

# 2019 Conventional Exploration Results

## ASPO; October, the 2nd, 2019

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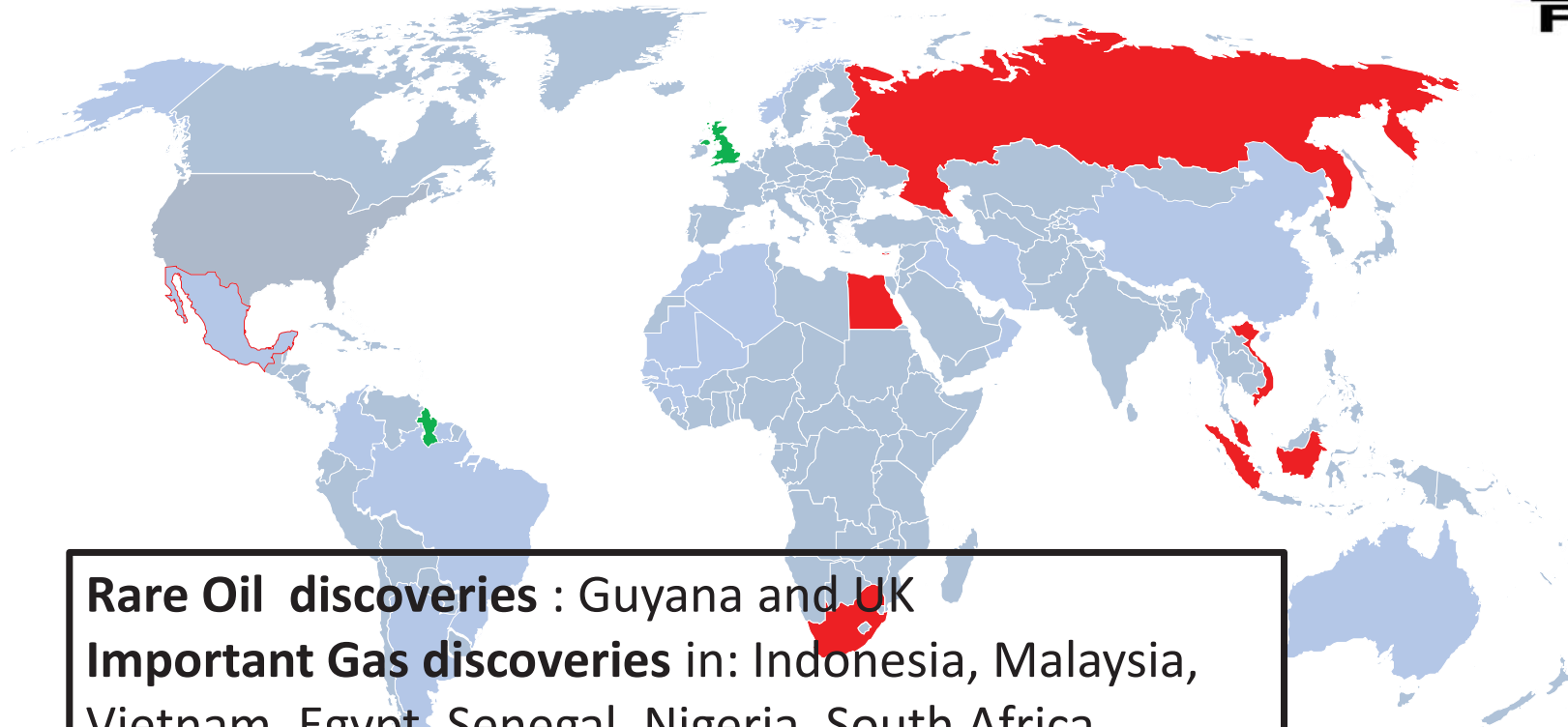


## 2019 Conventional EXPLORATION SYNTHESIS

### Exploration / Appraisal



■ OIL and GAS Discoveries



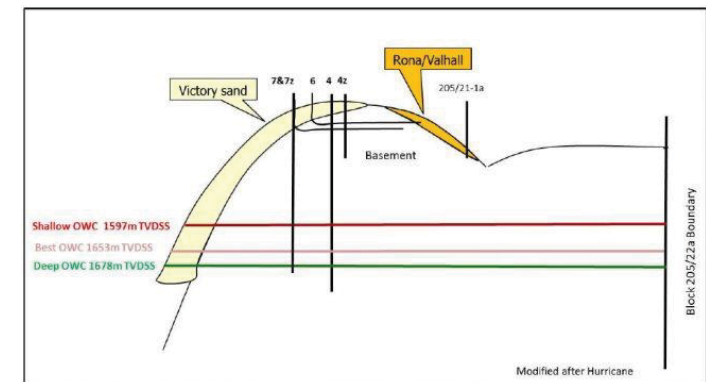
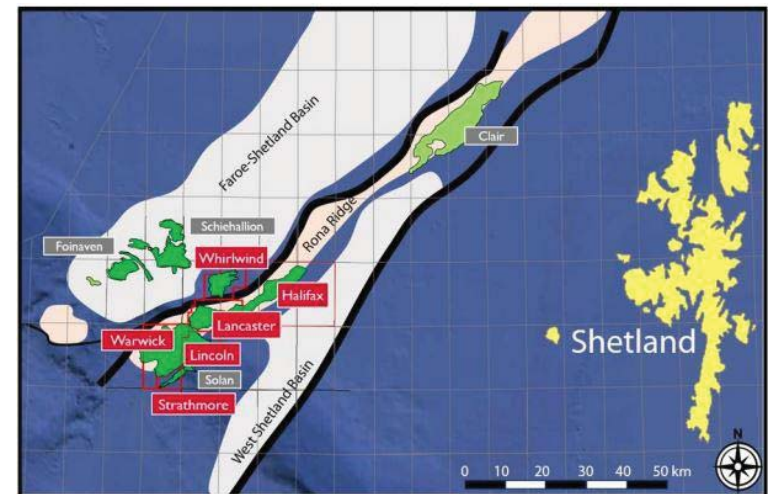
**Rare Oil discoveries** : Guyana and UK

**Important Gas discoveries** in: Indonesia, Malaysia, Vietnam, Egypt, Senegal, Nigeria, South Africa, Cyprus, Russia and UK.

TOTAL discovered : 8 Gboe (2,5 oil + 5.5 Gas)

# WOS : Lincoln Crestal Discovery ; Greater Warwick on the way to reach...1 Gbo ?

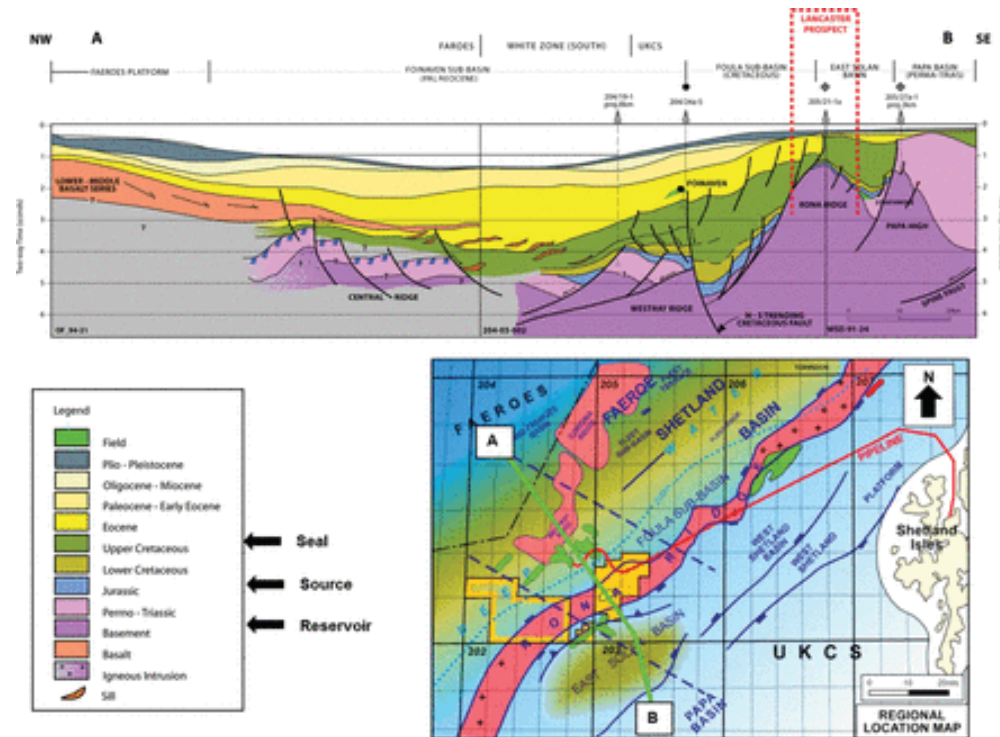
- Operator : **Hurricane Energy 50%** , Spirit Energy 50%
- Lincoln well : TD : 1780 m and 700 m horizontal drain
- DST : 9900 bopd with ESP ! 43 °API oil, no water ,in fractured basement
- 2P : 600 Mbo RR
- Tie-back to **Lancaster field** (discovered 2016, basement rocks) under EPS/FPSO/-2 Horizontal wells development since FO in July 2019 : 14400 bopd on one well only
- 2P contingent to EPS success : 500 Mbo
- Warwick West : exploration drilling in progress



