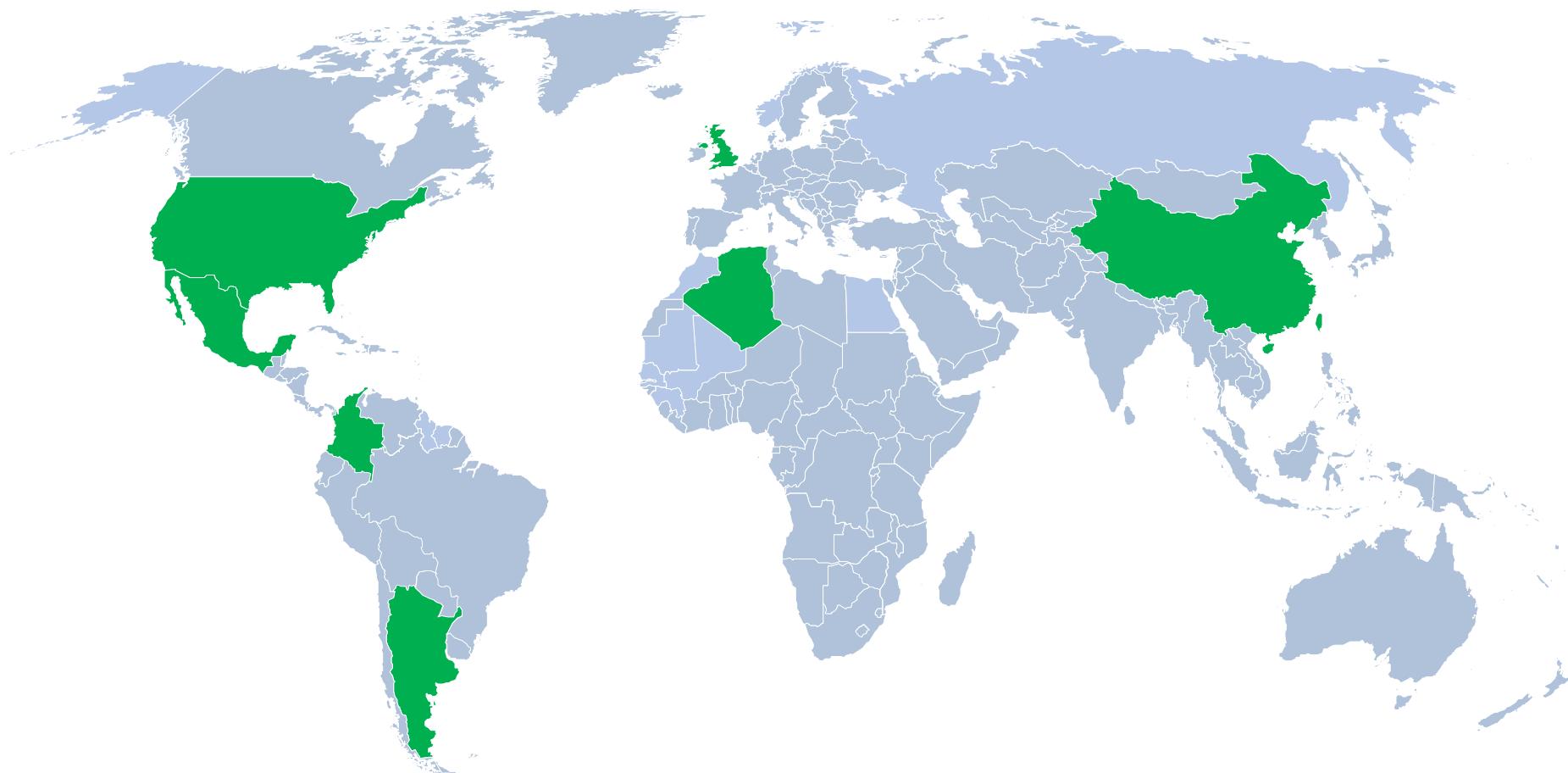
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# Highlights

- Unconventional LTO and shale gas
- Conventional Exploration
- New acreages

# UNCONVENTIONALS

## Exploration / Appraisal/Revisions



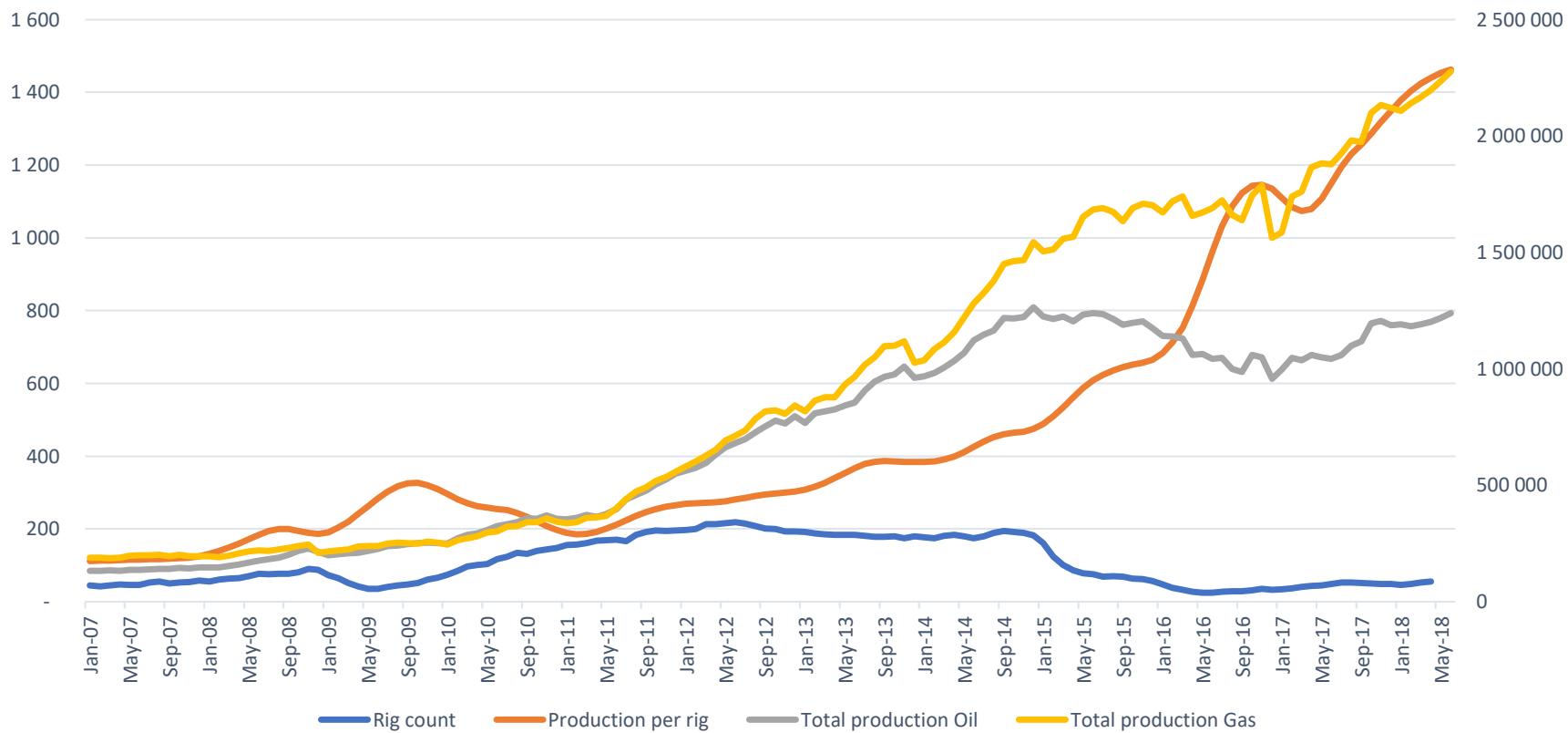
█ Résultats Puits positifs  
█ Résultats Puits négatifs



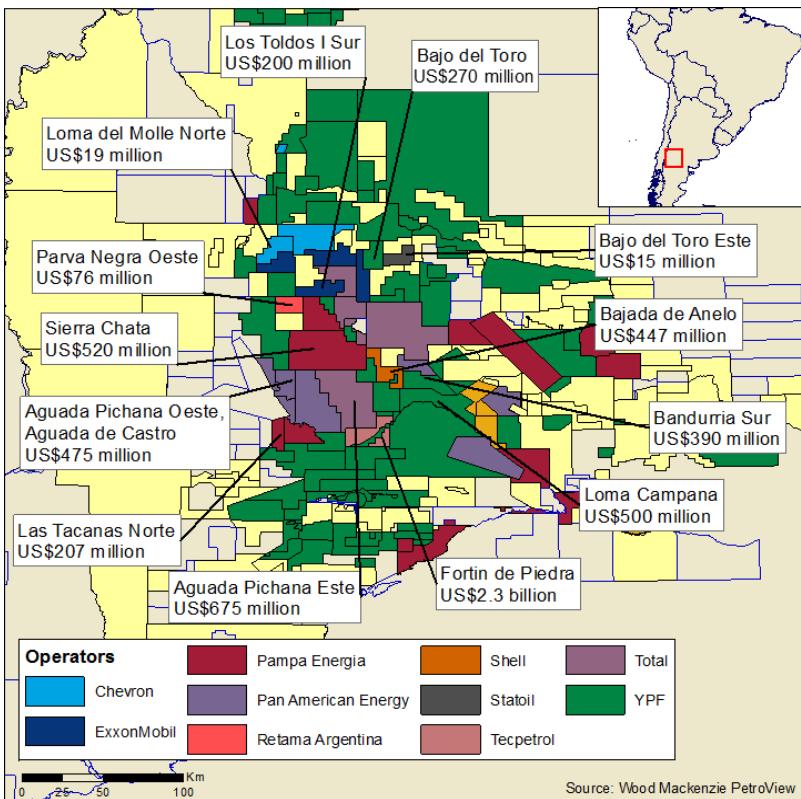
# US Shale gas and Oil

- LTO-US Production : close to 7 Mbopd (April 2018). Strong increase since one year particularly in Permian (2.2 to 3.1 Mbopd) and Niobrara (0.45 to 0.58 Mbopd)
- USGS : Revision on Haynesville/Bossier (U. Jurassic) shale gas EURR : 300 Tcf and 4 Gbo (onshore and shallow offshore) : 4 times higher than previous estimate thanks to production history,
- Apache : Alpine High in Delaware Basin (Texas) , EURR : 75 Tcf and 3 Gbo within the Barnett and Woodford Fm
- Bakken : strong increase of GOR ( from 100 to 250 m3/m3) since mid 2017 oil production resumption (back to 1 Mbopd)

