Dr. David L. Greene
Corporate Fellow
Oak Ridge National Laboratory
Visiting Faculty
ITS, University of California at Davis

WHY FUTURE OIL PRICES ARE SO UNCERTAIN.

OAK RIDGE NATIONAL LABORATORY

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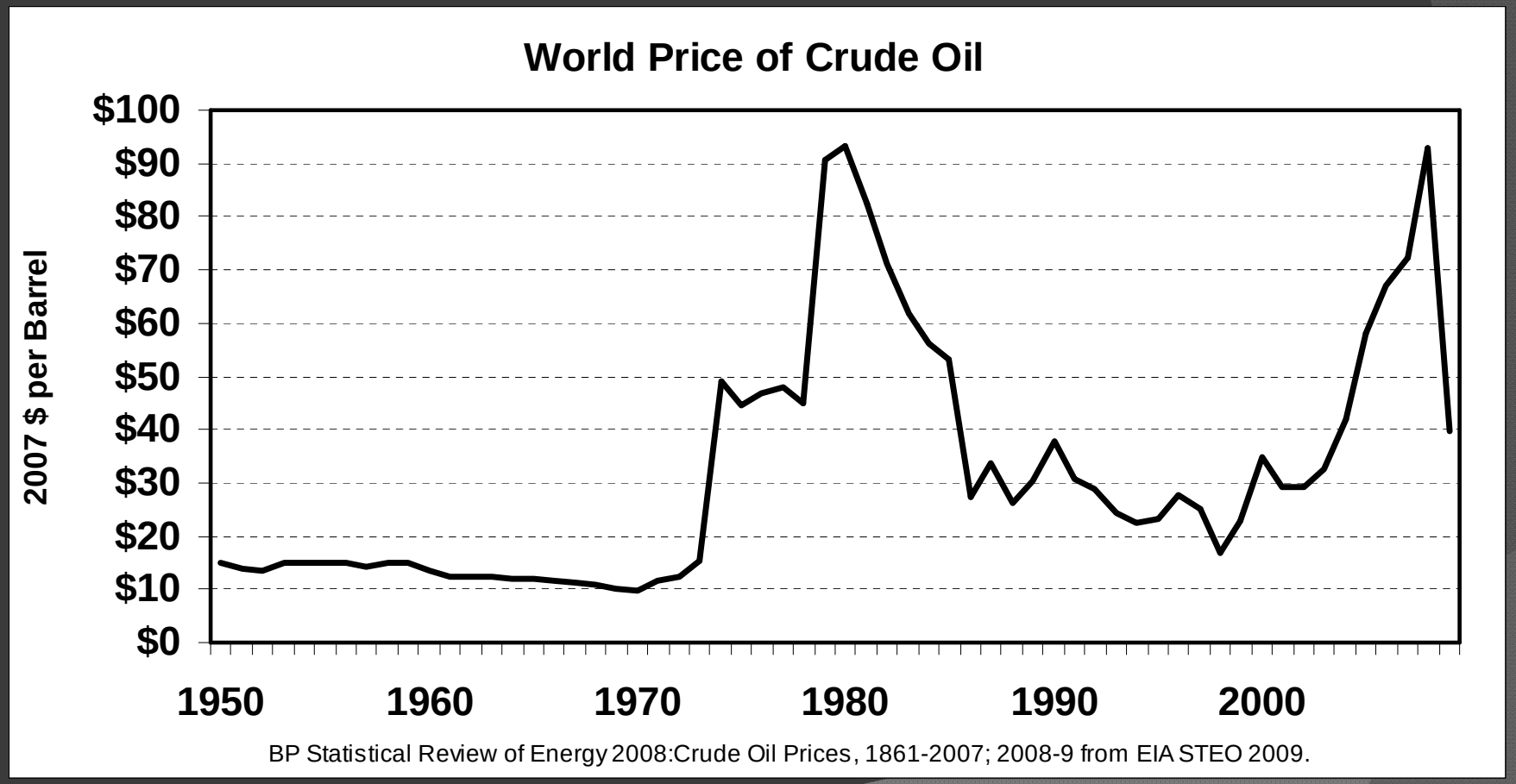
World oil prices will be volatile and highly uncertain for at least a decade or more.