# Rona Ridge Basement Target

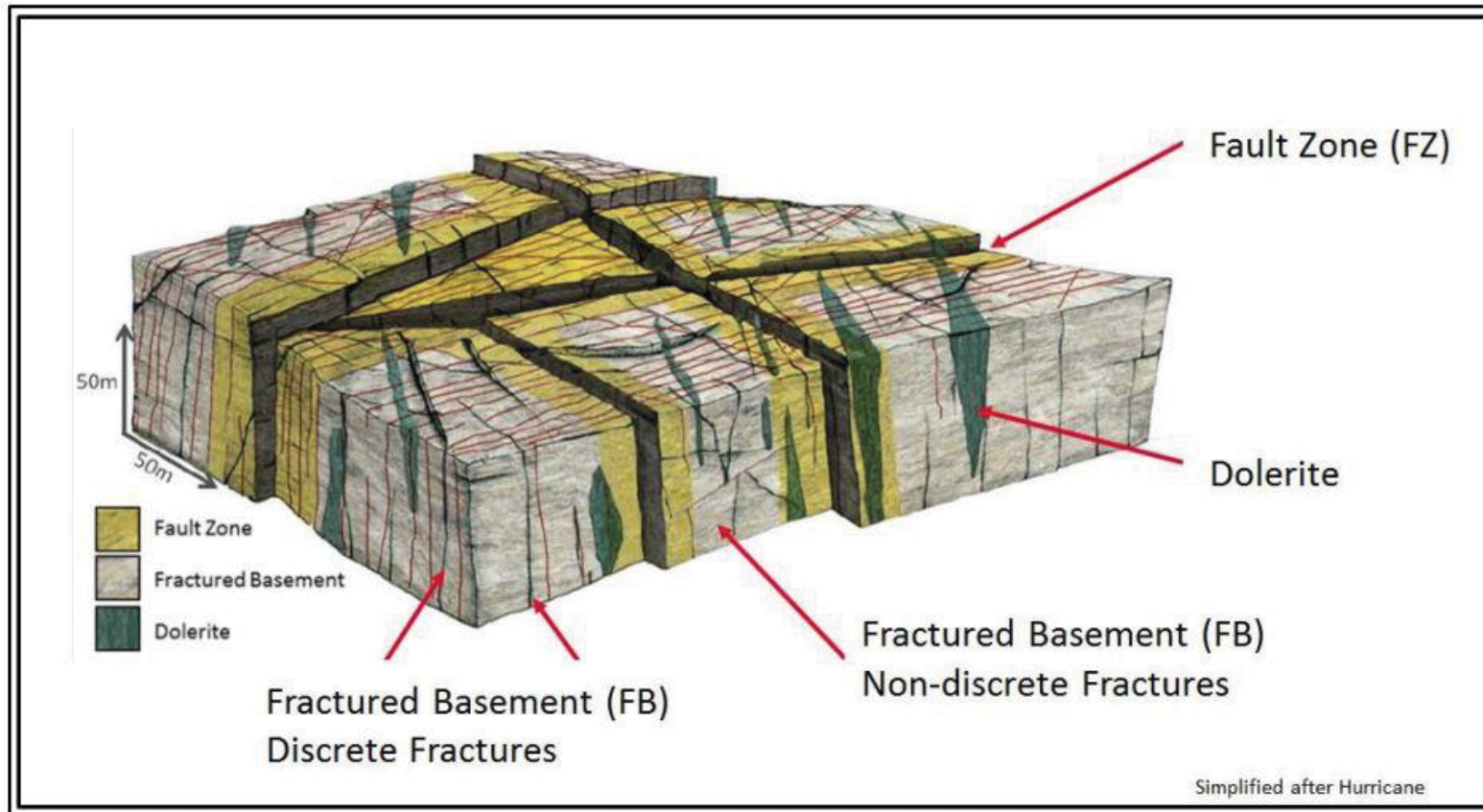
Upper Jurassic kimmeridgian Source-rock  
 Upper Cretaceous mudstones seal  
 Paleo buried hill trap  
 Fractured Basement reservoir  
 (granite/granodiorite/gneiss)

Excellent permeability but low density  
 areal reserves and high risks of water  
 venues



Modified after Roberts et al 1999

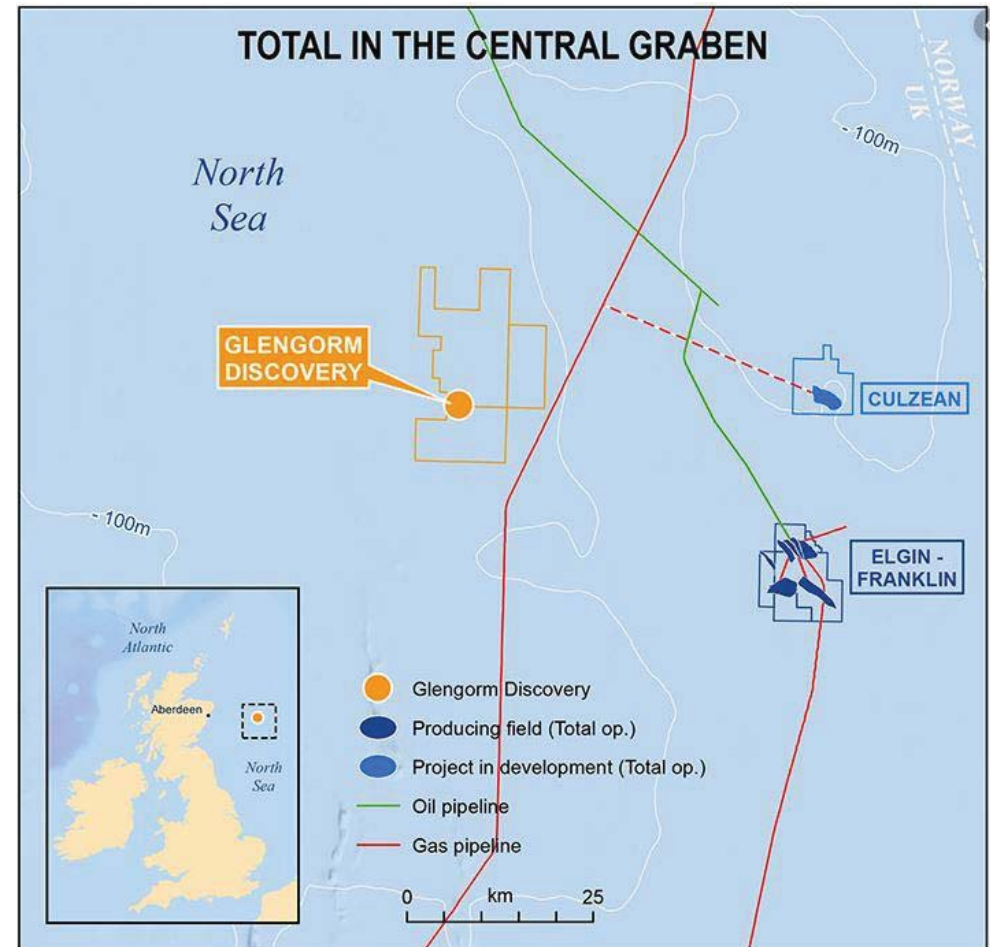
# West of Shetlands, Greater Warwick : Lincoln Crestal Discovery



**Figure 7.11: Conceptual Basement Reservoir Model<sup>14</sup>**

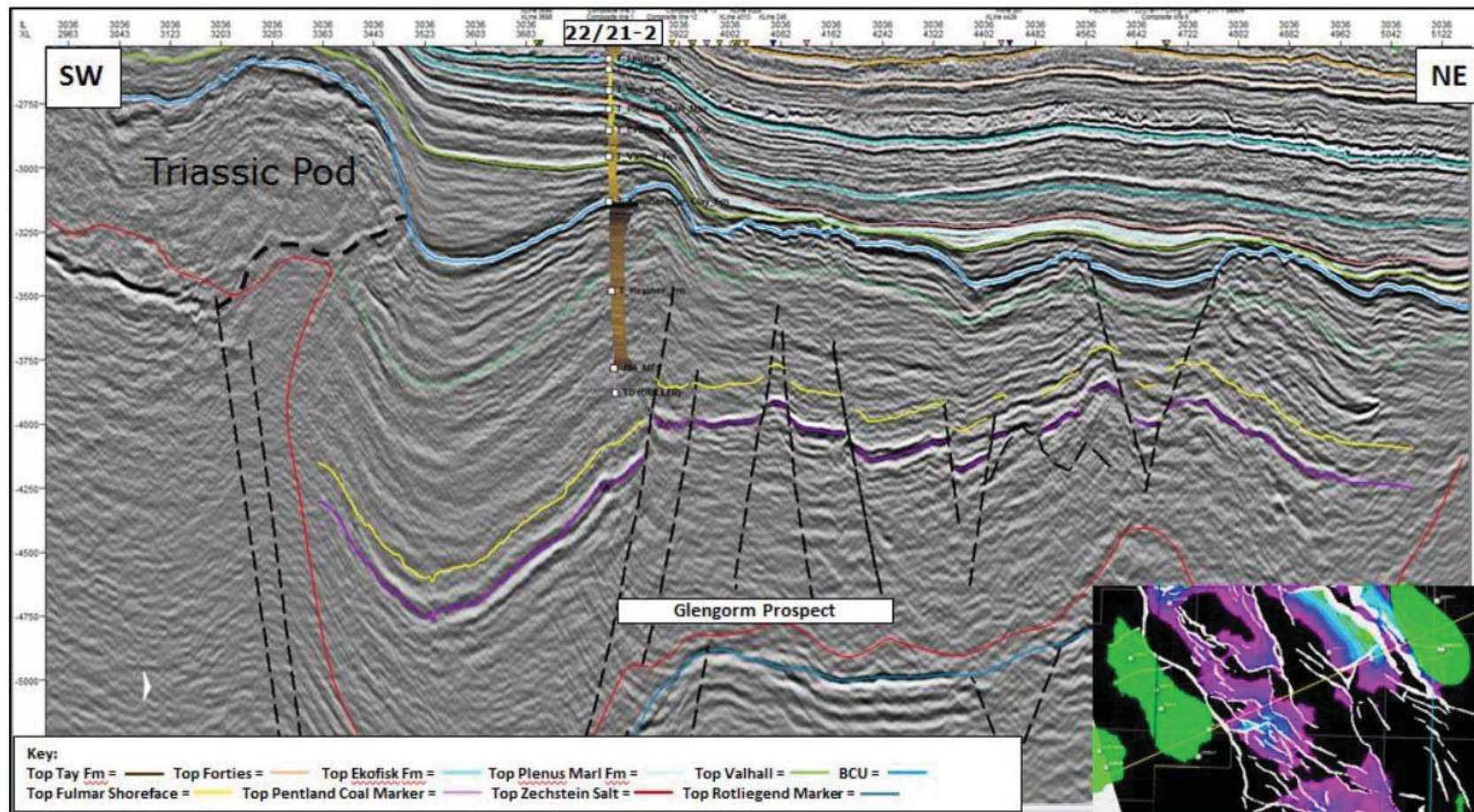
# UK, Central North Sea : Glengorm Discovery