## Recent (2017) Bakken LTO Production Resumption



# Argentina : Neuquen Basin (Vaca Muerta)



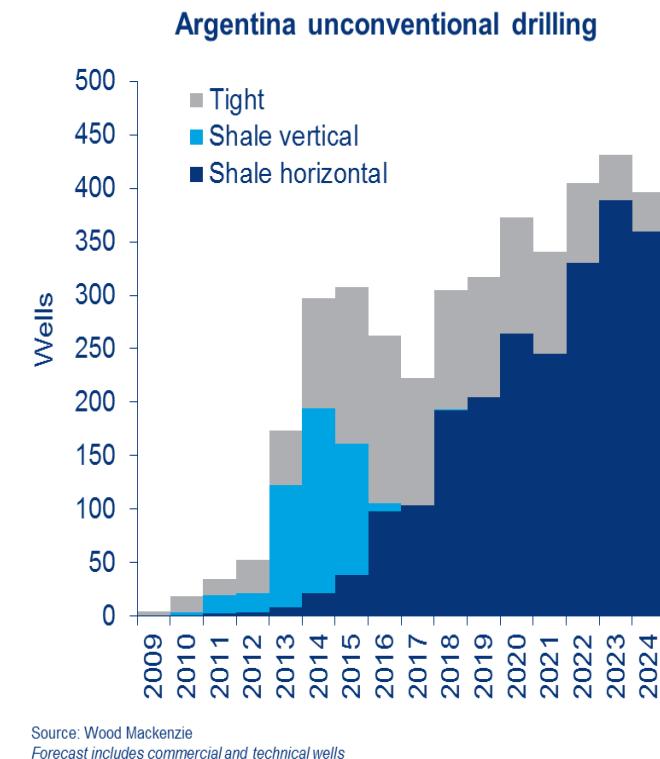
From US-EIA 2013 Report :

EURR : 16 Gbo and 545 Tcf

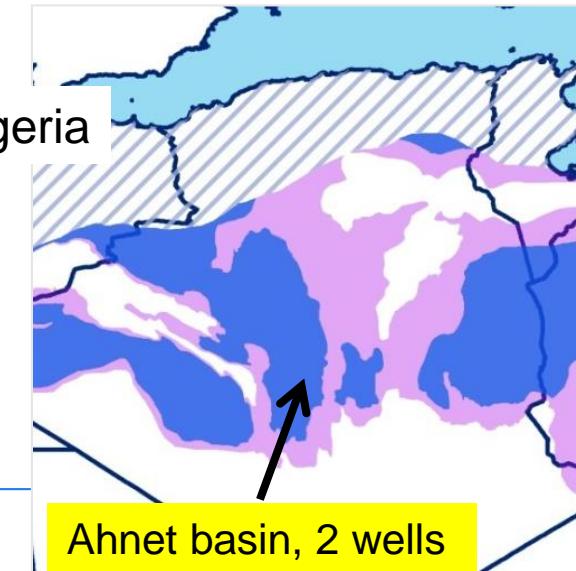
Completed : 600 v and H wells since 2010

Production : 0,7 to 1,3 Mboe/d en 2030

**Projects in progress :** Loma Campana YPF/Chevron; El Orejano : YPF/Dow; Fortin de Piedra : Tecpetrol; Aguada Pichana Este : TOTAL; Bajada de Anelo : Shell/YPF



# ALGERIA UNCONVENTIONAL / AHNET BASIN



## Frasnian shale gas pilot Project (Ahnet basin)

(Référence : EAGE-NAPEC-Oran-March 2018-Djamel Bekkouche)

### Results

1. 2 wells were drilled and tested the Frasnian (Upper Devonian) on a horizontal section (1 000 meters);
2. Well data supported by rock analysis indicate High Potential from Frasnian
  - 100 meters Net Pay, 5% TOC value,
  - 10% Porosity, 60% Clay Content
3. **Production, over a year**, showed interesting production, similar to the main plays US: single EUR between 8 and 10 BSCF gas (> to those encountered in the best US plays)

### Lessons learned

1. Commercial gas production is realized in Ahnet: Need for more pilot projects in the other basins.
2. Technology used in the US is applicable (sweet spot allocation, horizontal drilling, multi-frac).
3. Well cost is still high: Qualitative bound in drilling and fracking in terms of Costs and reduced times.
4. Big issue for logistic and equipment's: difficult for non-experienced companies to carry out such projects, mainly of the heavy invest, technology complexity and Supply chain management. **Need for a partnership with an experienced company**,

# Others unconventional highlights

**BAHRAIN** : 80 Gbo and 14 Tcf ! Location, figures remain a mystery !

**SAUDI ARABIA** : ARAMCO starting production in 2018 in the North TS (Phosphate plant) and **then in Jurassic SG in Jafurah Basin** (east of Ghawar) : 3 Bcf/d in 2028 ?

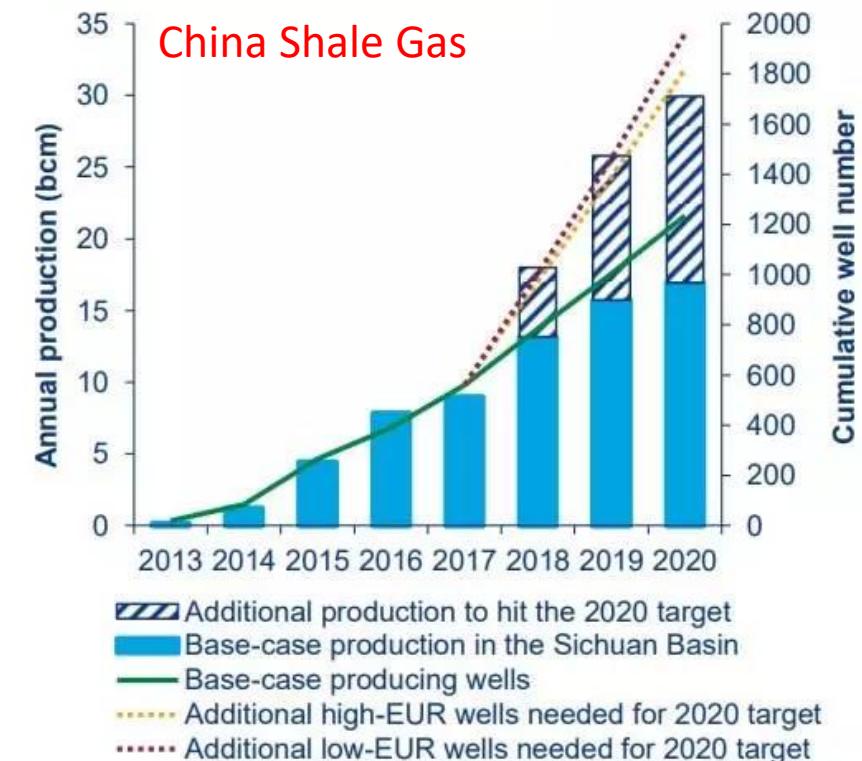
**MEXICO** : first round in Septembre 2018 : Burgos basin :Eagle Ford UC extension and UJ Pimienta Fm) , EIA 2013 report : 500 Tcf and 13 Gbo UERR

**COLOMBIA** : Magdalena Medio Cuenca : Cretaceous La Luna SR From Ecopetrol : 30 Gb in place (5Gb UERR)

**CHINA** : Ordovician-Silurian (graptolite radiolarian carbonic shales; 3 % TOC) shale gas production in 2017 : 9 Bcm from SINOPEC Fuling and PetroChina Changning fields ( Sichuan), 17 Bcm in 2020 ? , China's future unconventional O&G meeting : September 2018

**UK** : Cuadrilla successfully completed drilling the UK's first ever horizontal SG well at Preston New Road in Lancashire in Lower Bowland shale, TD: 2,700 metres 800 metres lateral drain, 4 wells

Our base case outlook forecasts 17 bcm production in 2020



Source: Wood Mackenzie

# Fuling SG Field (Sichuan Basin)

Marine Silurian Longmaxi Fm.

Porosity : 5 %/ TOC : 4 % excellent correlation between TOC and Phi.

Vro equiv, : 2,7 !

