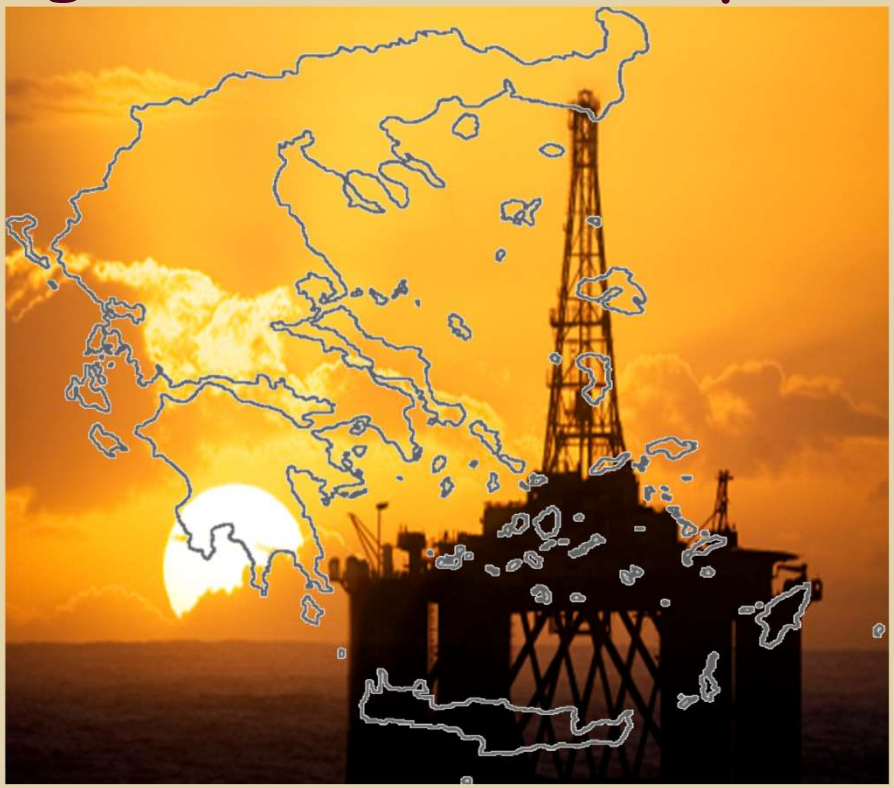
Overview of Deepwater Drilling & Production Operations



Dr. Vassilios C. Kelessidis

vassilios.kelessidis@gmail.com

SPE Distinguished Lecturer, 2019-2020

Γιατί αυτή η ομιλία; Βαθιά νερά;

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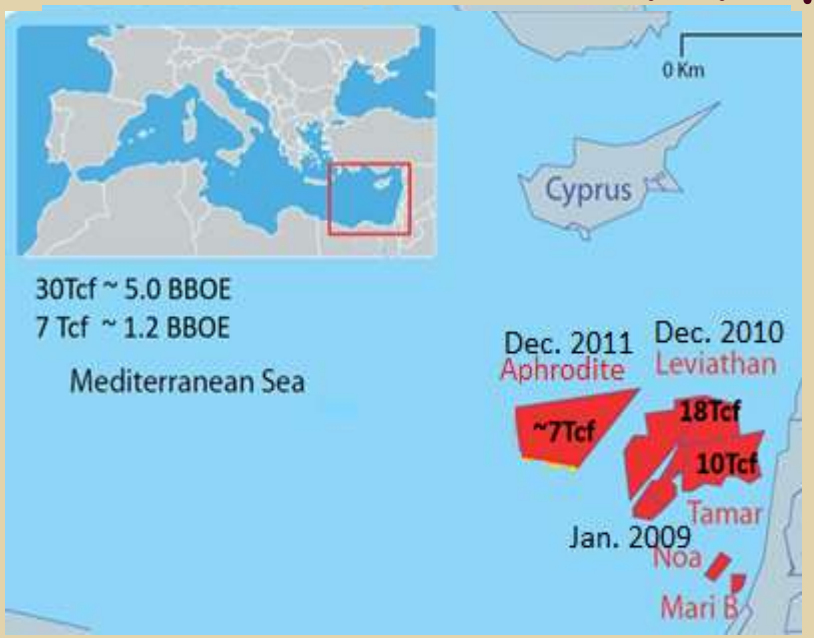

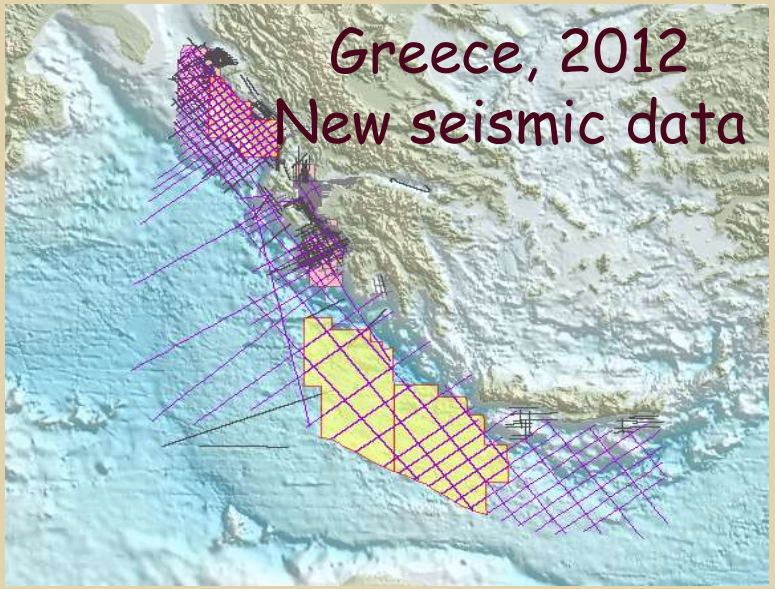

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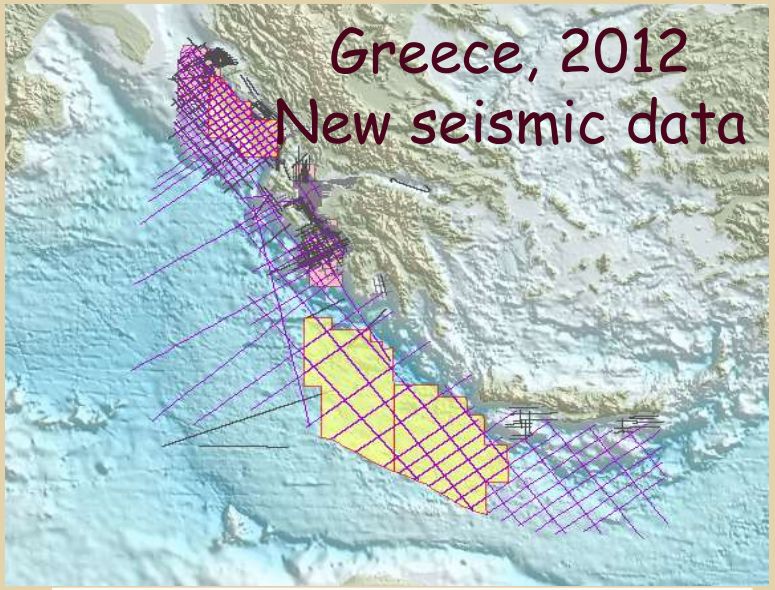

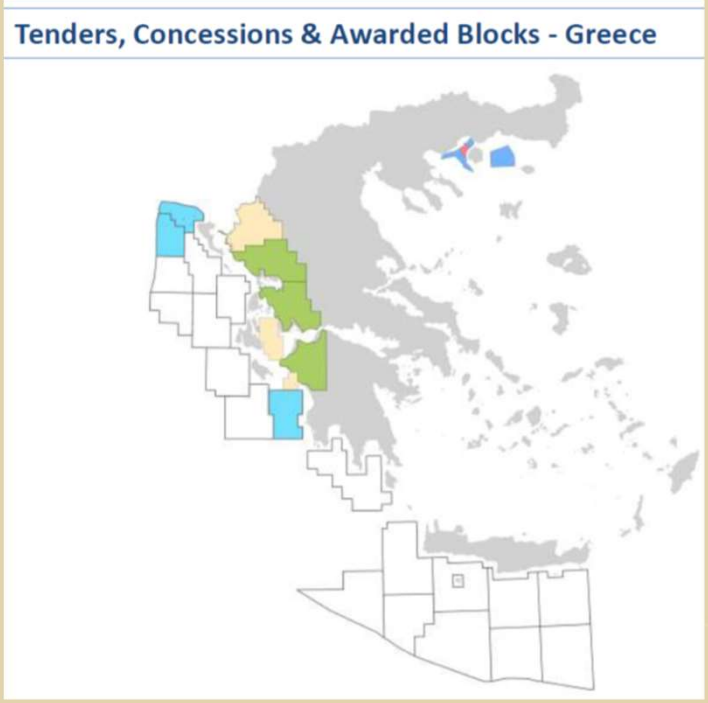

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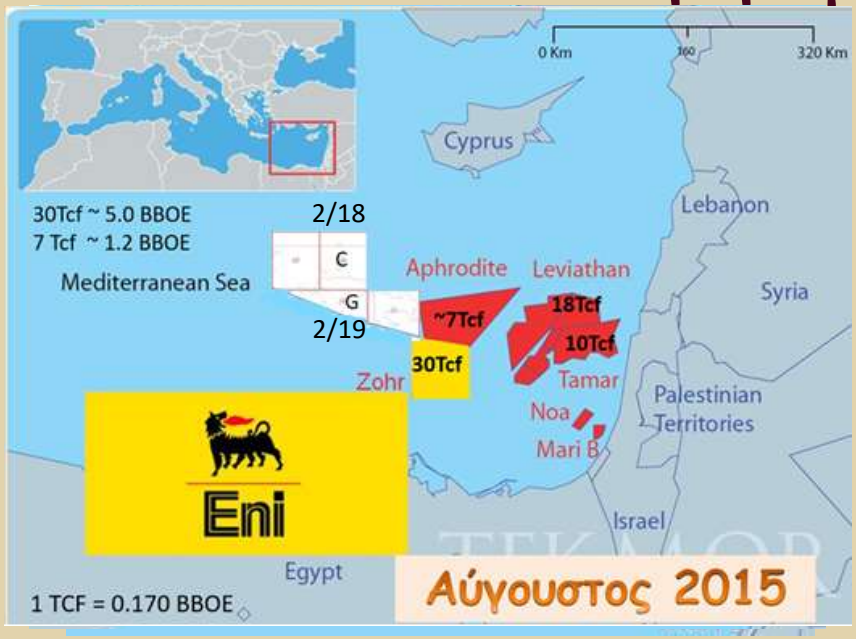

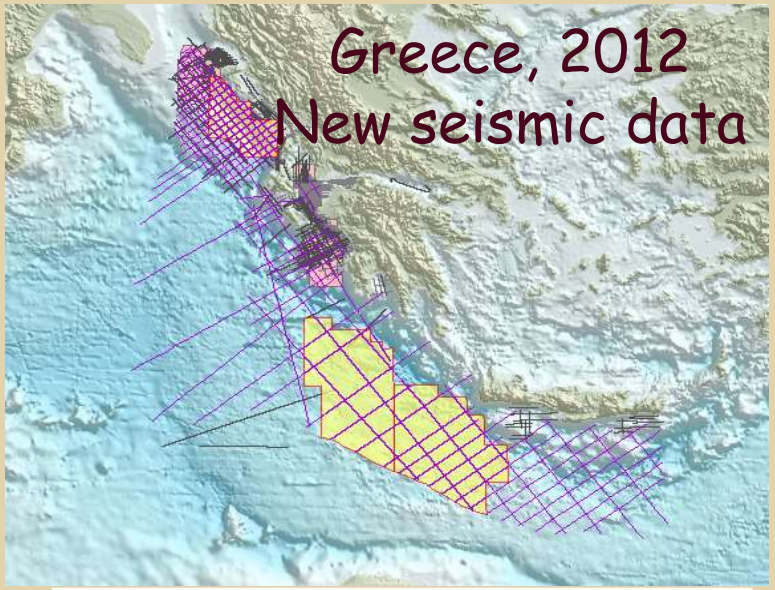

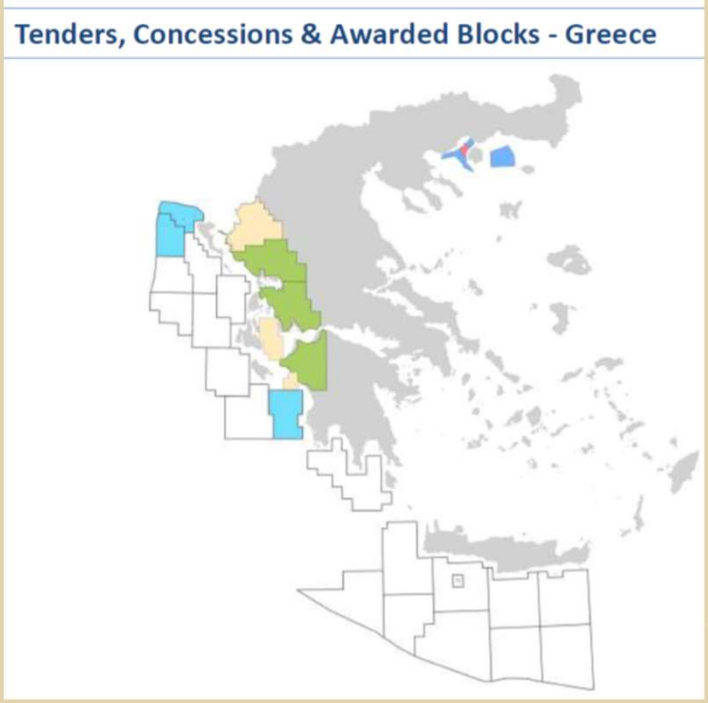

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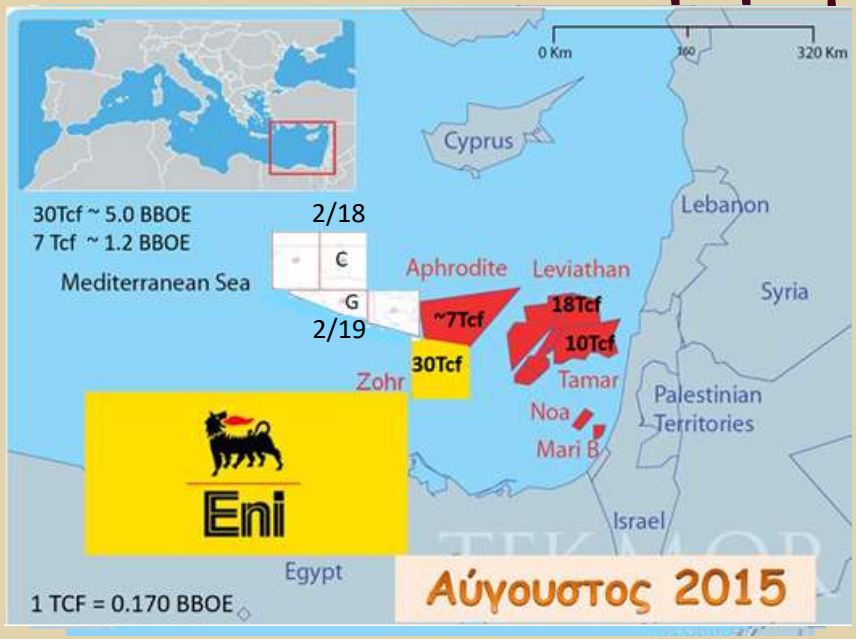
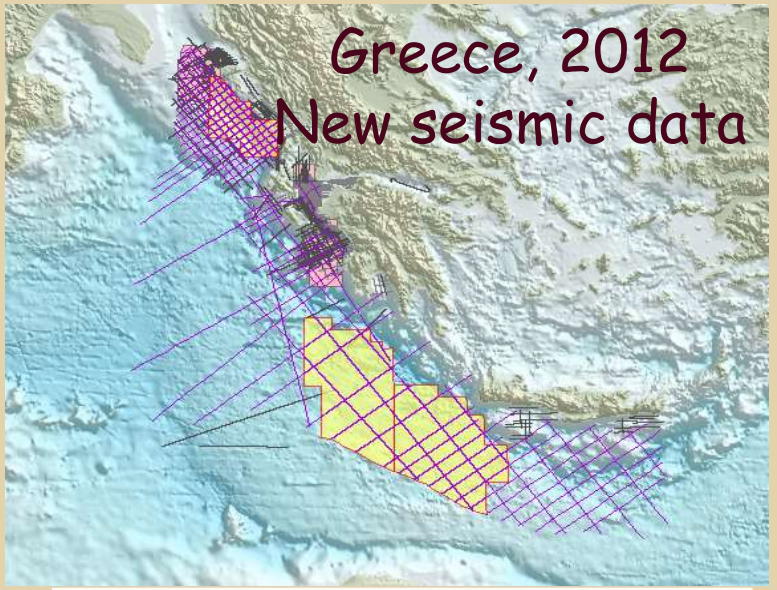
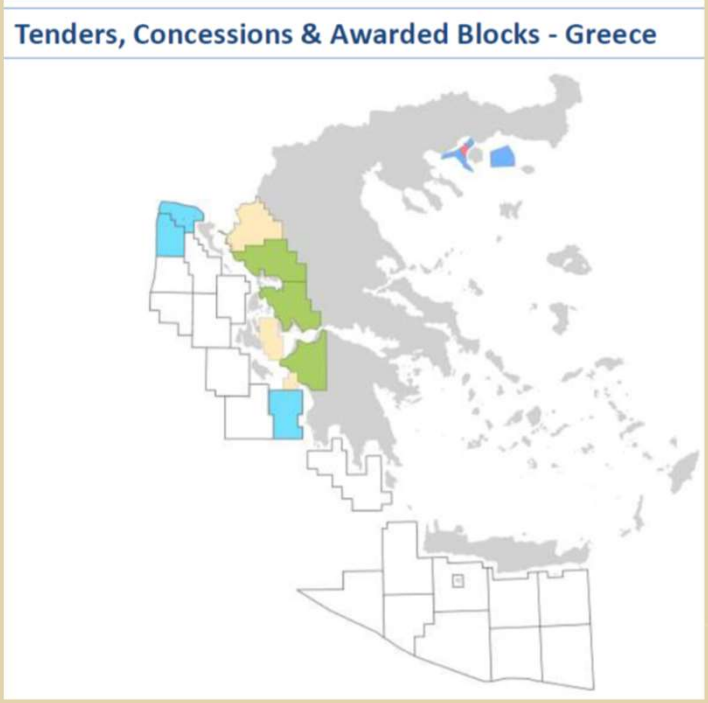