- Operator : **CNOOC** , 50% with TOTAL (Maersk) 25 % and Edison , 25 %
- -TD : 5056 m, WD : 86 m
- 38 m, HP/HT Jurassic Discovery
- 250 Mboe RR
- Largest UK discovery since 2008 **done by a new comer !**
- Tie-back to Elgin-Franklin TOTAL facilities ?



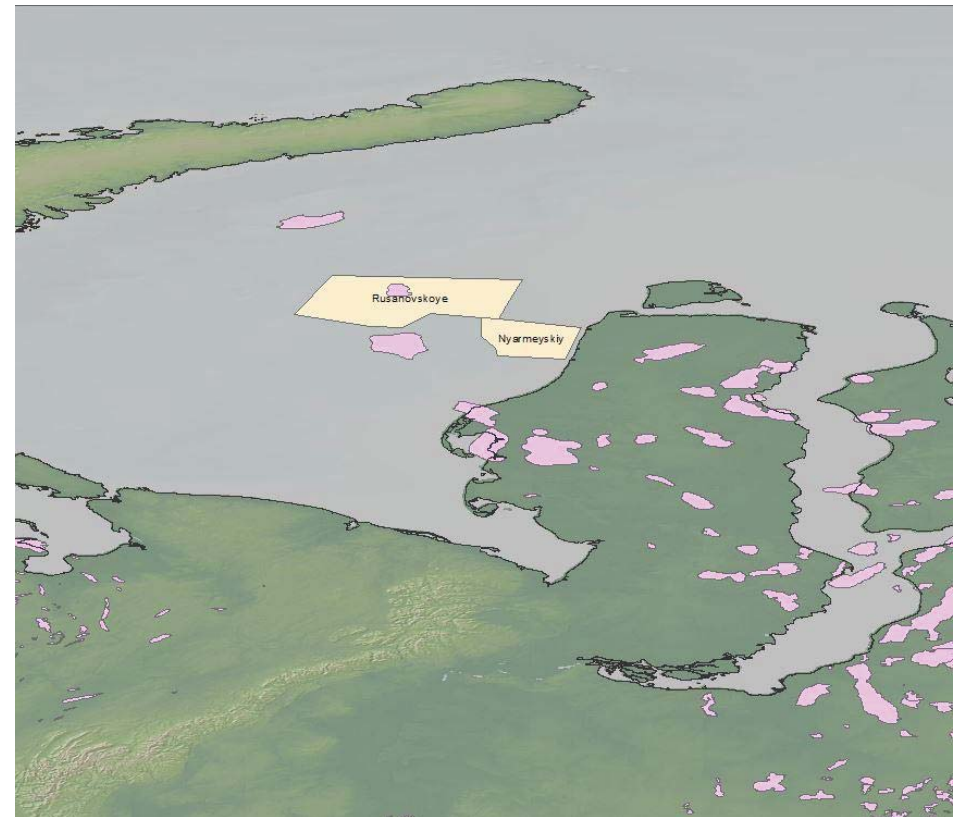


# UK, Central North Sea : Glengorm Discovery



# Russia, Kara Sea : Dinkov & Nyarmeyskoye Discoveries

- Operator: Gazprom
- Dinkov: 13,7 Tcf
- Nyarmeyskoye: 4,2 Tcf

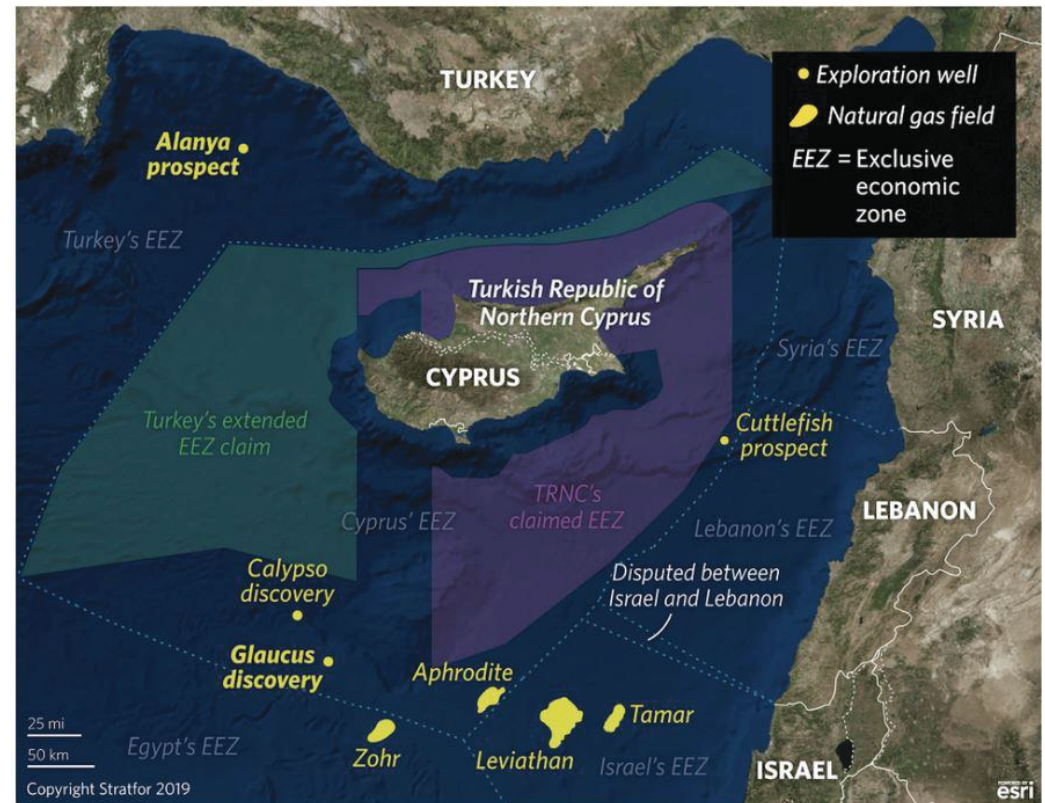




# Cyprus : Glaucus Discovery in block 10

- Operator : **EXXON** , 60% with Qatar Petroleum 40 %,
- TD : 4200 m, WD : 2060 m
- 133 m of net gas pay
- 3 to 8 Tcf

A Map of Recent Natural Gas Discoveries Around Cyprus and Maritime Disputes in the Eastern Mediterranean Sea



