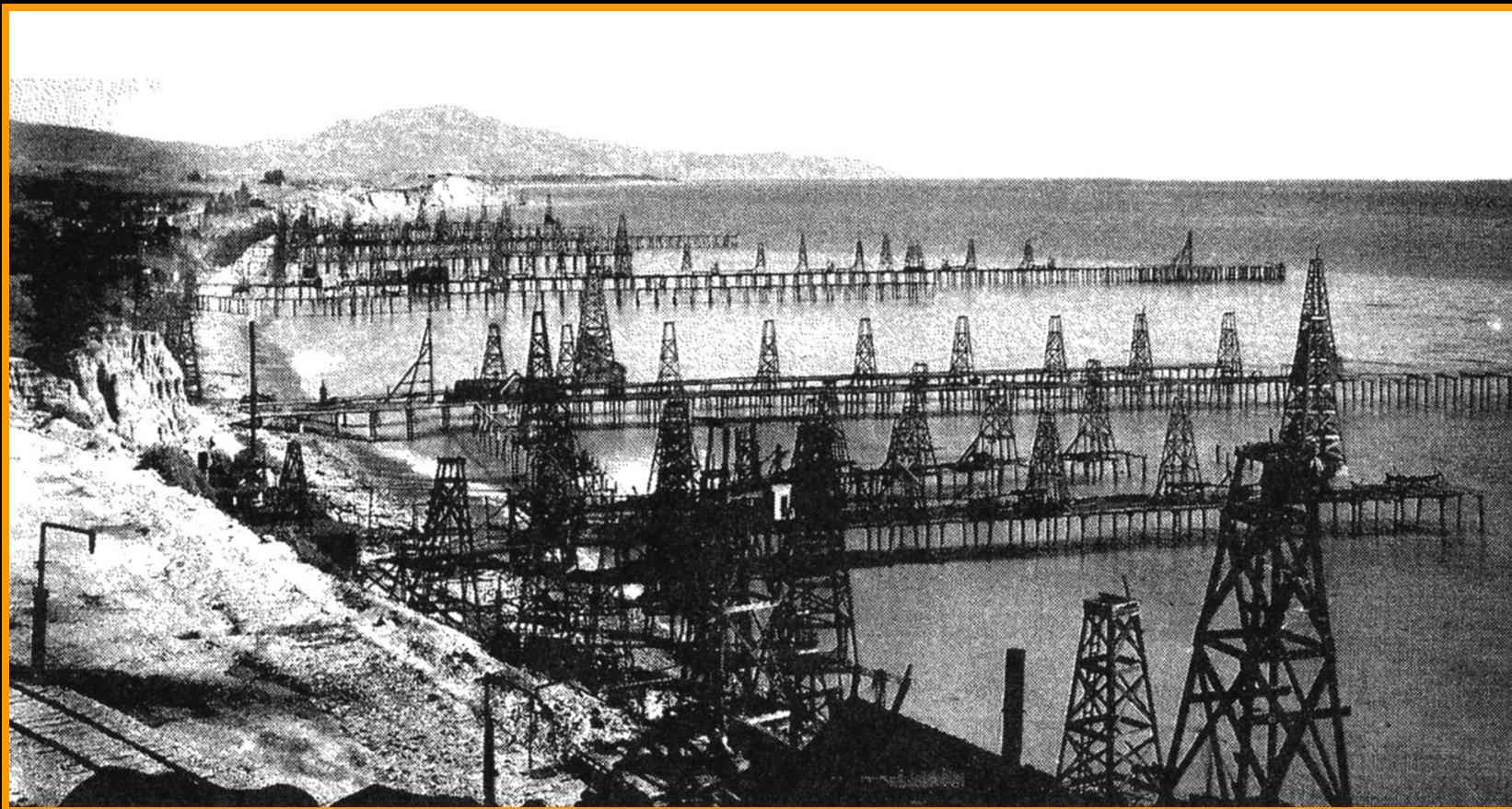


Offshore Oil Exploration

Story of Technology

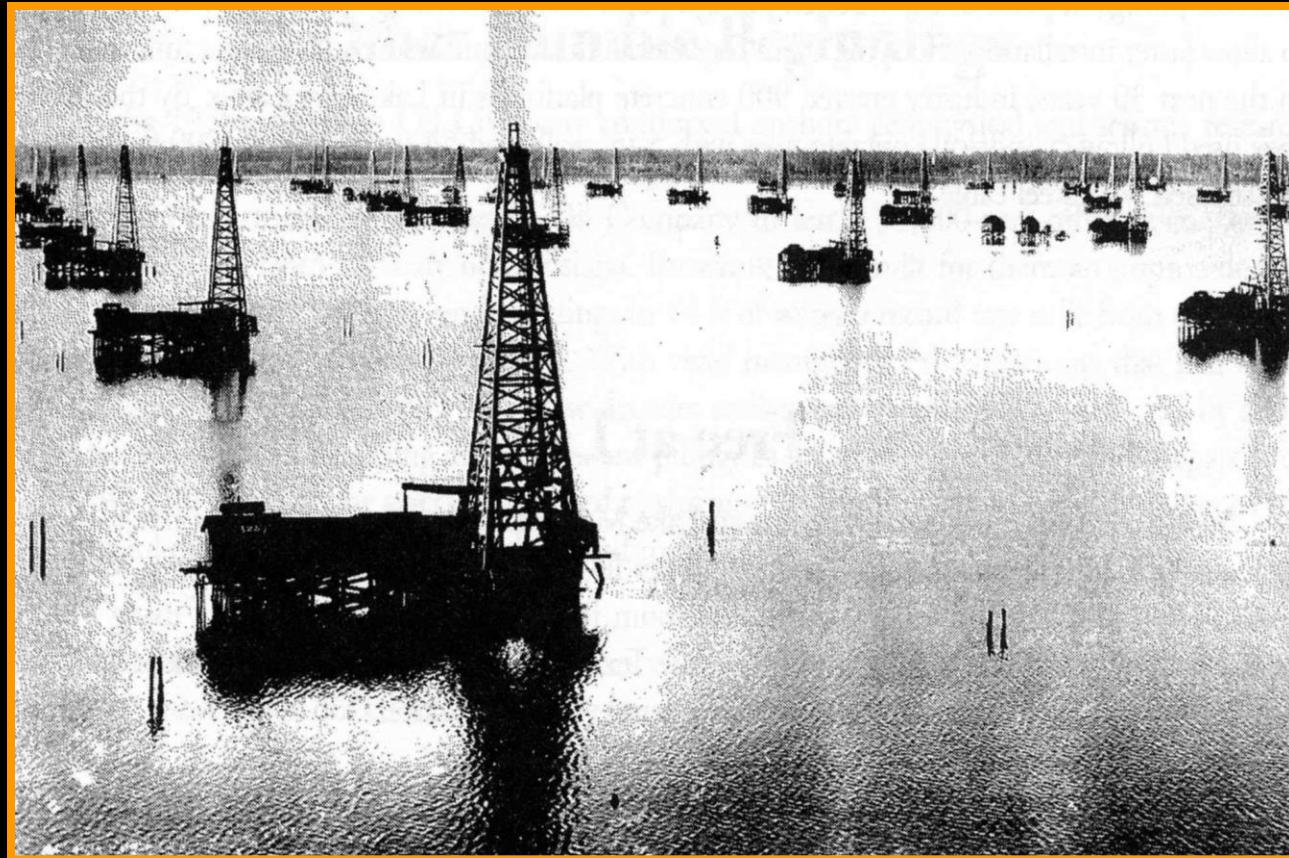


First Offshore Production



Summerland, Ventura County, CA

First Offshore Rigs



Lake Caddo, Texas 1907.

