

The Urgency Of Delivering Deepwater Oil

Shelf

Shallow Deep

Deep Deep

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The Importance Of Deepwater Energy

- Without the Deepwater Era:
 - The U.S. would have experienced a very different economic outlook.
 - Non-OPEC oil peak would have been seen several years ago.
 - It is hard to see where the future of oil lies.
- Most oil observers have little idea how important deepwater really is.
- To appreciate this, an energy history is required.

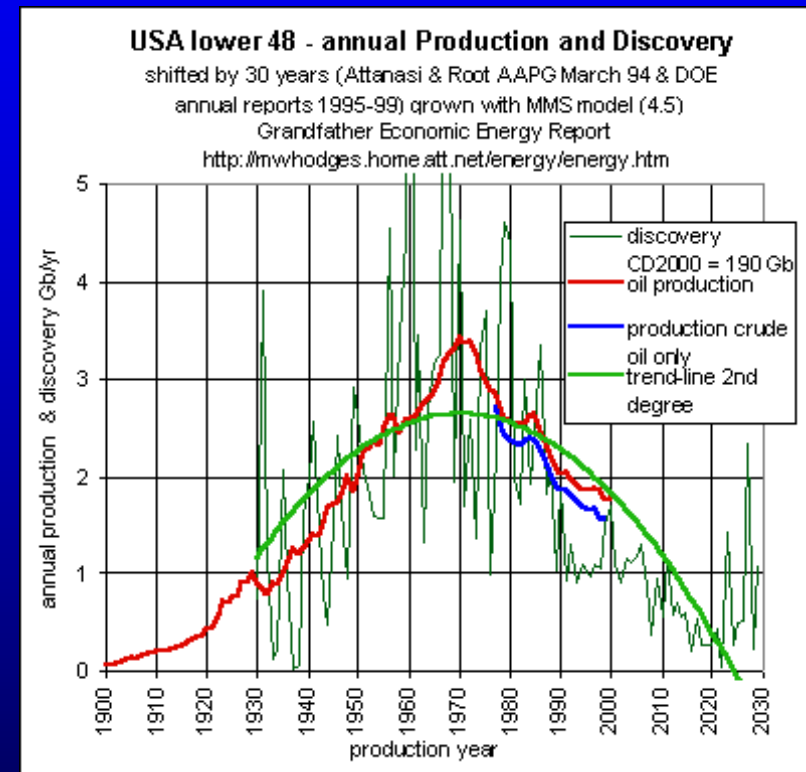
Deepwater Oil Is The U.S.'s Final Frontier

- Deepwater oil came of age in early 1993.
("Auger is now commercial.")
- Prior to this great event, deepwater was an R&D concept.
 - 1977: Deepwater drilling begins
(Sonat Offshore Drillship)
 - Bullwinkle: The last steel structure?
 - Issues ahead: Are reserves there?
Are they gas or oil?
Can they be technically produced?
Will they ever be commercial?