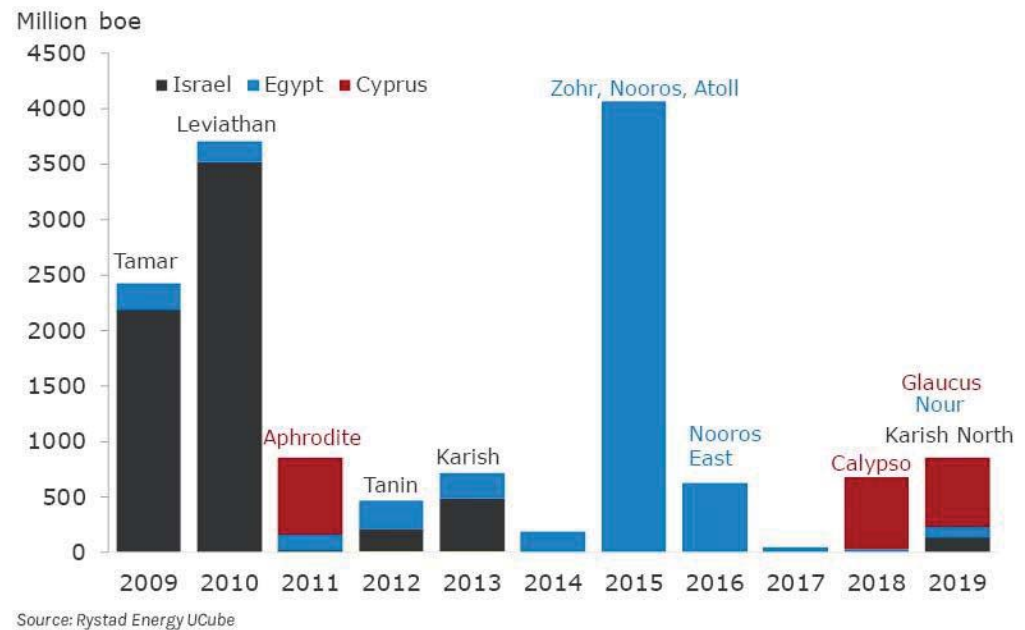
# East Med : a succesful decade

A huge biogenic methane province

More than 60 Tcf RR

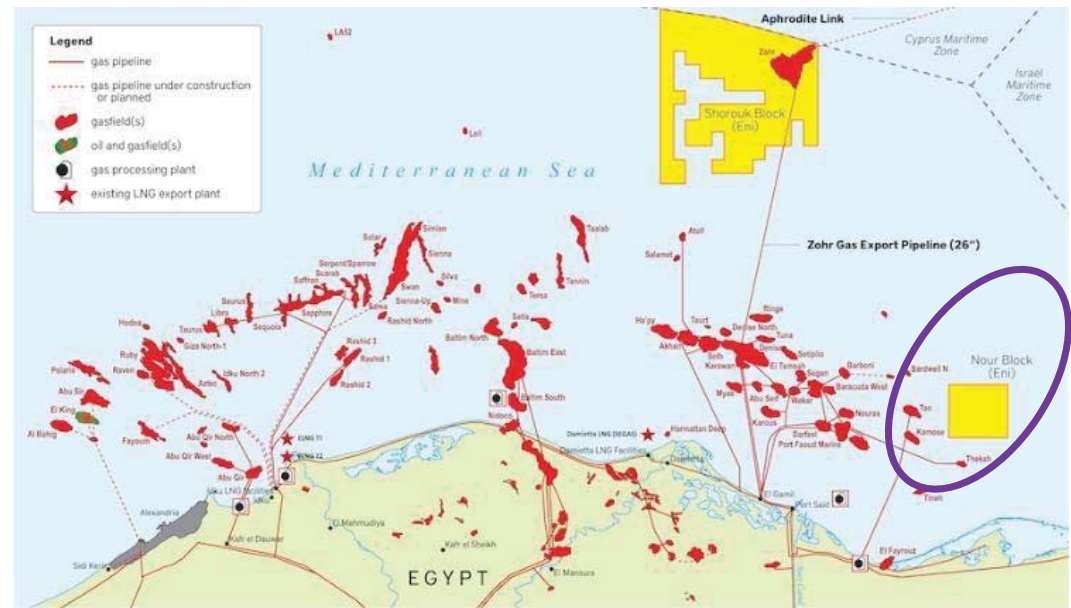
Two main reservoirs :

- Miocene clastics (Israel/Cyprus) : provenience ? South or East ?
- Miocene to Cretaceous Carbonate reefs (Egypt/Cyprus)
- Exceptional gas column thanks to Messinian salt
- Exceptional speed for development of Zohr (ENI) already at 2,2 Bcfd
- **- Next steps :**
- 1) Oligocene HP Sands (like in Nile delta)
- 2) Libano drillings (TOTAL, ENI, Novatek)
- 



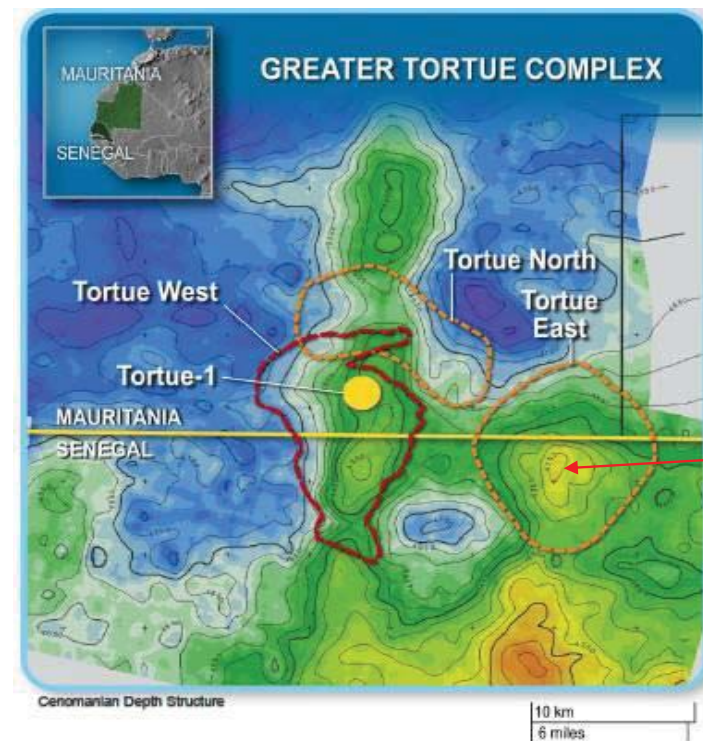
# Egypt: Nour Discovery , ENI

- Operator : **ENI** , 40% with BP 25 % , Mubadala 20% and Tharwa 15 %
- -TD : 59 00 m, WD : 300m
- 30 m, Gas & condensate, Oligocene sands (HP ?)
- 1 Tcf ? (Rystad)



# Senegal : Tortue East 1 Discovery

- BP operator, Kosmos
- First well outside Tortue West pole
- WD : 2500 m ; TD : 4890 m
- 30 m net gas sands in HQ **Albian** sands
- Not tested ?





# Appraisal successes (Tortue East-1 and Yakkar 2)

FID has been taken on GTA for FLNG with FG in 2021 , 4 to 12 wells in Lower Cenomanian turbidites, 2,5 Mtpa

Yakkar-Terenga : for domestic gas and GTP?

**Yakkar 2** : WD : 2500 m/TD : 4800 m- 10 km offset from Yakkar 1,

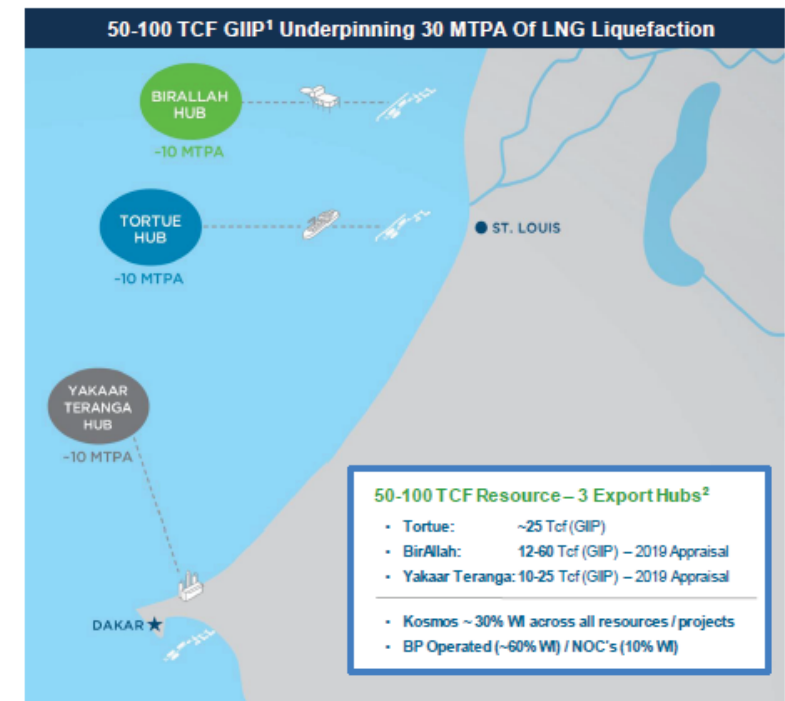
Birallah (Marsouin) : appraisal and deep explo well end of 2019 : Orca 1

## MAURITANIA & SENEGAL



Building A 30 MTPA LNG Business – 3 Exploration/Appraisal Wells in 2019

- **Greater Tortue Ahmeyim-1 Appraisal Well**
  - Further expanded Tortue resource base
  - Encountered ~30 meters of net gas pay in high-quality Albian reservoir
- **Yakkar-2 Appraisal Well**
  - Defines development area and secures Senegal LNG hub
  - Plan to spud September 2019
- **Orca-1 Exploration Well**
  - Underpinning Birallah LNG hub
  - Plan to spud October 2019



