

**Oil's Dramatic Price Retreat Ripples Around the World**

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Wednesday, September 11, 2006, Page A01

Just two weeks ago, spiking petroleum prices were ratcheting up conventional oil exporters such as Venezuela, Russia and Iraq, fueling inflation worries at the Federal Reserve, raising expectations of American oilfield production, and crimping the budgets of airlines and ordinary households alike.

Suddenly, the oil market's dynamic has changed. Prices have fallen a two-month stretch, compelling forecasts that many experts had just revised upward. Gasoline has risen within 0.50¢, clearing the financing prospects for alternative-fuel firms, and easing the pace of bid wars of



The Queen of oil, a view of Richmond, Calif., Monday, Sept. 11, 2006. Oil prices plunged in a two-month low Monday as the fuel cost energy bills also fell around widely, informed after markets for and leaders of the United States took what could be a major step toward a resolution. AP Photo/Chris Wedel

**Class Announcements:**

- Homework #3 due today at 5 pm in the wooden boxes
- Solutions will be available tomorrow

**Exam #1 is in class next Wednesday September 24, 2008.**

The exam will be open book and calculators are allowed. Thus, make sure to bring the book and a calculator to the exam!

The exam will cover all of the material in Chapters 1-2 of the text, Homework assignments 1-3, and lecture material through this Friday.

Exam problems will be similar to homework assignments, in class worked out problems, and issues discussed in the text or in lecture. I will post a practice exam (from a past year) on the web page later today.

<http://www.eia.doe.gov/bia/seo/otheranalysis/ongr.html>

How does this compare to the world supply?

How much money is the oil worth?

What just passed in the U.S. House of Representatives?

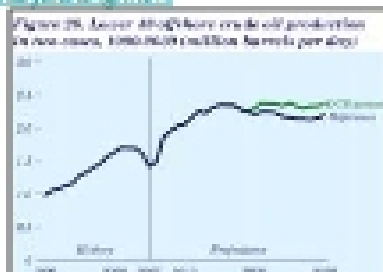


Figure 26. Lower through-burn crude oil production in new areas, 1980-2006 (million barrels per day)

The OCS is estimated to contain substantial resources of crude oil and natural gas; however, some areas of the OCS are subject to drilling restrictions.

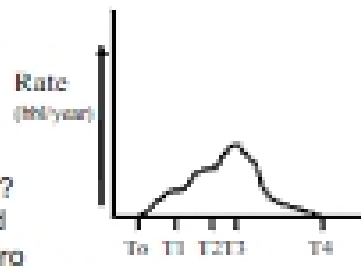
For AEO2007, an OCS access case was prepared to examine the potential impacts of the lifting of Federal restrictions on access to the OCS in the Pacific, the Atlantic, and the eastern Gulf of Mexico. Currently, except for a relatively small tract in the eastern Gulf, resources in these areas are largely off limits to exploration and development.

Mean estimates from the MMS indicate that technically recoverable resources currently off limits in the lower 48 OCS total 18 billion barrels of crude oil and 77 trillion cubic feet of natural gas (Table 10).

The projections in the OCS access case indicate that access to the Pacific, Atlantic, and eastern Gulf regions would not have a significant impact on domestic crude oil and natural gas production or prices before 2030. Because oil prices are determined on the international market, however, any impact on average wellhead prices is expected to be insignificant.

**Clicker Question**

Consider the following plot of production rate against time for the US oil supply:



Which of the following **MUST** be true?

- after T3 no more new oil is found
- the rate of production at T3 is zero
- after T4 the curve will rise again
- the area under the curve from T0 to T3 is the same as the area from T3 to T4.
- (none of these **MUST** be true)

(If you think several must be true - click your favorite)

Some **MIGHT** be true, but not **MUST** be true.

After T3, you might find more oil, for example that "extension" out to T4 might be because of one last big supply!

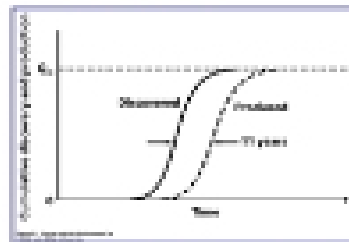
The rate of production at T3 is maximum, definitely not zero.

After T4 the curve could rise again, but there's no guarantee.

There is no reason the curve HAS to be symmetric. (Hubbert assumed it will be early so, but it's not a rule or law).

**Hubbert had one other advantage (preview).**

Look at discoveries of wells. Because production always follows. (Takes about a decade for a new discovery to "come online".)