- Why are world oil prices uncertain?
- OPEC cartel's "feasible price space"
- World economic uncertainty
- Uncertainty about key facts hinders investment in liquid fuels production capacity.
- Peak or plateau in conventional oil
- Global Climate Change Policy

"The real problem we face over oil dates from after 1970: a strong but clumsy monopoly of mostly Middle Eastern exporters operating as OPEC." Prof. M. Adelman, MIT, 2004.

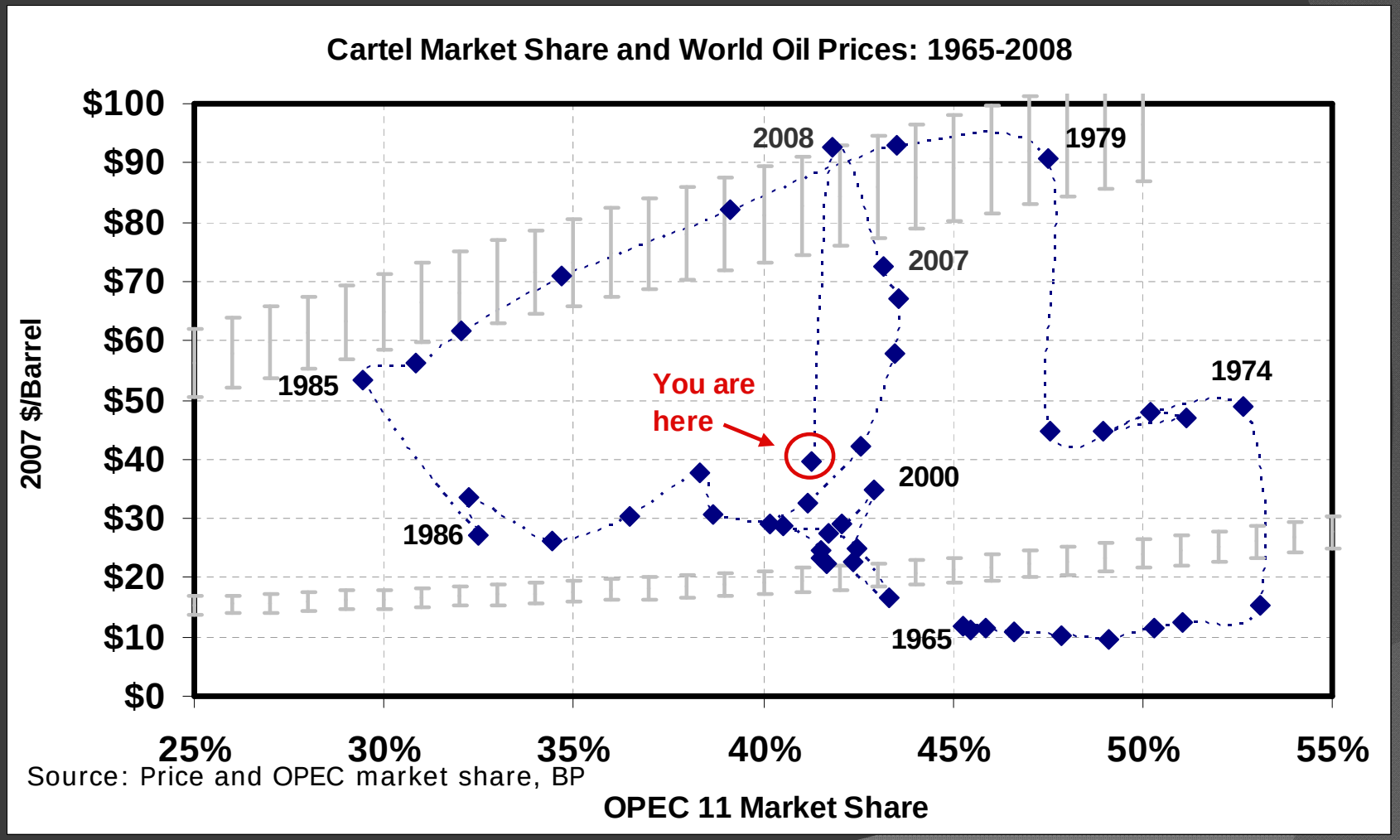


The economic theory to understand the behavior of the OPEC oil cartel was developed more than half a century ago by Heinrich von Stackelberg.
(Static equation for profit maximizing price.)