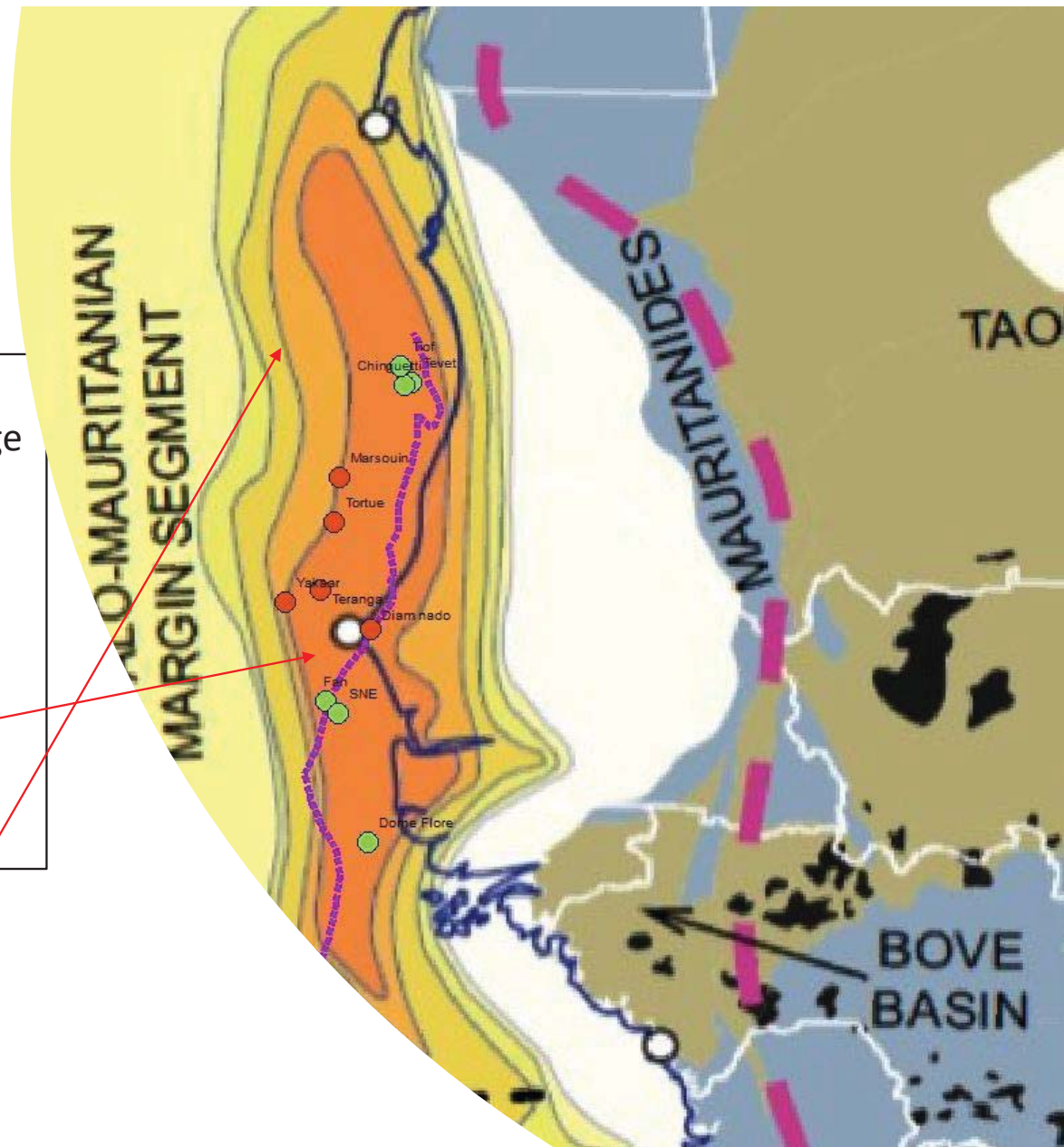
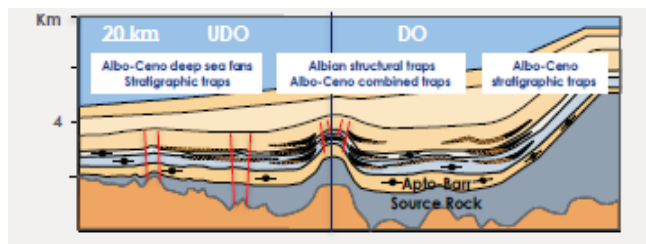
# Sénégal-Mauritanie Looking for oil ?

- **Oil fields (green) and gas fields (red)**

No clear relationship with total isopach (Yellow-orange curves), Which source-rock and which plumbing system ? OIL prone SR in the Jurassic-L Cretaceous eastwards platform ?

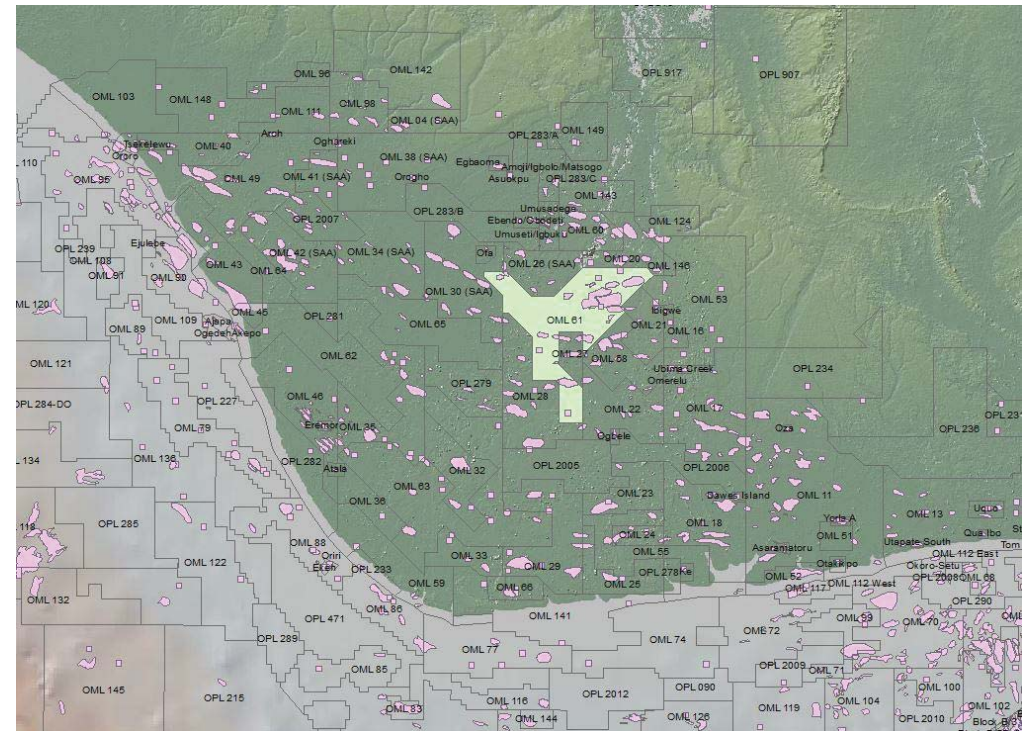
- **TOTAL Strategy : go west (VD Offshore)**

- **JAMM-1** drilled in 2019 WD : 3000 m by TOTAL on Rufisque Profond, oil non-commercial discovery
- **RICHAT 1** drilling in progress by TOTAL on C-9 block



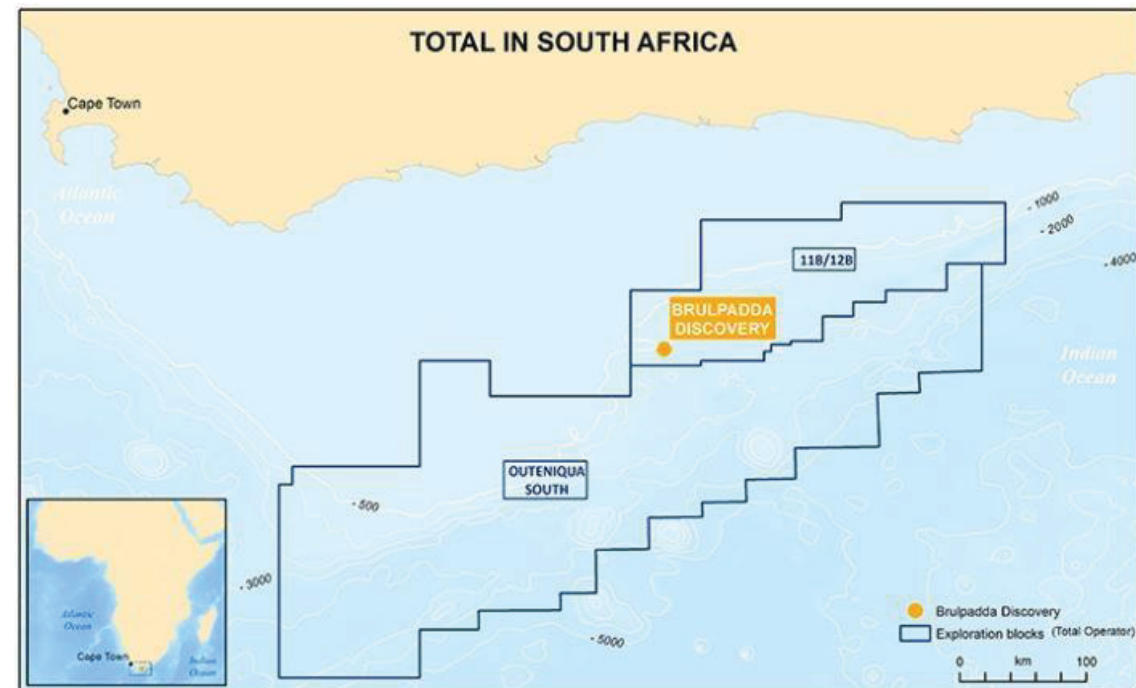
# Onshore Nigeria, Niger Delta : Obiafu 41 Discovery (oml-61)

- Operator : NAOC JV (**ENI 20%** , NNPC 60%, Oando 20%)
- TD: 4374 m
- Gas and condensate 130 m deltaic sequence in Oligocene
- 1 trillion cubic feet of gas & 60 million barrels of associated condensate