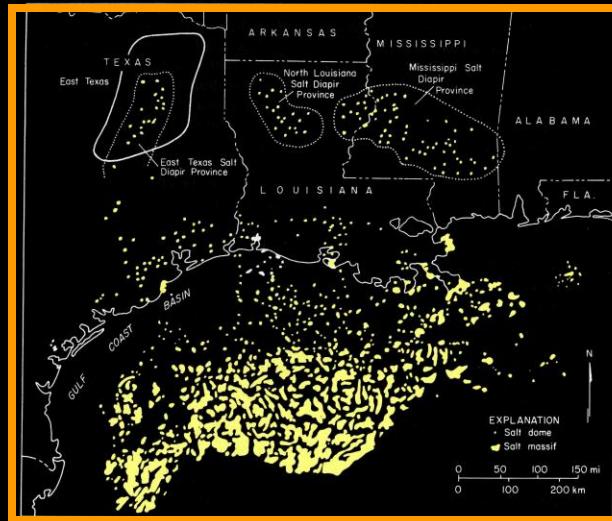
Gulf of Mexico

The New Frontier

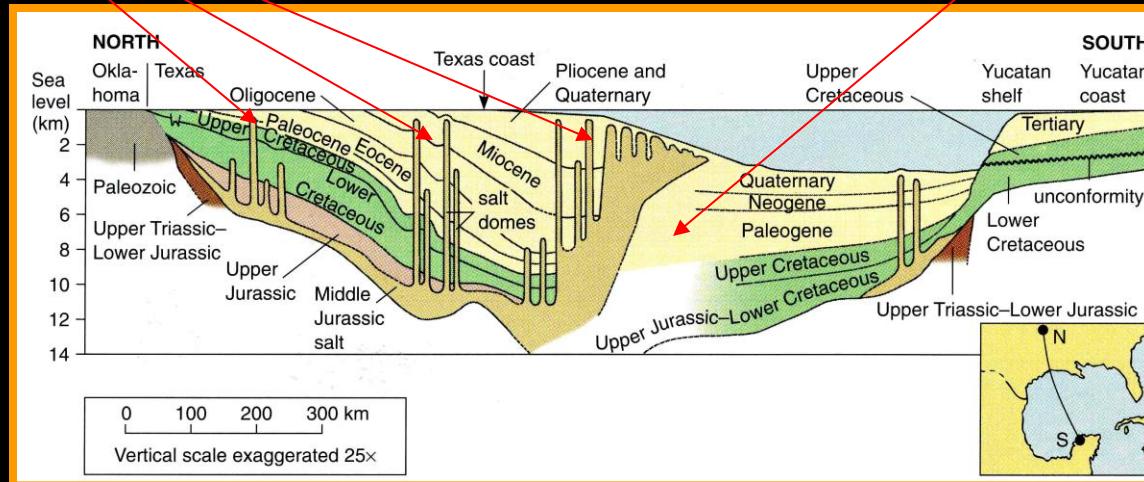


Numerous Individual Small & Large Fields

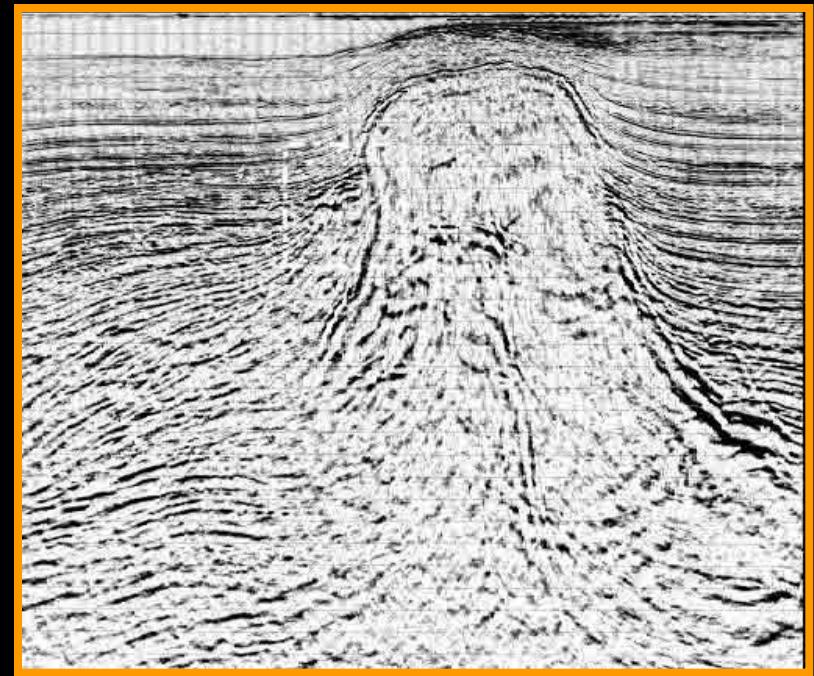
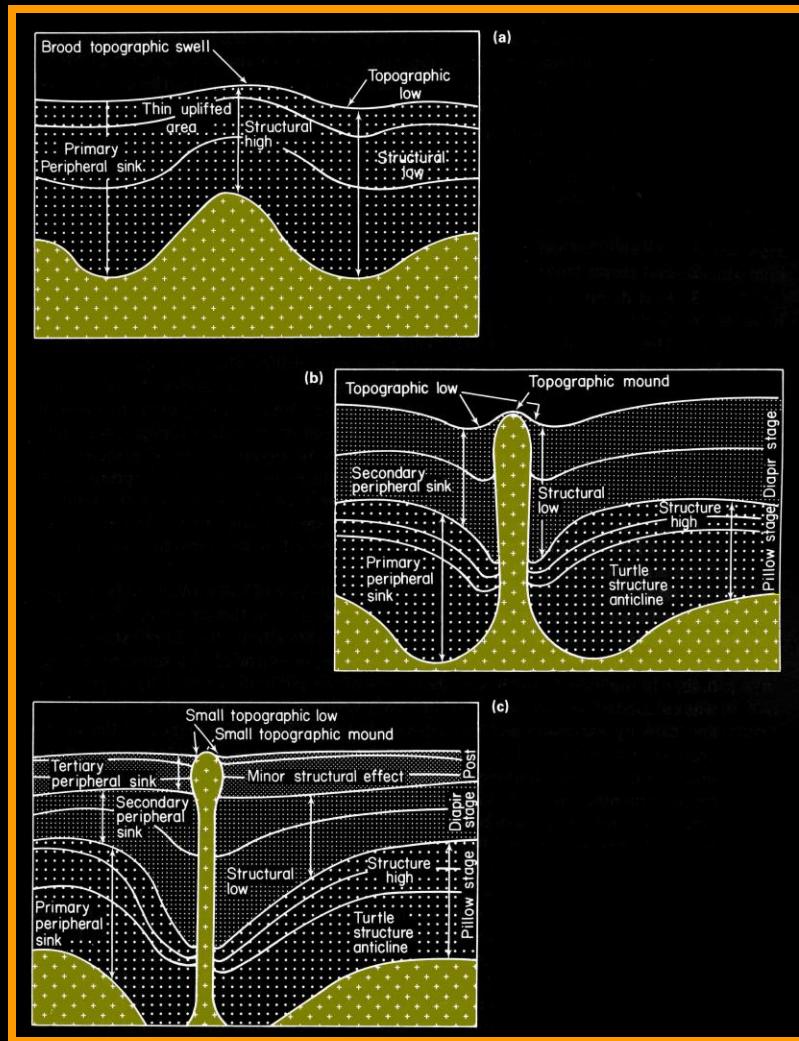
Small fields
salt domes



New large ultra-deep
fields



Salt Dome Formation



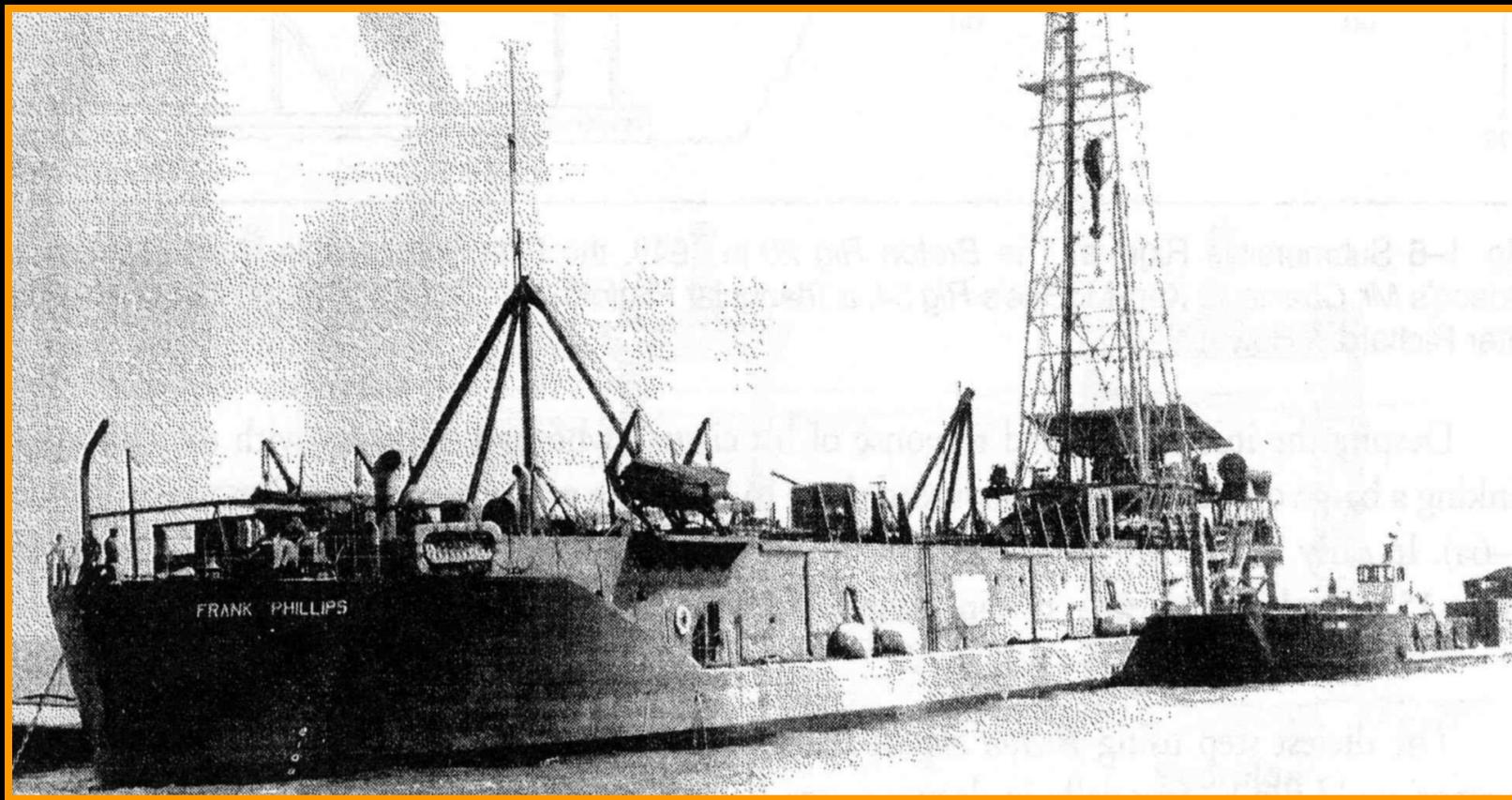
Seismic profile of a salt dome.

Early Offshore Drilling Rig



Superior's pre-fabricated template platform, 1947.
Water depth 20 ft.
Dry hole!

Kerr-McGee Ship Platform



**Converted WWII LST landing boat, Gulf of Mexico, 1947.
Brought in first offshore oil well Oct. 14, 1947.
Water depth 20 ft.
10 miles offshore of Louisiana.**

Evolution of Offshore Drilling Technology

Drilling from beach (1890's).

Drilling from wharves (1910's).

Platform rig and barge (1920's).

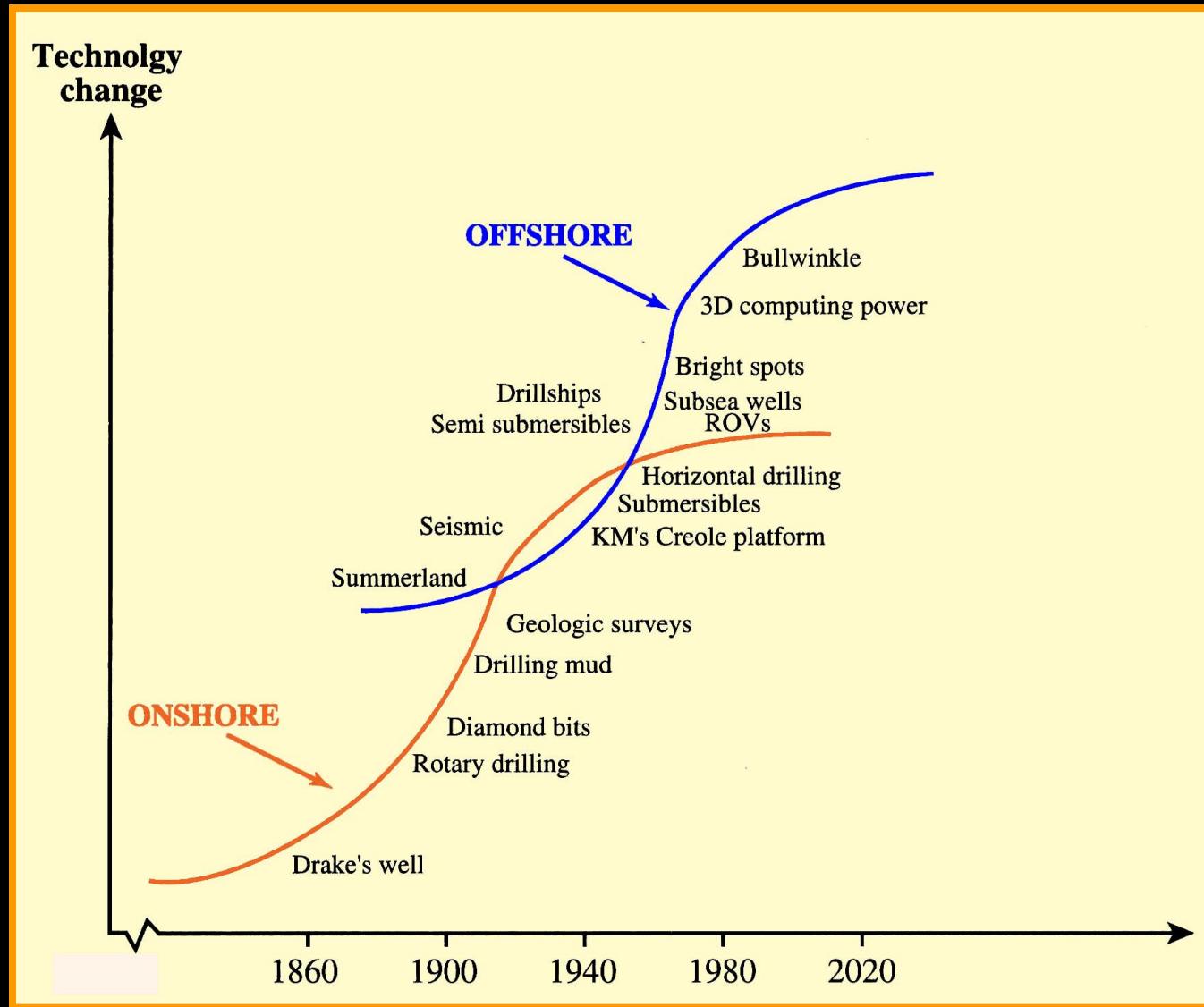
Submersible barge rig (1940's).