dry gas ; No H2S

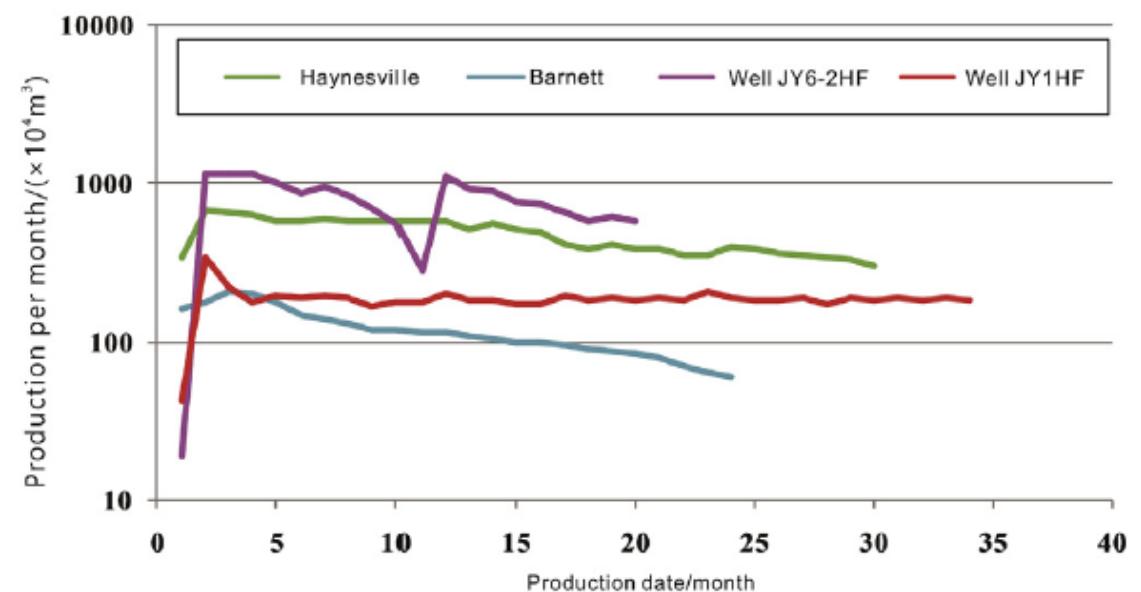
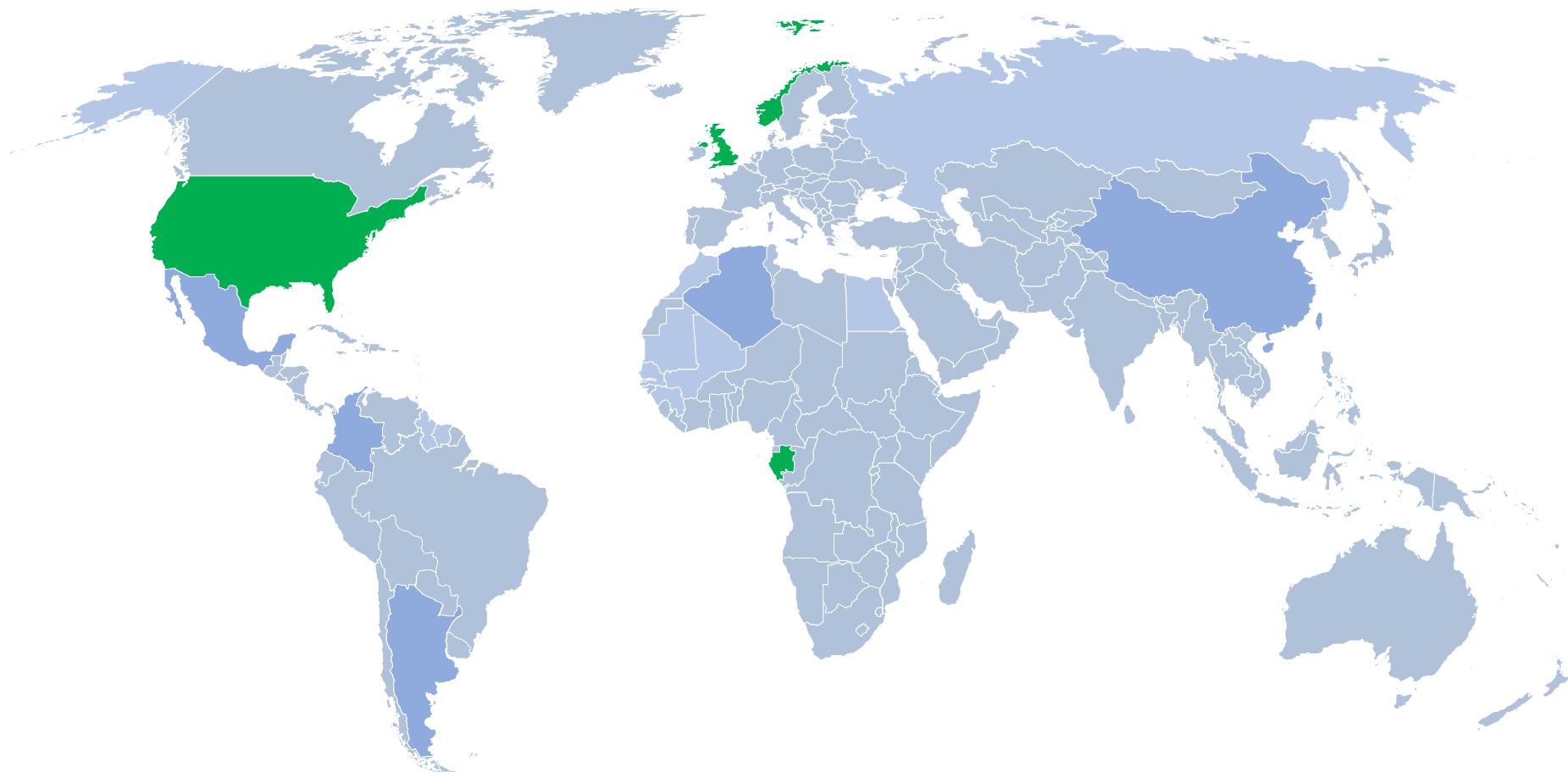


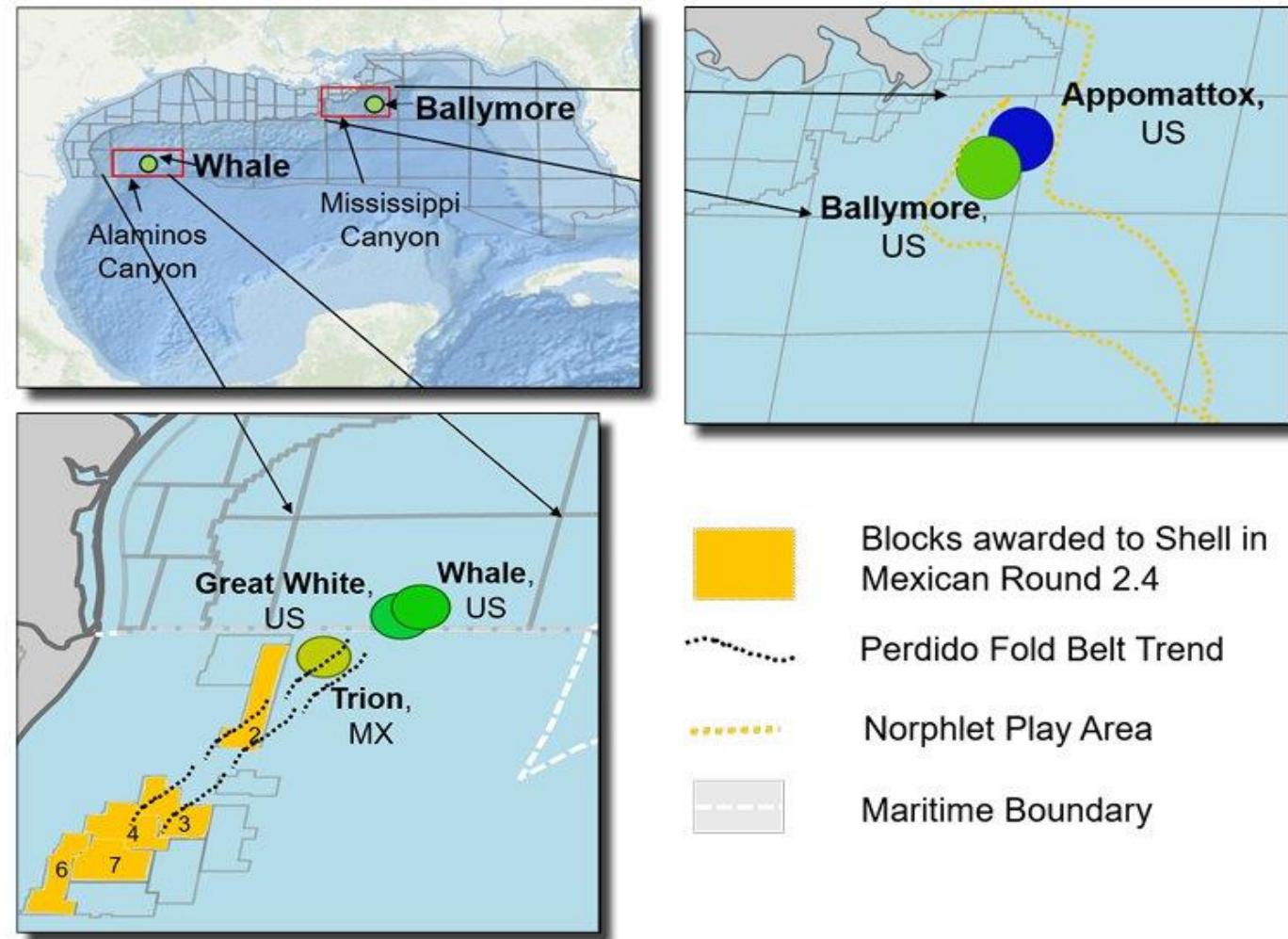
Fig. 9. Comparisons of the production curves between wells in the Fuling Shale Gas Field and in typical shale gas wells in North America.

**CONVENTIONAL**  
Exploration / Appraisal/Revisions



# Gulf of Mexico (US discoveries and Mexico Round)

2 poles of discoveries in 2018  
East : Norphlett  
West : Perdido

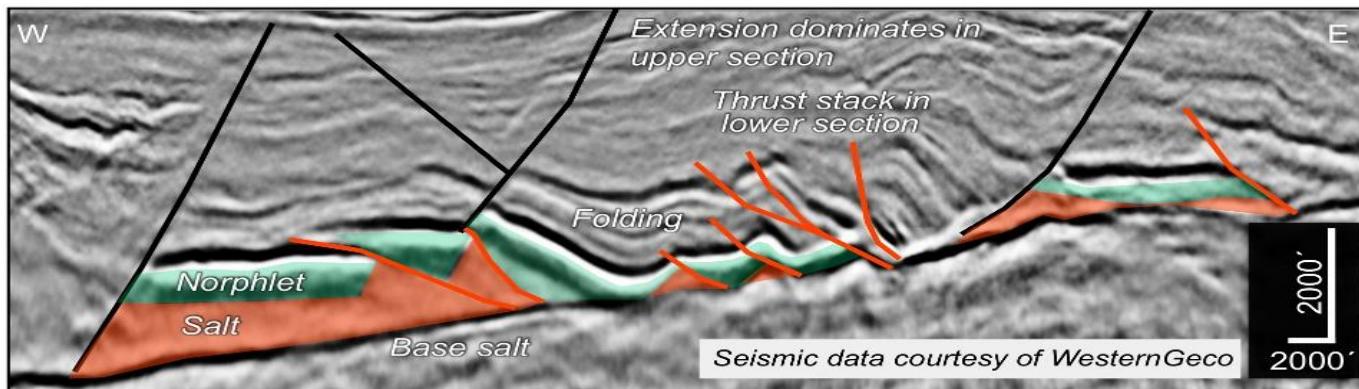


# Gulf of Mexico (US) : East

2 new discoveries in eolian U. Jurassic Norphlett:

**Ballymore** (Chevron-TOTAL): WD : 2000 m-TD : 8900 m- 220 m net oil pay; 5 km from Blind Faith platform, Size : biggest TOTAL discovery ?