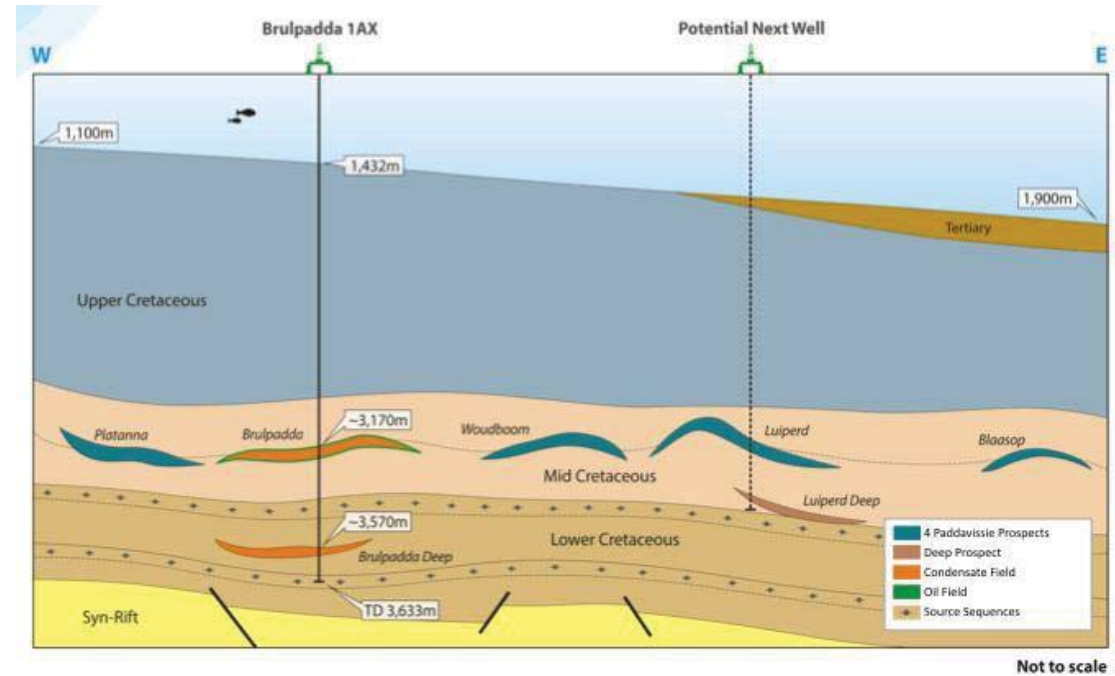
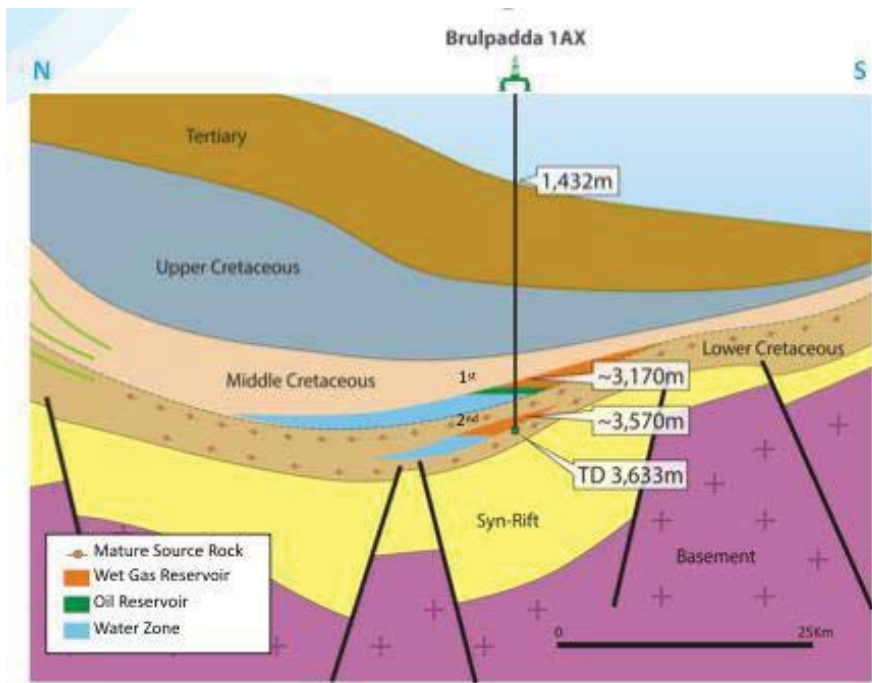
# South Africa, Outeniqua : Brulpadda Discovery

- Operator : **TOTAL** , 45% with Qatar Petroleum 25 %, CNR 20% and Africa Energy 10 %
- TD : 3600 m, WD : 1400 m
- 57 m, condensate, Lower Cretaceous
- 550 Mboe to 1 Gboe
- Several other prospects eastwards





# South Africa, Outeniqua : Brulpadda Discovery



Sources: Africa Energy Corp

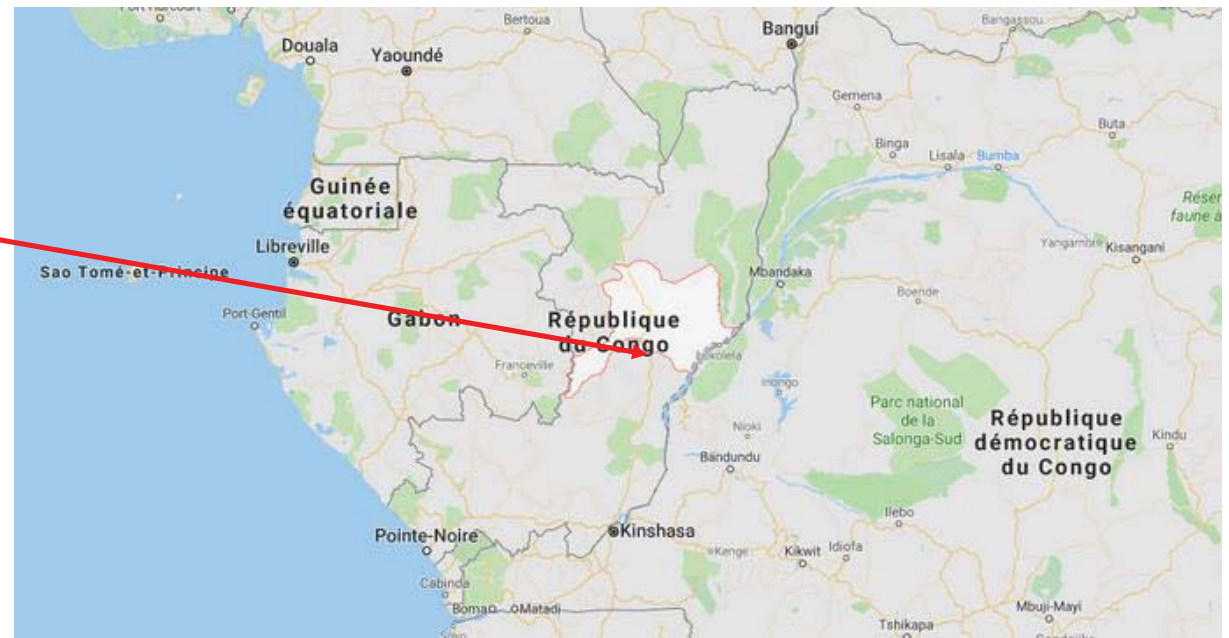
# Congo Brazaville, Onshore discovery ? **Very doubtful !!**

Giant Discovery onshore  
announced by **Le Monde** August  
the 12th

First Drilling in progress by PEPA  
Company, in « La Cuvette » in  
the Oyo region north of  
Brazaville

with oil shows confirmed  
through several sources  
Paleozoic ?

Important contradictions  
between surface (9300 m2!)  
and reserves estimates (390  
Mbo)



# Guyana, Stabroek : Tilapia and Haimara and Yellowtail 2019 Discoveries in the SE part of the block

- Operator : **EXXON** , 45% with Hess, 30 % and CNOOC, 25 %

## TILAPIA :

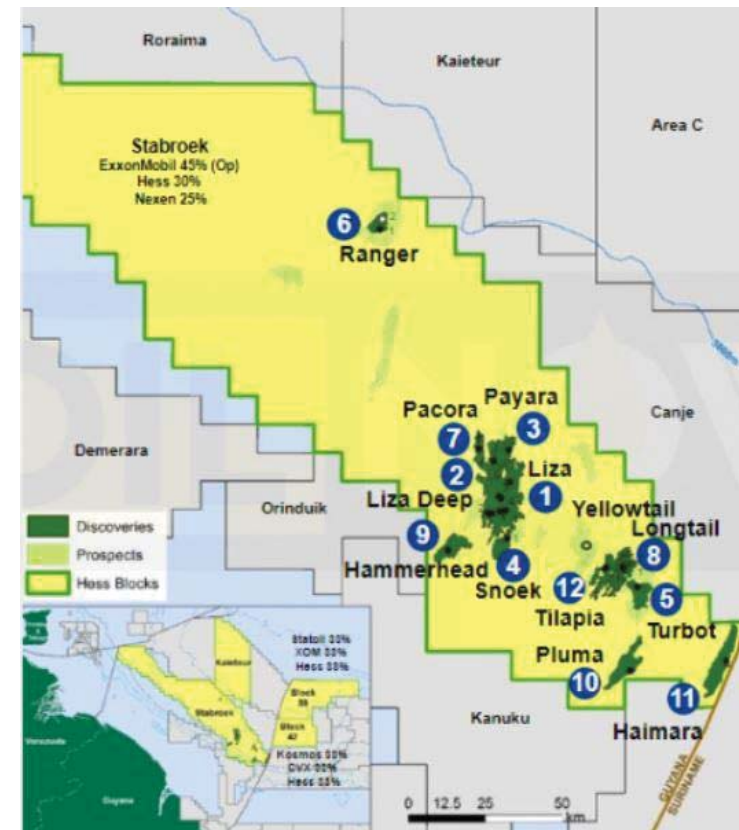
- TD : 5700 m, WD : 1780 m
- 93 m, high quality sands : the **highest net pay column so far !**
- 300 to 550 Mbo