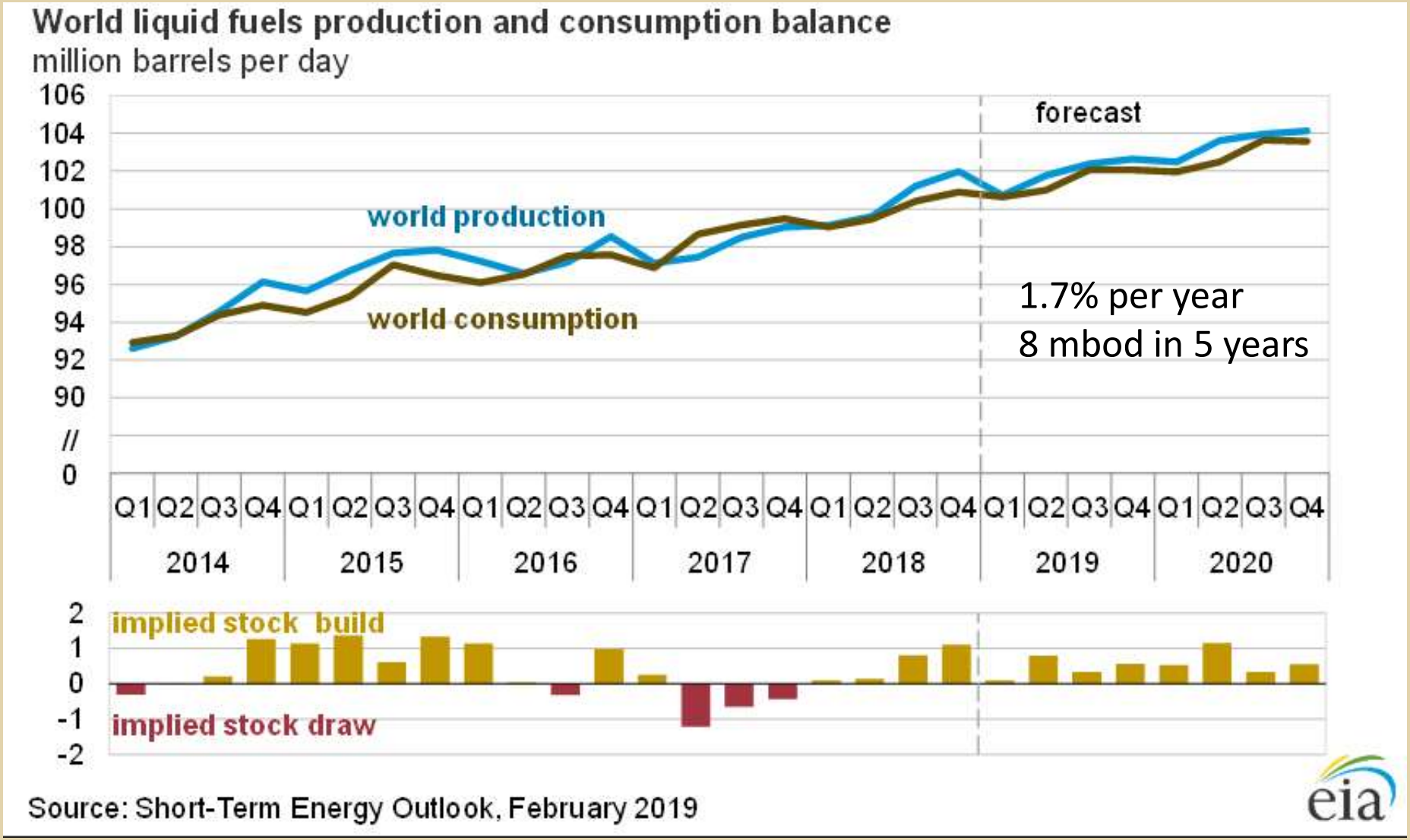
Δεκέμβριο 2017: Προκήρυξη
Ιούλιος 2018: ΕΛΠΕ, TOTAL και Exxon-Mobil, δικαιώματα για τις έρευνες νότια της Κρήτης
Σε αναμονή για υπογραφή συμβάσεων…



Περίληψη

- Εισαγωγή – ενεργειακά
- Γιατί βαθιά νερά;
- Ανακαλύψεις, κόσμος & ΝΑ Μεσόγειος
- Πως γίνονται, γεωτρήσεις και παραγωγή σε βαθιά νερά
- Προκλήσεις, ατύχημα στον ΚΜ, ανάλυση και διαπιστώσεις
- Οφέλη και προβλήματα: Δύο διαφορετικές χώρες
- Περιβαλλοντικά θέματα
- Επόμενα βήματα;

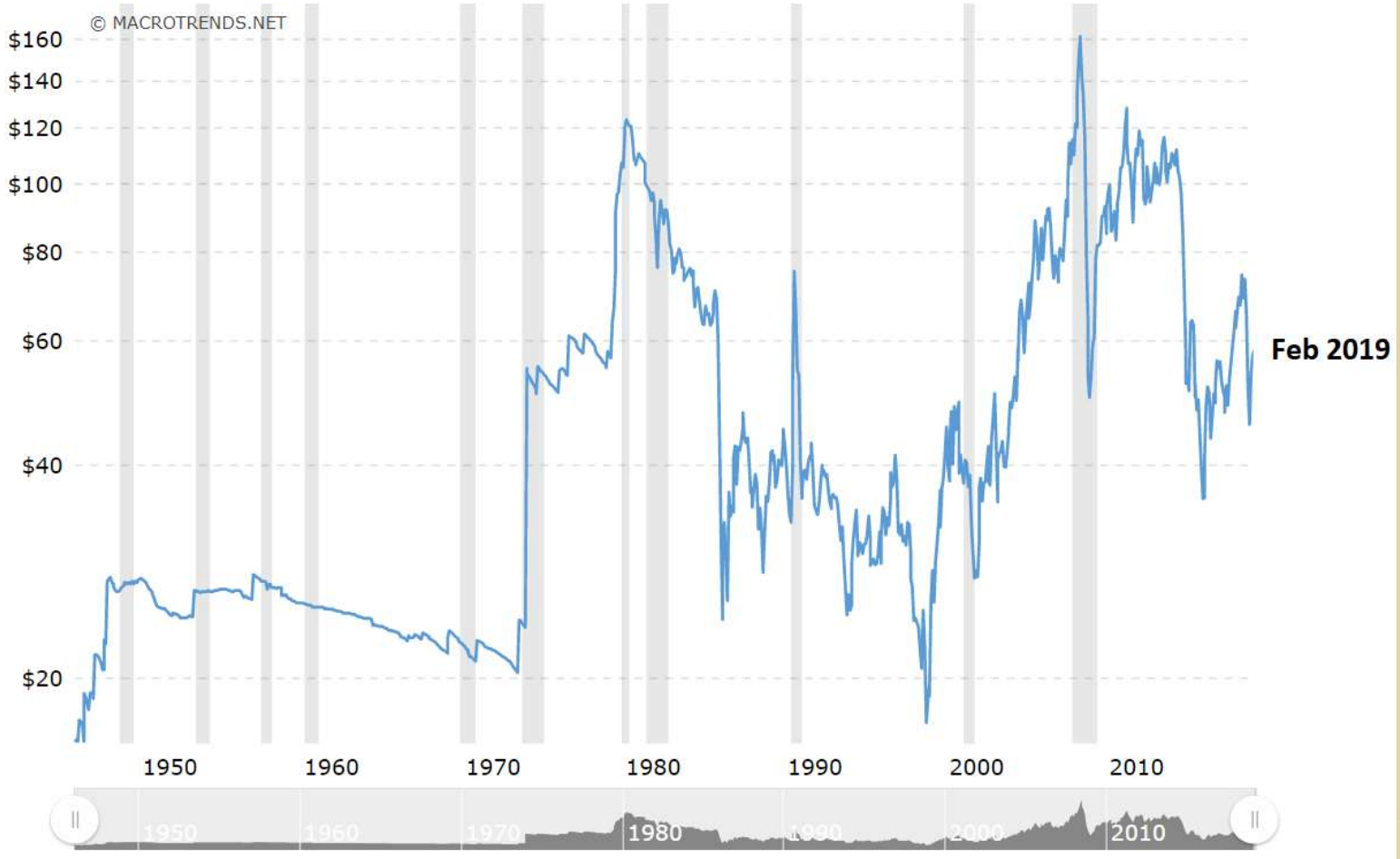
Energy thirsty world

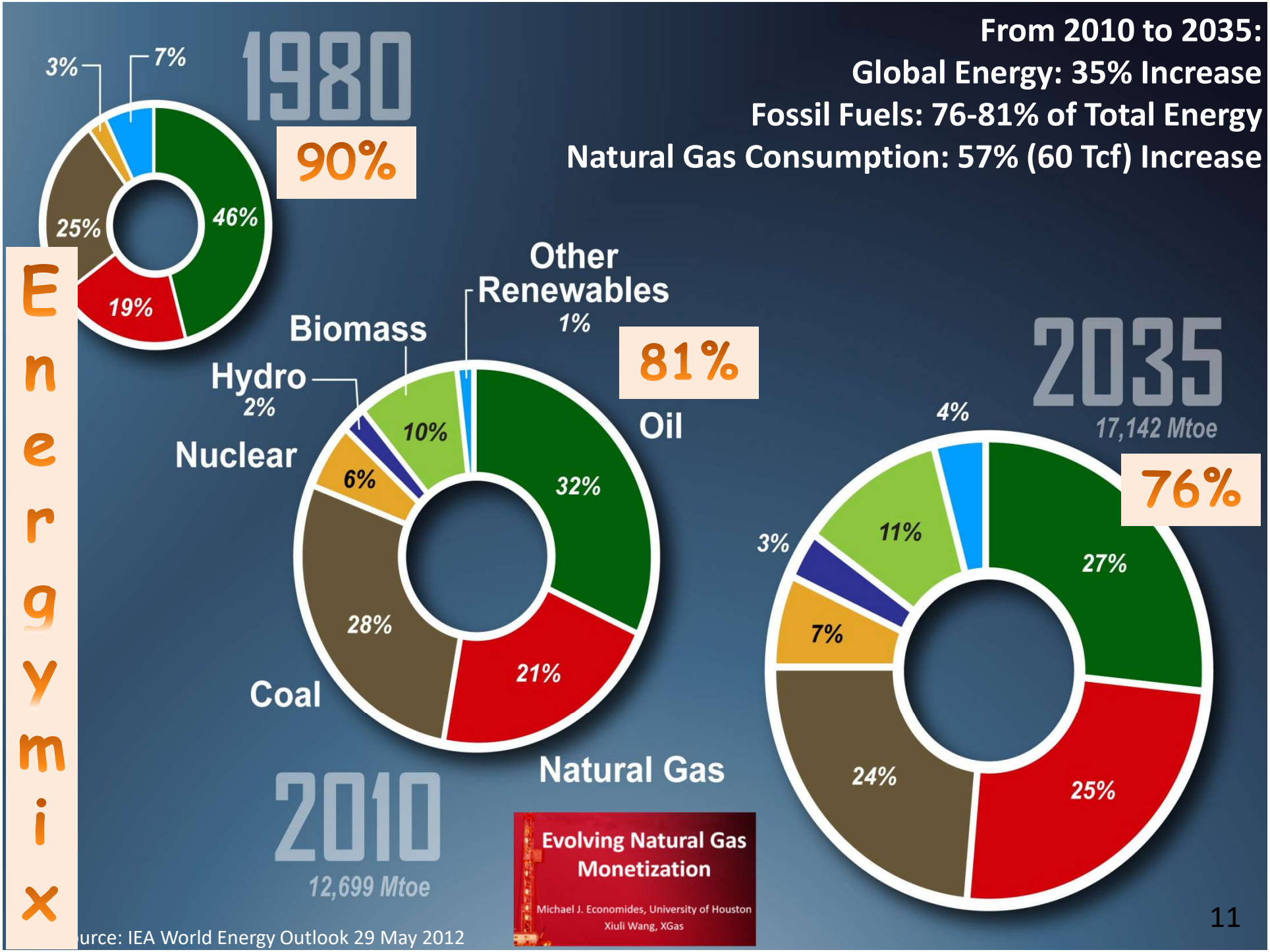


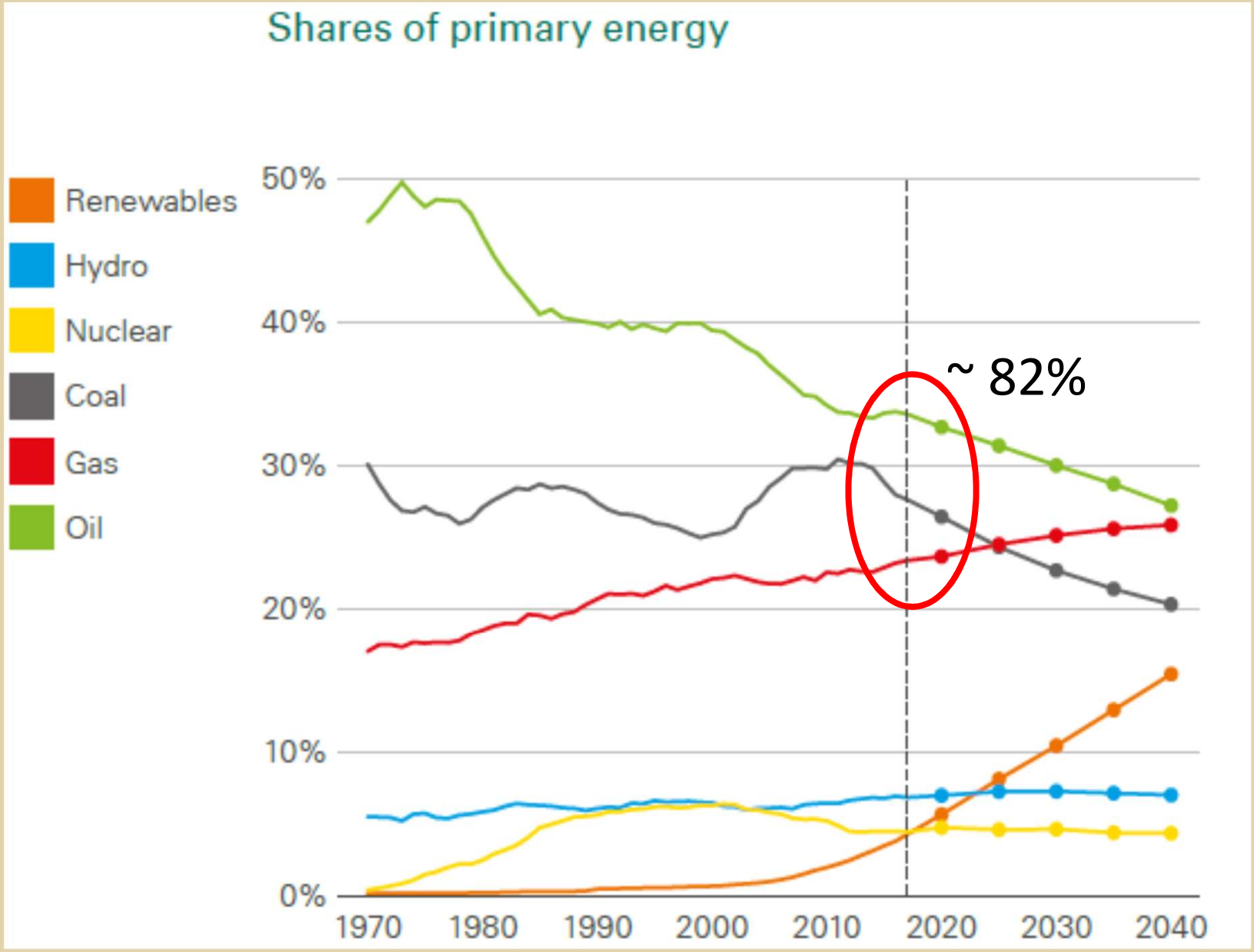
macrotrends

Crude Oil Prices - 70 Year Historical Chart

Interactive charts of West Texas Intermediate (WTI or NYMEX) crude oil prices per barrel back to 1946. The price of oil shown is adjusted for inflation using the headline CPI and is shown by default on a logarithmic scale. The current month is updated on an hourly basis with today's latest value. The current price of WTI crude oil as of March 13, 2019 is **$58.26** per barrel.