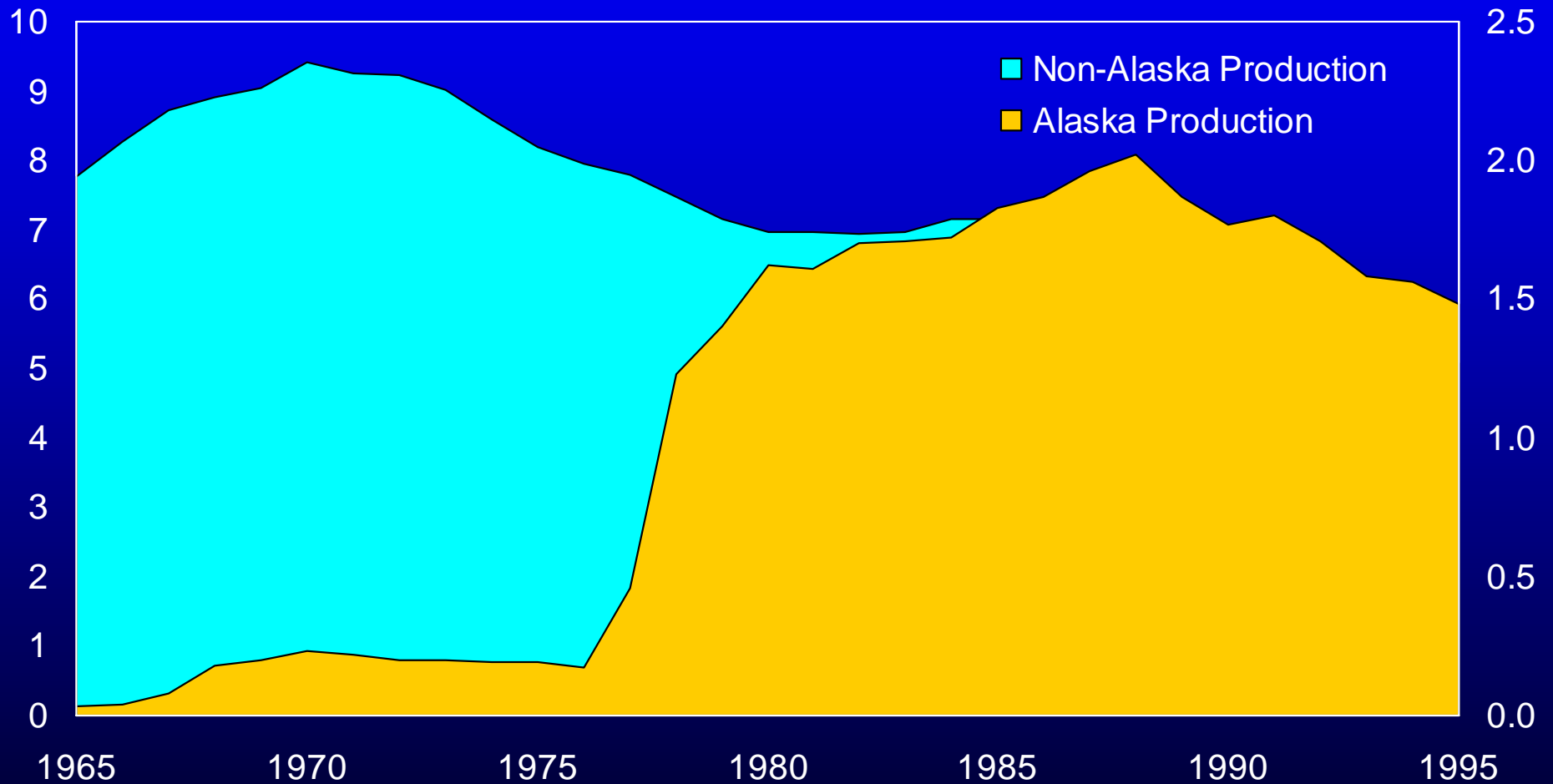
Answering The Deepwater Question Was Vital

- U.S. oil peaked in 1970 (≈ 9.6 million b/d).
 - North Slope oil was still years away.
 - Only peaking prediction was totally discredited.
 - Oil demand was soaring.
 - U.S. producers were finally able to produce!
 - Proration had finally died.



- These sudden changes were an energy earthquake!
(But too deep to be felt.)