## Haimara :

- **First gas discovery**
- 63 m net gas sand

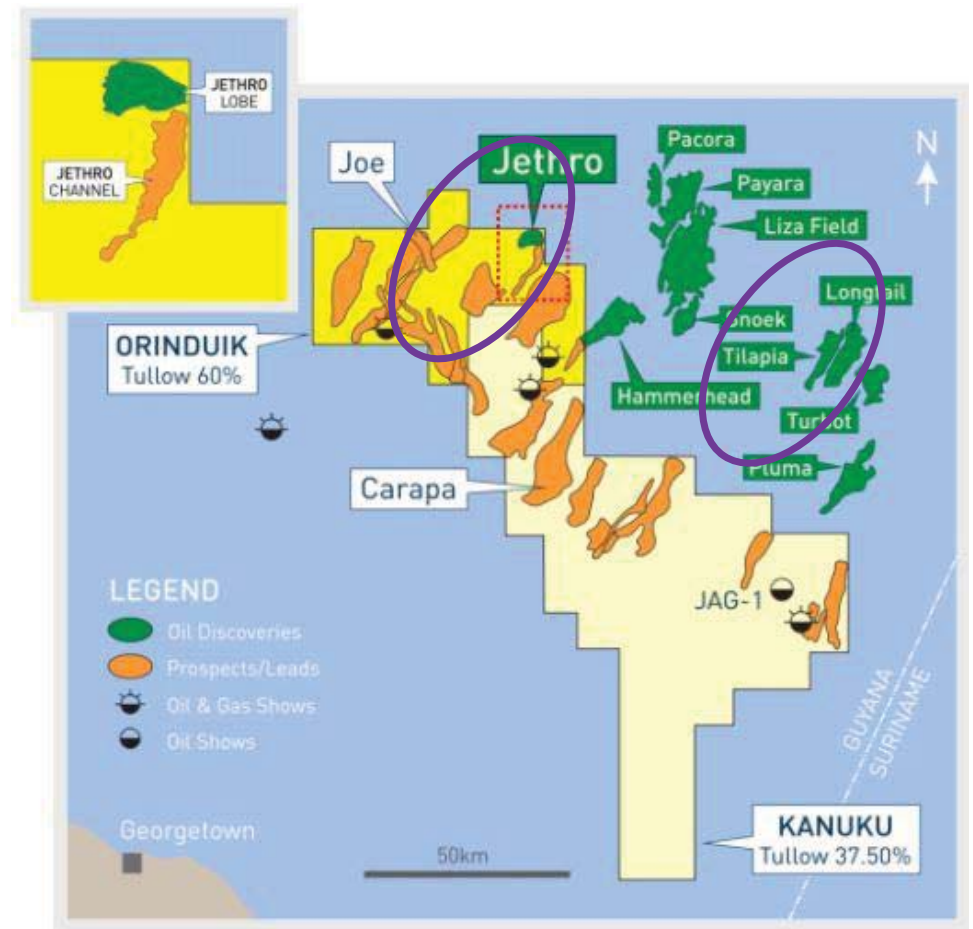
## Yellowtail

- TD : 5600 m; WD : 1850 m
- 90 m oil bearing sand
- 350 Mbo



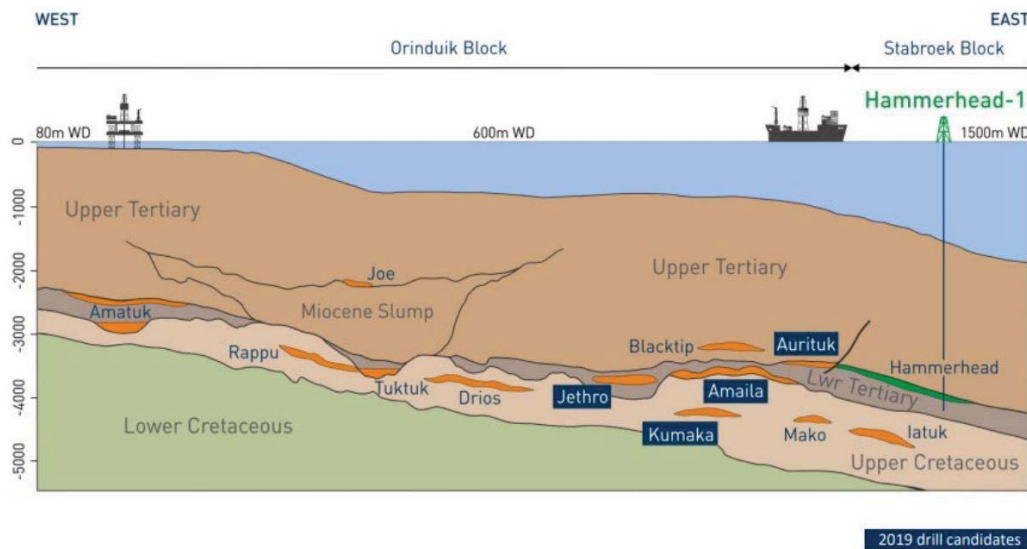
# Guyana, Orinduik block: Jethro and Joe Discoveries

- **Jethro**
- Operator : **TULLOW** , 45% ,  
TOTAL , 25% , QP 25 %
- WD : 1350 m / TD : 4400 m,
- 57 m net oil pay , Tertiary
- 100 Mbo
- Oil quality ? In this shallower reservoir

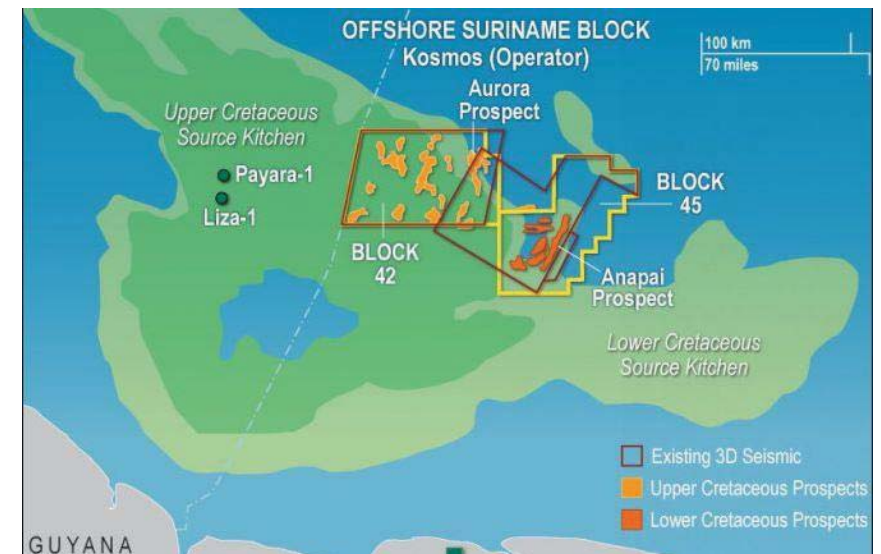




# Guyana : Onrinduick block : Joe & Jethro Discoveries : going westwards and younger !

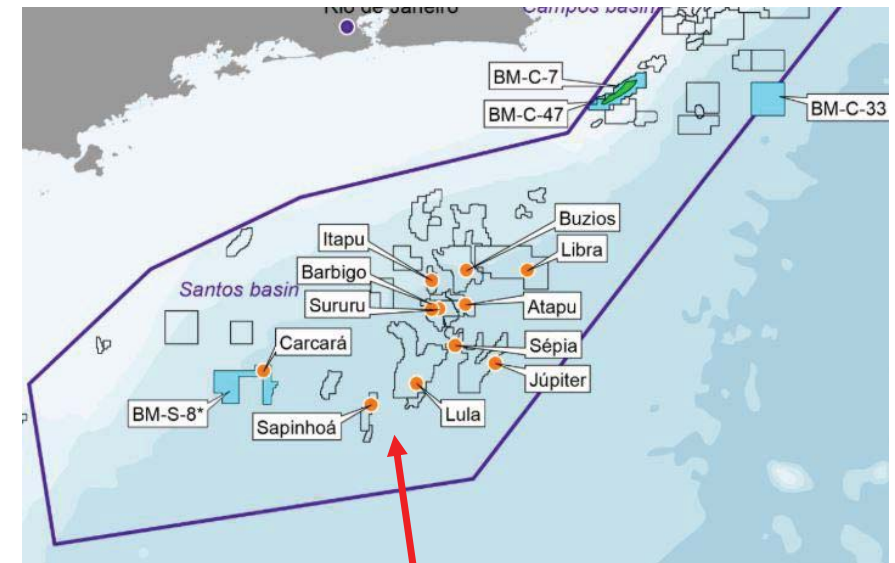


Source: Tullow Oil



# Brazil, Santos Basin : Peroba Discovery ?

- Operator : **Petrobras 40%** , BP 40%, CNODC 20%
- WD: 2235m
- Pre-salt
- Predrilled Estimate 5 billion boe
- Waiting for more precised data but fluid (CO2 , Jupiter like ?) probable (October-RigZone)