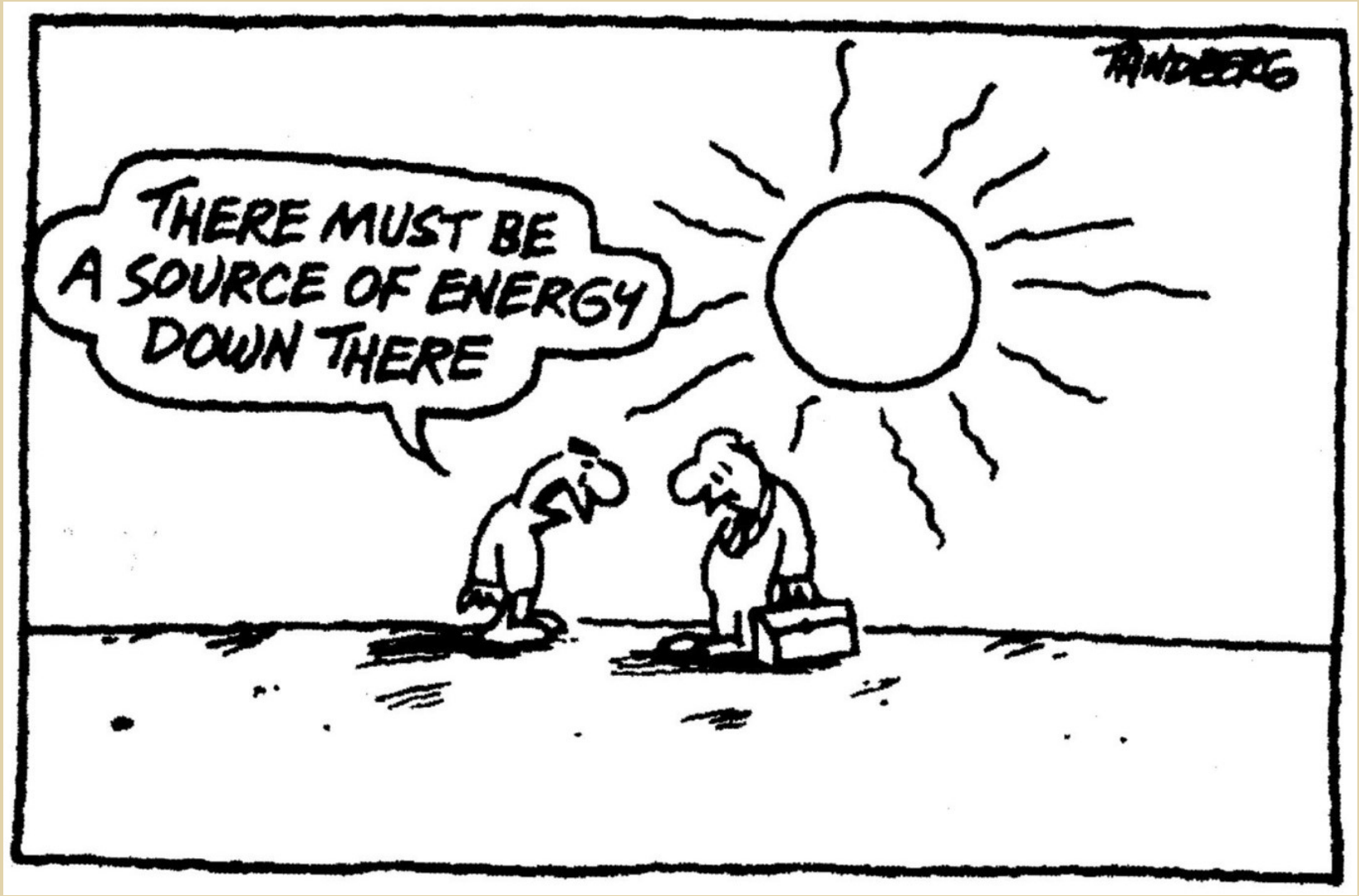



From 2010 to 2035:
Global Energy: 35% Increase
Fossil Fuels: 76-81% of Total Energy
Natural Gas Consumption: 57% (60 Tcf) Increase
Energy mix
1980
90%
3%
7%
46%
25%
19%
2010
12,699 Mtoe
Coal
28%
Oil
32%
Natural Gas
21%
Biomass
10%
Other Renewables
1%
Hydro
2%
Nuclear
6%
81%
2035
17,142 Mtoe
76%
4%
11%
3%
27%
7%
24%
25%
Evolving Natural Gas Monetization
Michael J. Economides, University of Houston
Xiuli Wang, XGas
urce: IEA World Energy Outlook 29 May 2012



BP Energy Outlook
2019 edition

Identify & utilize the obvious energy sources!



Ορυκτοί πόροι θα απαιτούνται για πολλά χρόνια ακόμη

Συνεχής προσπάθεια για μεγαλύτερη μείωση του περιβαλλοντικού αποτυπώματος της χρήσης των ορυκτών καυσίμων

Χρειαζόμαστε καθαρότερες τεχνολογίες για χρήση άνθρακα/λιγνίτη

Τεχνολογικές καινοτομίες για μείωση κόστους ανανεώσιμων πηγών ενέργειας

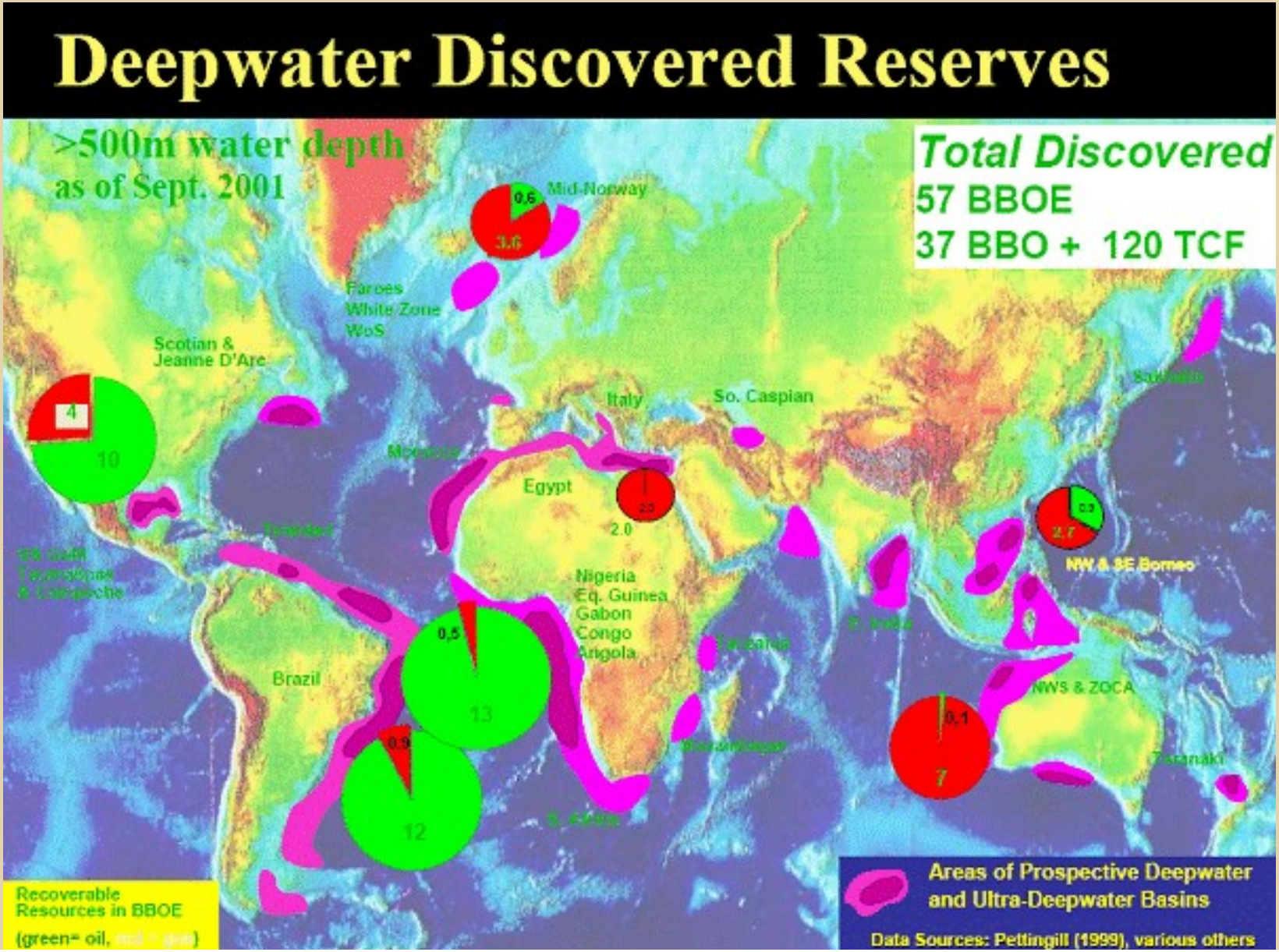
Why deepwater?

Terminology

SHALLOW	<150 m
MIDWATER	150-360 m
DEEPWATER	360 – 1500 m
ULTRADEEPWATER	1500 m+ (some 2280 m+)

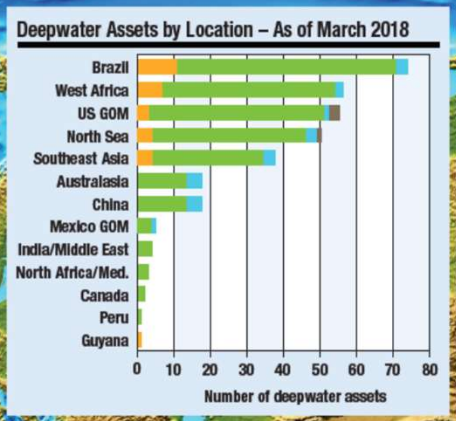
(Petrobras, deepwater >1000 m)

R.M. Slatt, Un. Oklahoma, 2001-02
AAPG Distinguished Lecture Series



Worldwide Locations of Deepwater Facilities and Status - As of March 2018

March 2018



STATUS	FPSO	FPU	TLP	SPAR	CT	FLNG	TOTAL
OP	2	0	0	0	0	0	2
AVAIL.	0	0	0	0	0	0	0
ABAND'D	0	0	0	0	0	0	0
Totals	2	0	0	0	0	0	2

	TLP	SPAR	CT	FLNG	TOTAL
	0	1	0	0	4
	2	0	0	0	43
	0	0	0	0	3
ABAND'D	0	1	0	0	1
Totals	13	3	1	0	0	51

US GOM

STATUS	FPSO	FPU	TLP	SPAR	CT	FLNG	TOTAL
S/UC	0	3	0	0	0	0	3
OP	2	8	18	18	3	0	49
AVAIL.	0	0	0	1	0	0	1
ABAND'D	0	1	1	1	0	0	3
Totals	2	12	19	20	3	0	56

Guyana

STATUS	FPSO	FPU	TLP	SPAR	CT	FLNG	TOTAL
S/UC	1	0	0	0	0	0	1
OP	0	0	0	0	0	0	0
AVAIL.	0	0	0	0	0	0	0
ABAND'D	0	0	0	0	0	0	0
Totals	1	0	0	0	0	0	1

China

STATUS	FPSO	FPU	TLP	SPAR	CT	FLNG	TOTAL
S/UC	0	0	0	0	0	0	0
OP	13	1	0	0	0	0	14
AVAIL.	3	0	0	0	0	1	4
ABAND'D	0	0	0	0	0	0	0
Totals	16	1	0	0	0	1	18

Mexico GOM

STATUS	FPSO	FPU	TLP	SPAR	CT	FLNG	TOTAL
S/UC	0	0	0	0	0	0	0
OP	4	0	0	0	0	0	4
AVAIL.	1	0	0	0	0	0	1
ABAND'D	0	0	0	0	0	0	0
Totals	5	0	0	0	0	0	5

North Africa/Med.

STATUS	FPSO	FPU	TLP	SPAR	CT	FLNG	TOTAL
S/UC	0	0	0	0	0	0	0
OP	3	0	0	0	0	0	3
AVAIL.	0	0	0	0	0	0	0
ABAND'D	0	0	0	0	0	0	0
Totals	3	0	0	0	0	0	3

Southeast Asia

STATUS	FPSO	FPU	TLP	SPAR	CT	FLNG	TOTAL
S/UC	2	0	1	0	0	1	4
OP	25	2	2	1	0	1	31
AVAIL.	3	0	0	0	0	0	3
ABAND'D	0	0	0	0	0	0	0
Totals	30	2	3	1	0	2	38

Peru

STATUS	FPSO	FPU	TLP	SPAR	CT	FLNG	TOTAL
S/UC	0	0	0	0	0	0	0
OP	0	0	0	1	0	0	1
AVAIL.	0	0	0	0	0	0	0
ABAND'D	0	0	0	0	0	0	0
Totals	0	0	0	1	0	0	1

India/Middle East

STATUS	FPSO	FPU	TLP	SPAR	CT	FLNG	TOTAL
S/UC	0	0	0	0	0	0	0
OP	4	0	0	0	0	0	4
AVAIL.	0	0	0	0	0	0	0
ABAND'D	0	0	0	0	0	0	0
Totals	4	0	0	0	0	0	4

Brazil

STATUS	FPSO	FPU	TLP	SPAR	CT	FLNG	TOTAL
S/UC	11	0	0	0	0	0	11
OP	46	14	1	0	0	0	61
AVAIL.	1	2	0	0	0	0	3
ABAND'D	0	0	0	0	0	0	0
Totals	58	16	1	0	0	0	75

West Africa

STATUS	FPSO	FPU	TLP	SPAR	CT	FLNG	TOTAL
S/UC	5	0	0	0	0	2	7
OP	41	0	4	0	2	1	48
AVAIL.	1	1	0	0	0	0	2
ABAND'D	0	0	0	0	0	0	0
Totals	47	1	4	0	2	3	57

Australasia

STATUS	FPSO	FPU	TLP	SPAR	CT	FLNG	TOTAL
S/UC	0	0	0	0	0	0	0
OP	11	2	0	0	0	1	14
AVAIL.	4	0	0	0	0	0	4
ABAND'D	0	0	0	0	0	0	0
Totals	15	2	0	0	0	1	18

World Totals

STATUS	FPSO	FPU	TLP	SPAR	CT	FLNG	TOTAL	%
S/UC	22	3	1	1	0	3	30	8.9%
OP	180	39	27	20	5	3	274	83.5%
AVAIL/AB	15	4	0	1	0	1	21	6.4%
ABAND.		1	2	1			4	1.2%
Totals	217	47	30	23	5	7	329	100.0%
% Total	66.1%	14.4%	9.2%	7.4%	1.5%	1.3%	100.0%	100.0%