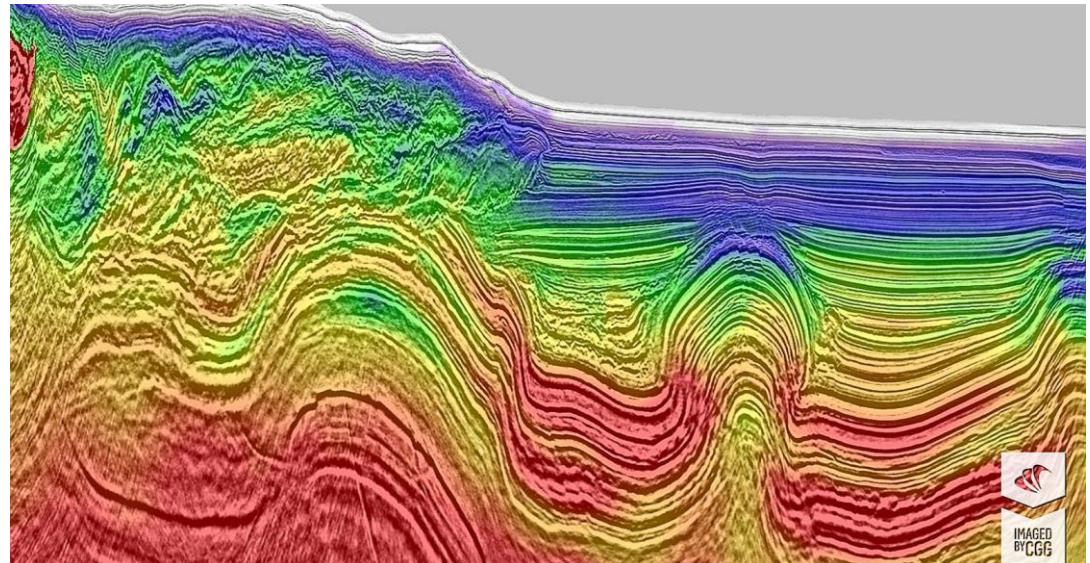
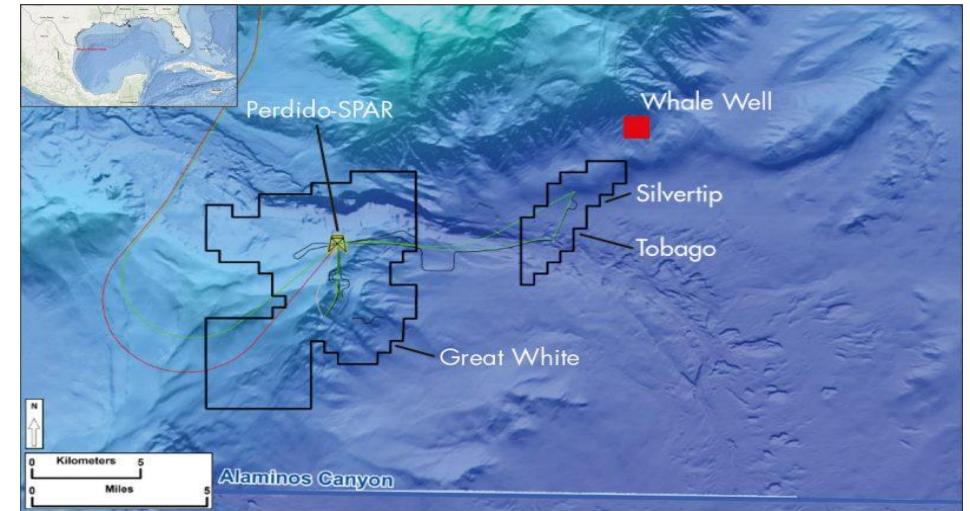
**Dover** (Shell) : 250 m net oil pay  
20 km from Appomatox (development in progress/ FO 2019 at 175 Kboepd)



# Gulf of Mexico : West : Perdido FTBelt

**Whale** (Shell-Chevron) 15 km from Perdido platform ; 430 m oil pay in Paleogene Turbidites ? Sources indicated a 700 Mbo reserves !

**Discovery kept confidential !** announcement after Mexico bid Sales ! (see later)

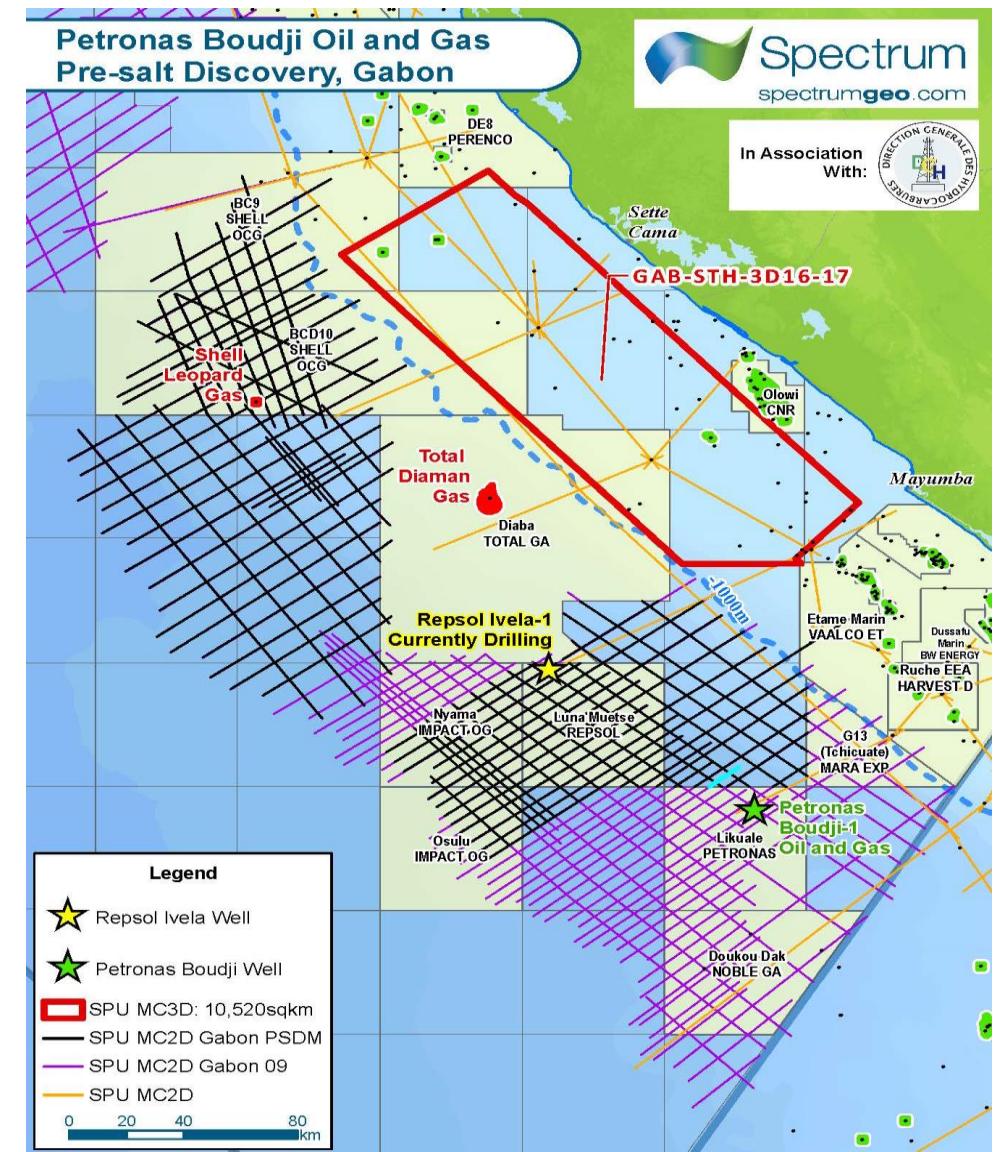


# GABON PRESALT DISCOVERIES (March 2018)

**PETRONAS- F14 Block-Boudji well**  
Discovery- WD : 2800 m, TD : 5500 m  
90 m Hydrocarbon bearing sands

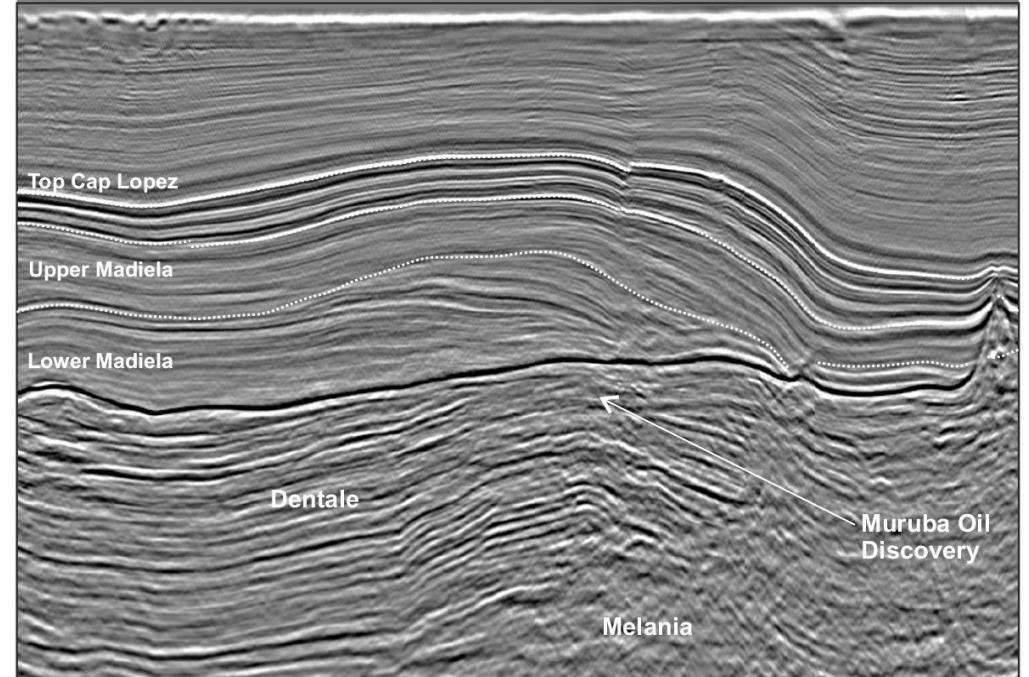
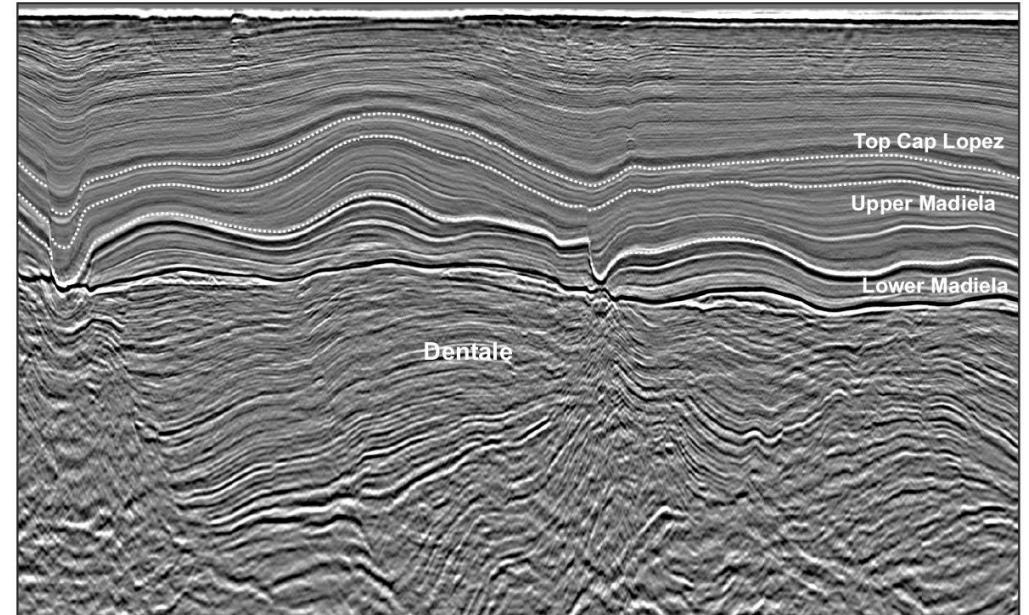
Which fluid ? Gas as Diaman (TOTAL 2013) and Leopard (Shell 2014) ?