$$P = \frac{C}{1 + \left(\frac{1}{\beta(P)} S\left(\mu(P) + 1\right) \right)}$$

β = price elasticity of world oil demand
S = OPEC share of world oil market (0 < S < 1)
μ= non-OPEC supply response (-1 < **μ** < 0)
Elasticity = % change in quantity / % change in price = d ln(y)/d ln(x)
Oil prices are uncertain because short-run elasticities are 1/10th as large as long-run elasticities!

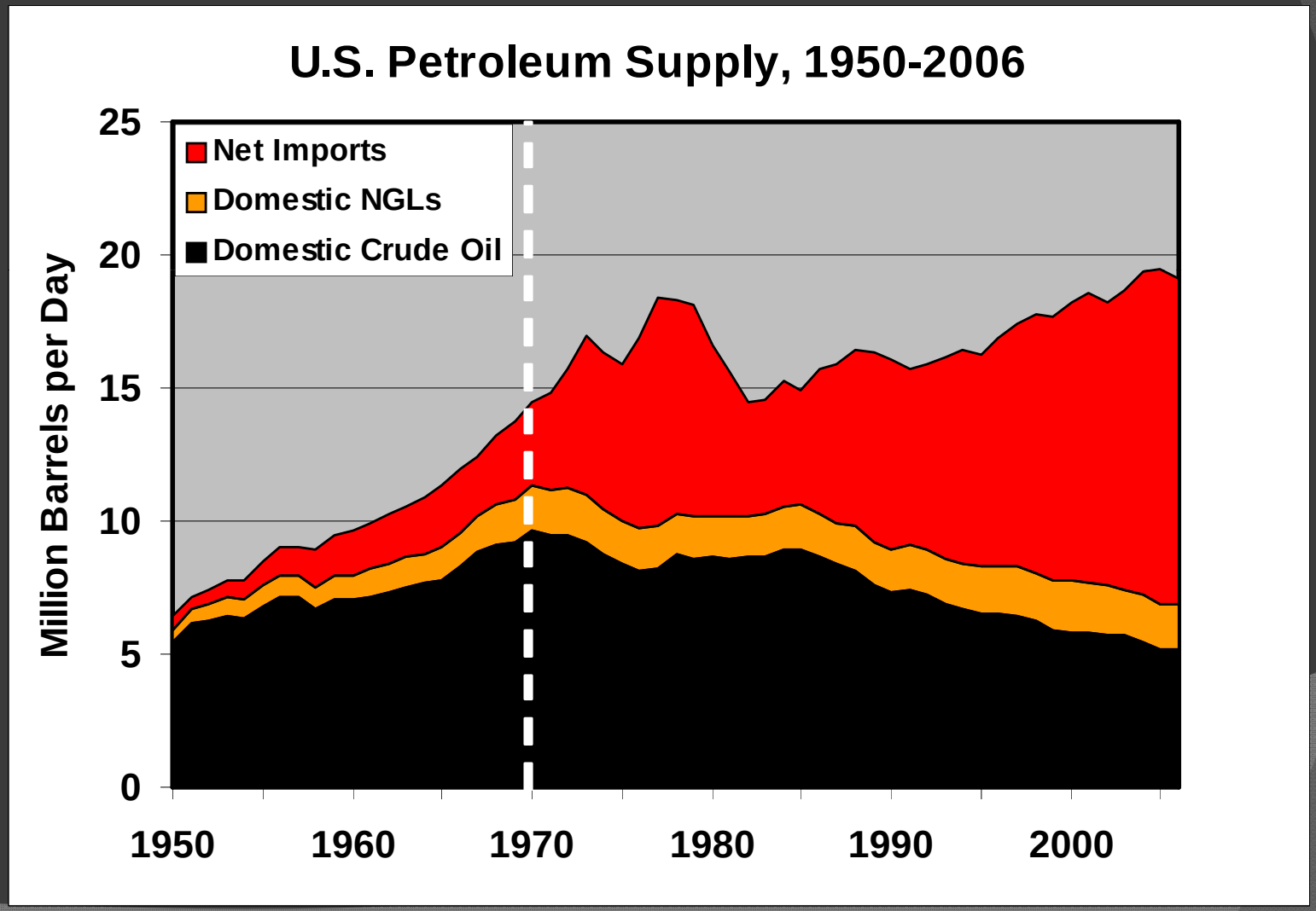
The past 35 years of oil market experience fit the partial monopoly theory remarkably well. OPEC has an enormous feasible price space in which to operate.