Post-Peaking U.S. Experience Was Grim



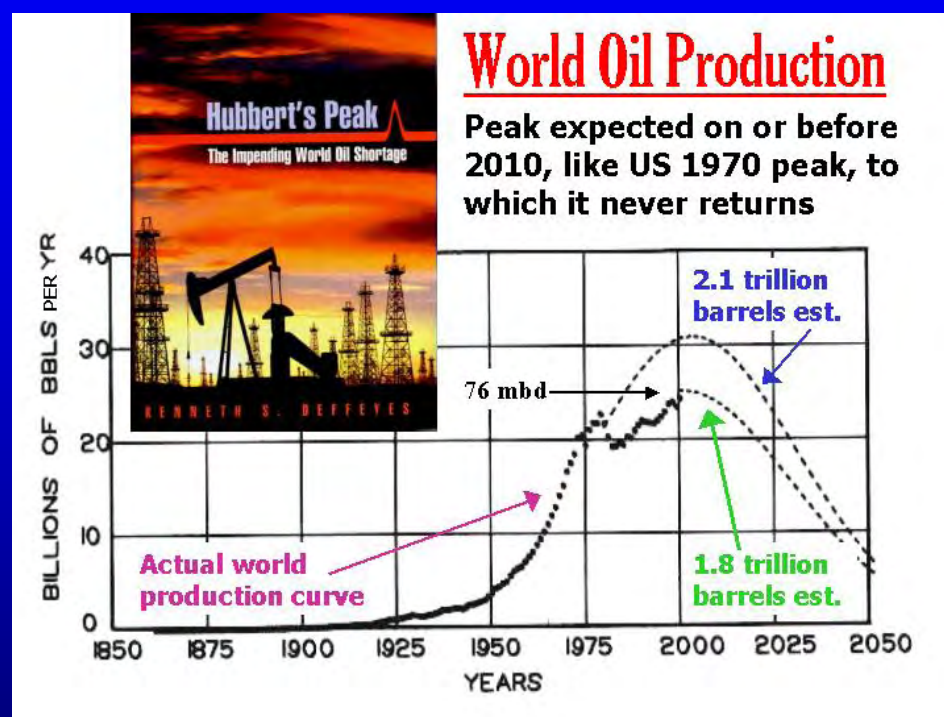
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The Conventional Wisdom For Oil Post-1990

- Prices would stay in \$15 to \$18 per barrel range as long as:
 - OPEC was disciplined.
 - U.S. oil demand stayed flat.
 - Global growth questionable (66 million b/d “rut”).
- Technology revolution would steadily decrease oil costs.
- Managing the pending glut would be a challenge.
- Scenario planning will help test \$10 to \$12 oil.

The Real Oil Story Post-1990

- Oil demand was rapidly rising (even in the U.S.).
- Alaskan oil had also peaked (3rd quarter 1989).
- Area-wide leasing was rapidly drilling up the shelf (in oil and natural gas).
- Technology was rapidly sweeping the last legacy oil out of the Gulf of Mexico.
- North Sea was entering its second life (before it peaked).
- Middle East giant fields were beginning to “lose steam.”

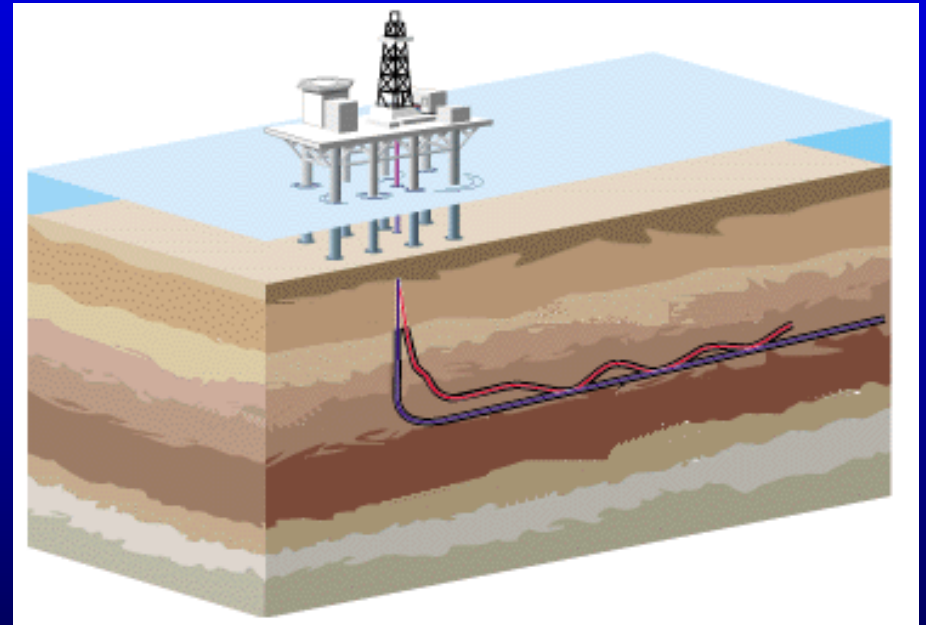


The First Half Of 1990s Very Different Era

- Perceptions of pending technology glut abounded.
- Demand worries were rampant.
- Concept of “depletion” evaporated with giddy technology hype.
- NYMEX era of pricing oil and gas began.
- We moved into the “Casino Era of Energy”
(Matthew R. Simmons, “Oil Service Industry Outlook”,
Calgary, Alberta, 1992)
- “We have a new driver of the Energy Bus.”
(Matthew R. Simmons, “1994 IADC/Simmons & Co Drillers
Survey”, New Orleans, Louisiana, 1994)

What Was Really Going On?