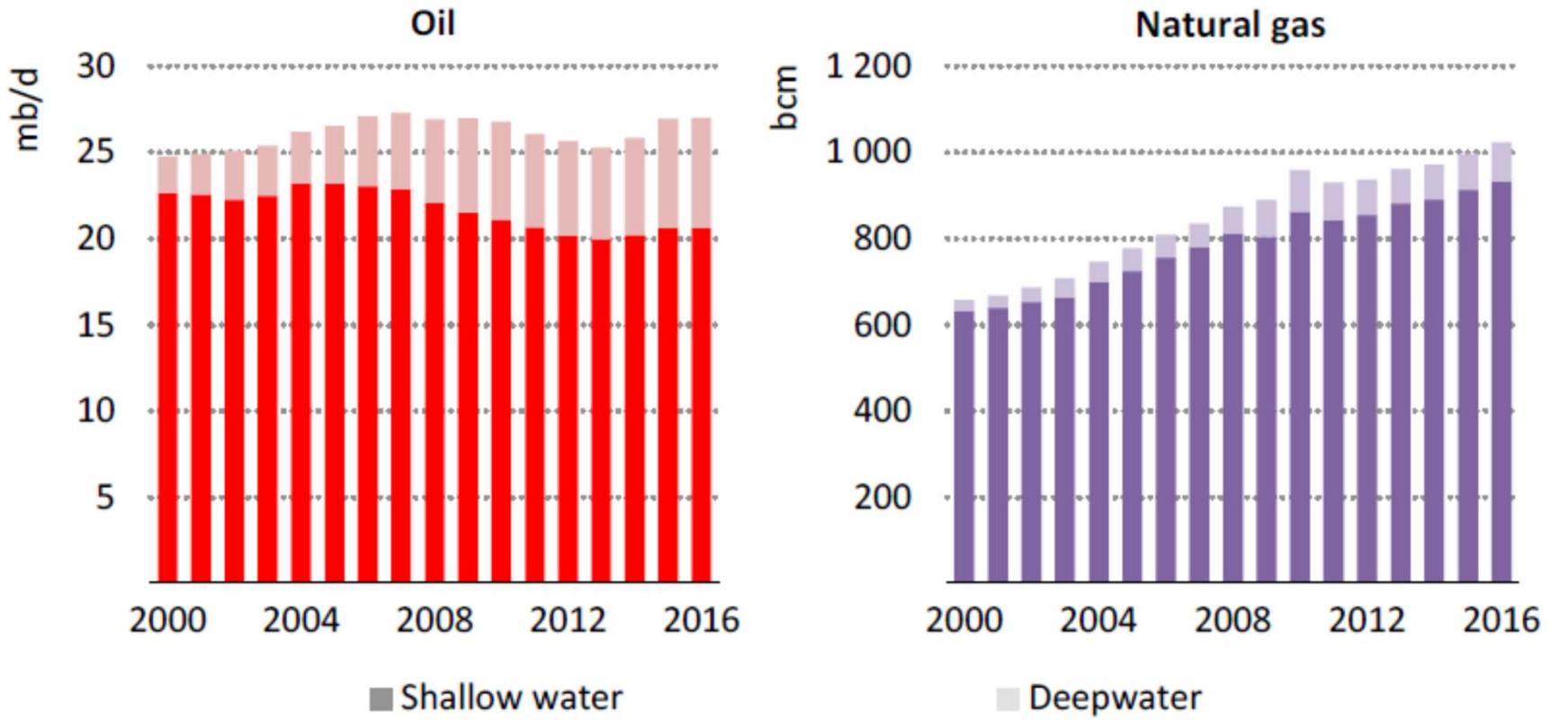
Numbers are based upon: Energy Maritime Associates and World Energy Reports (www.worldenergyreports.com) and research by Wood.

Legend:

- Sanctioned/Under Const.
- Operating
- Available
- Abandoned

COURTESY: Wood.

Figure 1 ▷ Global offshore oil and natural gas production by water depth

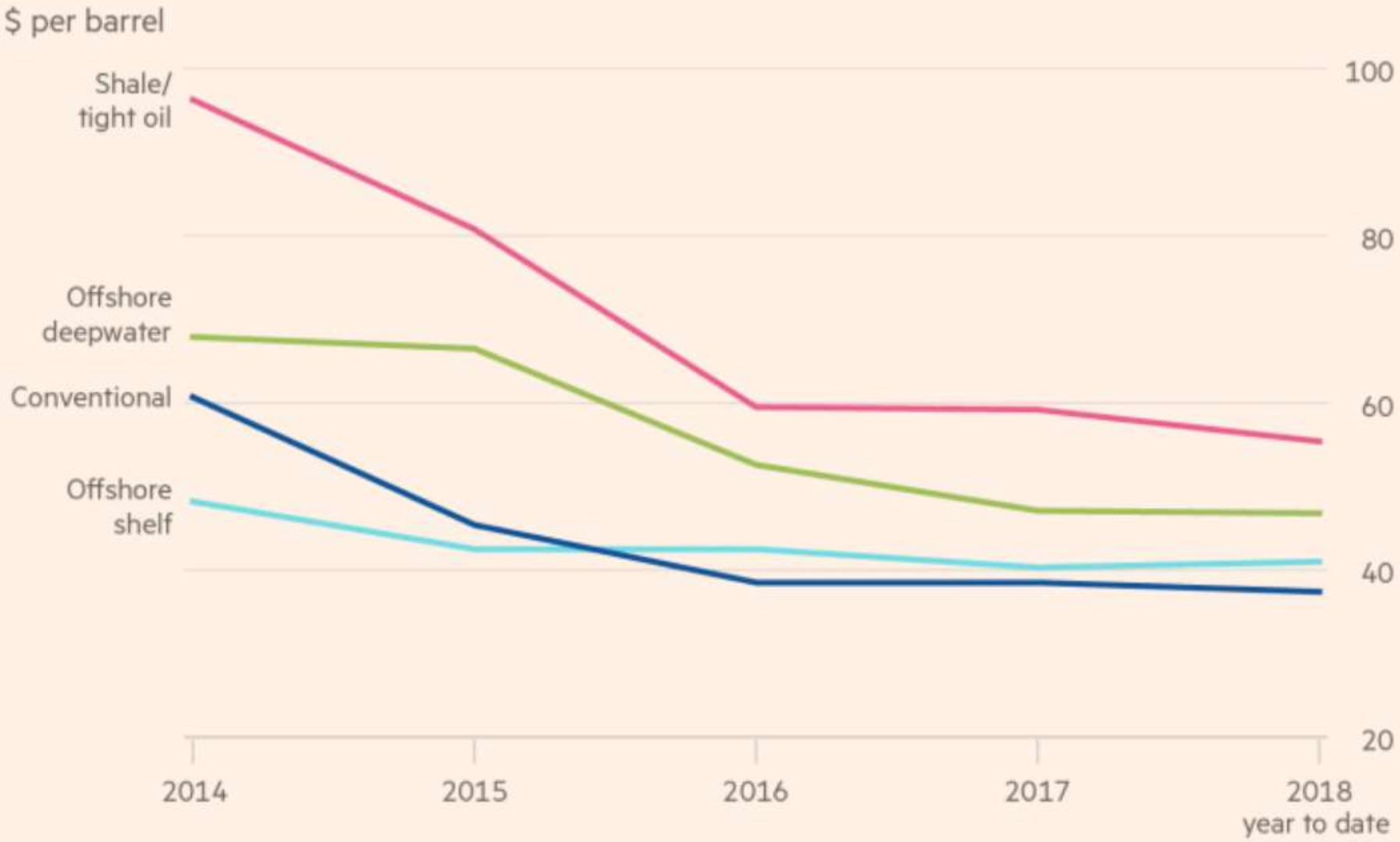


Growth in offshore hydrocarbons production since 2000 has come mainly from natural gas, while oil has moved to deepwater to keep output steady around 25 mb/d

Offshore Energy Outlook 2018

International Energy Agency
Secure Sustainable Together

Break-even prices for benchmark Brent crude have fallen



Source: Rystad Energy

Drilling in ultra deep waters

- Gulf of Mexico
- Brazil
- Angola, Nigeria
- China
- Canada
- India
- Myanmar
- ….

Mediterranean, after 2000

- Libya
- Egypt (up to 3000 m)
- Israel
  - Tamar, 1670 m / 4880 m
  - Leviathan, 1634 m / 5095 m
  - Leviathan-3, ~ 100 mil US$
- Cyprus
  - Aphrodite, 1688 m / 5859 m
  - Calypso, 2074 m / 3827 m
  - Glaucus, 2063 m / 4200 m
- Greece???
  - Crete, Ionian, 500 - 3000 m

What is it involved?

Exploration & Production ("Upstream") Process

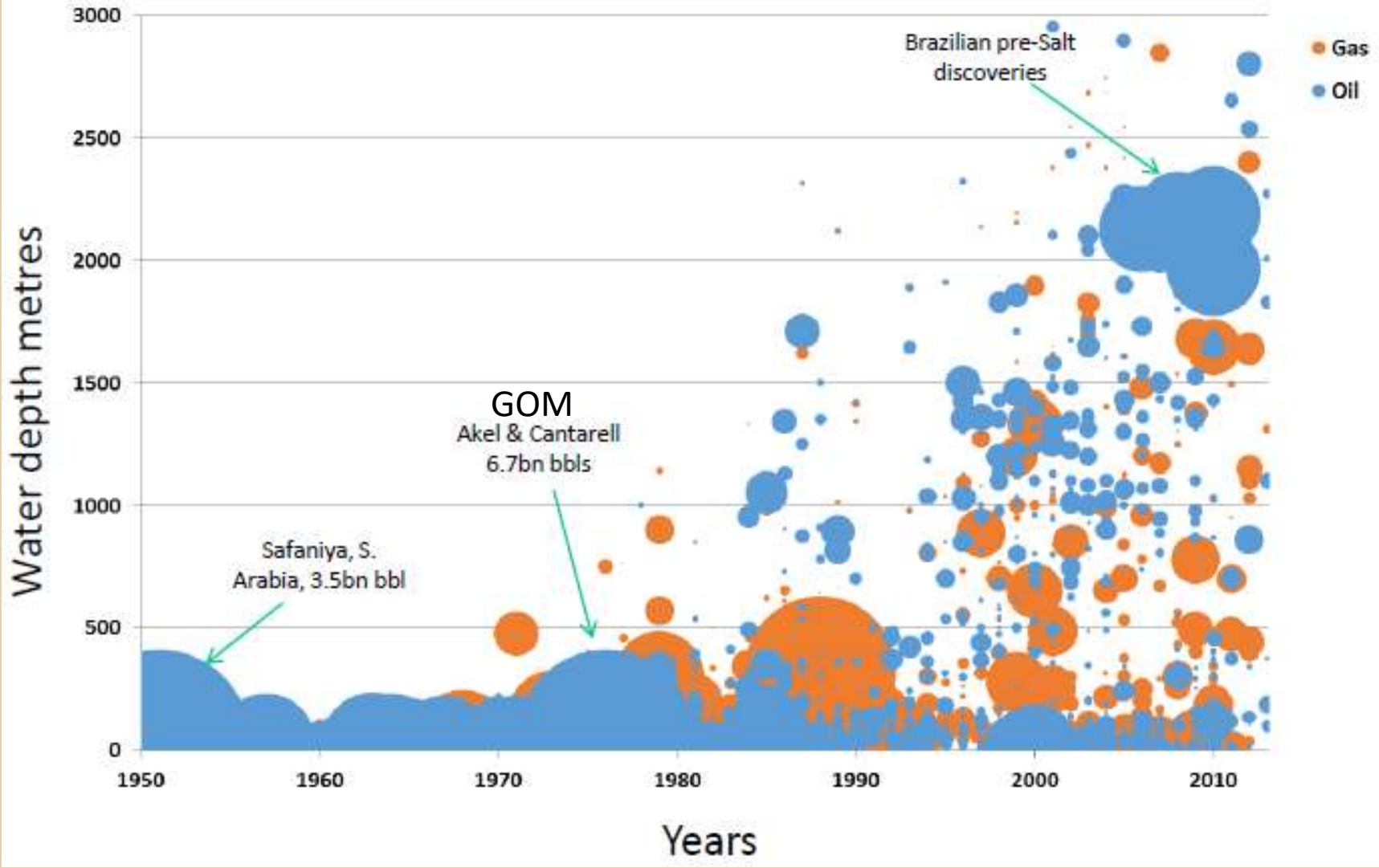
Find → **Develop** → **Produce**

- Identify Prospect
- Lease Block
- Drill Exploratory Well(s)
- Characterize Reservoir
- Determine Commerciality

- Wells
  - Drill
  - Complete
- Facilities
  - Platform
  - Production Processing
  - Pipeline

- Surveillance
  - Reservoir
  - Wells
  - Equipment
- Production Processing / Measurement
- Well Workovers
- Abandonment

History of offshore discoveries by water depth



Deepwater drilling
A macro-economic view

SPE Workshop
Deepwater drilling, interventions and completions
Bali 23 June 2014

Gavin Strachan,
Bassoe Offshore AS,
Oslo, Houston, London, Dubai, Rio

Santos Basin

DO NOT GIVE UP EVEN AFTER 59 DRY HOLES IN 18 YEARS

Thank you!

fjfeijo@uol.com.br

Santos Basin: 40 Years from Shallow to Deep to Ultra-Deep Water*

Fávio Juarez Feijó[1]

Search and Discovery Article #10553 (2013)
Posted December 16, 2013

Deepwater drilling
A macro-economic view
SPE Workshop
Deepwater drilling, interventions and completions
Bali 23 June 2014
Gavin Strachan,
Bassoe Offshore AS,
Oslo, Houston, London, Dubai, Rio

Libra field as an example for rig demand

Libra field Discovered in 2010

- Brazilian pre-salt field in c 7,200ft water 2180m
- estimated about 8 bn bbls 8 BBO
- requires 200 - 300 development wells
- requires up to ten rigs
- first oil expected in 2020

Expected to produce 1.4 million barrels of oil a day (mmbod) by 2021.

Signing bonus → 5.4 billion €
Estimated CAPEX → 76 billion €

Giant Libra oil field in Brazil starts production

November, 2017
50 MBOd

FPSO Pioneiro de Libra (Image by Teekay)

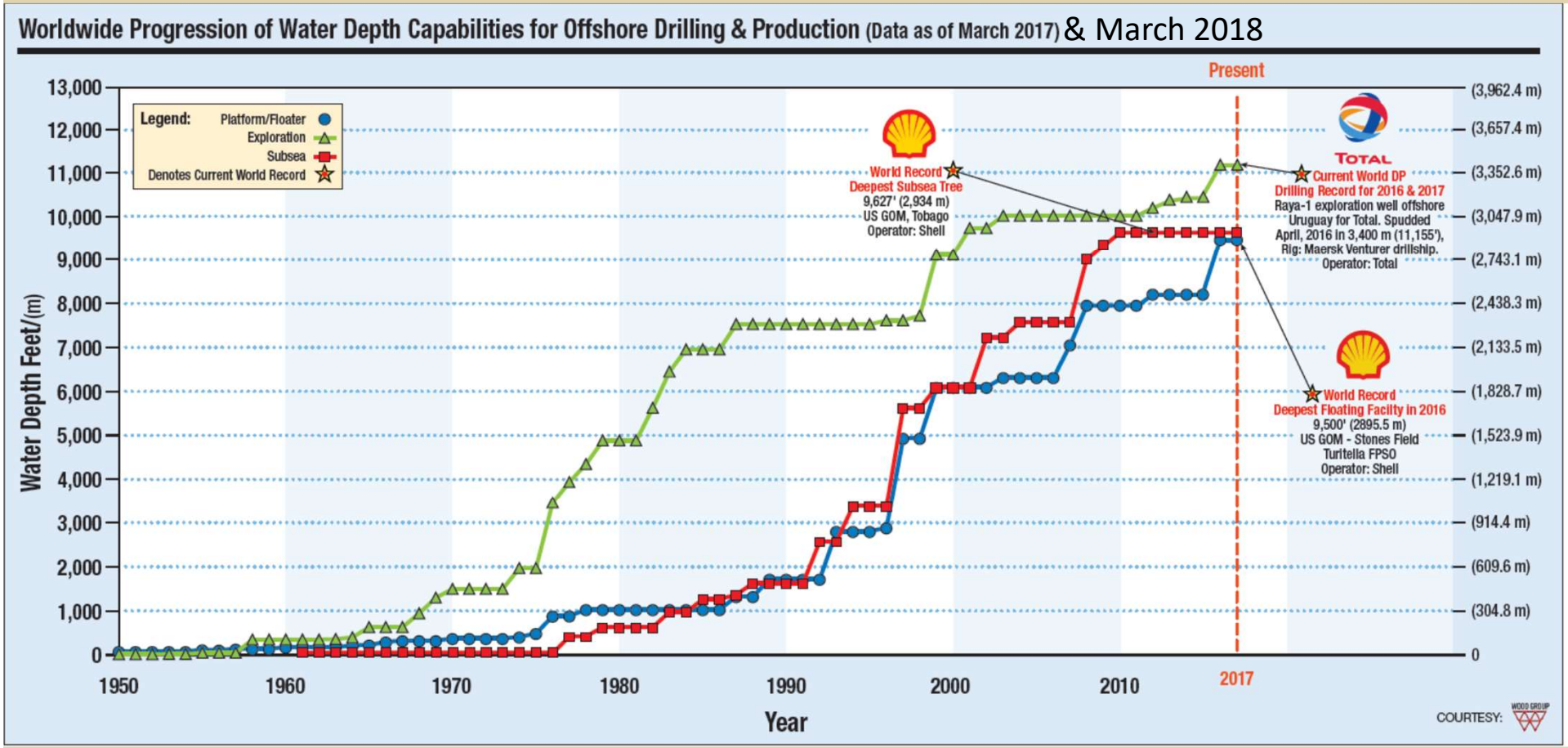
French oil company Total has announced first oil from the Libra mega-field, located i ultra-deep waters 180 kilometers offshore Rio de Janeiro, in the pre-salt Santos Basin in Brazil. The Libra project is operated by Brazil's Petrobras.