Jack-up rig (1950's).

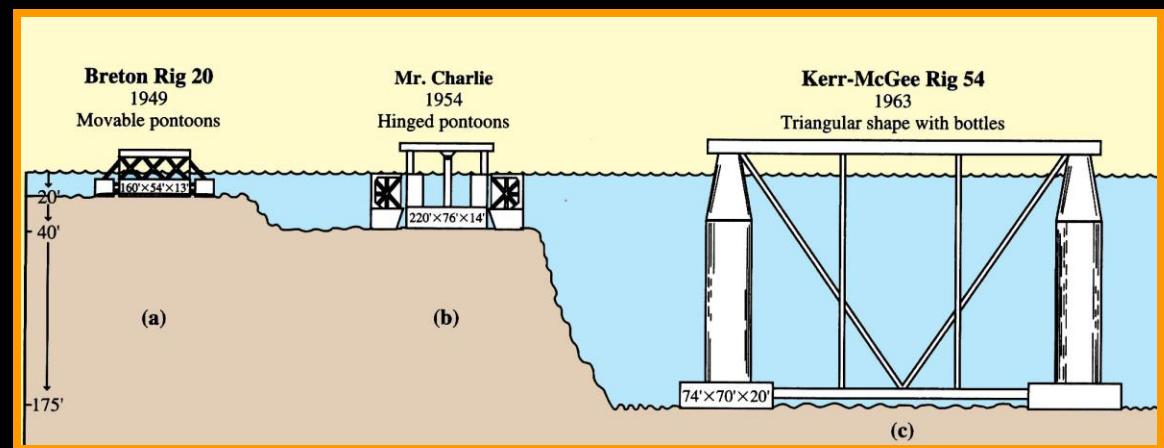
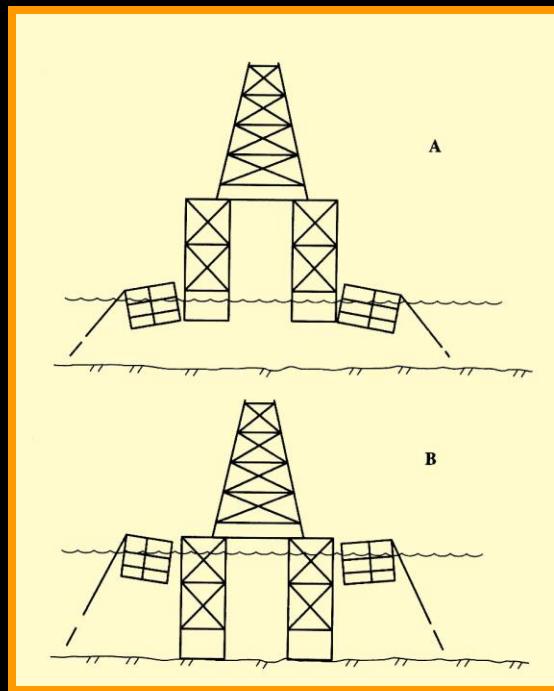
Semi-submersible rig (1970's).

Drillship (1980's).

Technology Curve



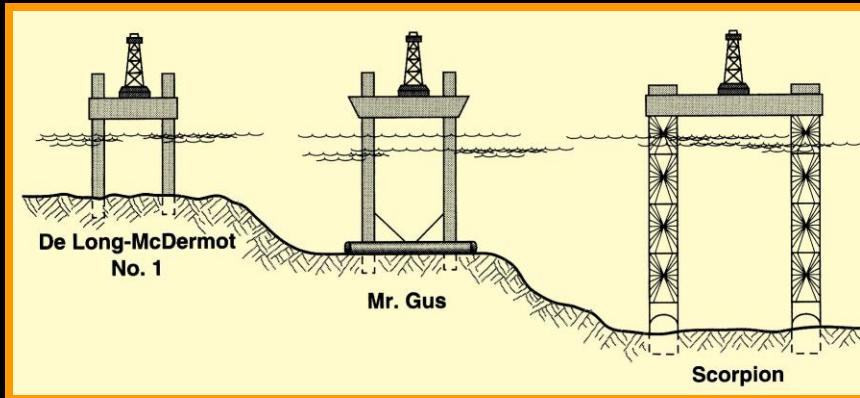
Submersible Platforms



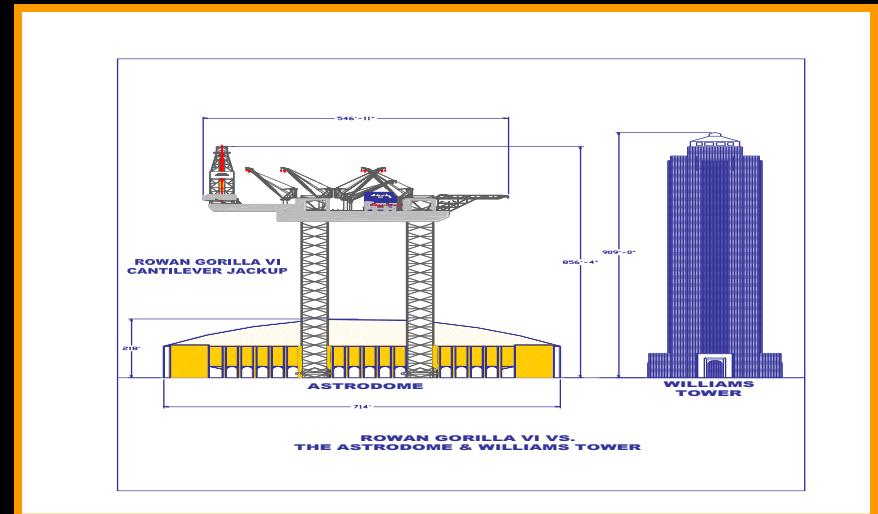
Began drilling in ever deeper water depth