- Asia's demand growth for energy was astonishing.
- Non-OPEC supply was flattening out and FSU supply collapsed (but so did FSU demand).
- North Sea giant fields were all peaking (or past peak).
- Technology was commercializing smaller, more complicated finds.
- Horizontal wells and multilateral well completions were making old wells look young.
- The world was using up the last of its "easy oil."
- Liquidating oil stocks was becoming biggest, new discovery.

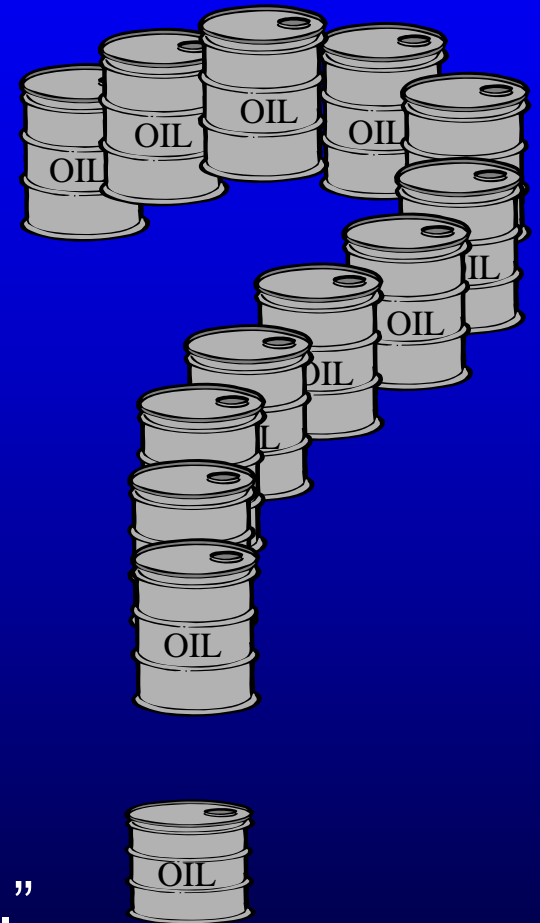


Post-1995, Non-OPEC (Excluding FSU) Supply Flattened Out

- Predicted non-OPEC “surge” was always “next 4th quarter.”
- New additions of oil became increasingly smaller.
- Declines in old, big fields began to accelerate.
- No large discoveries were found (outside deepwater).
- The 1980’s technological revolution was moving into OPEC’s giant fields.
- Oil prices were steadily rising (except when oil bears came out to feed).

The 1997 To 1999 Oil Crisis: \$10 Oil Forever!

- Oil prices began 1997 at \$27! (“Far too high”)
- Prices stayed high until “Asian Flu” ended demand for Asian oil.
- OPEC then “began producing too much oil.”
- The speculative shorts grew (and grew - and then grew even MORE!).
- By spring 1998: The world’s second greatest oil glut.
- But the glut never “arrived.”
- This began the IEA’s awful “Missing Barrel Era.”
- At its apex, over 700 million barrels of oil were AWOL!



\$10 Oil Would Have Destroyed Oil

- \$10 (or lower) oil became perceived as reality, BUT...
 - It was creating insolvency throughout all OPEC producers.
 - It would have financially crippled every public oil and gas company.
 - ❖ The bigger the company, the longer they could endure the pain.
 - A pending supply collapse would soon be inevitable.
- OPEC finally made an emergency cut of 2 million b/d.
- They cut into a market that was finally balanced.
- Within 18 months, oil prices grew almost four-fold!
- Extremely low oil stocks became a permanent feature of global oil system.

Oil Prices Became The Big Energy Surprise

- The real price of oil: What it is when speculators are neither short nor long.
- The costs incurred in E&P doubled over 5 to 7 years.
- 85% to 98% of these costs were merely to keep production flat.
- As costs rose, defining “fair price” for future oil was getting fuzzy.
- Costs per barrel hid Economics/Financing 101.