First oil is flowing into the Pioneiro de Libra FPSO, chartered by Petrobras from Teekay and Odeberecht consortium. The vessel, built in Singapore, arrived in Brazil in May this year.

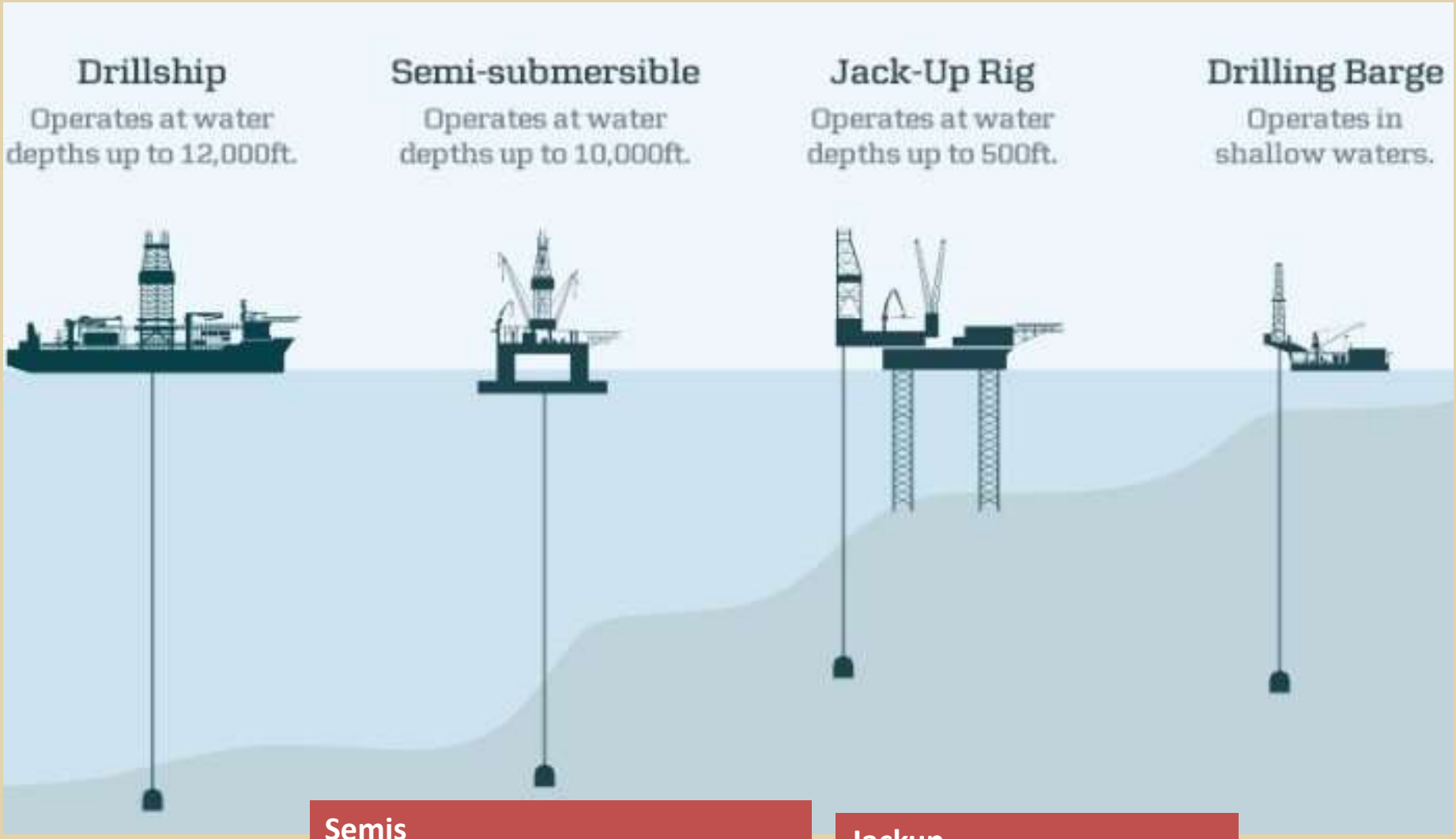
The floating production, storage and offloading has a capacity of 50,000 barrels of oil. It serves as the early production system which will generate revenue, and enabling technical data to be collected to optimize the subsequent development phases that will include a larger FPSO.

Drilling & Production Records

Drilling, 3400m
Subsea Tree, 2934m
Floating plat., 2896m



Offshore Drilling Rigs



Semis
from 150 to 3000 m water
Rig cost 300 million $
Well cost: 30-100 million $

Jackup
Up to 150 m water
Rig cost , 200 million $

Drilling ships

For water depths > 2500 m

Discoverer Clear Leader

(Transocean)

Up to 3650 m water depth

Well depth:

up to 8500 m from sea floor

Crew – 200 persons

Ship cost 640 million US$

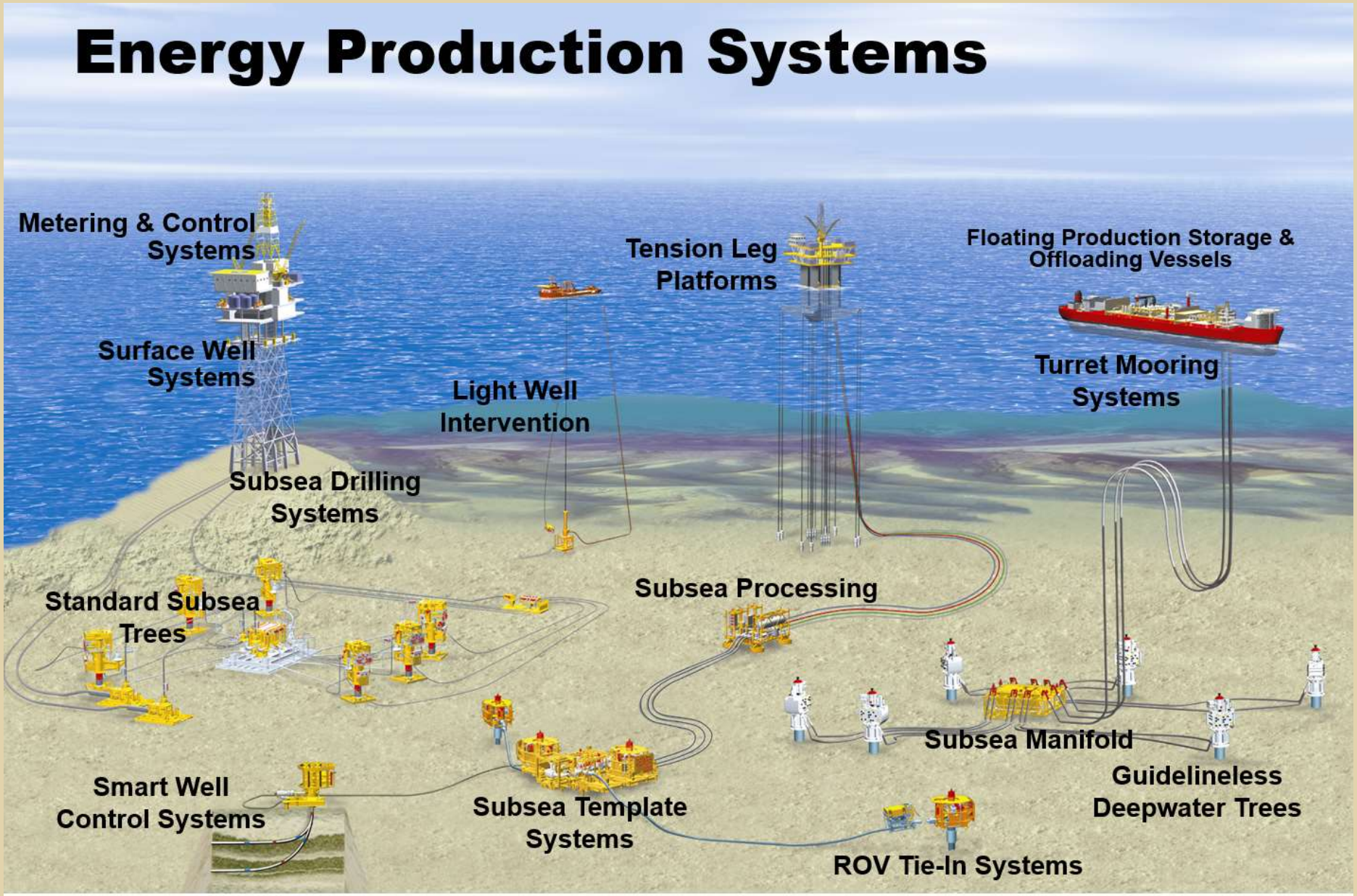
Daily cost : up to 650.000+ $

But all come at a price !

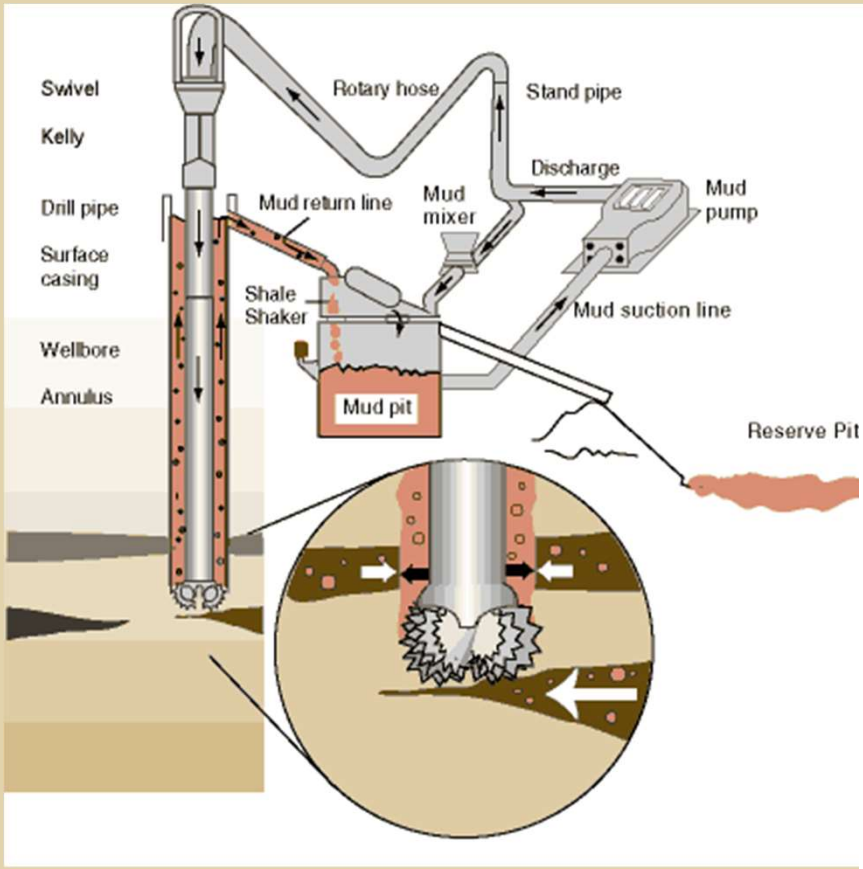
- US $ 10 – 100 million , single well
  - for 300 – 3000 m water depth
- US $ 3 – 9 million,
  - for onshore (TD ~5000 m)
  - or offshore shallow water (TD ~ 6000 m)

- 50% costs for Drilling / tripping
- 9.5% for Drilling Fluids (3rd largest)

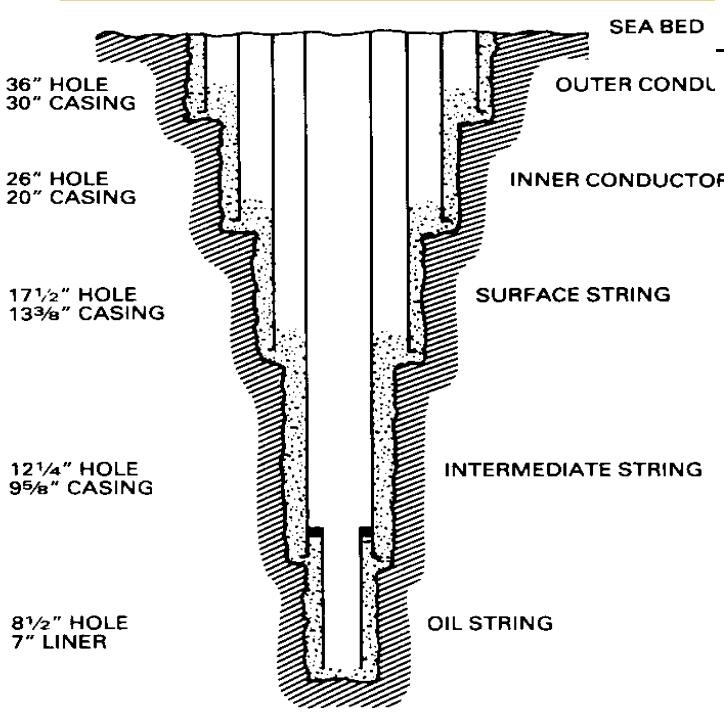
Energy Production Systems



Drilling



~800 m3 fluid
~350 m3 solids
~1000 t solids



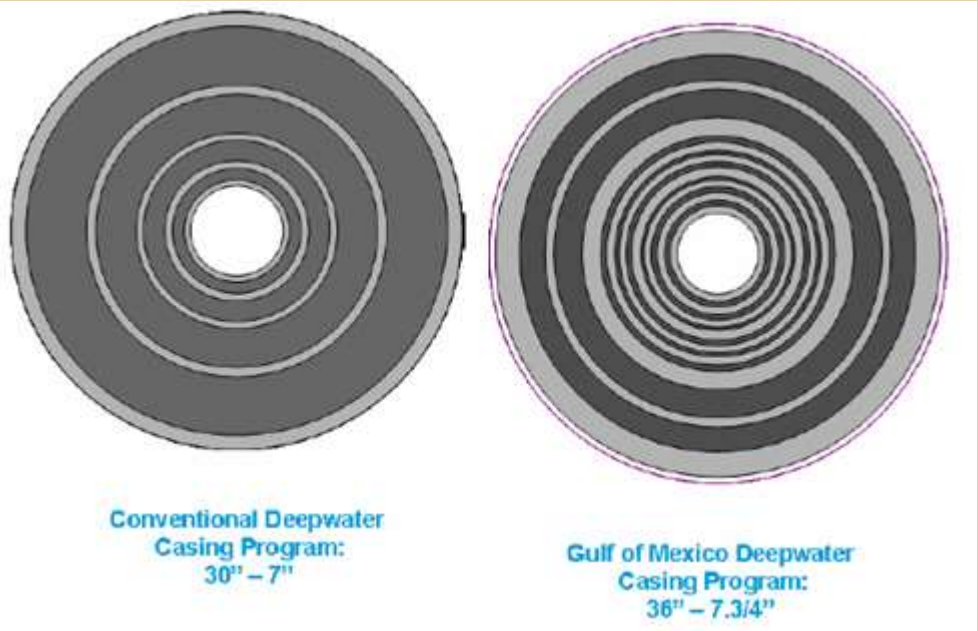
	Depth BML
	240 ft
	1,100 ft
	4,100 ft
	8,600 ft
	10,100 ft

A TYPICAL NORTH SEA CASING DESIGN

Challenges

Casing

4-5 conventional 9 GoM



Close F, B McCavitt, B Smith, 2008. Deepwater Gulf of Mexico Development Challenges Overview

Disasters

Thunder Horse
Hurricane Dennis, 2005
Back in production, 2008
After 30 months !

Driller's worst nightmare????

http://www.youtube.com/watch?v=4ntsk1g-2oY

A price to pay, April 20 2010, GoM

The rig is in the Gulf of Mexico Mississippi Canyon block 252, 41 mi (66 km) offshore Louisiana.