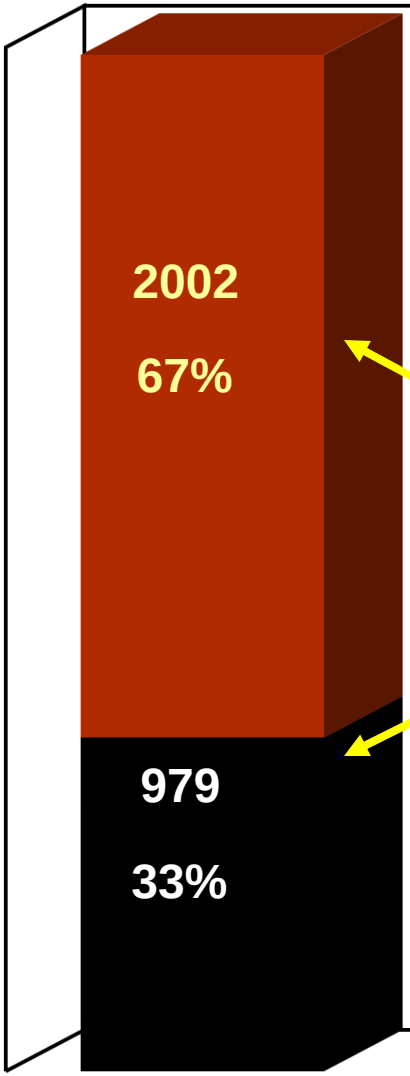
Source: BP, EIA.

Oil demand elasticities: Long-run = -0.07, short-run = -0.105
Oil supply elasticities: Long-run = 0.60, short-run = 0.06
Assuming linear functions and at $28/bbl., 1-year adjustment.

In the early 1970s the cartel's market power was strengthened by growing world demand, its increasing market share and…the peaking of US crude oil production in 1970.



The RATE of world oil use is alarming!



Billions of Barrels

The 2007 NPC report expects 1.1 trillion barrels of oil production over the next 25 years. More than consumed in in all of human history.