Submersible Gilisasso

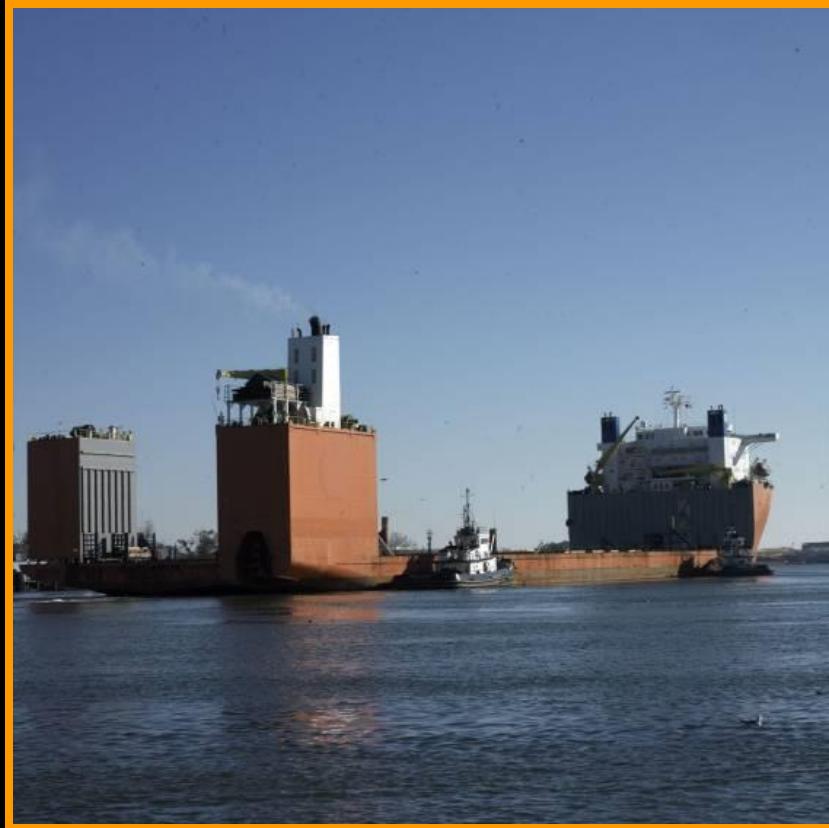
Jack-up Rigs



Jack-up rig in Halifax Harbor, Nova Scotia, Canada



Heavy-lift Rig Hauler

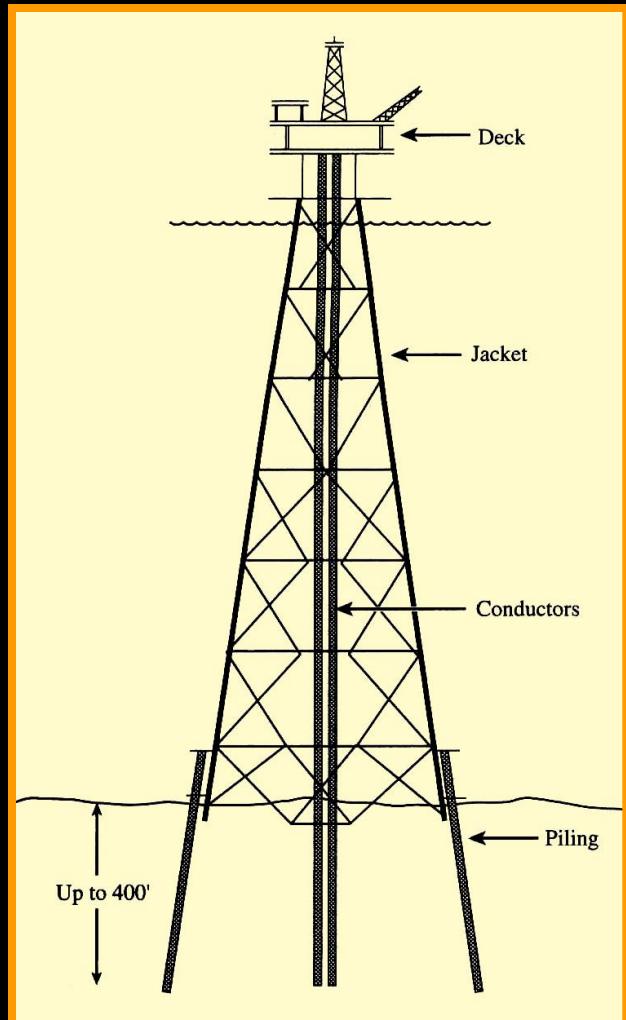


Heavy-lift hauler without rig



Rig floats on submerged deck

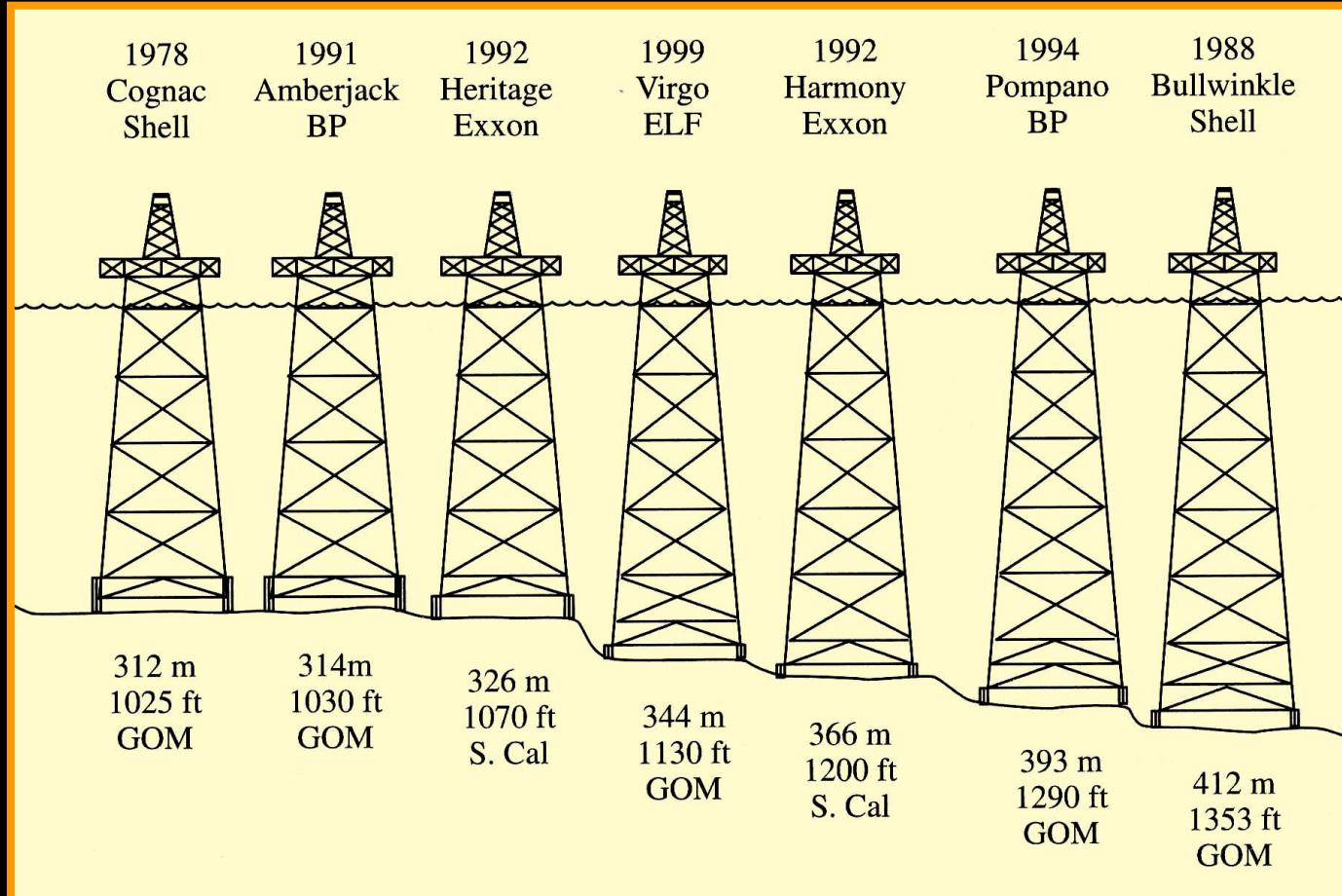
Development of Fixed Platforms



Bullwinkle Platform

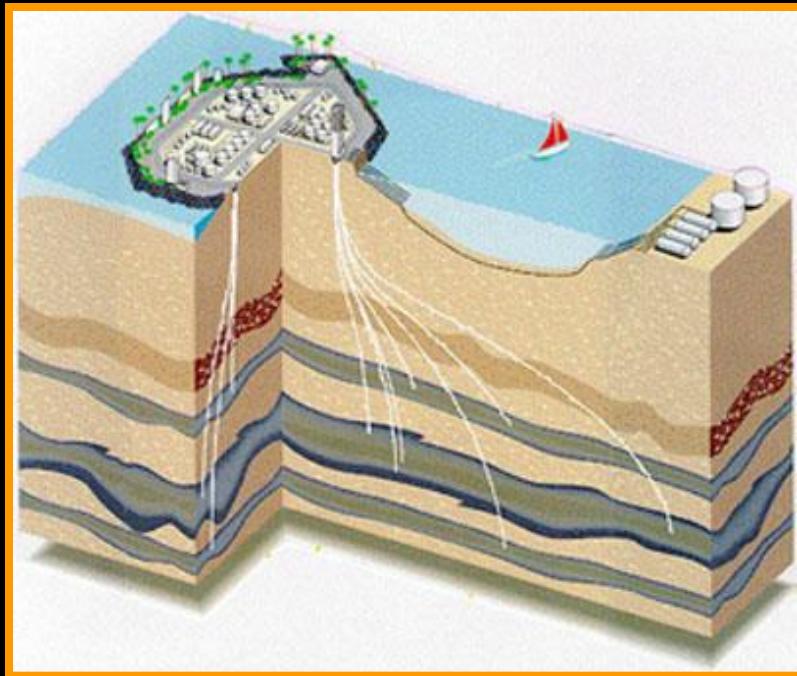
Securing platform to sea floor

Evolution of Fixed Platforms



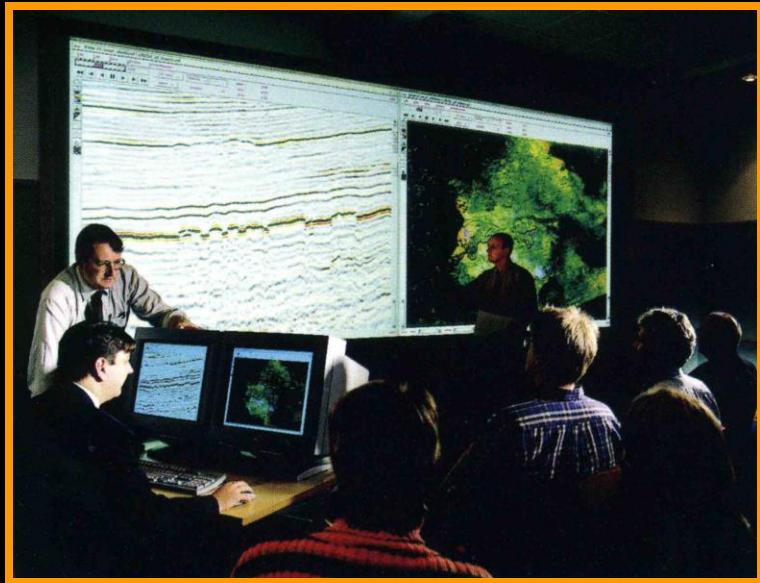
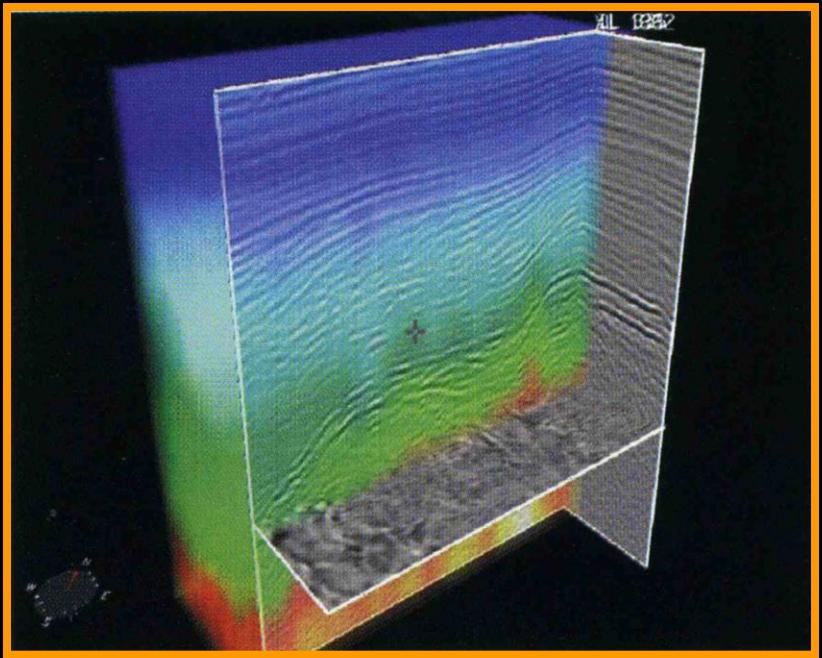
Movement into ever deeper water

Offshore Islands

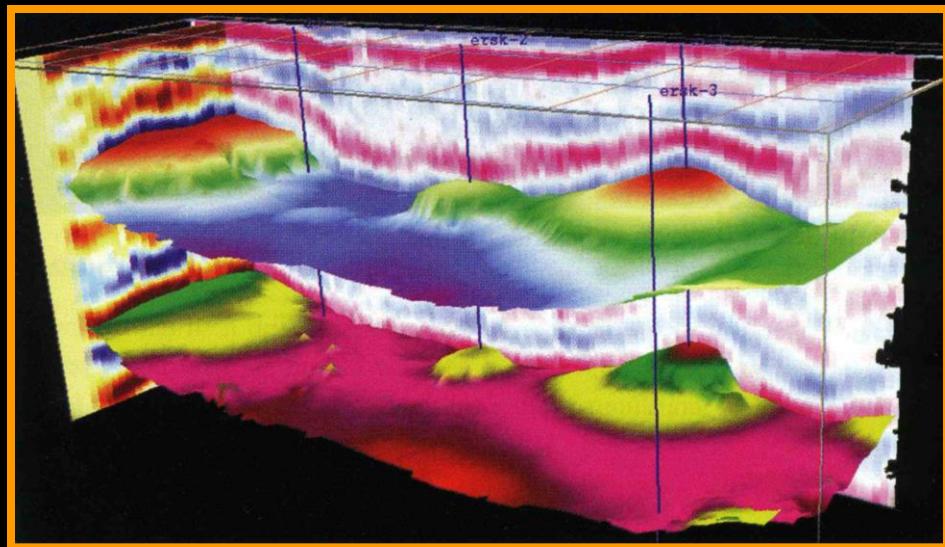


Long Beach Harbor, Ca.