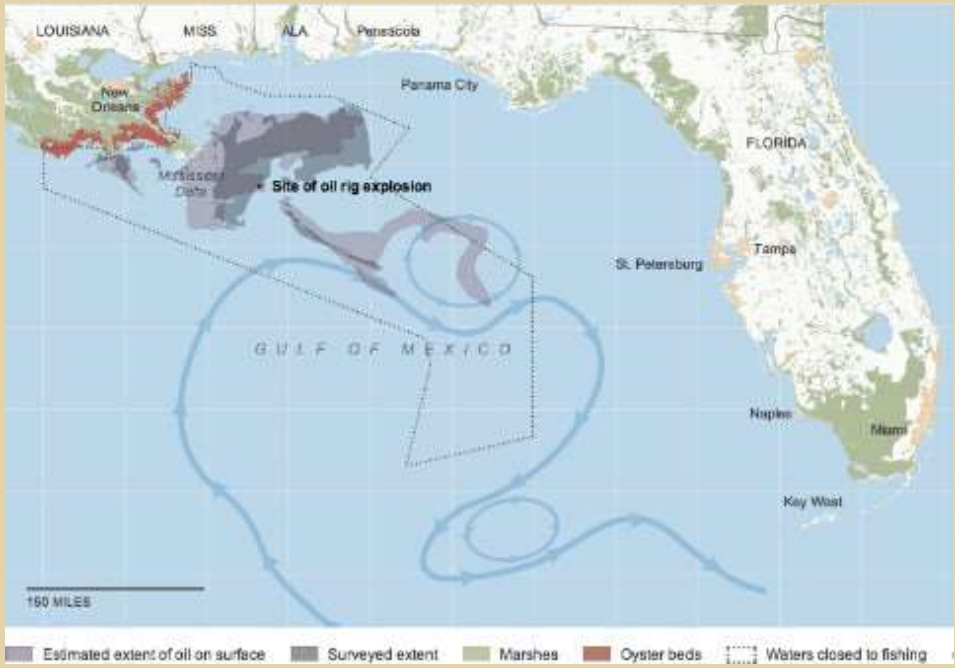
The incident occurred around 10 p.m. Tuesday on the Deepwater Horizon. As of 5 a.m., officials said the fire continued to burn on the water and on the rig.

Deepwater Horizon Analysis

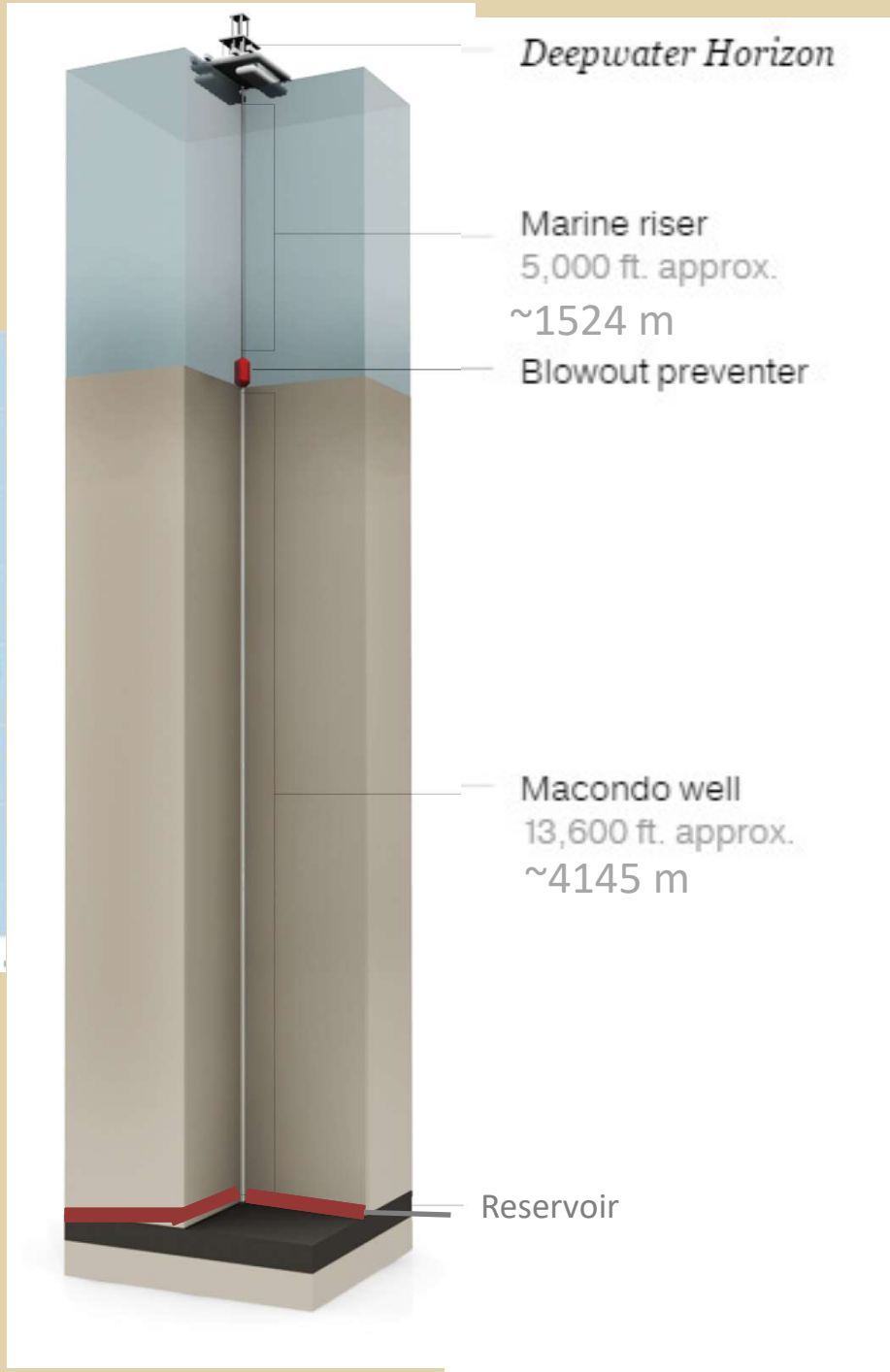
-

Lessons Learned

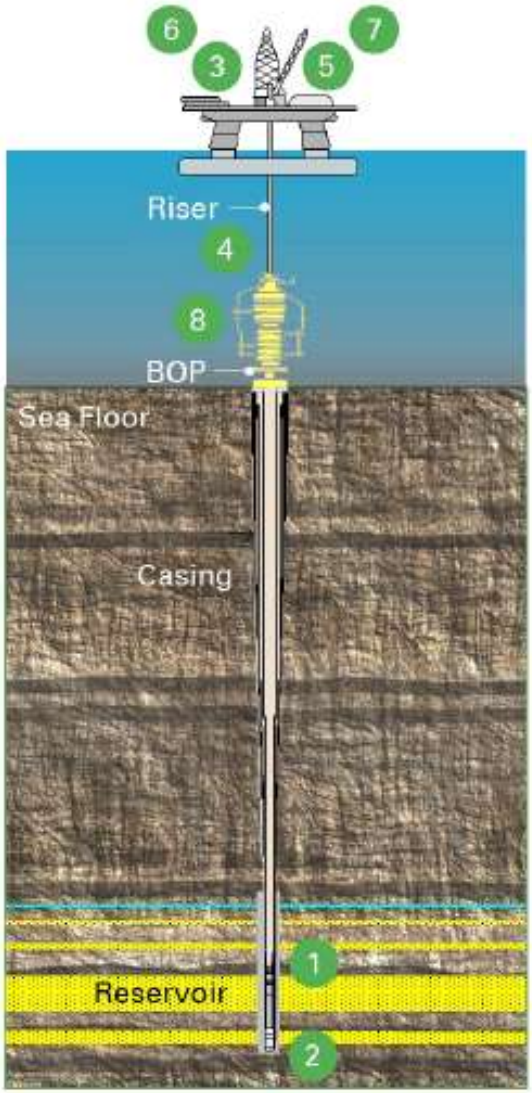
April 20, 2010



BRITISH PETROLEUM
TRANSOCEAN
HALLIBURTON



Investigation summary



Well integrity was not established or failed

1. Annulus cement barrier did not isolate hydrocarbons
2. Shoe track barriers did not isolate hydrocarbons

Hydrocarbons entered the well undetected and well control was lost

3. Negative pressure test was accepted although well integrity had not been established
4. Influx was not recognized until hydrocarbons were in riser
5. Well control response actions failed to regain control of well

Hydrocarbons ignited on the Deepwater Horizon

6. Diversion to mud gas separator resulted in gas venting onto rig
7. Fire and gas system did not prevent hydrocarbon ignition

Blowout preventer did not seal the well

8. Blowout preventer (BOP) emergency mode did not seal well

The estimated amount of oil spilled over the 87 days was 4.9 million barrels (780,000 m3)

The Guardian International edition

▲ Patches of oil from the Deepwater Horizon spill are seen from an underwater vantage in the Gulf of Mexico on 7 June 2010. Photograph: Rich Matthews/AP

Mark Dodd, a wildlife biologist from Georgia's Department of Natural Resources, surveying oiled sargassum seaweed in the Gulf of Mexico after the Deepwater Horizon oil spill in 2010. *(Georgia Department of Natural Resources)*

https://ocean.si.edu/conservation/pollution/gulf-oil-spill

Post-Macondo initiatives and results

The United States Department of Interior has created two new, independent agencies to carry out the offshore energy management and enforcement functions that were under the jurisdiction of the Bureau of Ocean, Energy Management, Regulation and Enforcement.

BOEM
Bureau of Ocean Energy Management

BSEE
Bureau of Safety and Environmental Enforcement

The **Bureau of Ocean Energy Management** is responsible for managing development of the nation's offshore resources in an environmentally and economically responsible way. Functions include: Leasing, Plan Administration, Environmental Studies, National Environmental Policy Act Analysis, Resource Evaluation, Economic Analysis and the Renewable Energy Program.

The **Bureau of Safety and Environmental Enforcement** enforces safety and environmental regulations. Functions include: All field operations including Permitting and Research, Inspections, Offshore Regulatory Programs, Oil Spill Response, and newly formed Training and Environmental Compliance functions.

Ν. 4409/2016 – ΕΔΕΥ / Αρμόδια Αρχή Προεδρικό Διάταγμα

Με προεδρικό διάταγμα που εκδίδεται με πρόταση του Υπουργού Περιβάλλοντος και Ενέργειας ορίζεται η Αρμόδια Αρχή, ρυθμίζονται τα ζητήματα που σχετίζονται με τη διοίκηση, τη στελέχωση και τη λειτουργία της, καθώς και κάθε άλλο σχετικό θέμα για την άσκηση των αρμοδιοτήτων της, σύμφωνα και με το Παράρτημα 3.

4. Τα κατά τον παρόντα Νόμο καθήκοντα της Αρμόδιας Αρχής ασκούνται από την Ελληνική Διαχειριστική Εταιρεία Υδρογονανθράκων (ΕΔΕΥ) ΑΕ (άρθρα 145–153 του Ν. 4001/2011), μέχρι την έκδοση του προεδρικού διατάγματος της παραγράφου 3 και εφόσον οι εγκαταστάσεις υπεράκτιων εργασιών που δραστηριοποιούνται στη χώρα είναι λιγότερες από έξι.

Results of Joint Industry Task Forces

- **Offshore Equipment**
  - API Std 53 *Practices for Blowout Prevention Equipment Systems for Drilling Wells*
- **Offshore Procedures**
  - API RP 96 *Deepwater Well Design Considerations*
  - API Bulletin 97 Well Construction *Interface Document*
  - API RP 65-2 Cementing & Isolation & Barriers
- **Subsea Well Control & Containment**
- **Oil Spill Preparedness & Response**

Containment Systems Equipment - Capping Stacks

- Each company has stated personnel and equipment are available to contain a deepwater well control incident in the U.S. Gulf of Mexico
- Each company has stated exercises (planned and unannounced) will be conducted on a regular basis to ensure personnel and equipment are ready to respond

Helix Well Containment Group

Wild Well Control*

Marine Well Containment Company

BP Deepwater Horizon fine capped at $13.8bn

January 16, 2015

Federal judge rules that total spill from accident was 3.2m barrels, fewer than the 4.2m claimed by US government

theguardian

A federal judge in New Orleans has rejected BP's effort to cap its fines from the 2010 Gulf of Mexico oil spill at $9.57 billion, nearly one-third lower than the penalty federal prosecutors are seeking. The court has not yet ruled how much the British oil giant will pay for the disaster.

U.S. District Judge Carl Barbier ruled Thursday (Feb. 19) that BP could pay a maximum civil penalty of up to $4,300 for each barrel of oil spilled. The fines apply under the Clean Water Act, the federal law governing water pollution.

The ruling means BP continues to face up to $13.7 billion in civil fines for the oil spill.

BP had asked Barbier to cap the fine at $3,000 per barrel, the maximum set in 1990. But federal prosecutors said Environmental Protection Agency and Coast Guard rules required adjustments for inflation.

nola The Times-Picayune Greater New Orleans

February 19, 2015

Federal judge rejects BP bid to lower $13.7 billion oil spill fine

NFWF

Who We Are What We Do Partn

Home » Gulf Environmental Benefit Fund

QUICK LAUNCH

- Gulf Home
- Plea Agreements
- States
  - Alabama
  - Florida
  - Louisiana
  - Mississippi
  - Texas
- Gulf Media Center
- NFWF History in the Gulf
- Partners in the Gulf
- GEBF Funding Priorities
- FAQ's
- Contact the GEBF

Brown pelican

Gulf Environmental Benefit Fund

In early 2013, a U.S. District Court approved two plea agreements resolving certain criminal cases against BP and Transocean which arose from the 2010 Deepwater Horizon explosion and oil spill. The agreements directed a total of $2.544 billion to NFWF to fund

GULF SPILL RESTORATION

Website maintained by NOAA on behalf of the Deepwater Horizon Natural Resource Damage Assessment Trustees

Home About Us How We Restore Restoration Areas Data Media & News

Home \ A Comprehensive Restoration Plan for the Gulf of Mexico

A Comprehensive Restoration Plan for the Gulf of Mexico

The Trustees have reached a settlement with BP to resolve BP's liability for natural resource injuries from the *Deepwater Horizon* oil spill. Under this settlement, BP will pay up to $8.8 billion for restoration.

Based on our thorough assessment of impacts to the Gulf's natural resources, we selected the comprehensive, integrated ecosystem restoration approach for restoration implementation. This approach is outlined in the comprehensive restoration plan, which will allocate funds from the settlement for restoration over the next 15 years.

The plan, and information on the settlement with BP (called the Consent Decree), can be found below.