**Repsol E 13block : Ivela Well**  
encountered a 80 m gross oil column



# GABON PRESALT DISCOVERY

Image on the right: Spectrum South Gabon 3D PSTM showing similar structures, related to fault block rotation, to the Boudji-1 structure (top) and first ever full imaging of the pre-salt structure at the Muruba oil discovery made inboard in shallow water (bottom).



# 2018 North and Norwegian Seas Discoveries after UK and Norway hitting a 45 years low exploration programs in 2017

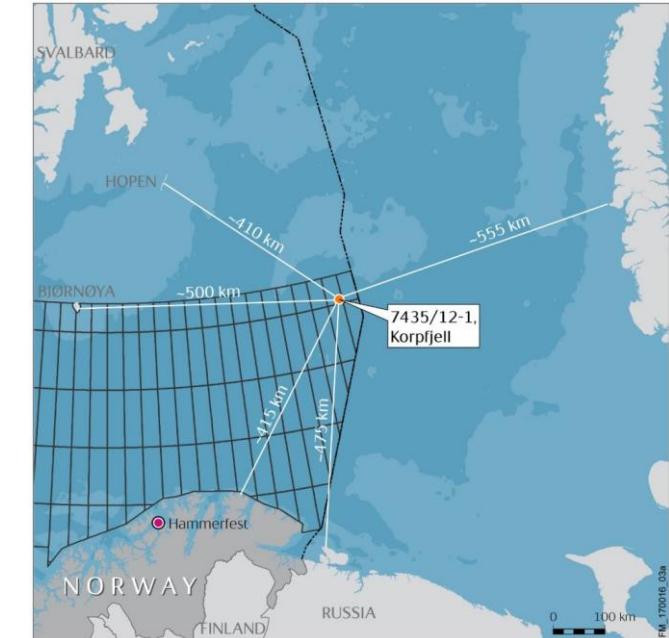
## According to British O&G UK body

Only 94 wells in 2017 (lowest since 1973)

350 Mboe discovered against 600 Mboe produced

According to NPD :Only 36 explo wells in 2017 in Norway

**Strog disappointments at Korpjell well (7435/12-1) by Equinor (Statoil) in Barents Sea S.East : minor amount of gas (50 Mboe)**

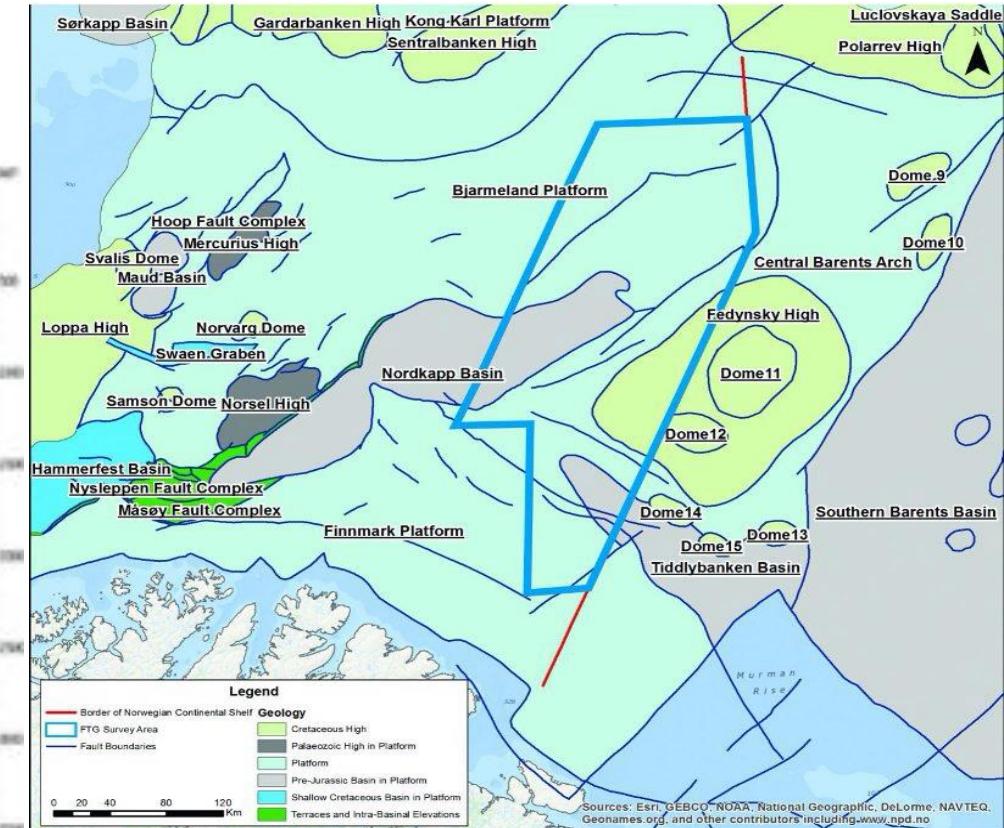
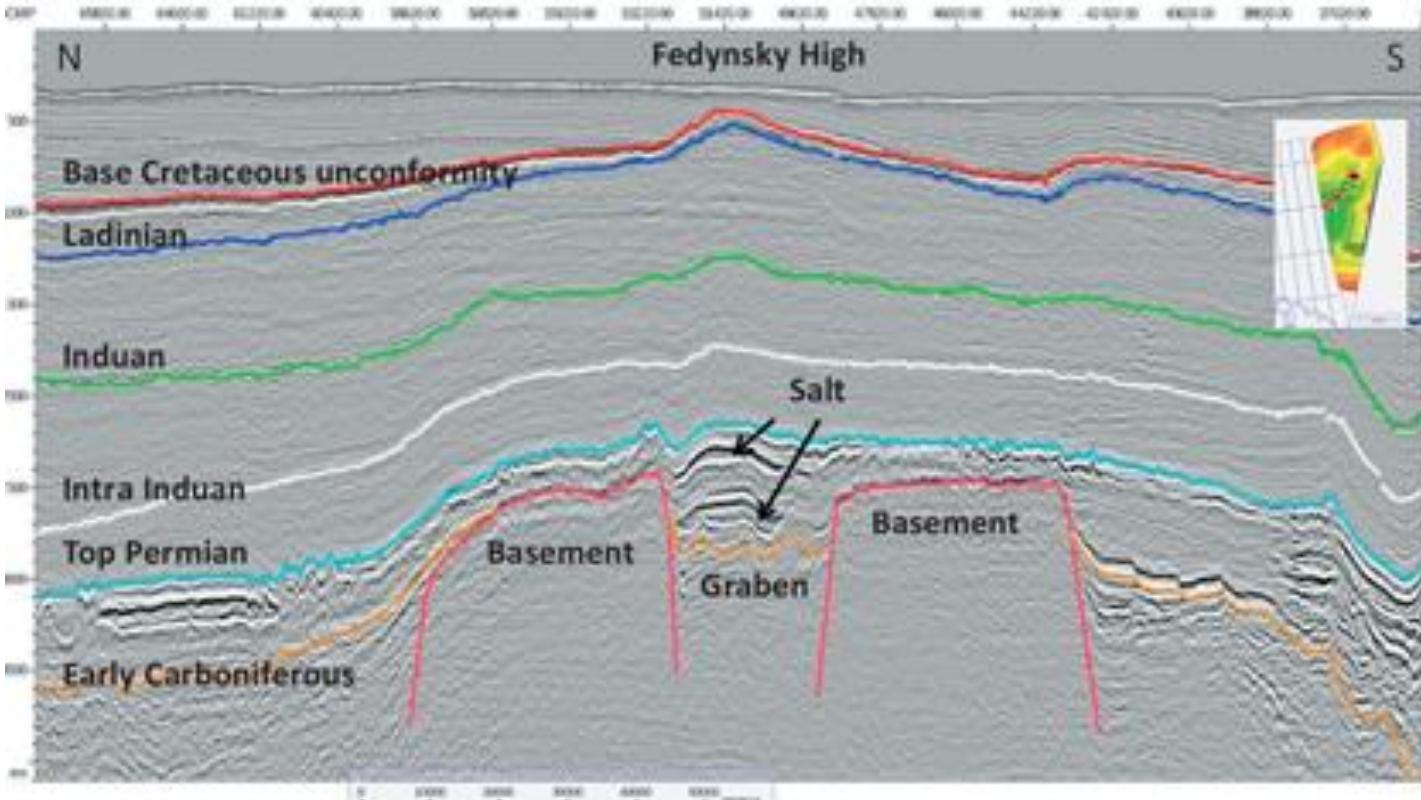


OMV-Faroes Haltenbanken well 6506/11-10 O1G discoveries in both Cretaceous and Jurassic 50 to 250 Mboe to be appraised (prospect known since ...2008 !)