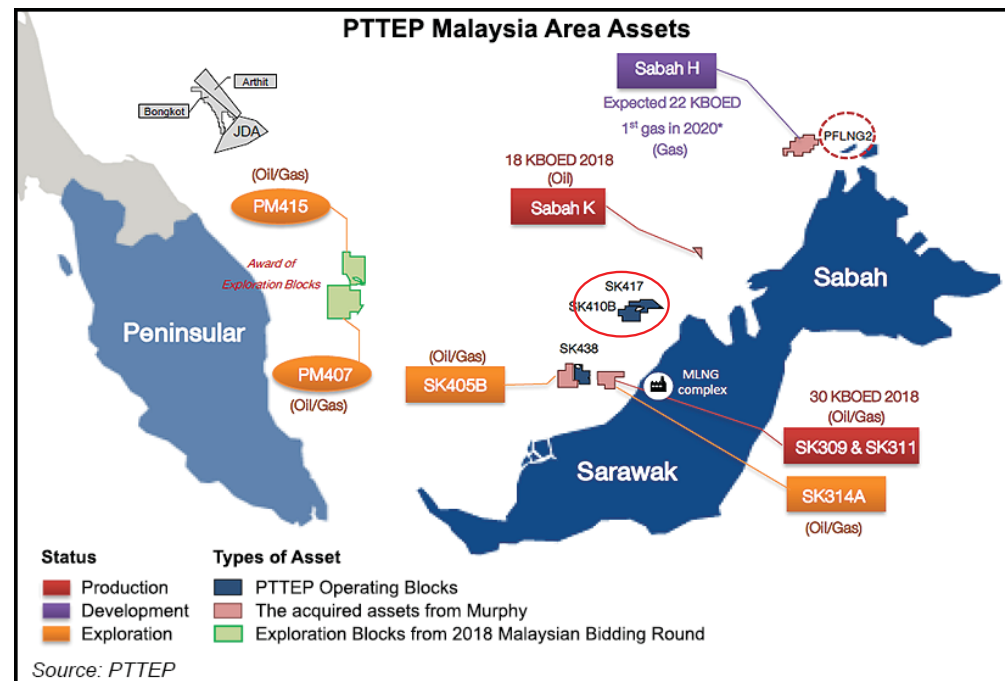
# Indonesia, Sumatra onshore : Kali Berau Dalam Discovery

- Operator : **REPSOL** , 45% with Petronas 45 %, MOECO 10 %
- Close to Conoco gas plant
- 1 to 2 Tcf reserves (biggest since 2001 Cepu Exxon discovery)
- **-TD : 3600 m ?**
- Pre Tertiary fractured basement
- Excellent DST flow: 45 MM scf/d



# MALAYSIA , offshore Sarawack block SK410B : Lang Lebah Discovery

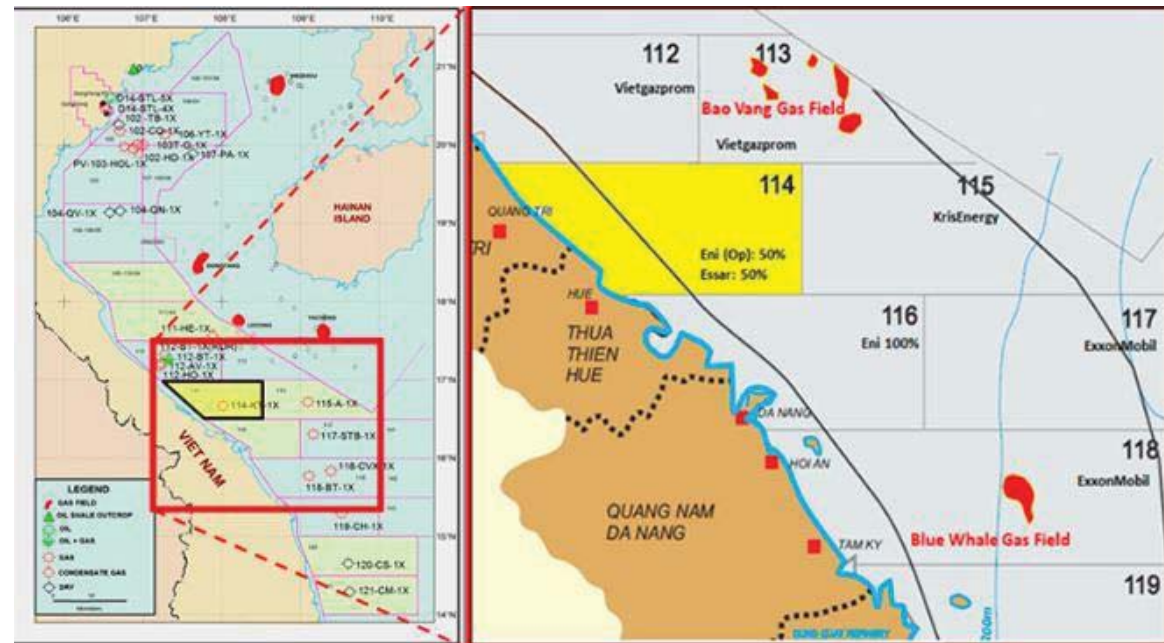
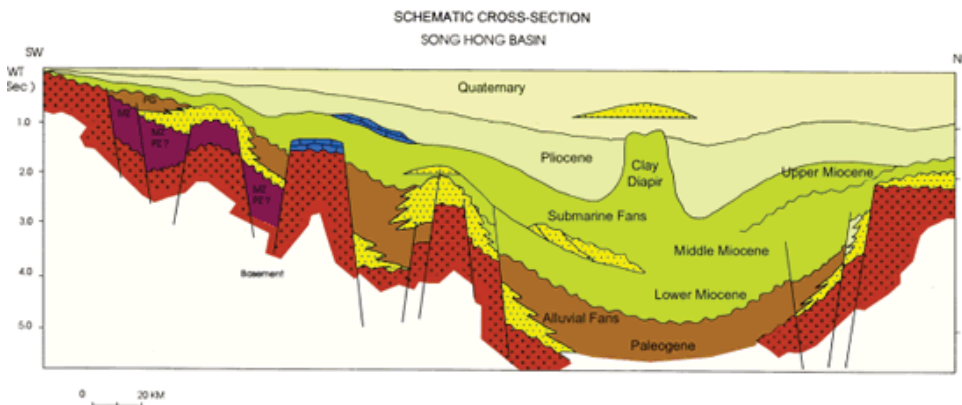
**PTTEP Operator 42,5 %**,  
Kupfec 42,5 % and Pertamina  
15 %,  
TD : 3810 m  
Middle Miocene **carbonate**  
250 m net gas pay reservoir  
2 to 3 Tcf RR  
DST : 41 MMscfd and 250  
bcpd  
Gas composition ? Low inert  
content ?





# Vietnam, Song Hong Basin : Ken Bau 1X Discovery

- Operator : **ENI 50%** , ESSAR 50%
- TD: 3600 m, WD: 95m
- Gas and condensate Miocene sandstones
- 100m net reservoir pay
- Appraisal drilling in 2020
- Inert content ?



## 2019 EXPLORATION Main Results (to date : September)

| Discovery       | Country      | Basin       | Operator  | WD | TD | Reservoir            | Reserves OIL Mbo | Reserves GAS Tcf | Reserves Mboe |
|-----------------|--------------|-------------|-----------|----|----|----------------------|------------------|------------------|---------------|
| Lincoln         | UK           | WOS         | Hurricane |    |    | basement             | 600              |                  |               |
| Lancaster       | UK           | WOS         | Hurricane |    |    | basement             | 500              |                  |               |
| Glengorm        | UK           | CNS         | CNOOC     |    |    | Upper Jurassic sands |                  |                  | 250           |
| Dinkum          | Russia       | Kara Sea    | Gasprom   |    |    | Cretaceous           |                  | 13,7             |               |
| Nyarmeynskoye   | Russia       | Kara Sea    | Gasprom   |    |    | Cretaceous           |                  | 4,2              |               |
| Glaucus         | Cyprus       | Esat Med    | Exxon     |    |    |                      |                  | 4                |               |
| Nour            | Egypt        | Nile        | ENI       |    |    | Oligocene            |                  | 1                |               |
| Tortue East     | Senegal      | MS          | BP        |    |    | Albian               |                  | 3 ?              |               |
| Ofiabu          | Nigeria      | Niger Delta | ENI       |    |    | MOI-Oligocene        |                  | 1                | 60            |
| Brulpadda       | South Africa | Outenica    | TOTAL     |    |    | Lower Cretaceous     |                  |                  | 550           |
| Tilapia         | Guyana       | Guyana      | EXXON     |    |    | Upper Cretaceous     | 400              |                  |               |
| Yellowtail      | Guyana       | Guyana      | Exxon     |    |    | Upper Cretaceous     | 350              |                  |               |
| Jethro          | Guyana       | Guyana      | Tullow    |    |    | Lower Tertiary       | 100              |                  |               |
| Peroba          | Brasil       | Santos      | Petrobras |    |    | PRESALT              | 5000 ?           |                  |               |
| Kaliberau Dalam | Indonesia    | Sumatra     | Repsol    |    |    | Basement             |                  | 1,5              |               |
| Long Lebah      | Malaysia     | Sabah       | PTTEP     |    |    | Tertiary Carbonates  |                  | 2,5              |               |
| Ken Bau         | Vietnam      | Song Ho     | ENI       |    |    | Tertiary Sands       |                  |                  |               |
|                 |              |             |           |    |    |                      | 2000             | 30               | 860           |