Final Programmatic Damage Assessment and Restoration Plan (PDARP) and Final

Case Study

Gas Production

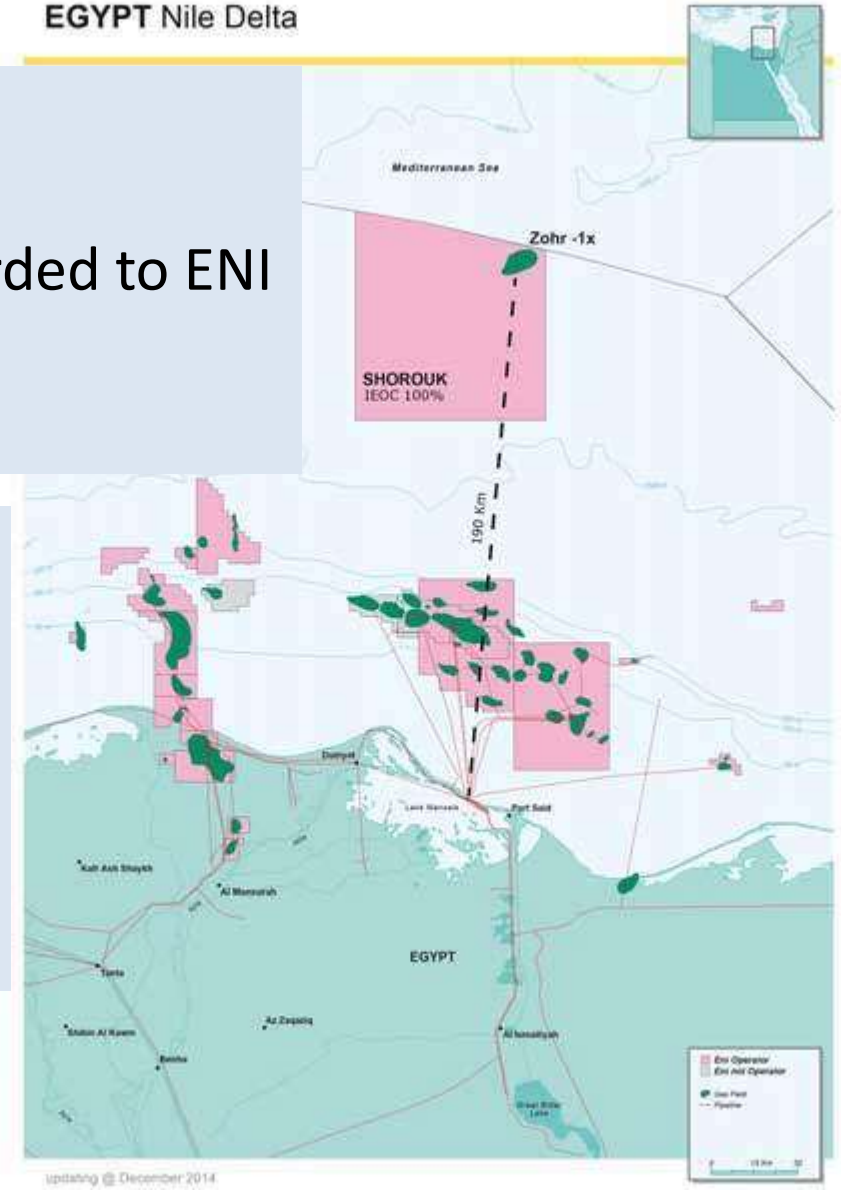
Zohr Field

Zohr Giant Gas Discovery (2015) is the largest ever made in the Mediterranean

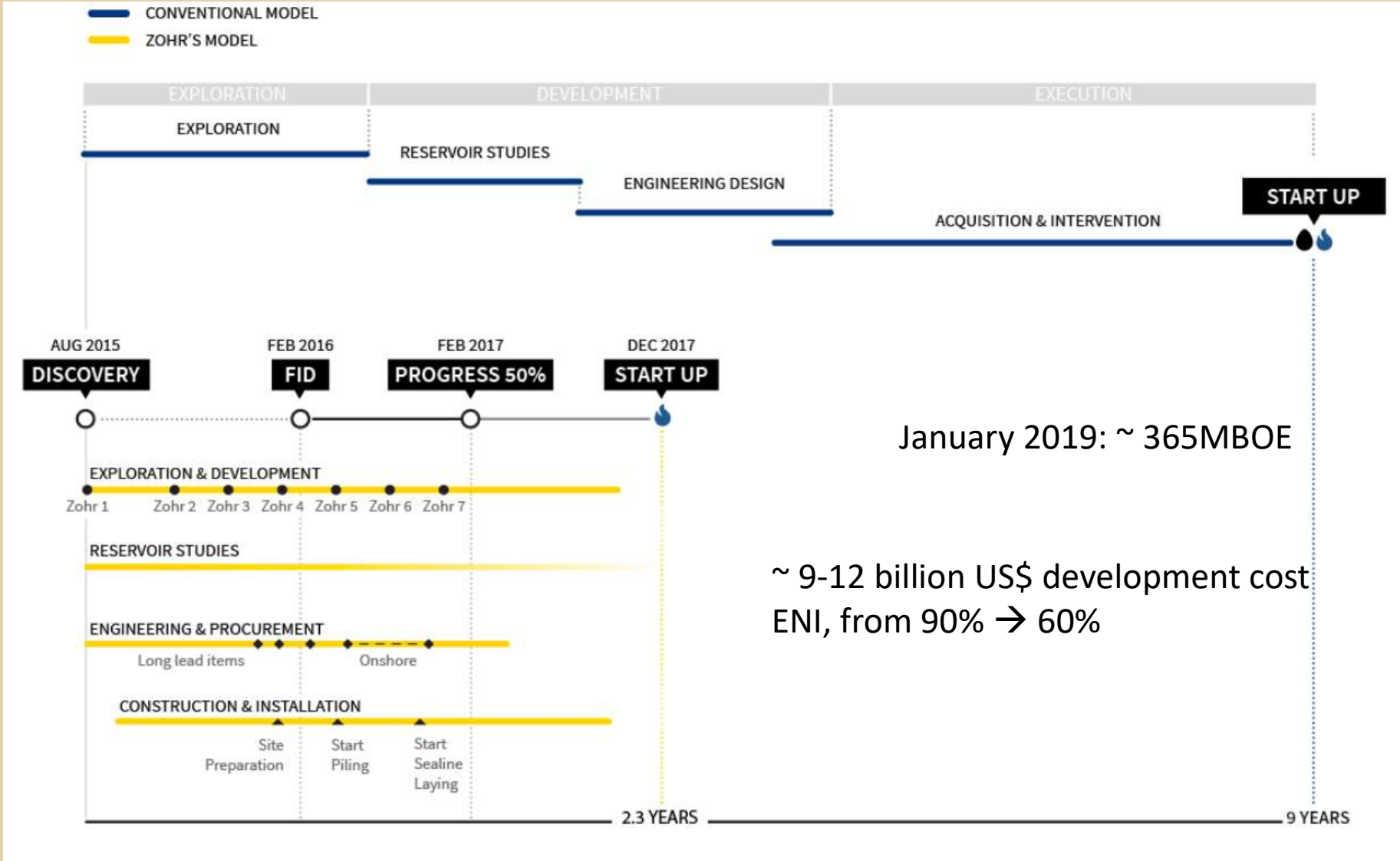
Zohr Field, Aug. 2015

Shell was exploring the
area for >15 years!
Then, area rights were awarded to ENI
Zohr discovery was made in
less than three years.

1450 m water
4170 m total depth
area 100 km2
~30 Tcf, 5.5 BBOE
Carbonates, ~ 300-450 m net pay!
26 wells, convey the gas to shore through three 215km long subsea pipelines.



Fast Track Development, 2.3 years!



January 2019: ~ 365MBOE

~ 9-12 billion US$ development cost
ENI, from 90% → 60%

eni.com

Environmental Aspects

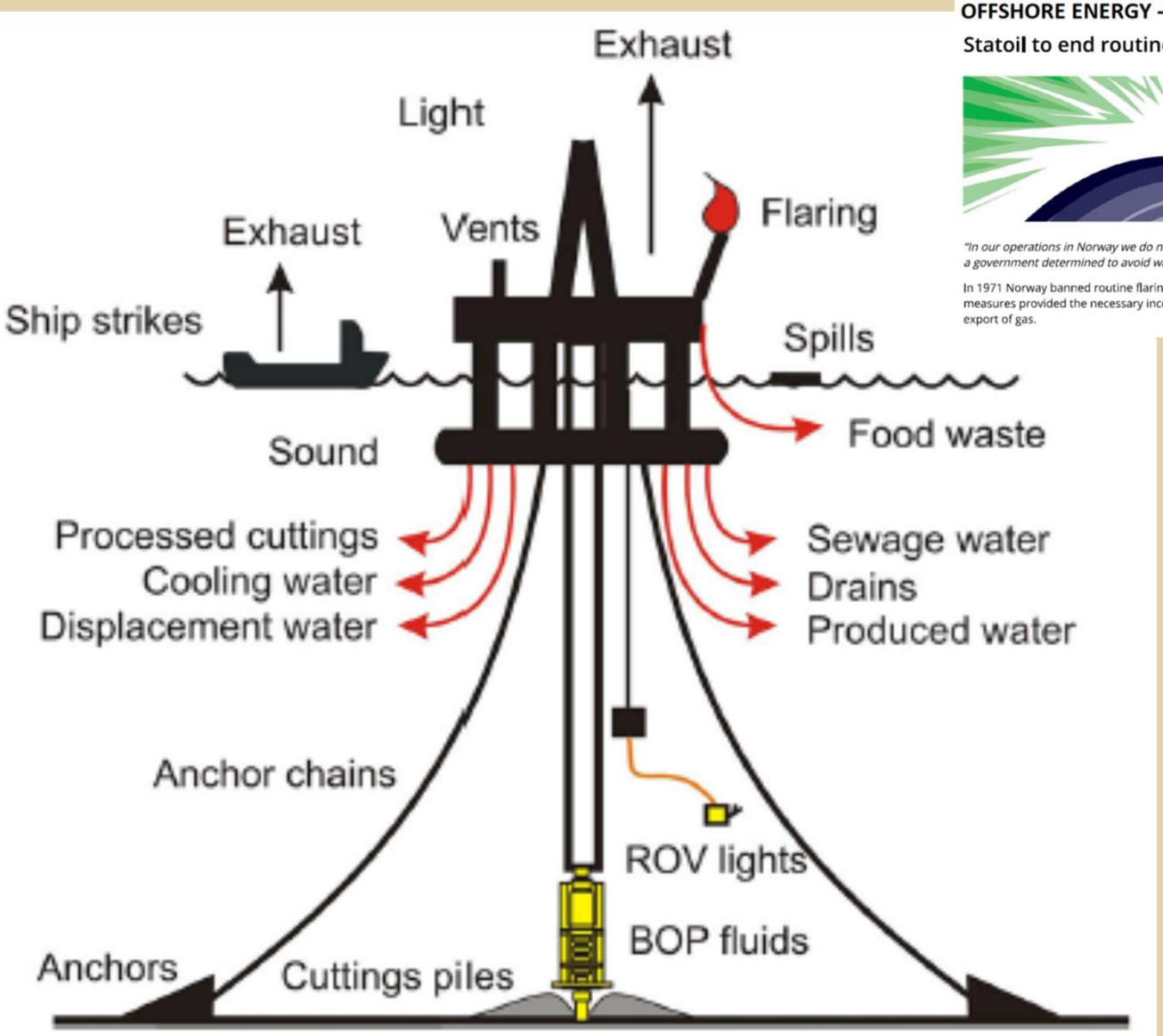


FIGURE 3 | Diagram of impacts from typical deep-sea drilling activity.

OFFSHORE ENERGY - 2015

Statoil to end routine gas flaring by 2030

Statoil and several other oil companies and nations joined together today to commit, for the first time, to end the practice of routine gas flaring at oil production sites by 2030.

CEO Eldar Sætre represented Statoil at the signing at the World Bank in Washington together with Norwegian foreign minister Børge Brende.

"Meeting the target of zero routine flaring by 2030 is a highly important contribution our industry can make towards mitigating climate change," **Eldar Sætre** said in his speech in Washington today.

"In our operations in Norway we do not carry out any routine flaring. This leading performance was made possible by a government determined to avoid waste and maximise value from its natural resources," Sætre continued.

In 1971 Norway banned routine flaring. Coupled with a price on carbon equivalent of USD 65/ton CO2 today, these measures provided the necessary incentives for both the government and the industry to invest in production and export of gas.

OPEN ACCESS

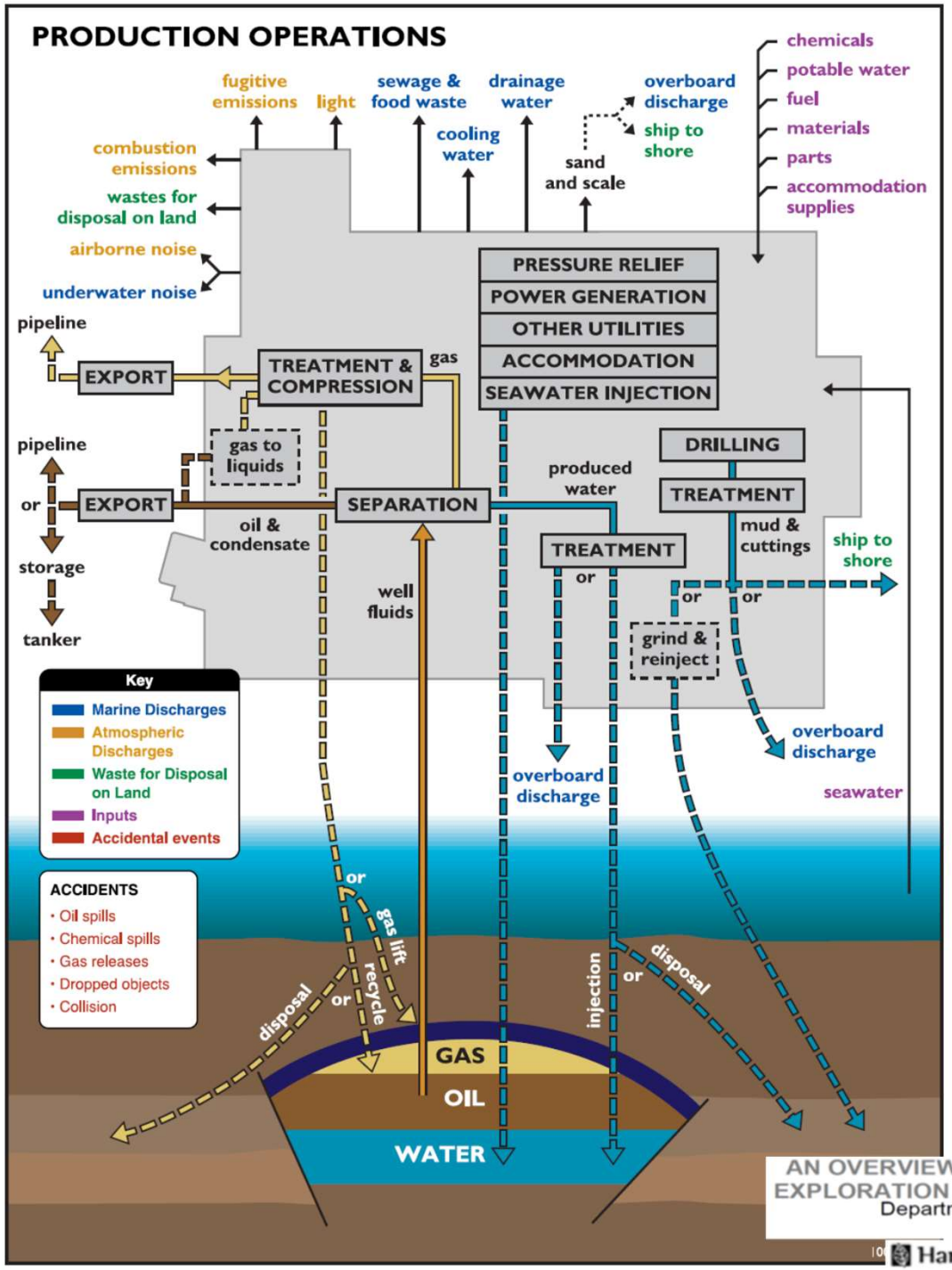
frontiers in Environmental Science

Edited by:
Jérôme Cachot,
University of Bordeaux 1, France

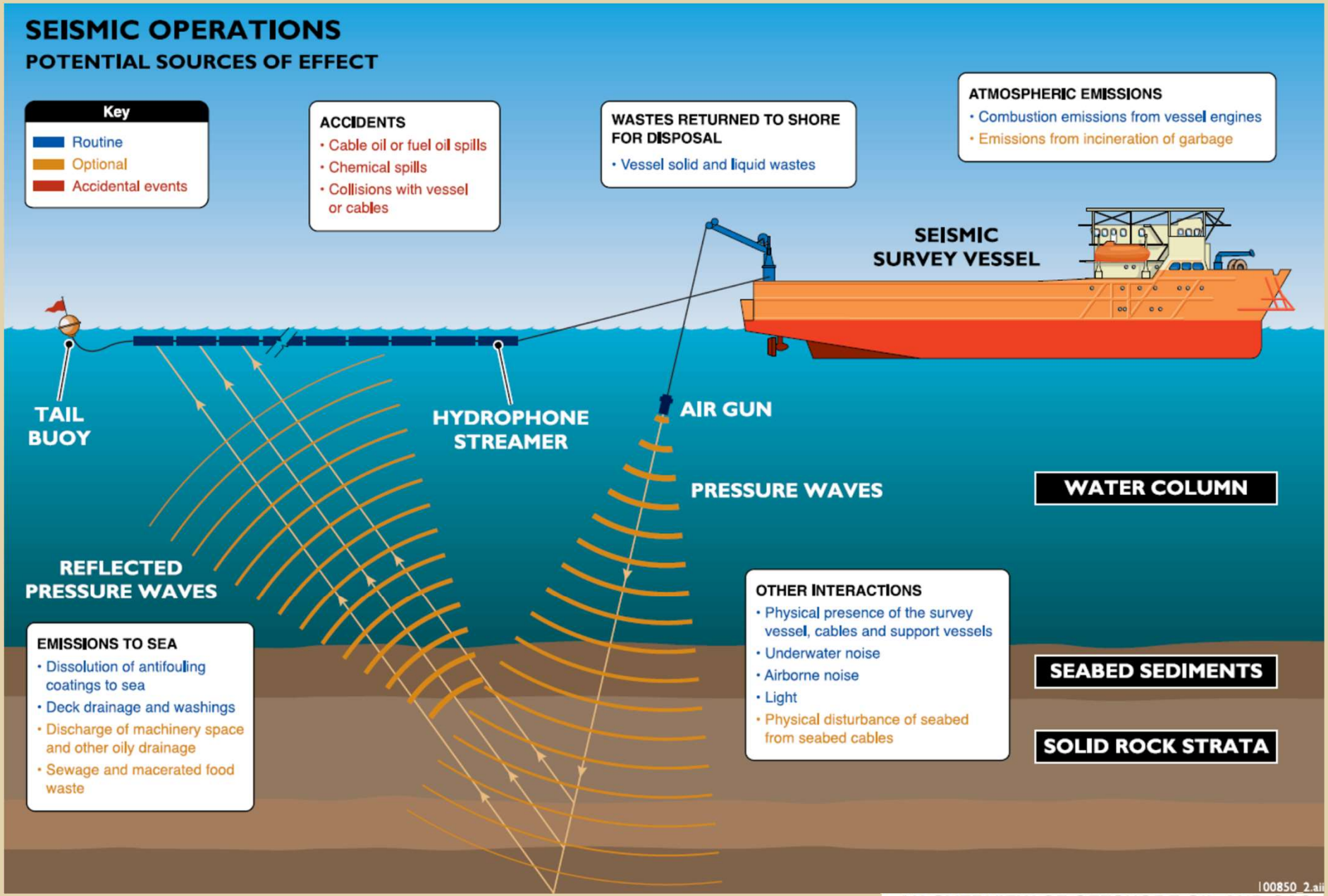
Environmental Impacts of the Deep-Water Oil and Gas Industry: A Review to Guide Management Strategies

REVIEW
published: 16 September 2016
doi: 10.3389/fenvs.2016.00058

September 2016 | Volume 4 | Article 58



AN OVERVIEW OF OFFSHORE OIL AND GAS EXPLORATION AND PRODUCTION ACTIVITIES
Department of Trade and Industry
AUGUST 2001



AN OVERVIEW OF OFFSHORE OIL AND GAS EXPLORATION AND PRODUCTION ACTIVITIES
Department of Trade and Industry
AUGUST 2001
Hartley Anderson Limited

Considerations for oil spill

Guidelines for Oil Spill Response Training and Exercise Programs Guidance for Spill Management Teams and Oil Spill Responders

1.1 Purpose

API's ***Guidelines for Oil Spill Response Training and Exercise Programs*** (Guide) is intended to provide organizations with information on developing an **Oil Spill Response Training and Exercise Program** for oil Spill Management Teams and operational oil spill response personnel.