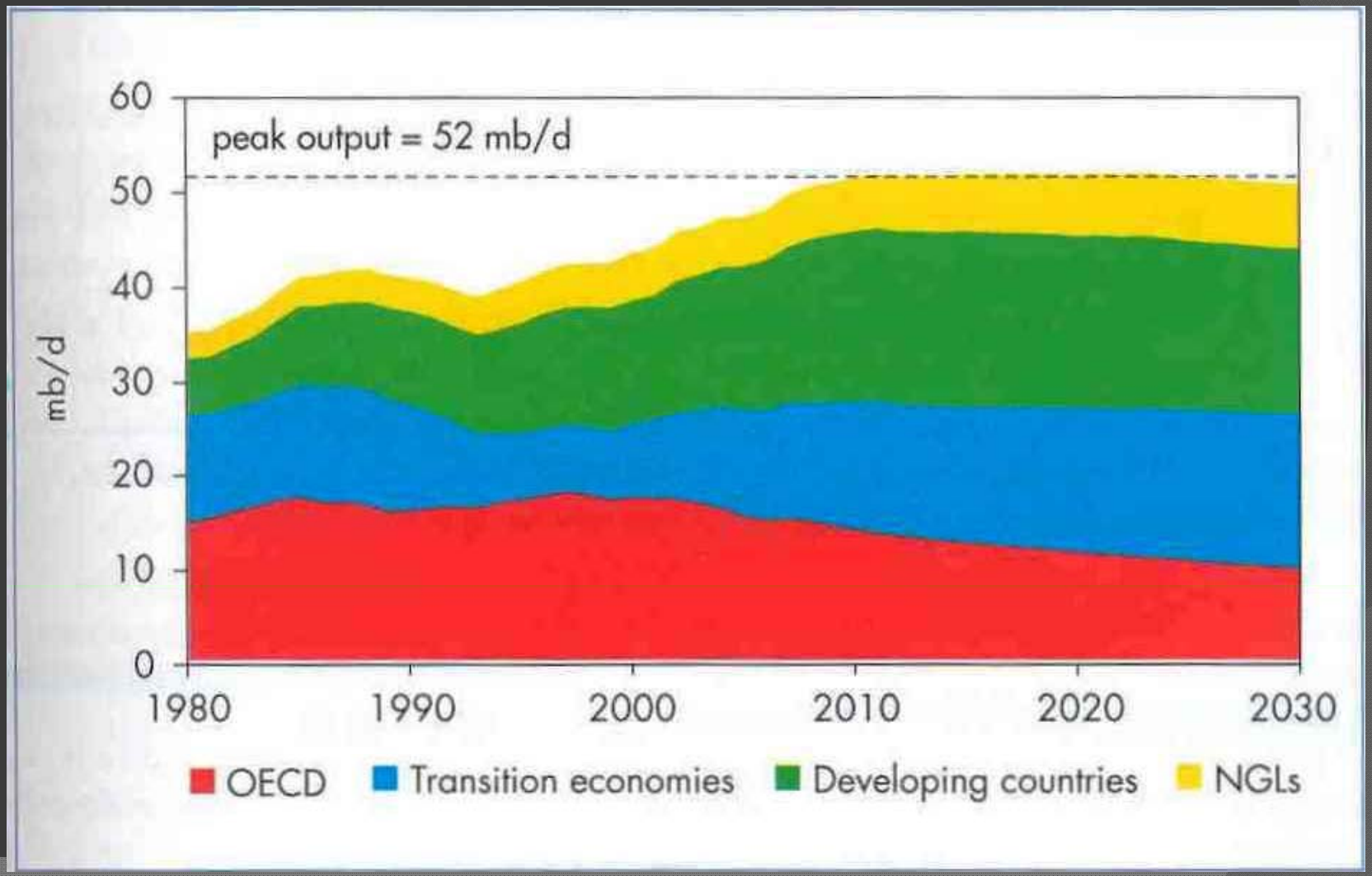
Remaining recoverable crude oil*
Not reserves, ULTIMATE RESOURCES