Bp-Shell : West of Shetlands well 206/9b well Almelvich : oil in Mesozoic reservoir at 2400 m TD,

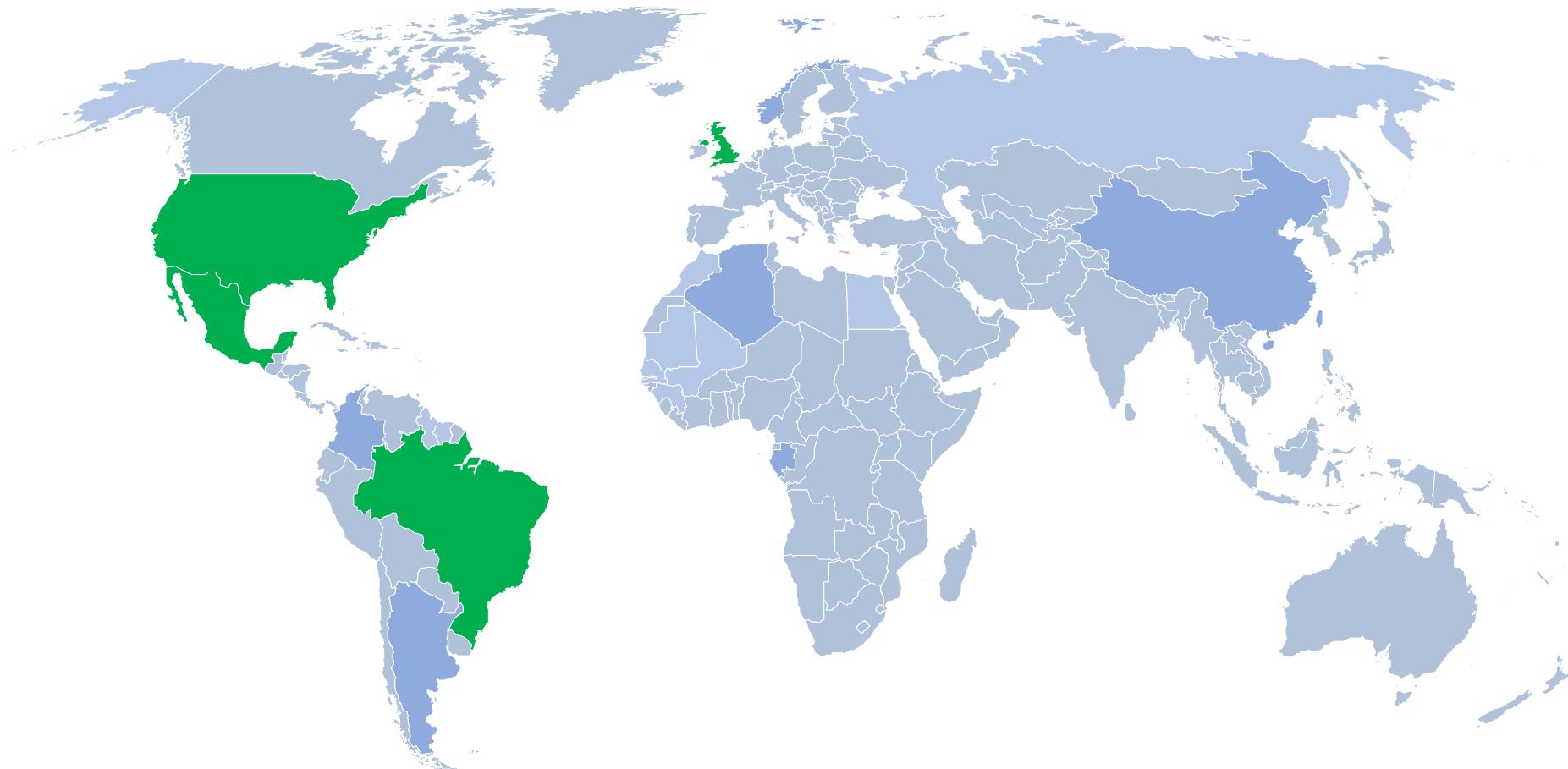
Bp- Central North Sea : 29/4<sup>e</sup> block : light oil in Paleocene-Cretaceous at 3800 m TD,

# NORWAY/RUSSIA : FEDYNSKY HIGH : the largest UNDRILLED STRUCTURE IN EUROPE : 15000 km<sup>2</sup> : 4/5 in Russian waters (Rosneft-ENI permit)



# NEW ACREAGES

## Exploration



█ Résultats Puits positifs  
█ Résultats Puits négatifs



# Central and Eastern GOM – US -21-03-2018- Sale 250-

125 M\$ for 148 leases

33 participants

Maxi water depth : 3400 m

Main offers on Norphlett area south of Appomatox

# Mexico Auctions (1)

**Deep offshore Gulf : 31-01-2018)**

Successful : 19 blocks obtained for 525  
M\$ with 23 wells commited

**Shell** large winner (and buyer) : 9 blocks  
for 423 M\$ : 5 (block 2,3,4,6 and 7) in  
Perdido ! 4 (20,21,23 and 28 ) in Salina

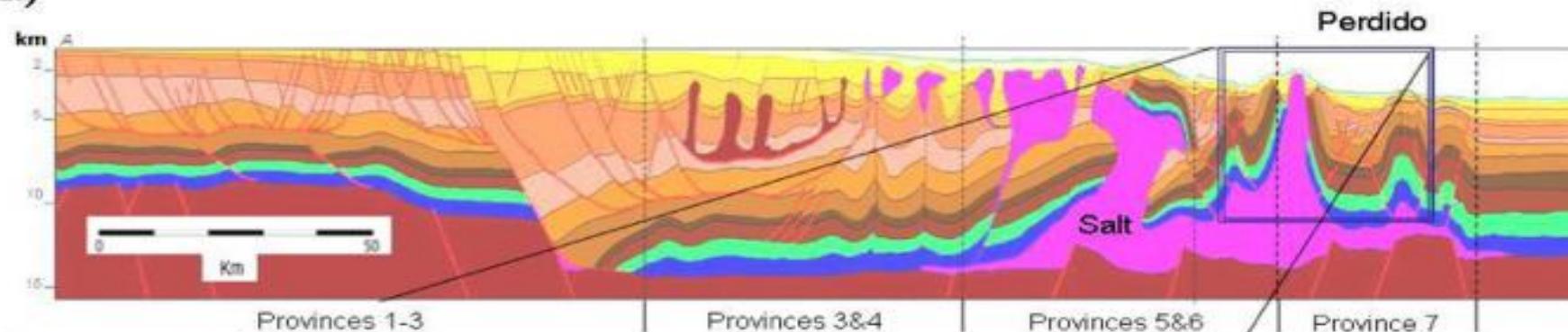
Repsol wins blocks 10,14,29,

ENI : block 24.

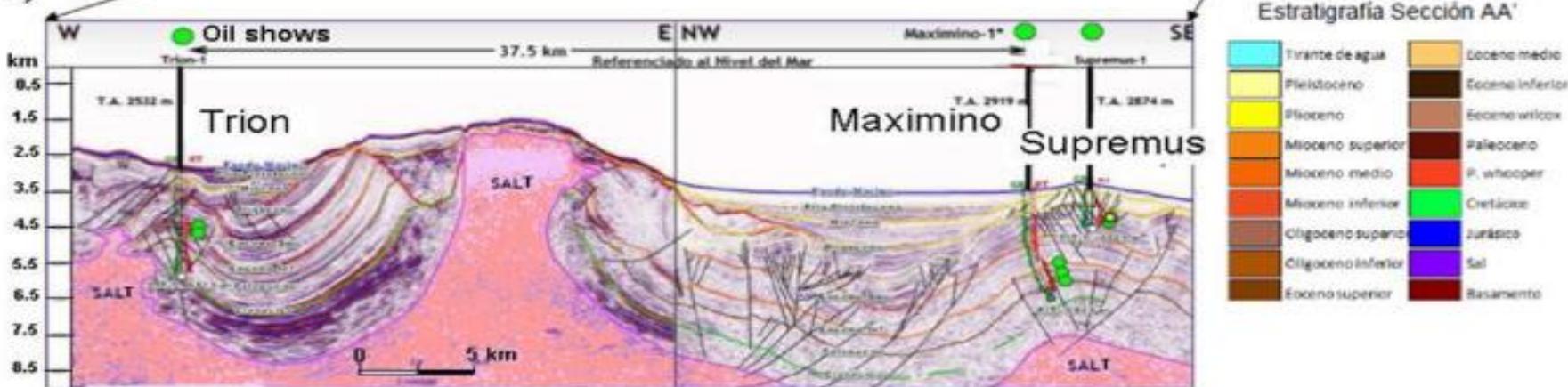


# MEXICO PERDIDO FT Belt

a)



b)



# MEXICO Auctions (2<sup>nd</sup>)

**Shallow waters Round 27-03-2018**

16 blocks awarded (on top of 19 proposed)