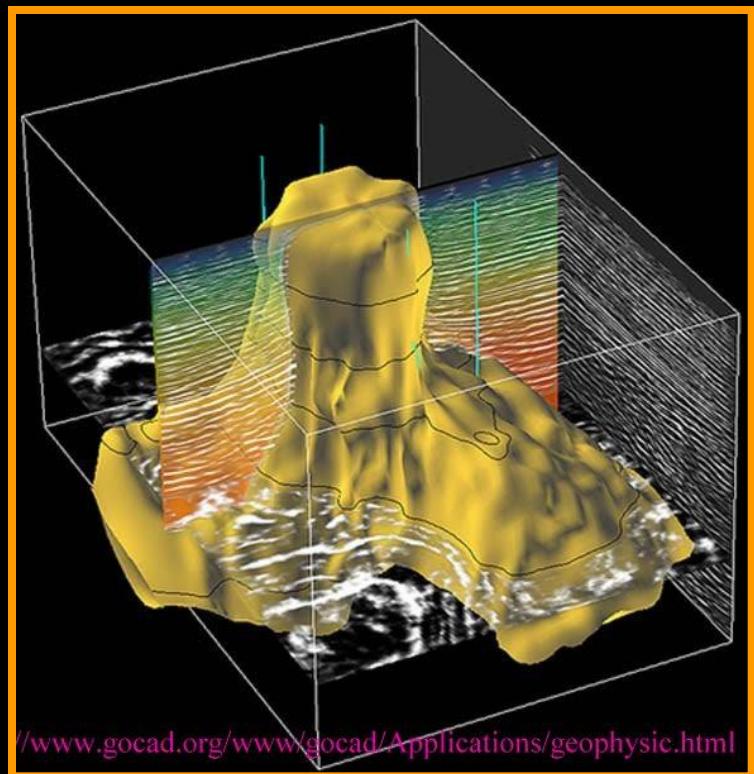
Development of 3-D Imaging Room



3-D Subsurface Imaging

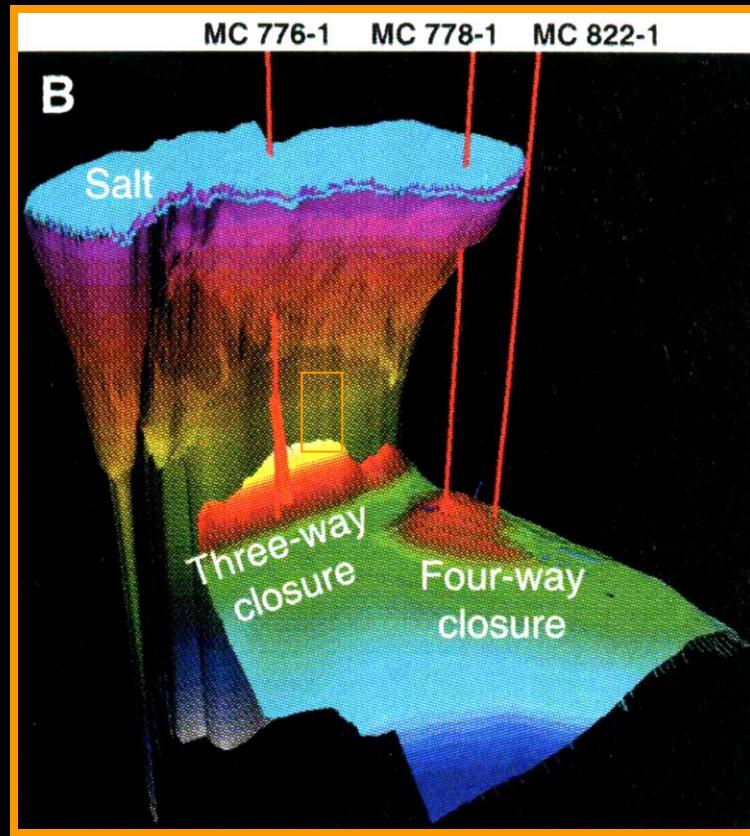
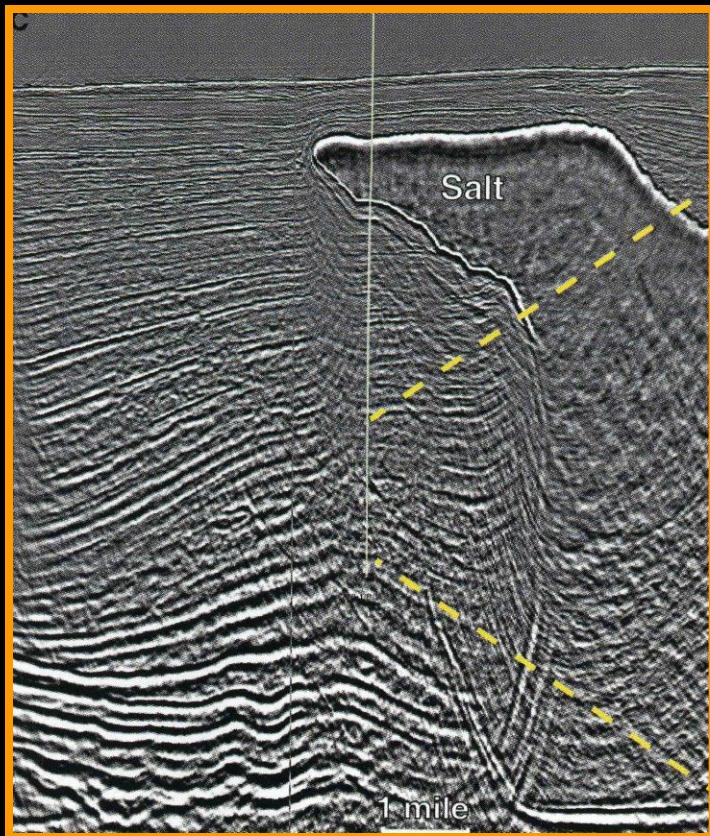


Possible Traps

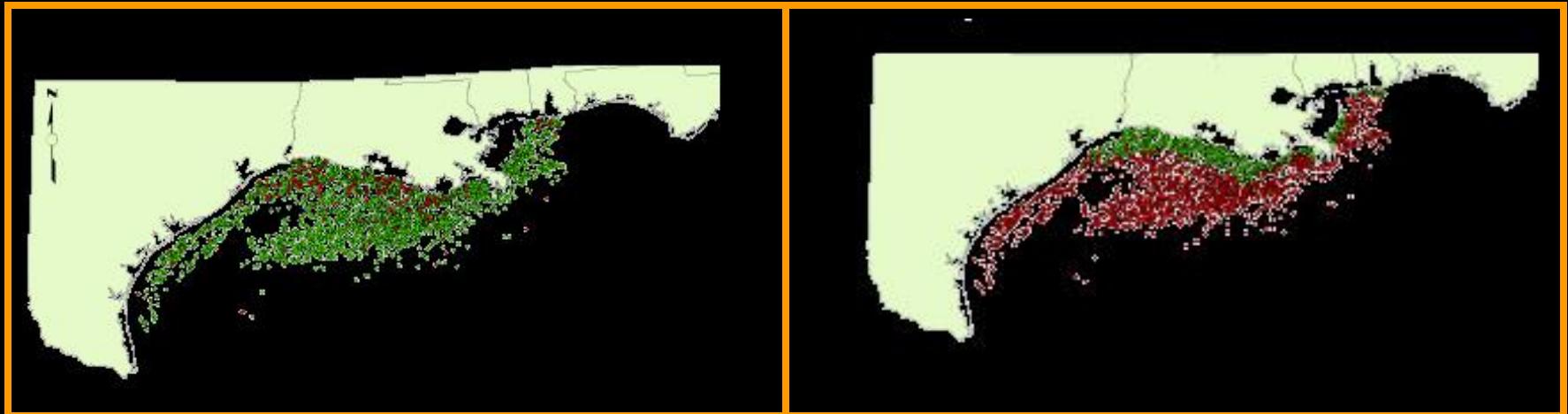


Salt Dome

New Seismic Technologies Enables Exploration Below Salt Domes



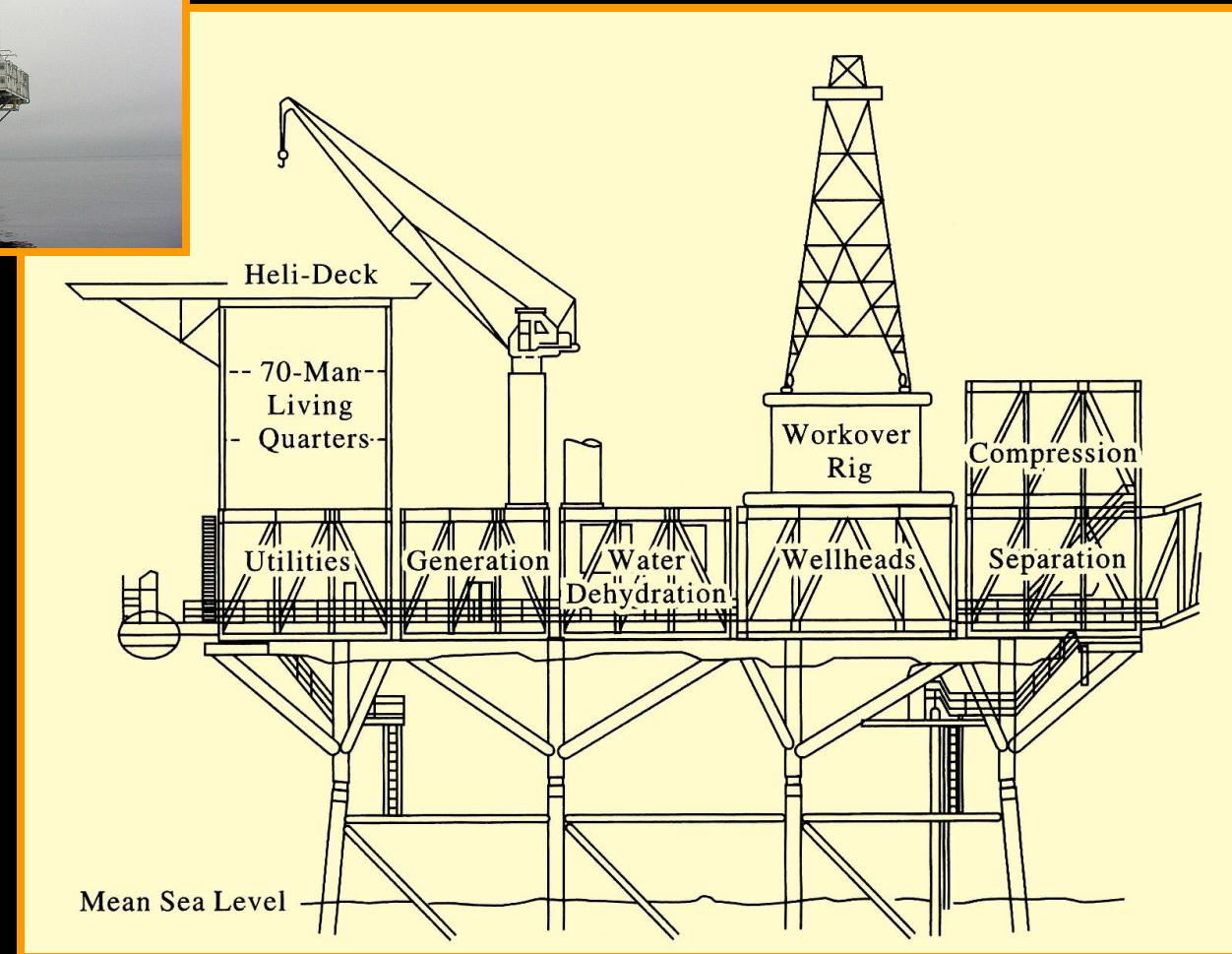
Location of Rigs & Platforms In Gulf of Mexico



Rigs & platforms:
Green = platforms
Red = rigs

**Depth distribution of
offshore structures:**
Green <50'
Red >50'

Superstructure of a Platform



Drilling Rigs & Production Platforms



Drilling rigs



Production platforms
(Development of drilling can occur
on the platform)

Petroleum Infrastructures

Gulf of Mexico

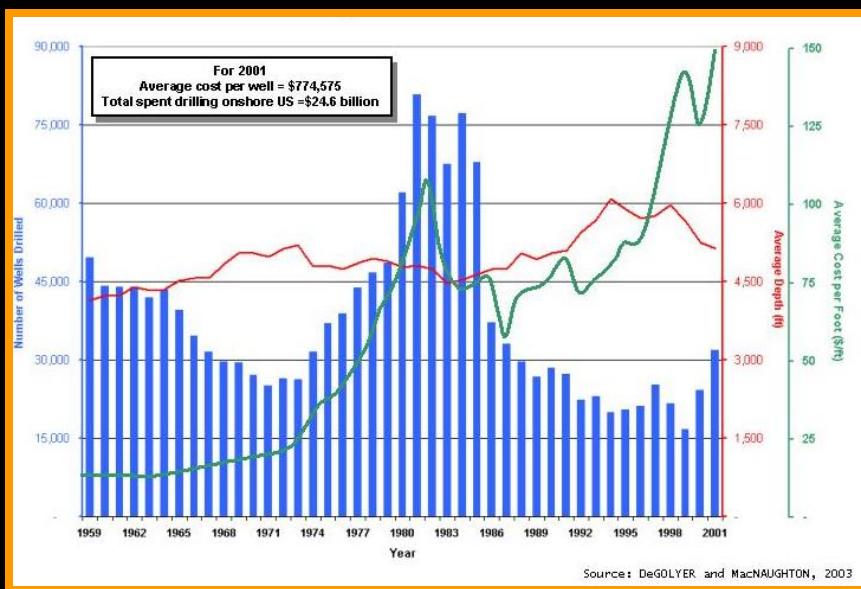
819 manned, 4000+
unmanned platforms.