Cumulative Production to end of *2005*

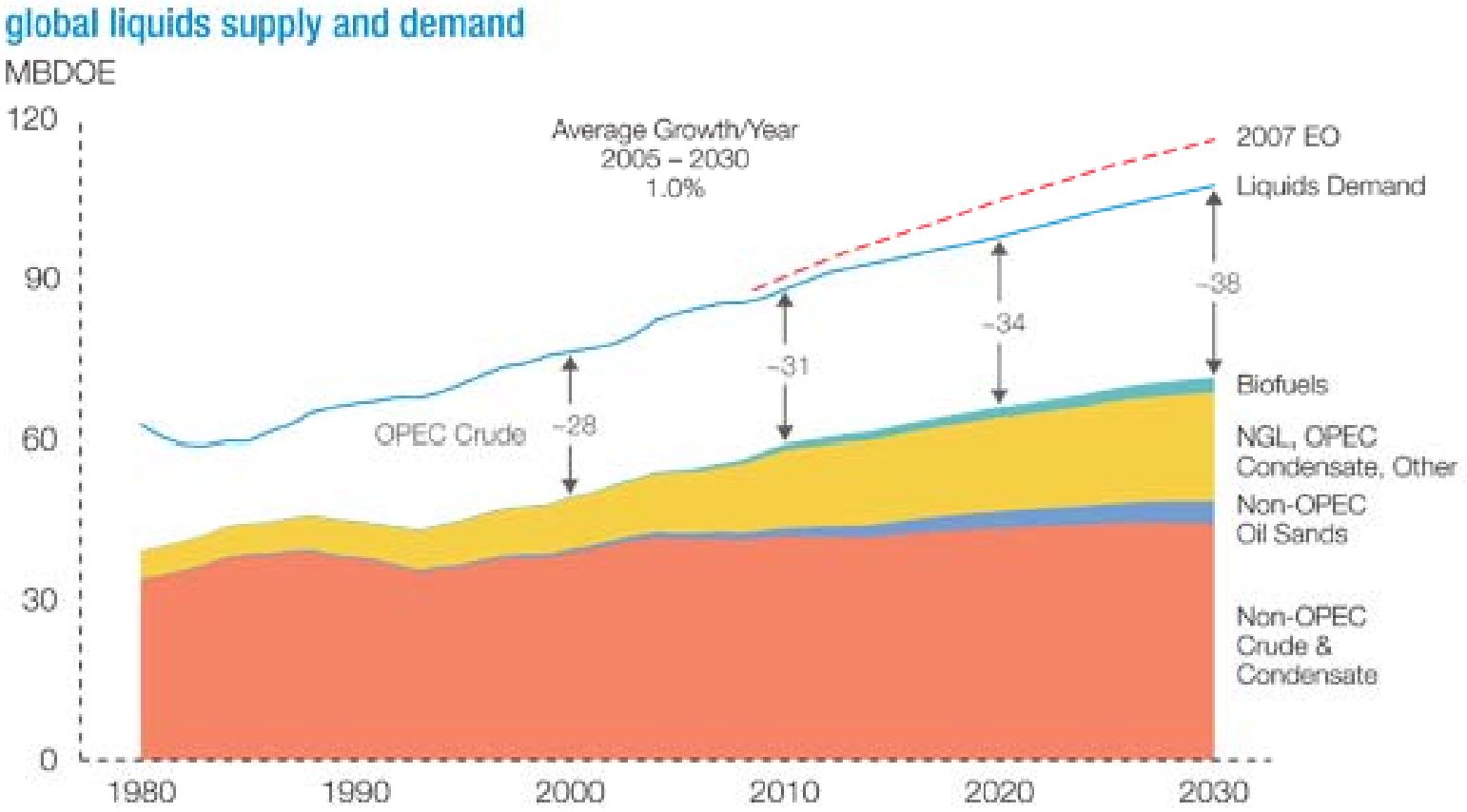
Cumulative Production to the end of *1995* was 710. Over ¼ of all oil ever consumed was consumed in the last 10 years.

* From USGS 2000, USGS 1995, and MMS 1996

The question is when non-OPEC supply will peak. The IEA foresees a non-OPEC plateau with less OPEC supply and more unconventional resources filling the gap. But energy companies face enormous uncertainty when considering investments in unconventional oil.