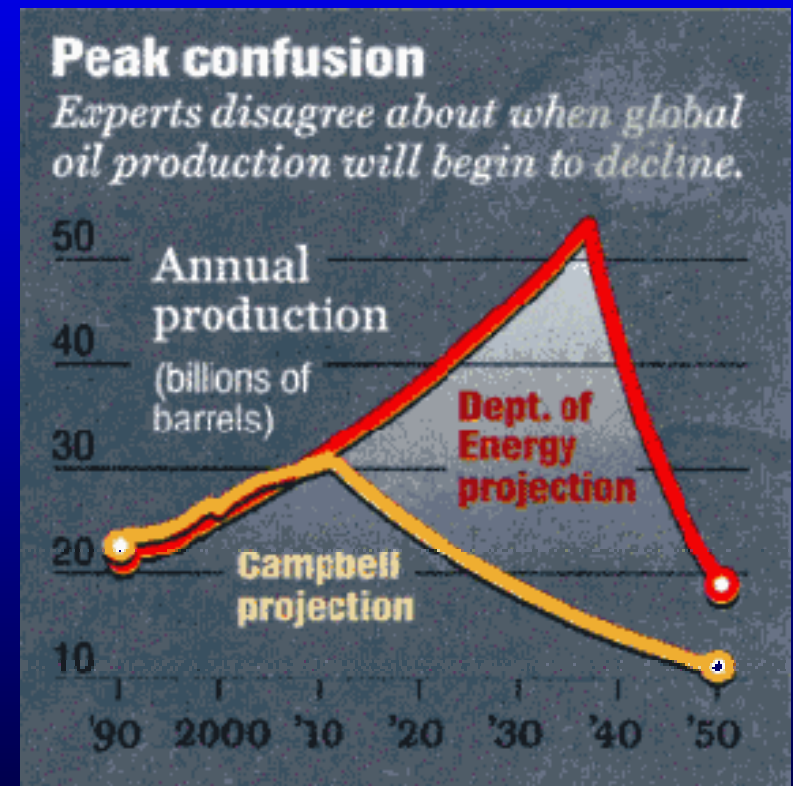
U.S.'s Oil And Gas Picture Highlights

Deepwater Urgency

- If deepwater oil had not happened, U.S. oil production would now be over 4 million b/d.
- U.S. (excluding Alaska and deepwater) fell from 9.6 million b/d in 1970 to > 3 million b/d in 2003.
- U.S. natural gas (excluding non-conventional and deepwater) also peaked.
- 1991 to 1992: 50 Bcf/d conventional gas became approximately 35 Bcf/d by 2003.
- We missed both oil and natural gas peaks!

Global Non-Deepwater Oil Is Peaking (Or Has Peaked)

- “Peaking” of oil and gas is always impossible to prove until it is a foregone conclusion. (The “rear view mirror” phenomenon.)
- Non-OPEC (excluding FSU) non-deepwater oil peaked 3 to 7 years ago.
- FSU oil growth is non-sustainable until real exploration identifies commercially viable new fields (and builds transportation complexes so oil can be exported).
- Middle East oil is badly misunderstood.



Source: U.S. Department of Energy, Colin Campbell.