33,000 miles of offshore
pipe lines.

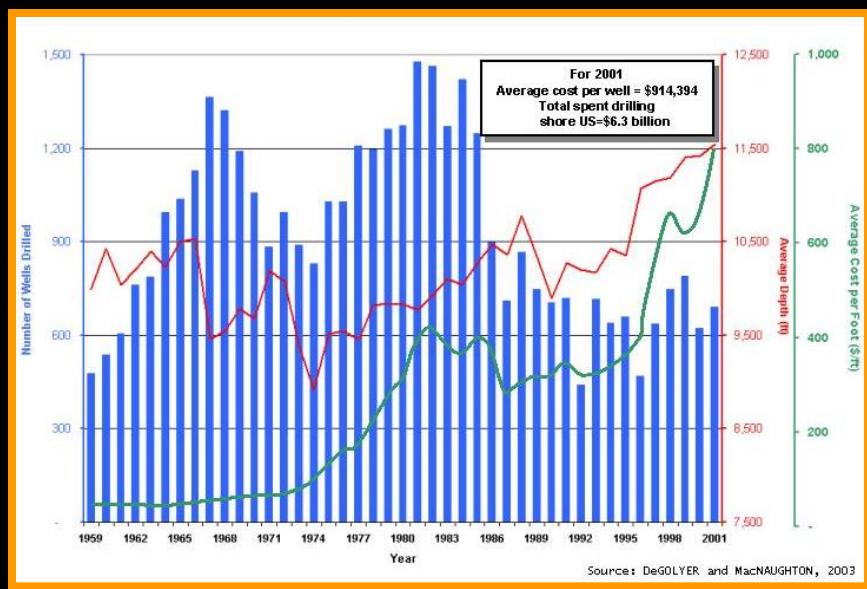


Platform congestion in the Gulf of Mexico

Estimated Cost of Drilling Onshore & Offshore



Onshore



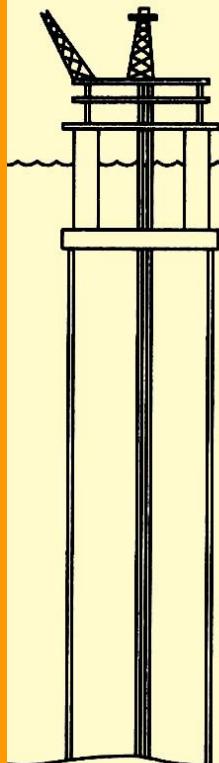
Offshore

New Technologies Provide New Geological Insights

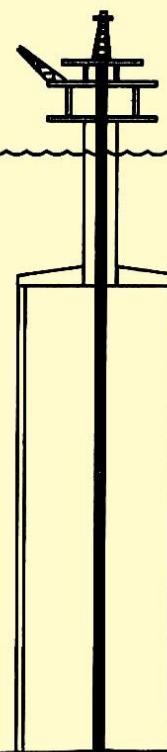
- Innovating drilling and development systems.
- 3-D seismic imaging.
- Realization of the high productivity of deepwater turbidite sands, in cost and ultimate recovery from these reservoirs.

Floating Platforms

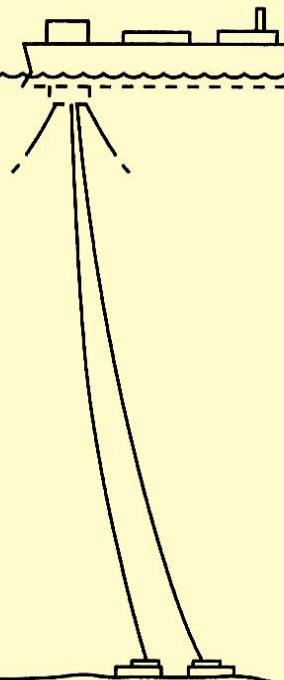
Tension Leg Platform



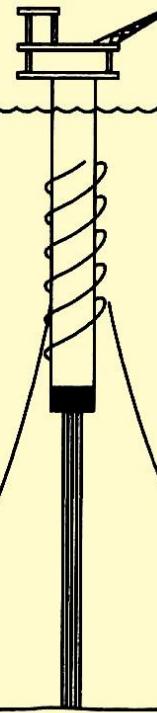
Mini-TLD
or
Mono-Column



Floating production,
storage &
offloading



SPAR



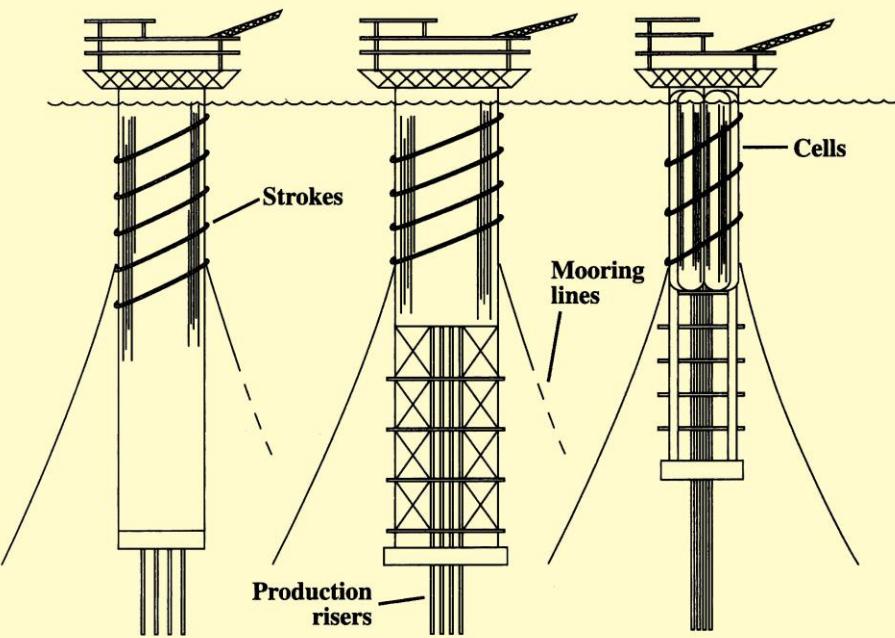
Floating production
system



Mono-Column TLP

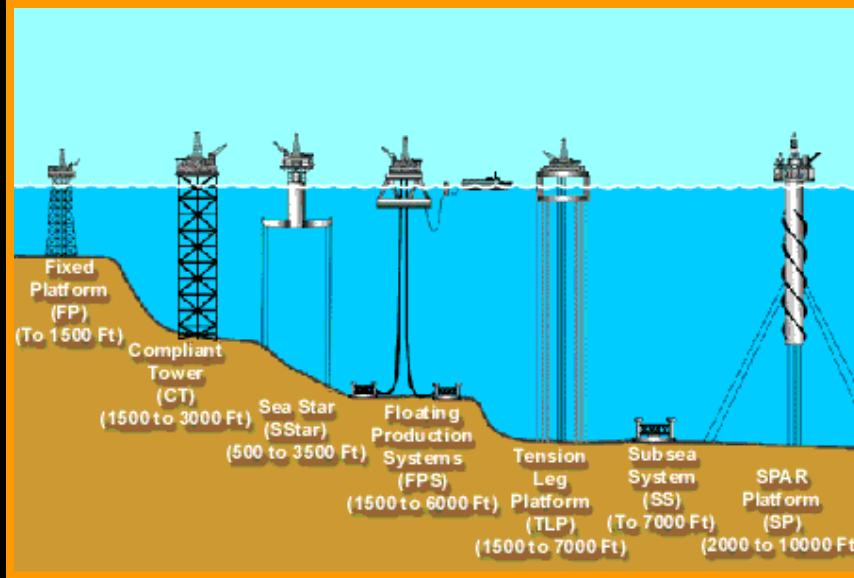


SPAR Platforms



Construction of a SPAR

Drilling Depth Capability



Fixed platforms	up to 1500'
Gravity platforms	1000'
CT's	3000'
TLP's	5000'
SPAR's	7500'
FPSs	Unlimited
Subsea systems	Unlimited