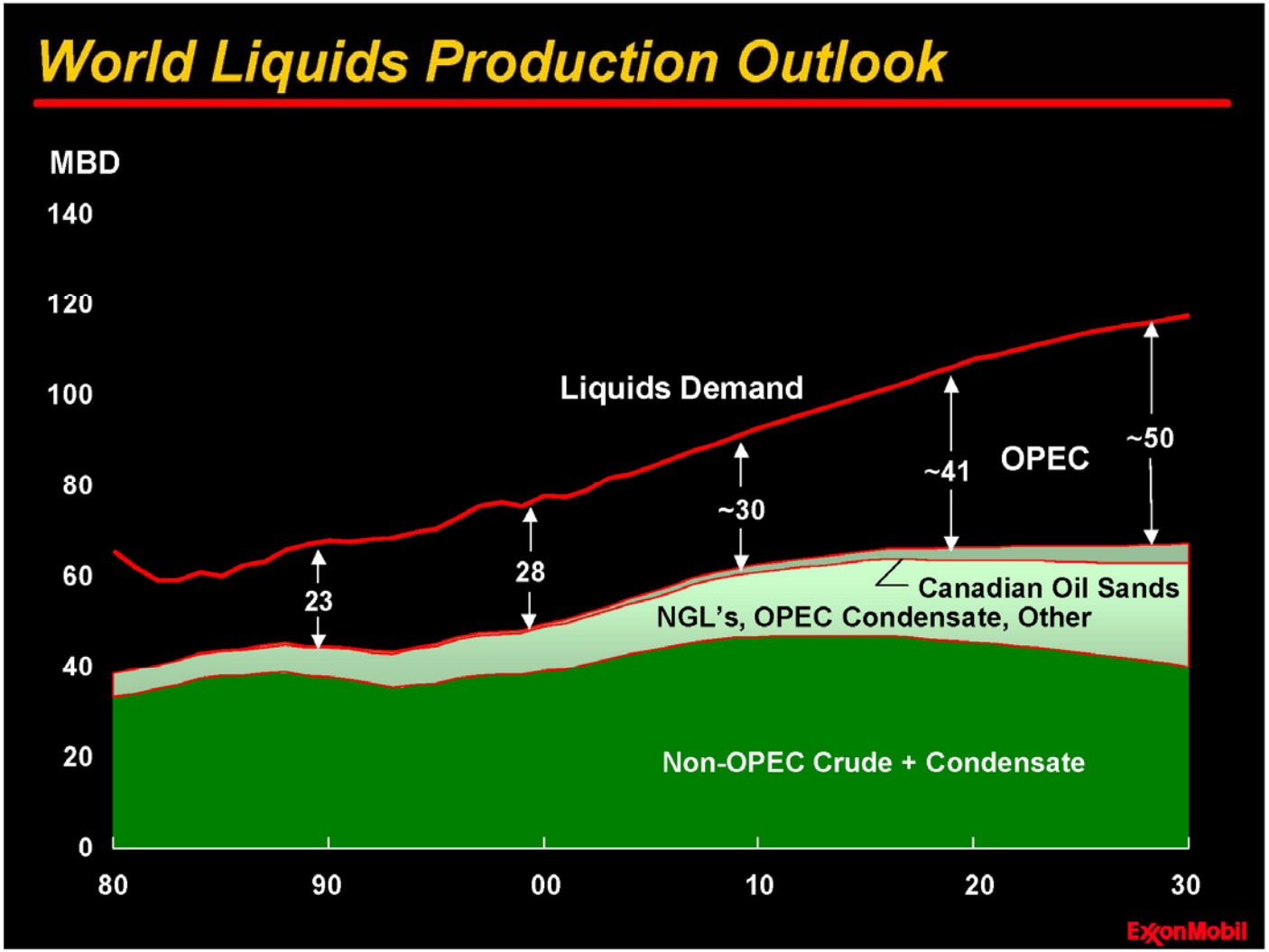


ExxonMobil's 2008 energy outlook was not much more optimistic.



Source: ExxonMobil, The outlook for energy: a view to 2030, January 14, 2009. http://www.exxonmobil.com/Corporate/energy_outlook.aspx