The Real Story Of Middle East Oil

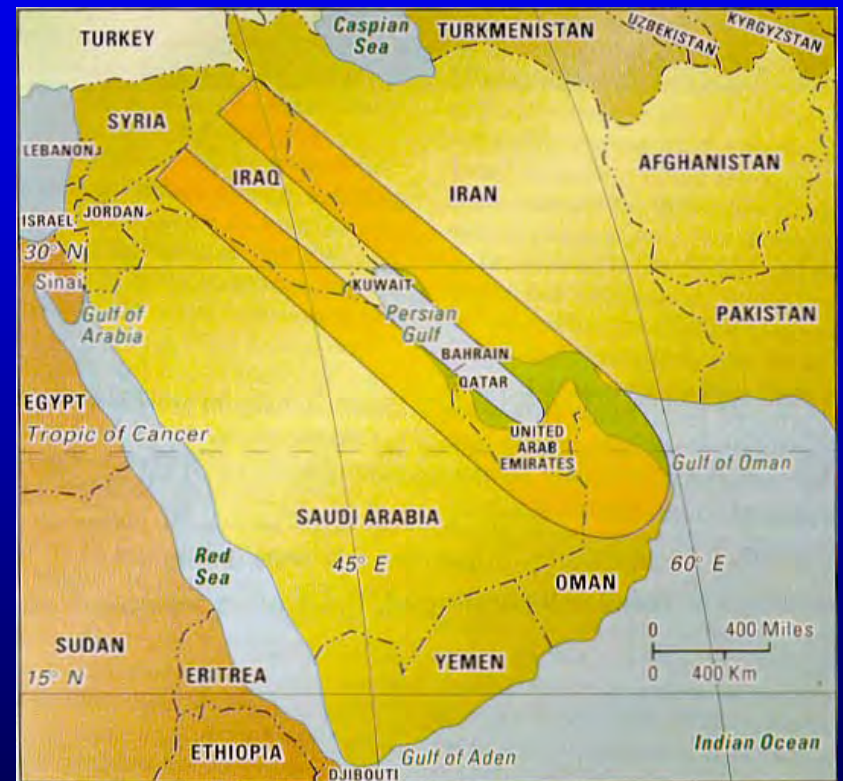
- High percentage of daily supply comes from a small number of super giant oil fields.
- All were discovered between 1927 and 1967 (The Golden 40 Years).
- Most have sustained fabulous well productivity through massive waterfloods.
- Technology of horizontal wellbores and multilateral well completions created last illusion of “youth.”
- Big future production declines are likely.



Middle East Oil Is Not Evenly Disbursed



Matthew R. Simmons
“Golden Triangle”



A.M. Samsam Bakhtiari
“Petroleum Endowment Horseshoe”

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The Real Saudi Arabian Oil Story

- Saudi ARAMCO discovered five super giant oilfields.
- It also found 5 to 7 excellent oilfields.
- Exploration for added fields has been intense.
- From 1970 through 2003, exploration success has been illusive. (Hawtah Trend is the only “miracle” at 200,000 b/d.)
- Five fields have accounted for approximately 90% of total production for over 50 years.
- Ghawar has accounted for 55% to 65% of total production for over 50 years.
- Days of free flowing oil are nearing an end.



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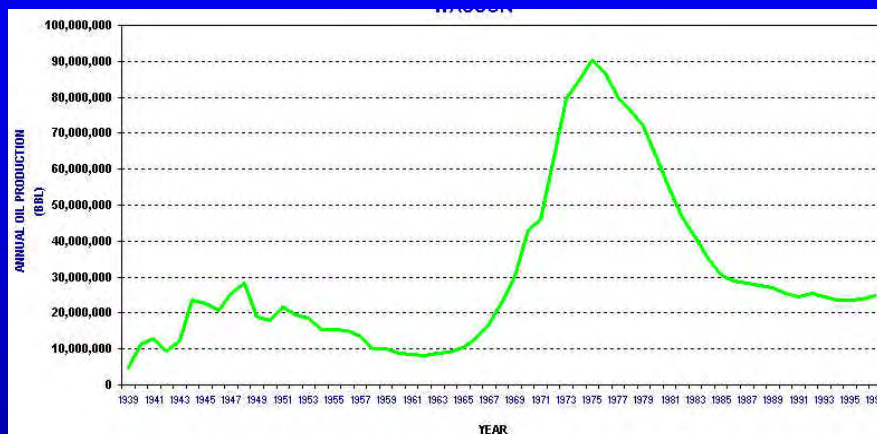
Saudi Arabia Will Always Have Vast Oil Reserves



- When Saudi Arabia's super giants water out, there are vast amounts of oil "left behind."
 - Berri recovered 21% of its oil in place.
 - 75% of Ghawar's field never produced much free flowing oil.
 - Tar mats and oil left behind are vast.
- The cost and volumes of oil each well can produce are the stunning changes.
- The experience of West Texas oil is still relevant.