A robust and comprehensive training and exercise program is an important element of an organization's oil spill preparedness and response capability. Such a program will provide personnel with the knowledge and skills necessary to safely and effectively respond to oil spills and demonstrate that capability through a variety of exercises. An effective program will be flexible and scalable to maintain an adequate level of preparedness over time as the organization's oil spill risk profile changes.

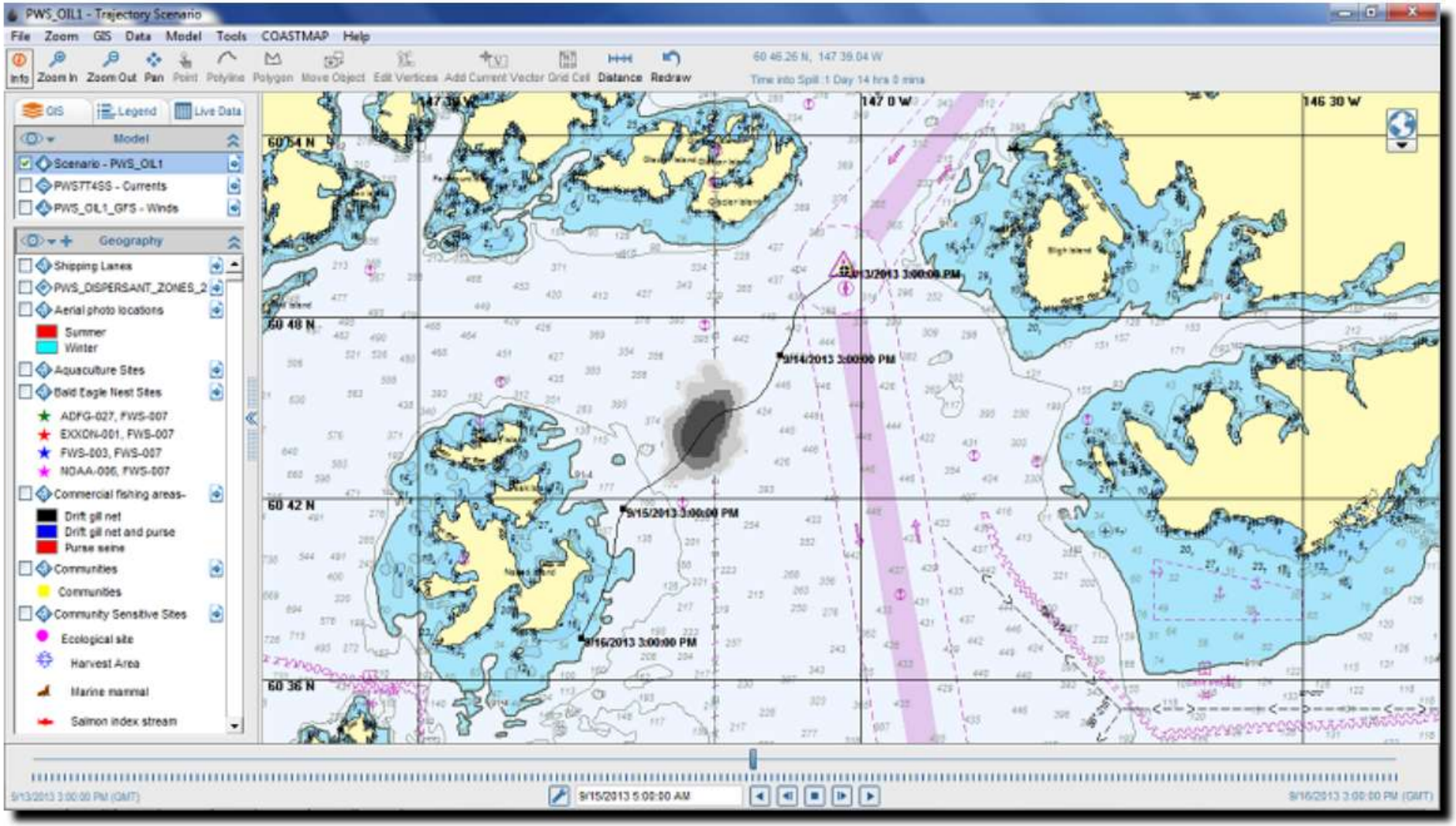
Example Oil Spill Tier Level Descriptions

Tier Level	Description
Tier 1	Minor spills, including incipient spills that are quickly controlled, contained and cleaned up using local (onsite or immediately available) equipment and personnel resources. A Tier 1 spill would typically be resolved within a few hours or days.
Tier 2	Moderate spills requiring activation of significant regional oil spill response resources. A Tier 2 spill response may continue for several days or weeks.
Tier 3	Major spills requiring activation of large quantities and multiple types of response resources including those from out of the region, and possibly international sources. A Tier 3 spill response may continue for many weeks or months.

Guidelines for Oil Spill Response Training and Exercise Programs
Guidance for Spill Management Teams and Oil Spill Responders
API TECHNICAL REPORT 1159
JULY 2014

OILMAP software for pollutants' dispersion
Example: Deepwater Horizon spill

The OILMAP model leverages experience from real oil spill events – download a sample reference paper here.



ΣΥΜΒΟΥΛΟΣ - ΜΕΛΕΤΗΤΗΣ:
Ιούνιος 2018
adens ADVANCED ENVIRONMENTAL STUDIES
ADVANCED ENVIRONMENTAL STUDIES A.E. (δ.τ. ADENS A.E.)
Βασ. Σοφίας 98Α, Τ.Κ. 115 28, Αθήνα, Τηλ. 210 7257539,
Fax: 210 7788668, E-mail: info@adens.gr

- Σύμβαση Βαρκελώνης (Μεσόγειος)

Όροι διάθεσης της διατρητικής ιλύος και των διατρημάτων καθορίζονται από το

- **Dumping Protocol** άρθρο 4, παράγραφος 2 (ε) επιτρέπεται γενικά η πόντιση υλικών τα οποία είναι «*αδρανή και μη-ρυπασμένα γεωλογικά υλικά, τα χημικά συστατικά των οποίων δεν ενδέχεται να απελευθερωθούν στο θαλάσσιο περιβάλλον*».
- **Offshore Protocol** της Σύμβασης της Βαρκελώνης και συγκεκριμένα από το άρθρο 10.2 και το Β Μέρος του Παράρτημα V αυτού.

Η τελική διάθεση των θρυμμάτων διάτρησης γίνεται είτε στην ξηρά είτε στη θάλασσα, σε κατάλληλη τοποθεσία ή περιοχή η οποία θα αδειοδοτηθεί στο πλαίσιο της ΕΠΕ. Η διάθεση στη θάλασσα των θρυμμάτων διάτρησης που έχουν ως βάση **πετρελαιοειδή** επιτρέπεται μόνο υπό τον όρο ότι έχει εγκατασταθεί αποδοτικός εξοπλισμός ελέγχου στερεών ο οποίος λειτουργεί εύρυθμα, ότι το σημείο απόρριψης βρίσκεται σε αρκετά μεγάλο βάθος και ότι η περιεκτικότητα σε πετρελαϊκούς υδρογονάνθρακες είναι μικρότερη από 100 γραμμάρια ανά χιλιόγραμμο ξηρών θρυμμάτων.

ADVANCED ENVIRONMENTAL STUDIES A.E. (δ.τ. ADENS A.E.)
Βασ. Σοφίας 98Α, Τ.Κ. 115 28, Αθήνα, Τηλ. 210 7257539,
Fax: 210 7788668, E-mail: info@adens.gr

- Σύμβαση Βαρκελώνης (Μεσόγειος)

Απαγορεύεται η χρήση ρευστών διάτρησης που έχουν ως βάση πετρέλαιο ντίζελ.

Για τα **ρευστά συνθετικής βάσης** (Synthetic based muds, SBM) και τα θρύμματα διάτρησης ισχύουν οι περιορισμοί που εφαρμόζονται για τα υδατικά ρευστά και θρύμματα διάτρησης.

Για τη διάθεση των θρυμμάτων διάτρησης, επιλογή προτεραιότητας θα πρέπει να αποτελέσει η μεταφορά και διαχείρισή τους σε κατάλληλα αδειοδοτημένες μονάδες. Εάν διασφαλιστεί ότι τα θρύμματα αποτελούνται από αδρανή και μόνο υλικά και είναι απαλλαγμένα από ρύπους, και τεκμηριωθεί ότι η μεταφορά τους στις ως άνω μονάδες είναι αντικειμενικά δυσχερής, μπορεί να εξετασθεί η απόθεσή τους σε κατάλληλο θαλάσσιο χώρο, χαμηλής περιβαλλοντικής ευαισθησίας, ο προσδιορισμός και η περιβαλλοντική αδειοδότηση του οποίου θα αποτελέσει μέρος της έγκρισης περιβαλλοντικών όρων του συνολικού έργου της γεώτρησης.

Πίνακας 8-2 Κίνδυνοι και επιπτώσεις για τα διάφορα υποστάδια της ερευνάς, της εκμετάλλευσης και της αποκατάστασης

Εργασίες/ Διεργασίες/ τεχνολογίες	Επιπτώσεις	Επίπεδο κινδύνου (μετά τη λήψη διαχειριστικών μέτρων)	Επίπεδο κινδύνου (χωρίς τη λήψη διαχειριστικών μέτρων)
2.2.3 Ανόρυξη γεώτρησης με χρήση διατρητικών ιλύων (OBM/WBM)	**Ατυχηματική διαρροή υδρογονανθράκων – Επίπεδο κηλίδων III**		
	Θαλάσσια βιοποικιλότητα/απώλεια οικοτόπου	Πιθανότητα: Σπάνια Επίπτωση: Καταστροφική Κίνδυνος: 10 (υψηλός)	Πιθανότητα: Σπάνια Επίπτωση: Καταστροφική Κίνδυνος: 20 (πολύ υψηλός)
	Παράκτια βιοποικιλότητα/απώλεια οικοτόπου	Πιθανότητα: Σπάνια Επίπτωση: Καταστροφική Κίνδυνος: 10 (υψηλός)	Πιθανότητα: υψηλή Επίπτωση: Καταστροφική Κίνδυνος: 20 (πολύ υψηλός)
	Επιδείνωση ποιότητας υδάτων	Πιθανότητα: Σπάνια Επίπτωση: Καταστροφική Κίνδυνος: 10 (υψηλός)	Πιθανότητα: υψηλή Επίπτωση: Καταστροφική Κίνδυνος: 20 (πολύ υψηλός)

ΑΔΑ:

ΕΛΛΗΝΙΚΗ ΔΗΜΟΚΡΑΤΙΑ
ΠΕΡΙΦΕΡΕΙΑ ΚΡΗΤΗΣ
ΠΕΡΙΦΕΡΕΙΑΚΟ ΣΥΜΒΟΥΛΙΟ

Απόσπασμα Πρακτικού 10/08-10-2018
Αριθμ. Απόφασης 114/2018

Στο Ηράκλειο σήμερα **Δευτέρα 08 Οκτωβρίου 2018 ώρα 14.00 μ.μ.** στην αίθουσα συνεδριάσεων του **Περιφερειακού Συμβουλίου Κρήτης** (Πλατεία Ελευθερίας), συνήλθαν σε **συνεδρίαση** τα μέλη του Περιφερειακού Συμβουλίου της Περιφέρειας Κρήτης που αναδείχθηκαν κατά τις εκλογές της 18ης Μαΐου 2014 και ανακηρύχθηκαν με την αριθμ. 54/2014 απόφαση του Πολυμελούς Πρωτοδικείου Ηρακλείου, ύστερα από τη με αριθμ. πρωτ. **232324/02-10-2018** πρόσκληση του Προέδρου του.

Μετά από διαλογική συζήτηση,

ΑΠΟΦΑΣΙΖΕΙ ΚΑΤΑ ΠΛΕΙΟΨΗΦΙΑ

Γνωμοδοτεί θετικά για τη στρατηγική μελέτη περιβαλλοντικών επιπτώσεων (ΣΜΠΕ) για την έρευνα και εκμετάλλευση υδρογονανθράκων στις θαλάσσιες περιοχές νοτιοδυτικά Κρήτης και δυτικά Κρήτης της ΣΜΠΕ, **με τις προϋποθέσεις που αναφέρονται** στο με αρ. πρωτ. **235595/04-10-2018** έγγραφο της Δ/νσης Περιβάλλοντος και Χωρικού Σχεδιασμού ΠΚ καθώς και το **02/10/2018 έγγραφο του Πολυτεχνείου Κρήτης,** σύμφωνα με όσα αναφέρονται στο σκεπτικό της παρούσας απόφασης.

Στην παρούσα απόφαση **γνωμοδοτούν αρνητικά οι Περιφερειακοί Σύμβουλοι κ.κ. Κλάδος Μιχαήλ, Βάρδα Μαρία, Λυμπεράκης Πέτρος, Ορφανός Στυλιανός, Ζερβάκης Γεώργιος και Παπαδάκης Αριστείδης,** για τους λόγους που ανέφεραν και καταχωρήθηκαν στα πρακτικά.

Σύνοψη

Η εξερεύνηση και παραγωγή υδρογονανθράκων σε βαθιά νερά:

- Βοηθά στην ανακάλυψη και παραγωγή μεγάλων ποσοτήτων
- Είναι έργα πολύ υψηλού ρίσκου
- Κοστίζουν σημαντικά
- Μπορεί να έχουν τεράστια οφέλη
- Υπάρχει διαθέσιμη τεχνολογία και τεχνογνωσία για ελαχιστοποίηση των κινδύνων
  - Ασφάλειας
  - Μείωσης του περιβαλλοντικού αποτυπώματος

Επόμενα βήματα

- Υπάρχουν κίνδυνοι, είναι γνωστοί και αντιμετωπίσιμοι
- Παρακολούθηση και ρύθμιση των υπεράκτιων δραστηριοτήτων
- Πρόληψη → Συνεχής παρακολούθηση
  - Περιοχές έρευνας, % για έρευνα
  - Βελτιστοποίηση παραγωγής
  - Μείωση περιβαλλοντικού αποτυπώματος
- Κανονισμοί και Οδηγίες, στην υψηλότερη στάθμη τεχνικής
  - Τεχνογνωσία, συνεχής εκπαίδευση
  - Νόμος 4406/2016 – Αρμόδια Αρχή, Προεδρικό Διάταγμα

Discipline areas which could be developed

Drilling & Pumping

Intelligent Fields

- Sensors (Electrical, Electronic, Mechanical, Chemical)
- Big Data Analytics (Information Technologies, Computer Science, Software Development)

Flow Assurance

- Multiphase Flows
- Coatings
- Corrosion

Reservoir Engineering

Offshore Structures

- Civil
- Mechanical
- Nautical

Environmental Management

- Petroleum
- Chemical
- Marine

Surface Facilities

- Petroleum
- Chemical
- Mechanical


Ευχαριστώ
για την προσοχή σας!