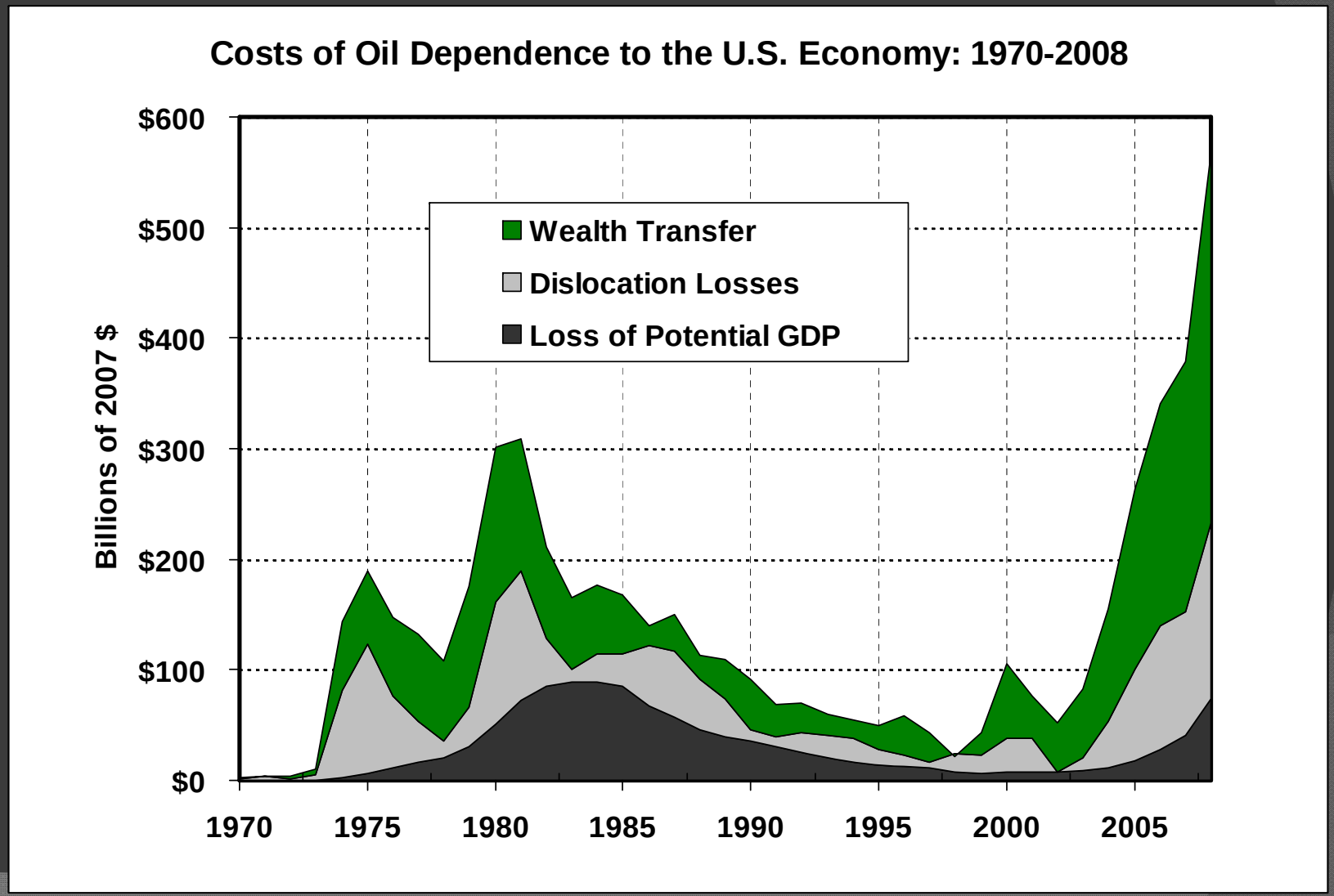
Projections made 3 years ago at lower oil prices expected peaking of non-OPEC oil supply.



The result is highly uncertain future oil prices. Volatility is far more likely than gradual change.

- When will conventional oil production outside of OPEC peak and at what rate will it decline?
- How quickly will oil demand grow when the global economy rebounds?
- How much will (can) OPEC produce?
- Will energy companies invest in more carbon intensive unconventional liquids?
- What will the price of oil be?
- What will global carbon mitigation policy be?
- What technologies will be available?

Over the past 5 years, the direct economic costs of oil dependence have exceeded $1 trillion. We can achieve oil independence without driving imports or oil consumption to zero. How?



THANK YOU.