The Giant West Texas Fields

Wasson



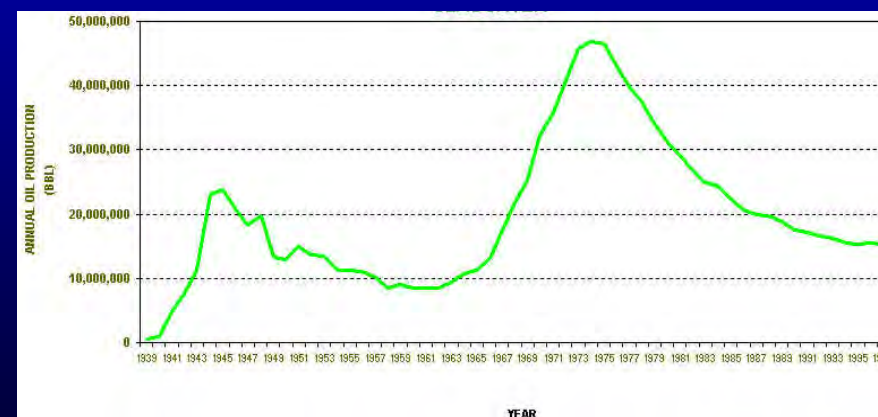
Yates



Levelland



Slaughter



Source: Railroad Commission of Texas.

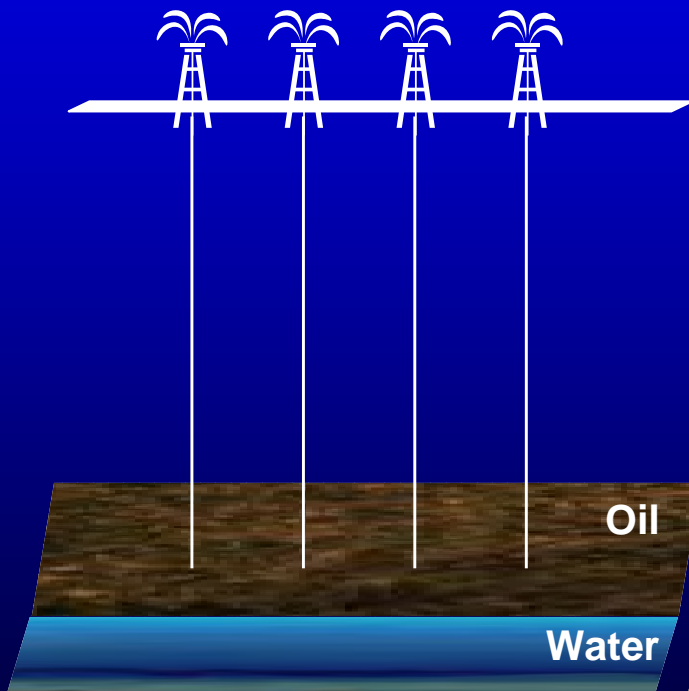
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Middle East Depletion Is Already A Fact

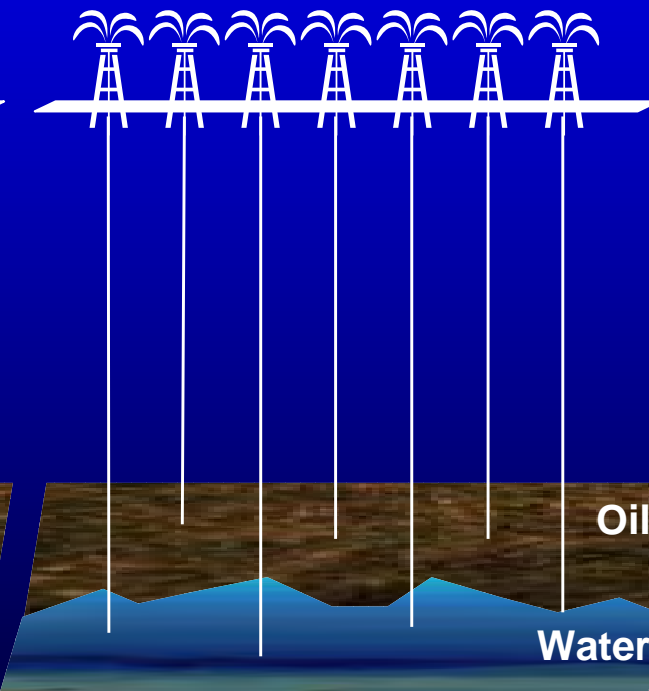
- While conventional wisdom has assumed Middle East oil is possibly inexhaustible, major declines in previously great oilfields has already occurred.
- The great Iranian fields were classic case studies.
- Oman's surprising production declines were "unexpected."
 - They were the first Middle East producer to embrace oilfield technology.