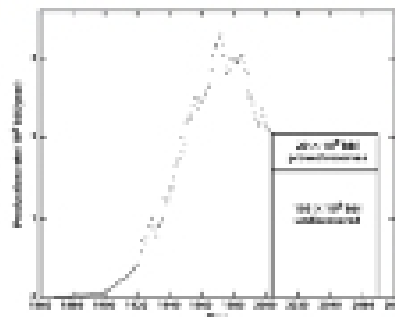
Discovery rate is not constant. Rises steeply at first in a given region, then steadily declines.  $1.1 \times 10^9$  bbl discovered in US in 2003 (50% less than previous year)

"Discovery" can also include revisions of predictions from wells due to improved technology.

**How much oil is there in the US?**

Hubbert (1956):  $Q_{\infty} = 185 \times 10^9$  barrels, not counting Alaska Peak in production will occur 1966-1971.

More recent value is  $Q_{\infty} = 324 \times 10^9$  barrels including Alaska.



However, we have already used much of this. Amount remaining now is about  $134 \times 10^9$  bbl, including about  $5 \times 10^9$  bbl in Alaska.

\* This includes ("proven reserves" + estimate of undiscovered)!

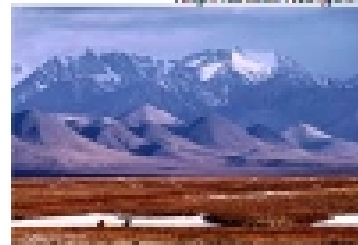
Current production level in US is about  $2 \times 10^9$  barrels/year

Thus, there are about 68 years total at **current production level**.

Oil in Alaska contributes about 2-3+ years.

\* Note that this does not include the Arctic National Wildlife Refuge (see homework problem).

Former Alaskan Senator, [Frank Murkowski](#), in 2001, stood on the floor of the Senate and held up a large piece of white posterboard. He said "that" is all one can see in winter on the Arctic National Wildlife Refuge's coastal plain: "It's flat, it's unattractive, it's not pristine; this is what it looks like. Don't be misinformed."



## World Oil Reserves

Using Hubbert-type analysis:

$$Q_{\infty}(\text{world}) = 2.5 \times 10^{12} \text{ barrels}$$

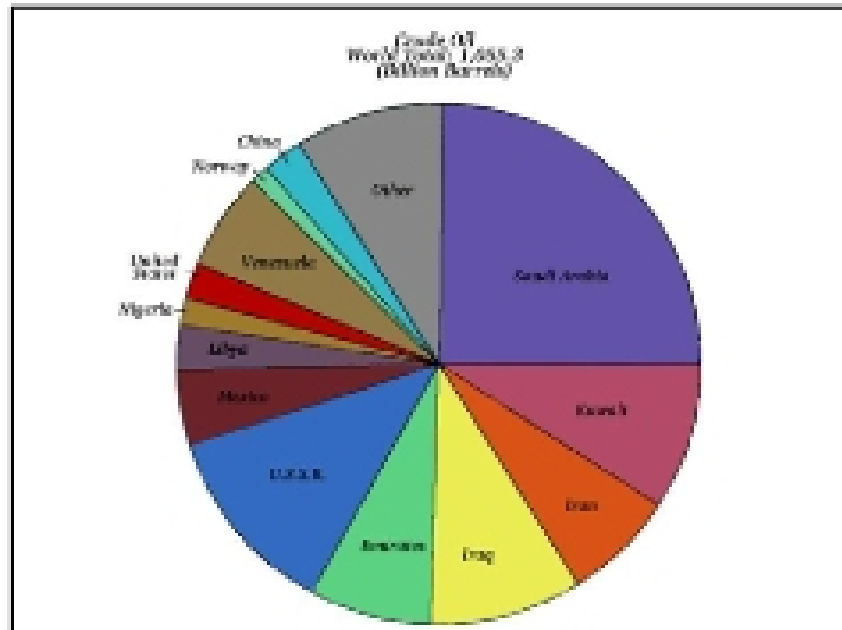
By comparison the value for the USA =  $Q_{\infty} = 324 \times 10^9$  barrels

Estimated maximum remaining oil in the world =  $1.8 \times 10^{12}$  barrels  
Proven reserves =  $1.1 \times 10^{12}$  barrels

Current product rate =  $3 \times 10^{10}$  barrels/year

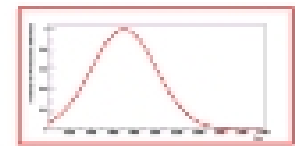
Proven reserves will last about 37 years at **current production level (big assumption)!**

Maximum estimate will last about 60-80 years.



### Clicker Question

"Hubbert Curve" analyses predict global oil production peaking within 0-20 years.



But what about future oil discoveries, increased efficiency, improved technology?