Undersea Gas Pipelines

Gulf of Mexico

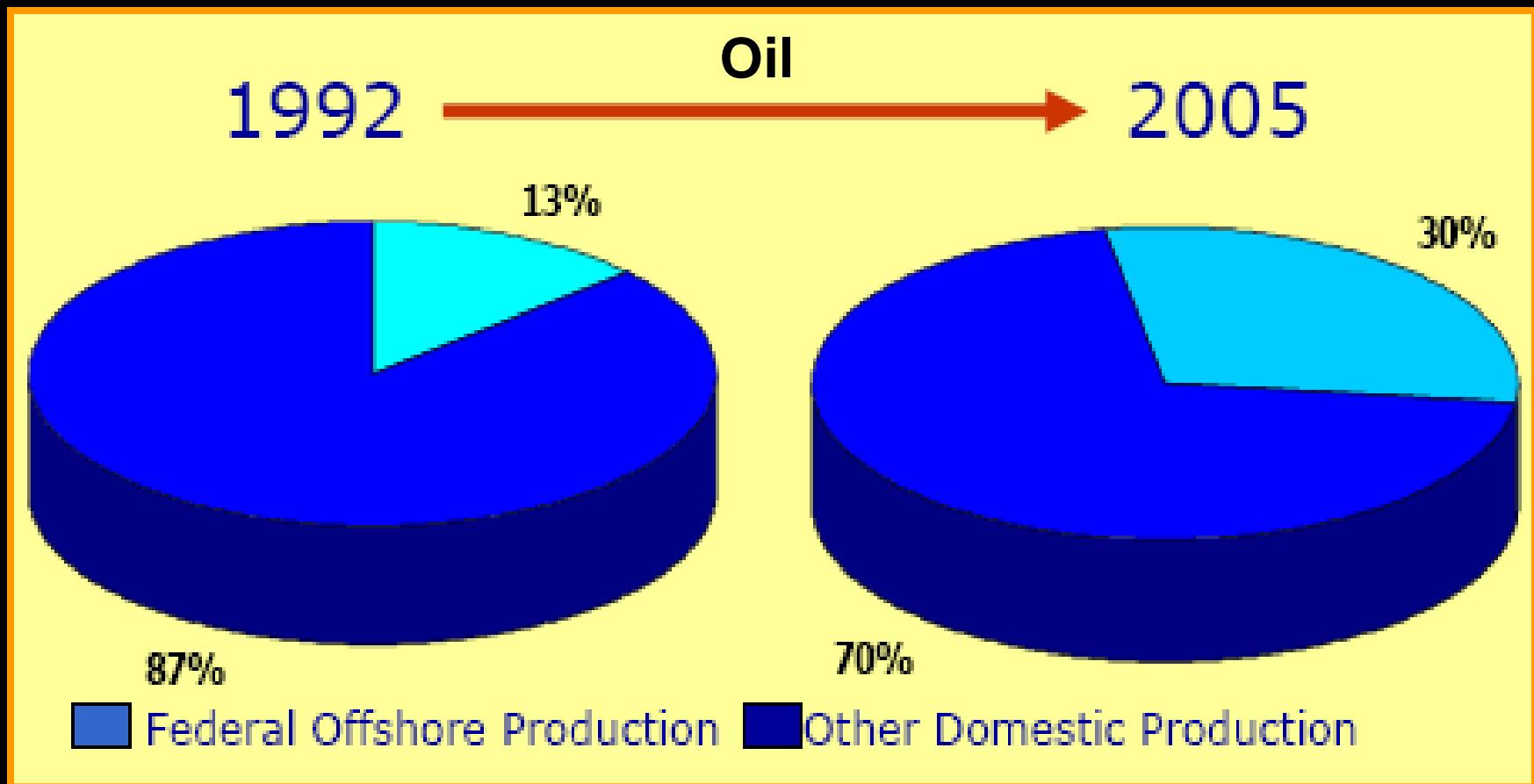
Transmission and Gathering



- 5 large supply aggregation corridor pipelines
- 1482 miles – Enbridge operates 1000 mi
- 4.7 BCF/D delivery capacity
- 7 partnership pipelines – Enbridge operates 4
- Connecting deepwater developments in up to 6500 ft. of water depth



Gulf Coast Domestic Production



10 bcf/d natural gas (19% of U.S. production)

Risks

- Lightning strikes.
- Boat, helicopter, and crane accidents.
- Equipment defects and malfunction.
- Pipeline and platform strikes.
- Blowouts.
- Sabotage.
- Nationalization/confiscation.
- War risk/terrorism.
- Hurricanes.

Lightning Strike



Lightning strike



Derrick collapse

Equipment Failure

Thunderhorse Platform



Pump failure in one of the legs

Equipment Failure

2010 BP Deepwater Horizon Sink



Blow-outs

PEMEX Blow-out



Offshore operator's worst nightmare

Offshore Fire

Egypt, August 2004



Icebergs & Ice Flows in the Arctic



**Hibernia platform,
Newfoundland, Canada**



Towing small iceberg

Economic Blackmail



Storm Damage



Hurricane Lilly (October, 2002)

Hurricanes Ivan, Katrina, Rita

**Three of the worst hurricanes to hit the U.S.,
Gulf of Mexico. All three struck the Gulf within
a 13-month period, devastating the offshore
oil and gas industry.**