The Impact Of Technology On Middle East Oil

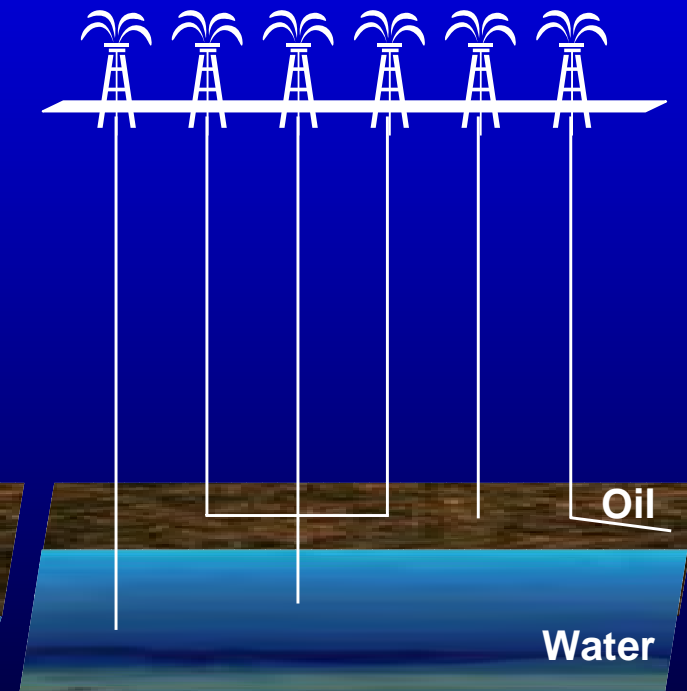
Oil Drainage Model
Early Producers



Late Producers



New Drainage Model



The World Needs Deepwater Oil!

- Deepwater oil is the “bridge” from conventional to highly unconventional (or very expensive and manpower/rig intensive) oil.
- Its need is urgent in the U.S. and globally.
- But deepwater oil is far from easy or cheap.
- And many technically challenging issues are ahead.

Some Deepwater Challenges

- Have the best fields already been found?
- Are there sufficient rigs to mount exploration in the 5 to 20 new countries with deepwater potential?
- Separating deepwater oil/gas and water = technology and cost challenges.
- Dealing with deepwater gas: flaring, reinjection, gas to liquids, gas deepwater pipelines, gas to wire?
- **Transporting deepwater oil!!**
- Deepwater emergencies: Is there a deepwater fire truck?

Deepwater Transportation Is Complex

- Shallow offshore pipelines are safe and conventional.
- Deepwater pipelines are technically challenging and expensive.
- Pipelines are permanent. Deepwater well production is not.
- FPSO issues:
 - Deck space is very precious.
 - Separating gas and transporting it.
 - Drilling from platform or from floating rig?
 - Reusable (in theory)
- Shuttle tankers:
 - Can go anywhere.
 - Conventional and no water depth issues.
- Spars and other new technologies.
- Hubs and satellite fields.



These Challenges Must Be Solved - And FAST!

- If the world's non-deepwater oil is peaking, deepwater takes on an increasing urgency.
 - Not only in the U.S. (where deepwater natural gas is already an urgent issue).
- Creating a realistic deepwater inventory is a looming and urgent need.
 - “How much might lie where” dictates future deepwater rig and reusable production unit assessment.



A World Post Oil Peaking Will Be Very Different

- “Peaking of oil” does not mean oil is gone.
- It merely means supply growth ended.
- This has historically introduced steady product declines.
- The world can go on without oil growth.
- But adjusting could be harsh.
 - Oil is the only energy source that efficiently creates transportation.
 - 10% of world’s population use 90% of its oil.
 - The other 90% are planning to drive in the foreseeable future.
 - Globalization means transportation.

This Workshop Is Timely

- Deepwater oil is a critical bridge.
- Where the bridge leads is still unknown.
- Without the bridge, a chasm could be deep and wide.
- The jump could be risky.
- Falling is riskier still.
- **GOOD LUCK!**



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