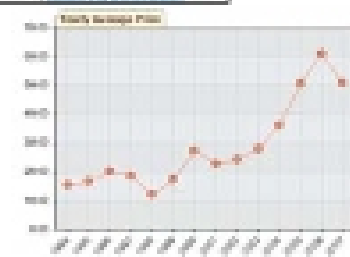
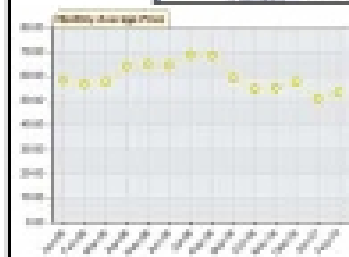
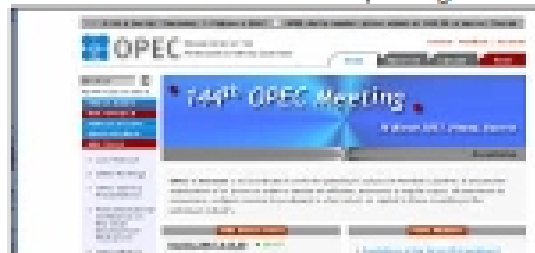
What impact will these have?

- A) The Hubbert Curve presumably already factors that in.
- B) It will increase the "time to peak", but by a negligible amount
- C) It will increase the "time to peak" by perhaps a factor of 2.
- D) It could increase the "time to peak" indefinitely - centuries, millennia, the sky is the limit.

A is the best answer - the Hubbert curve *certainly* factors in new discoveries and technologies. B is also correct.

<http://www.opec.org>

Organization of the Petroleum Exporting Countries



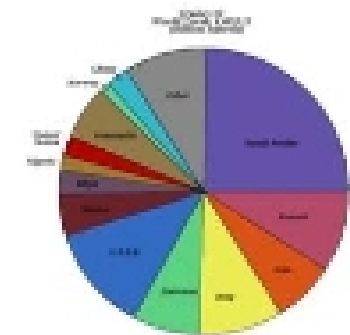
### Clicker Question

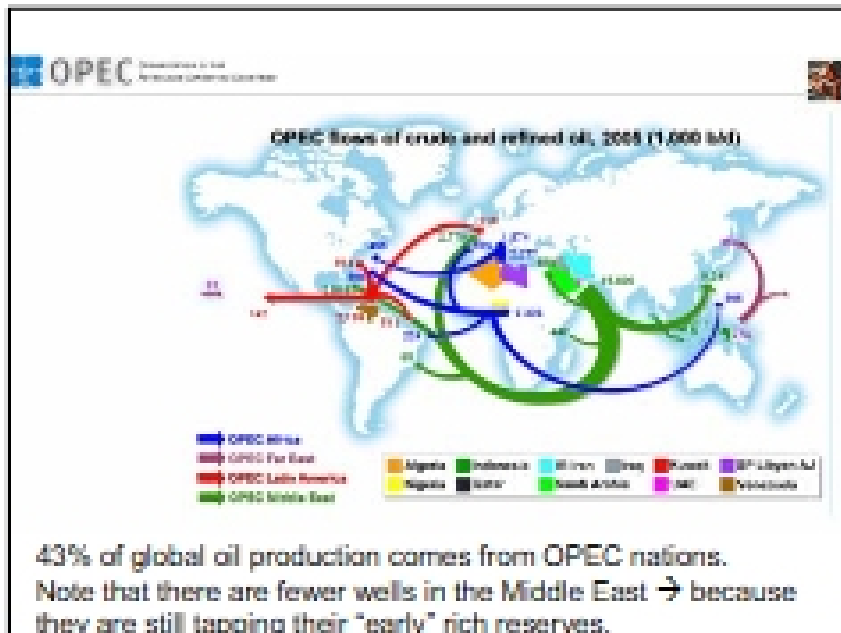
Which of the following countries is not a member of OPEC?

- A) Nigeria
- B) Venezuela
- C) Iran
- D) Iraq
- E) Russia

#### OPEC Members

Algeria  
Angola  
Indonesia  
Iran  
Iraq  
Kuwait  
Libya  
Nigeria  
Qatar  
Saudi Arabia  
UAE  
Venezuela





**OPEC Web Page:  
 Frequently asked questions**

Is the world running out of oil?

Oil is a limited resource, so it may eventually run out, although not for many years to come.

At the rate of production in 2005, OPEC's oil reserves are sufficient to last more than **80 years**, while non-OPEC oil producers' reserves might last less than **30 years**. The worldwide demand for oil is rising and OPEC is expected to be an increasingly important source of that oil.

If we manage our resources well, use oil efficiently and develop new fields, then our oil reserves should last for **many more generations** to come.