2005 Hurricane Tracks



Hurricane
Tracks
1983
To
1993

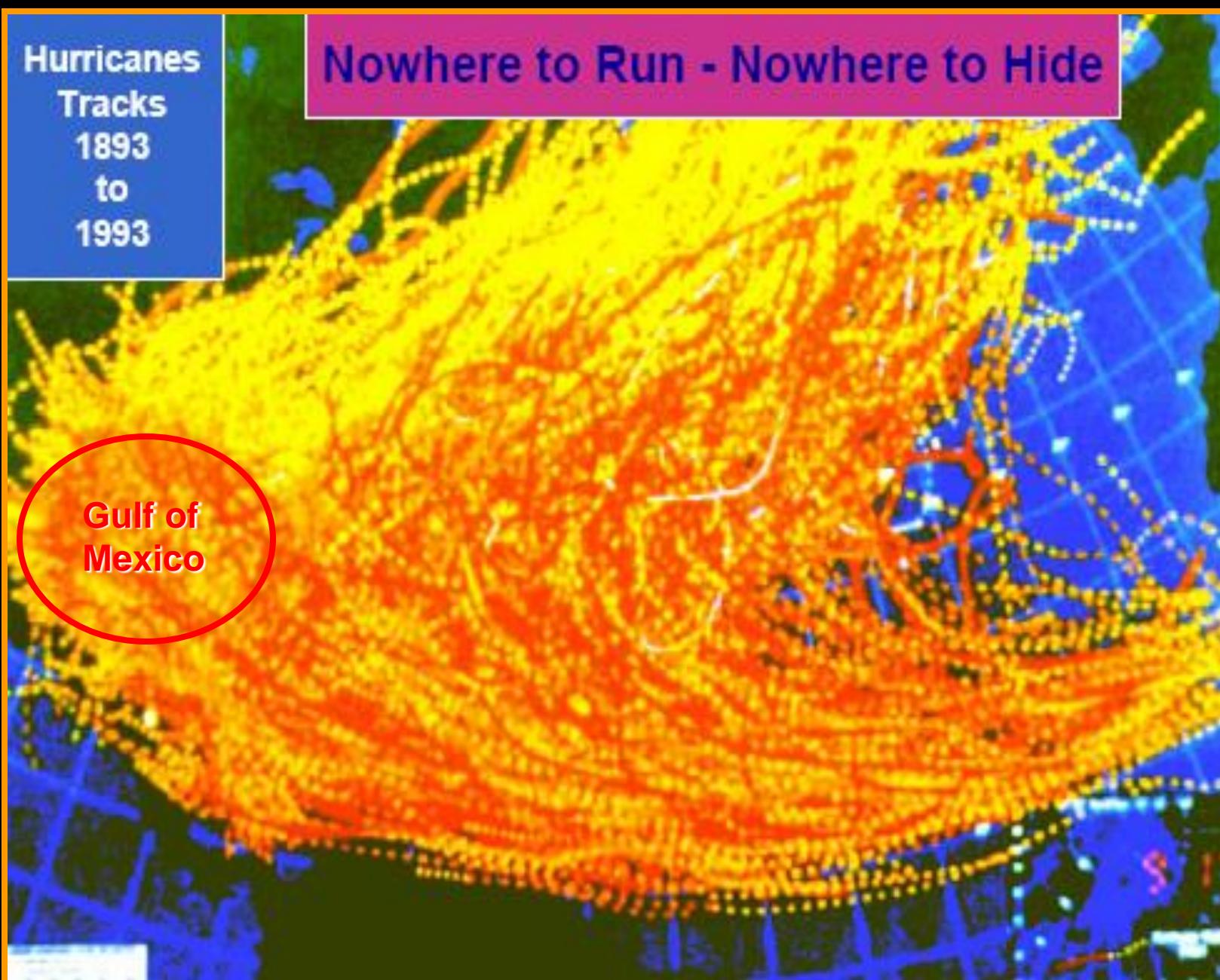
TEN YEARS – NORTH AMERICA



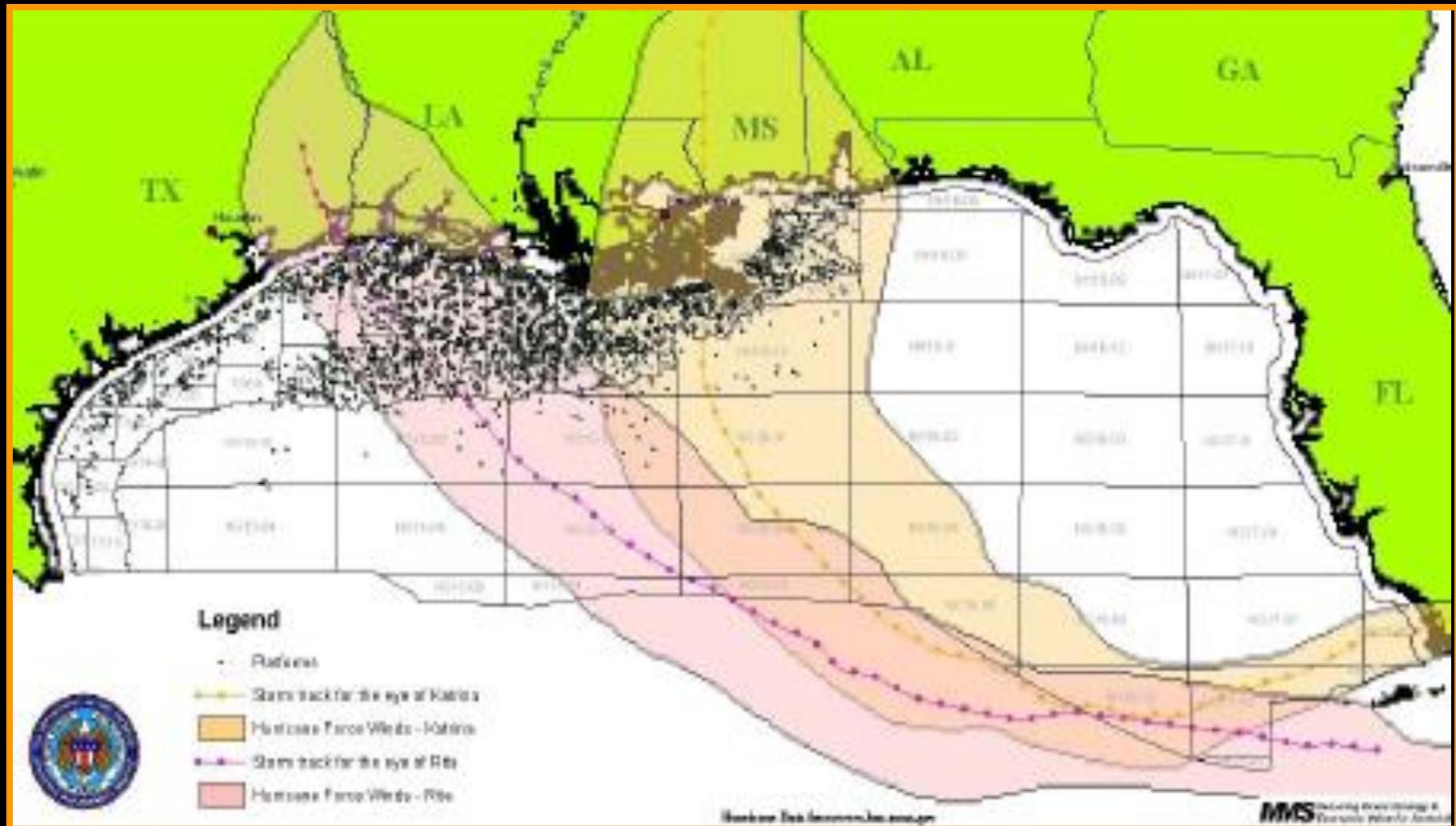
Hurricanes
Tracks
1893
to
1993

Nowhere to Run - Nowhere to Hide

Gulf of
Mexico



Katrina & Rita Tracks through the Oil and Gas Region



Shell Oil Mars Platform



Before



After

Chevron Typhoon Platform



Before



After

Diamond Ocean Warwick



Before



After

Rowan-Fort Worth



Before



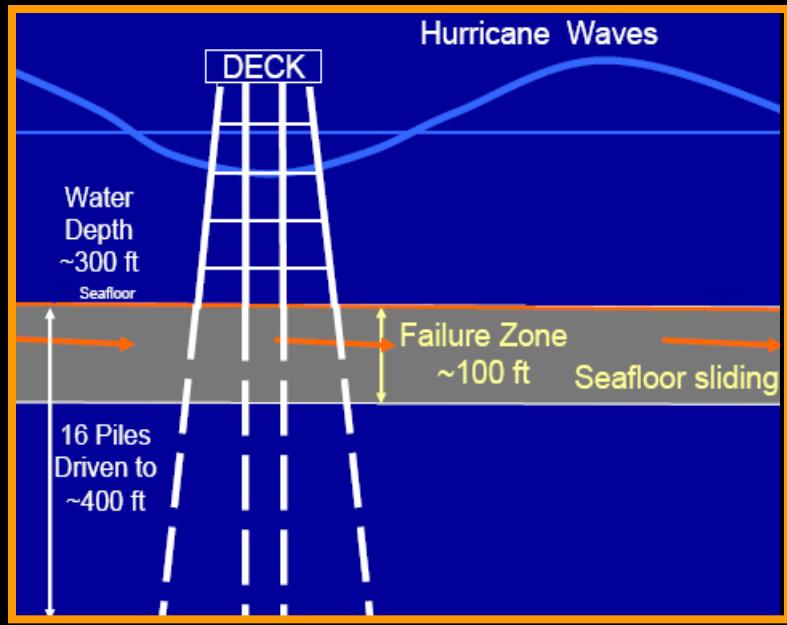
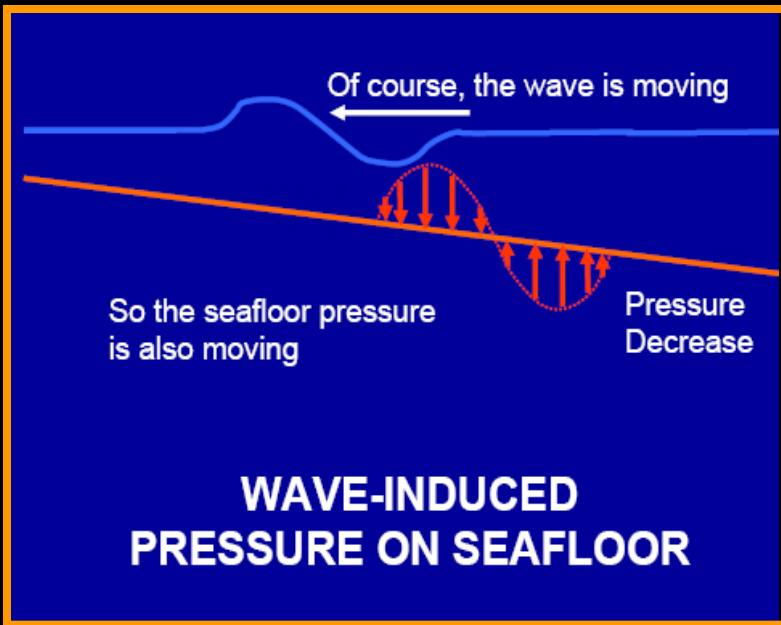
Nothing! Never found

Noble Therald Martine Drill Rig off Louisiana Coast

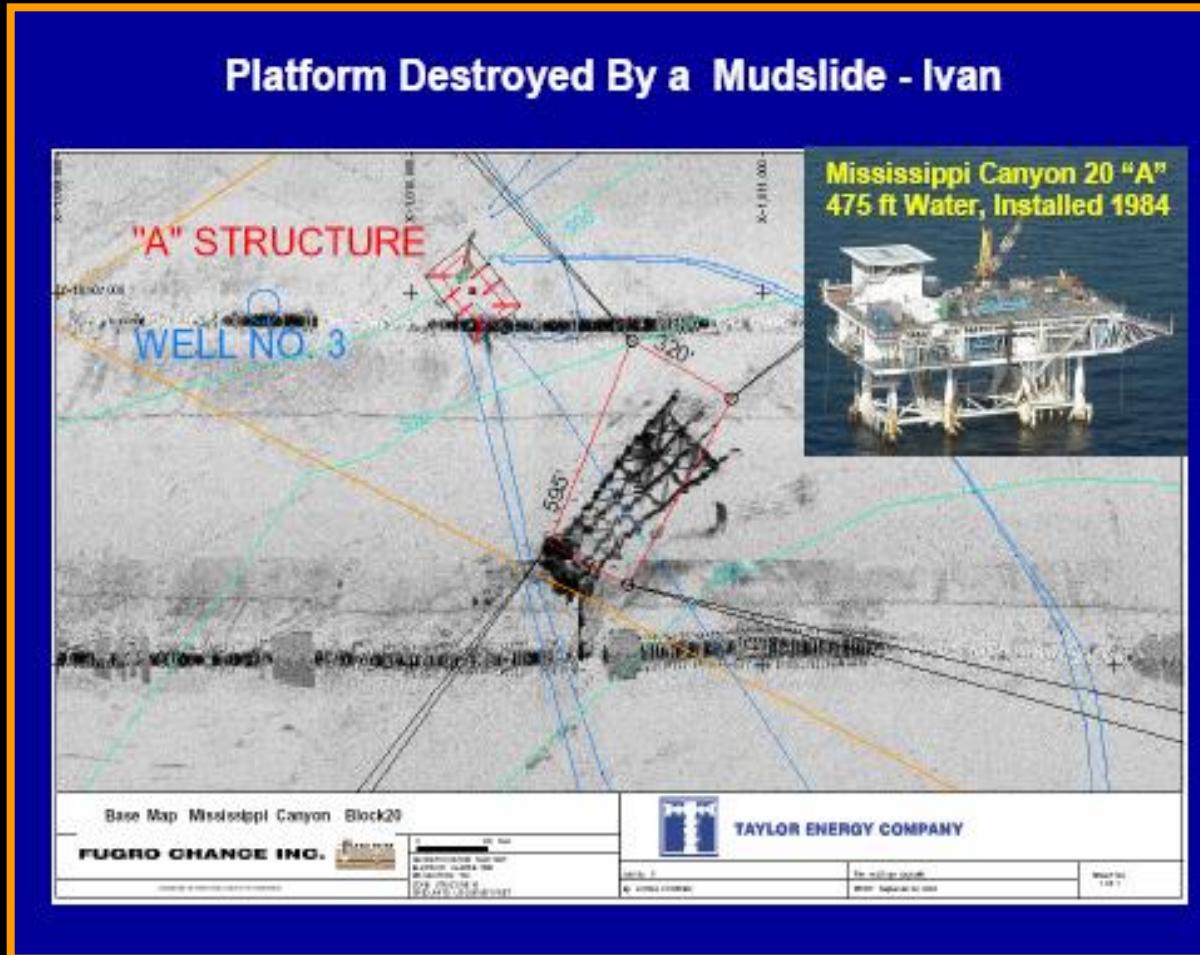
Rig drifted 125 MILES
dragging 6 anchors
before beaching itself in
Vermillion, LA.



Underwater Mudslides



Platform Lost Due to Mudslide



Onshore Damage



Refinery Flooding

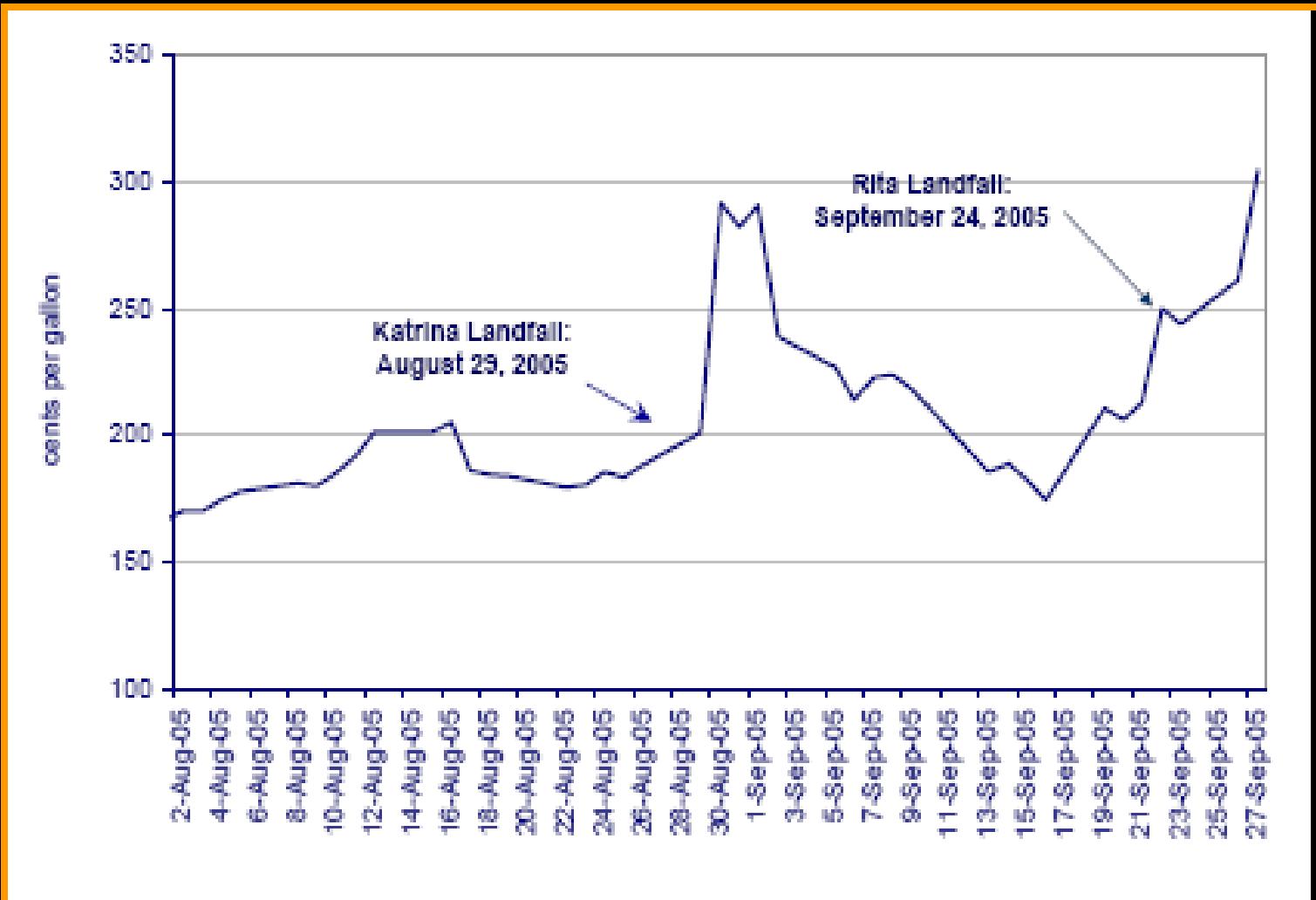
Pascagoula, Mississippi



Flooding & Crude Leakage



Gasoline Price Rise Following Hurricanes



Hurricanes Katrina/Rita Scorecard

- **Platforms:** 167 destroyed or damaged.
- **Drilling Rigs:** 8 destroyed; 22 extensively damaged; 19 knocked off station and adrift.
- **Pipelines and Refineries:** extensive damage
- **No one injured or killed in offshore industry!**
- **Fallout:** (1) Tight rig supply and rig costs increase.
 (2) Increase in oil and gas prices.
 (3) Government intervention.
 (4) Increase in insurance costs.



CALM ONCE AGAIN

UNTIL THE NEXT HURRICANE