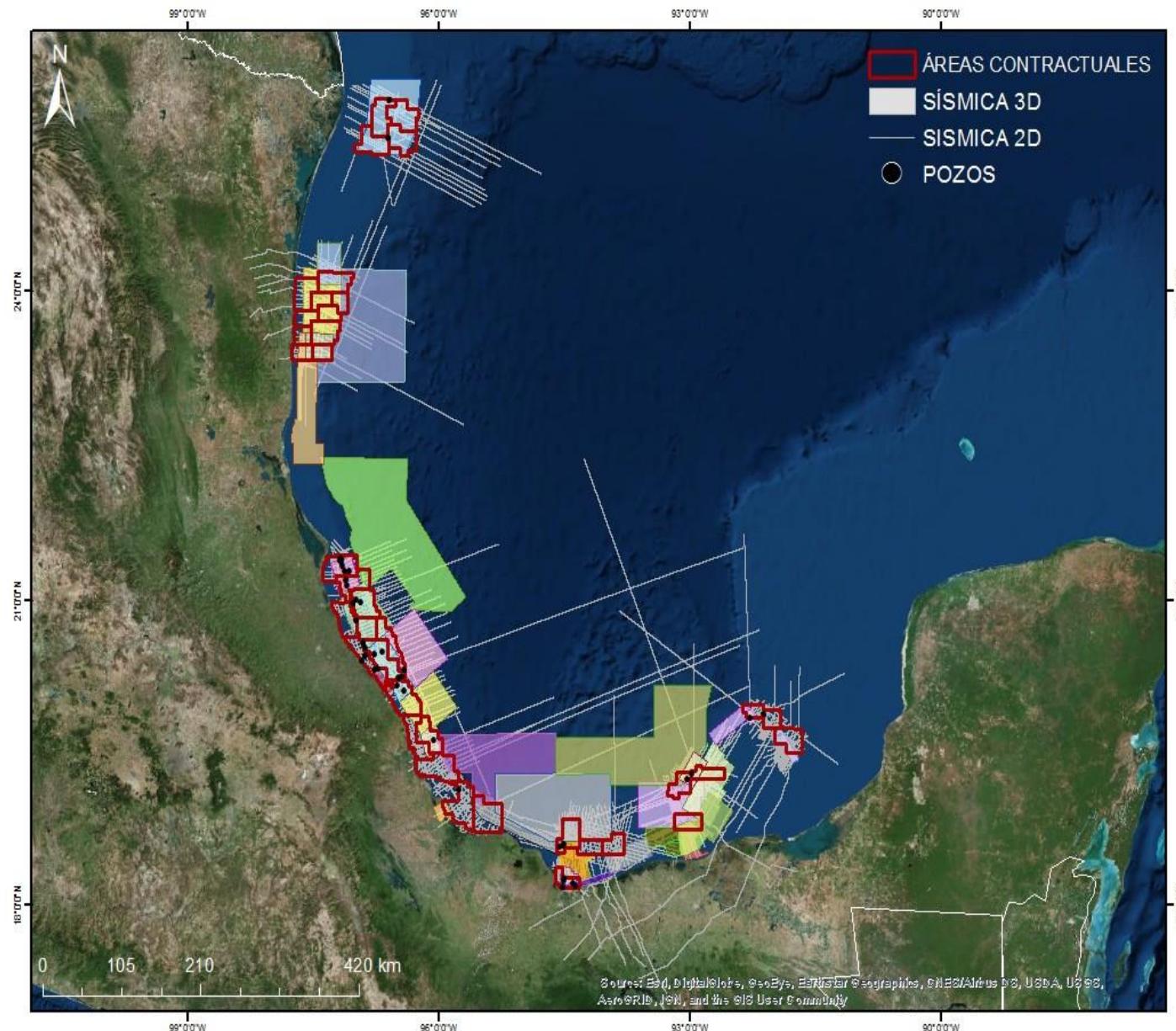
**Total commitments : 8.6 G\$ !**

**4 blocks in Burgos ( Repsol 2, Premier 2)4**

**3 Blocks in Tampico (Pemex)**

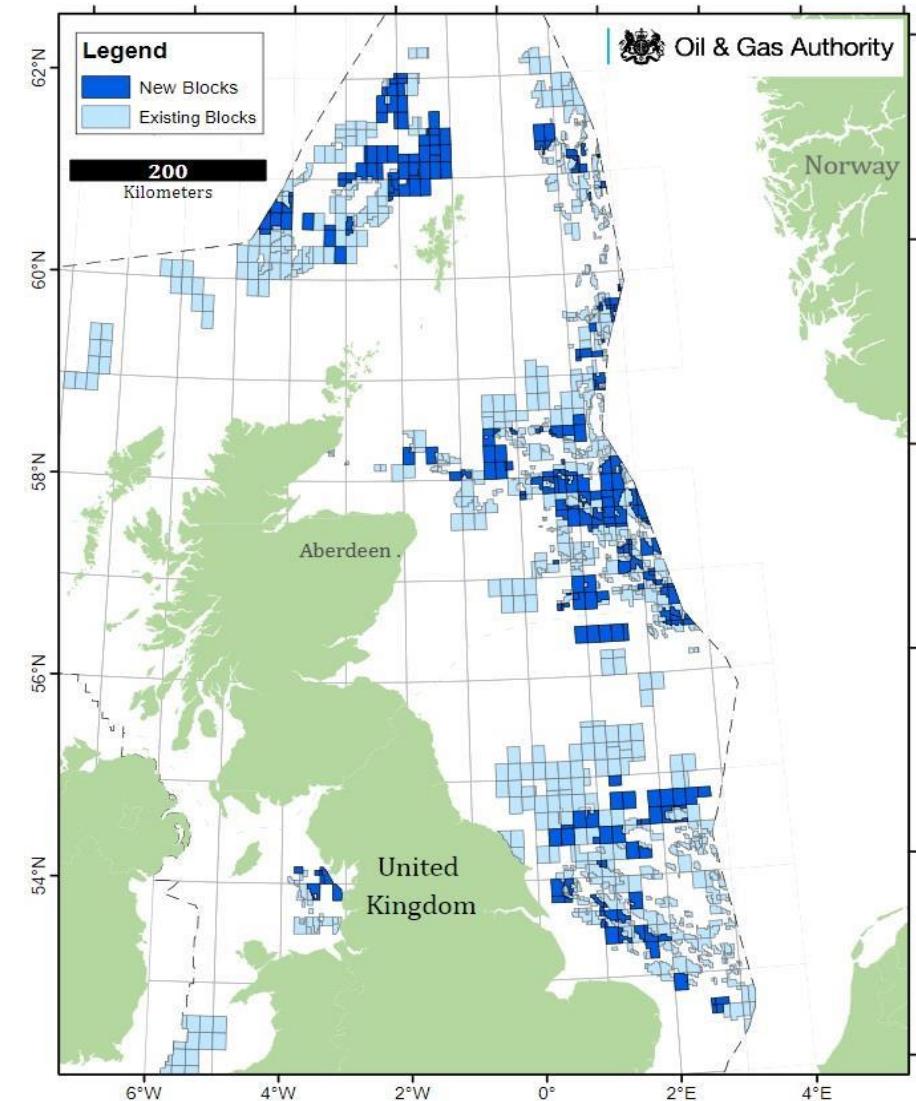
**6 blocks in Cuenca Sureste**

**TOTAL 3, Shell 1, ENI 1**



# UK 30 th Round Results

196 licences awarded but  
only nine 3D seismics and 8 commitment  
exploration wells !  
Mainly in WOS and Central North Sea areas



# BRAZIL 15th Round (March 2018)

**Impressive sucess in DO blocks : 22/47 acquired in  
Potiguar, Sergipe Alagoa**

**Fierce compétition in Campos and Santos basins**

**Bonus record : 2,4 G\$**

**21 oil compagnies , all major except TOAL**

**(consequences of FOZ de Amazonas conflict ?)**

**Exxon winner : 8 blocks**

**Petrobras : 7 ; Wintershall : 7 and Chevron : 4,**

**No offer on onshore block (SG and LTO targets)  
because of the Hydraulic fracturing legal  
uncertainties (waiting for environmental studies),**

Basin	Sector	Block	Winning company/consortium	Signature bonus
Santos	SS-AUP1	S-M-536	ExxonMobil Brasil* (64%), QPI Brasil (36%)	R\$165,000,000.00
Santos	SS-AUP1	S-M-647	ExxonMobil Brasil* (64%), QPI Brasil (36%)	R\$49,500,000.00
Santos	SS-AUP1	S-M-764	Chevron Brasil* (40%), Wintershall Holding (20%), Repsol (40%)	R\$131,930,768.13
Potiguar	SPOT-AP1	POT-M-762	Petrobras* (100%)	R\$5,134,684.33
Potiguar	SPOT-AP2	POT-M-857	Wintershall Holding* (100%)	R\$57,304,800.00
Potiguar	SPOT-AP2	POT-M-859	Petrobras* (60%), Shell Brasil (40%)	R\$13,494,981.55
Potiguar	SPOT-AP2	POT-M-863	Wintershall Holding* (100%)	R\$24,559,200.00
Potiguar	SPOT-AP2	POT-M-865	Wintershall Holding* (100%)	R\$16,372,800.00
Potiguar	SPOT-AP2	POT-M-948	Shell Brasil* (100%)	R\$ 1,963,358.55
Potiguar	SPOT-AP2	POT-M-952	Petrobras* (60%), Shell Brasil (40%)	R\$20,051,365.75
Campos	SC-AP5	C-M-657	Petrobras* (30%), Statoil Brasil O&G (30%), ExxonMobil Brasil (40%)	R\$2,128,500,000.00
Campos	SC-AP5	C-M-709	Petrobras* (30%), Statoil Brasil O&G (30%), ExxonMobil Brasil (40%)	R\$1,500,000,000.00
Campos	SC-AP5	C-M-753	ExxonMobil Brasil* (40%), Petrobras (30%), QGI Brasil (30%)	R\$330,000,000.00
Campos	SC-AP5	C-M-755	BP Energy* (60%), Statoil Brasil O&G (40%)	R\$43,361,000.00
Campos	SC-AP5	C-M-789	ExxonMobil Brasil* (40%), Petrobras (30%), QGI Brasil (30%)	R\$ 2,824,800,000.00
Campos	SC-AP5	C-M-791	Shell Brasil* (40%), Petrogal Brasil (20%), Chevron Brazil (40%)	R\$551,100,197.94
Campos	SC-AP5	C-M-793	BP Energy* (60%), Statoil Brasil O&G (40%)	R\$43,361,000.00
Campos	SC-AP5	C-M-821	Repsol* (40%), Wintershall Holding (20%), Chevron Brazil (40%)	R\$51,770,822.13
Campos	SC-AP5	C-M-823	Repsol* (40%), Wintershall Holding (20%), Chevron Brazil (40%)	R\$40,080,826.13
Ceará	SCE-AP2	CE-M-601	Wintershall Holding (100%)	R\$9,005,040.00
Sergipe-Alagoas	SSEAL-AUP1	SEAL-M-430	ExxonMobil Brasil* (50%), Murphy (20%), Queiroz Galvão (30%)	R\$3,630,430.00
Sergipe-Alagoas	SSEAL-AUP2	SEAL-M-573	ExxonMobil Brasil* (50%), Murphy (20%), Queiroz Galvão (30%)	R\$3,630,573.00

\*Operator

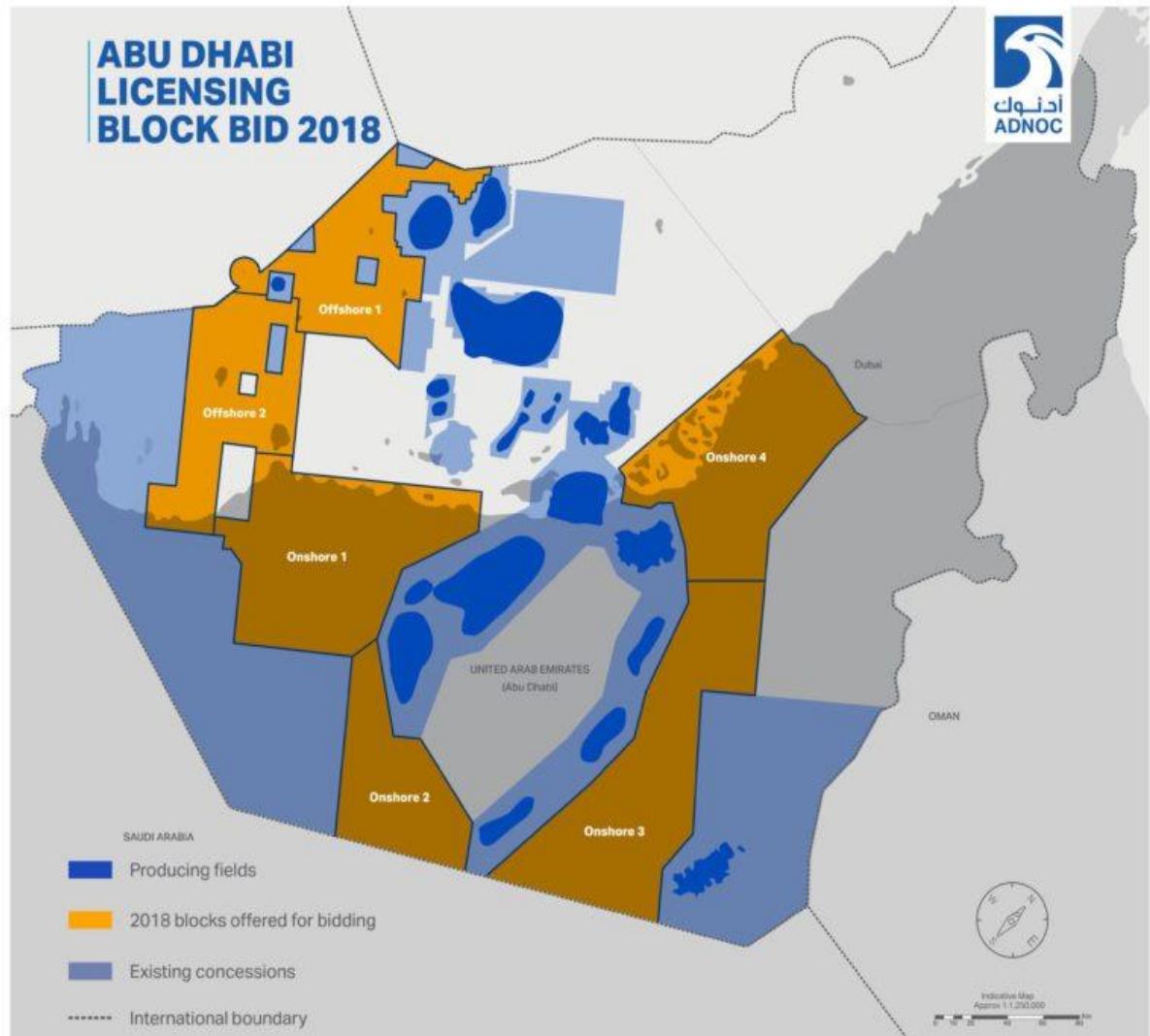
# Middle East: UAE new rounds : Abu Dhabi

## **1<sup>st</sup> competitive bidding Round ;**

Two of the six exploration blocks are offshore and four are onshore. Successful bidders will have the opportunity to explore and then develop and produce blocks with ADNOC.

Bids are due by October and the first bidding round is expected to conclude this year.

## **Unconventional/Conventional ?**

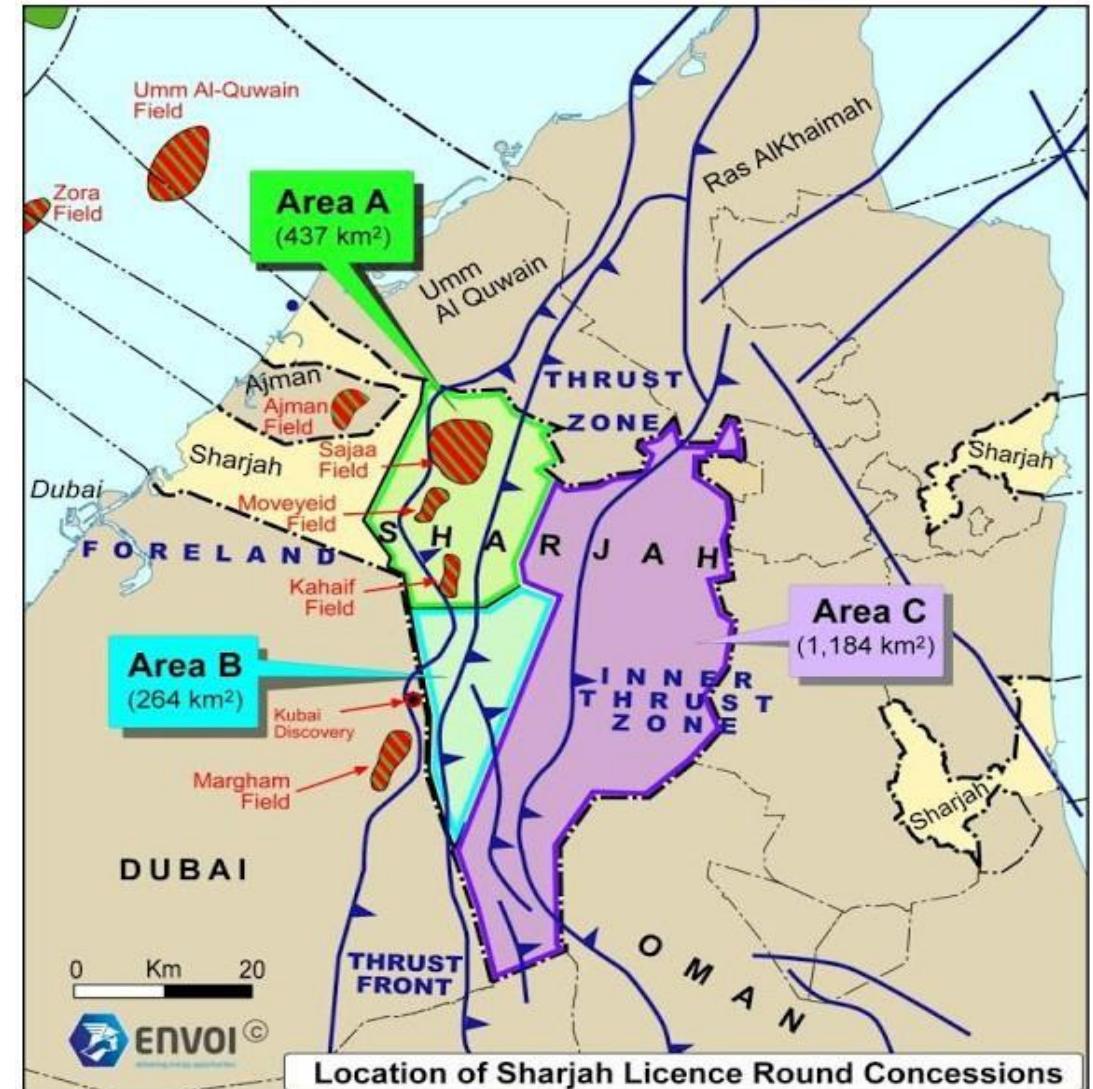


# Middle East: UAE new rounds : Sharjah onshore

Newly acquired extensive 3D seismic (shot in 2016 and fully processed in 2017 and early 2018), significantly improved the imaging of the **fold-thrust belt** and early indications are emerging of potentially large, undrilled leads & prospects and untested plays

Commercial documents available for review in the SNOC Data Room from the July 4th, together with the relevant technical data, including the 3D seismic.

Bidding instructions are available online at [www.snoc.ae](http://www.snoc.ae) and the window for bids will close on **18th November 2018** with the winning bidder(s) announced shortly thereafter and contracts effective from January 1, 2019.

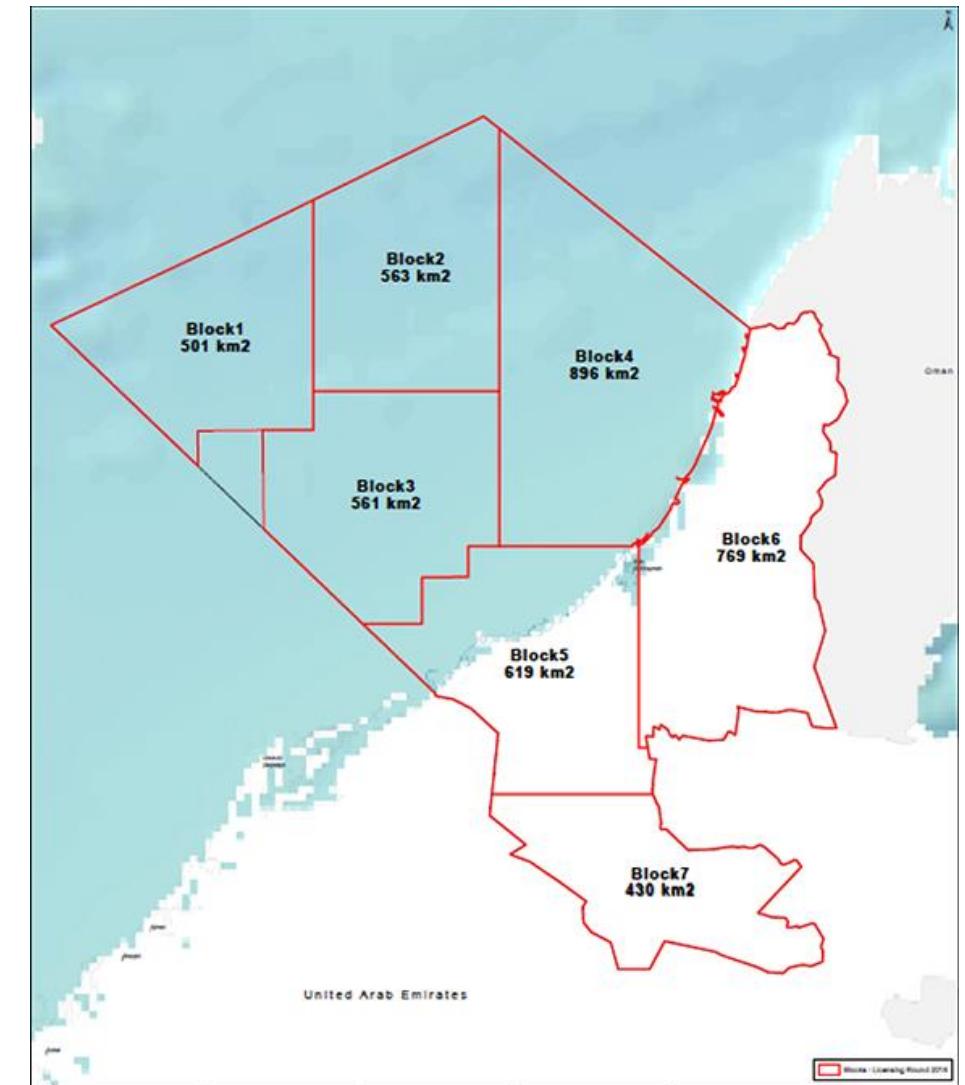


# Middle- East: UAE new rounds : RAK

RAK Gas has committed to organise a License Round for its entire offshore and Onshore concessions in 2018, to allow prospective companies bid for acreage.

Block 5/6/7 : Compressive FTBelt with targets from Tertiary to Permian (from West to East)

Block 1/2/3/4 : Mainly Cretaceous arabian platform with possibility in Paleocene to Jurassic



# Back-up slides