

The Petroleum Problem



The Perfect Fuel

- Abundant
- Inexpensive
- Transportable

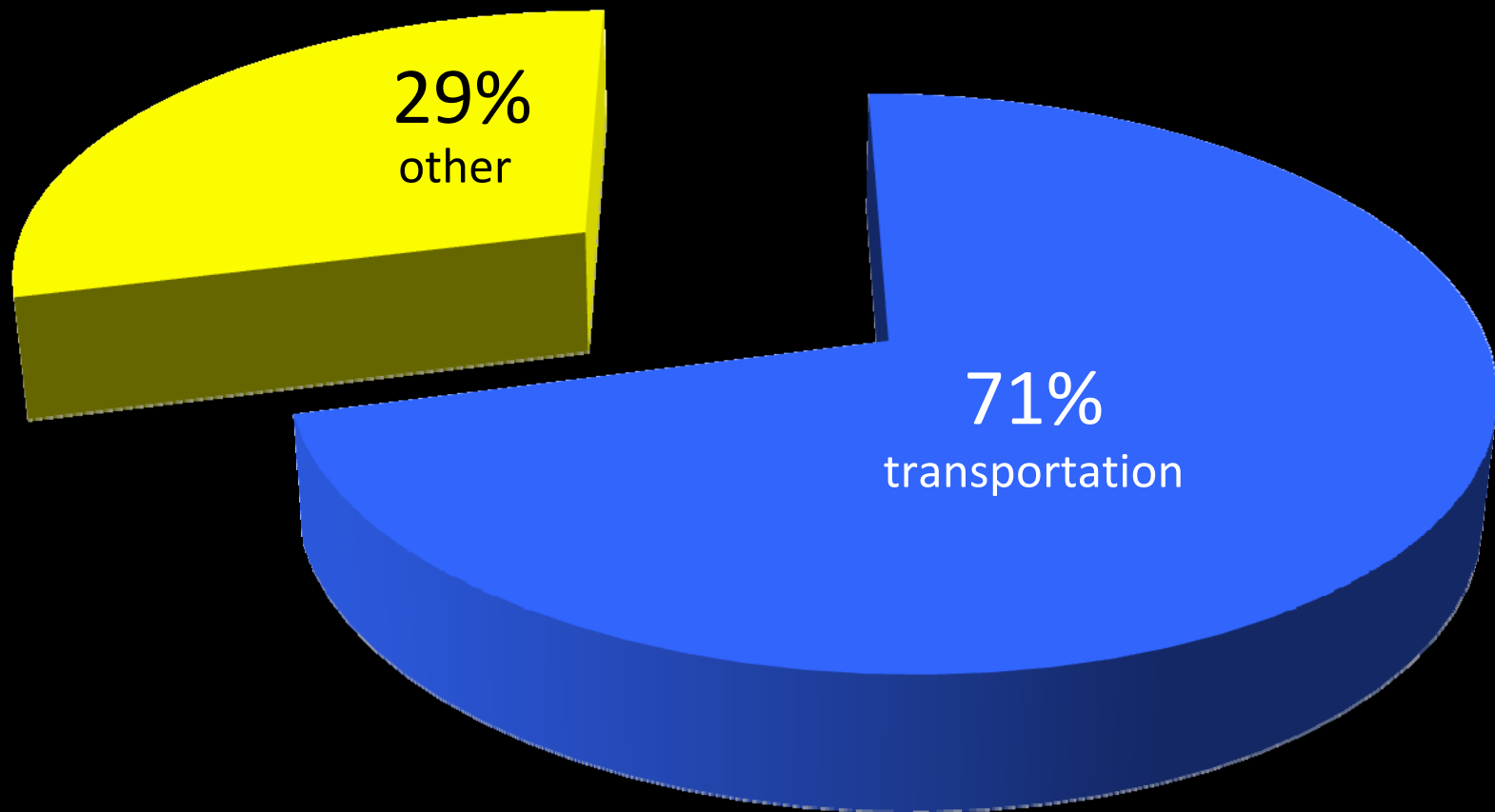


1

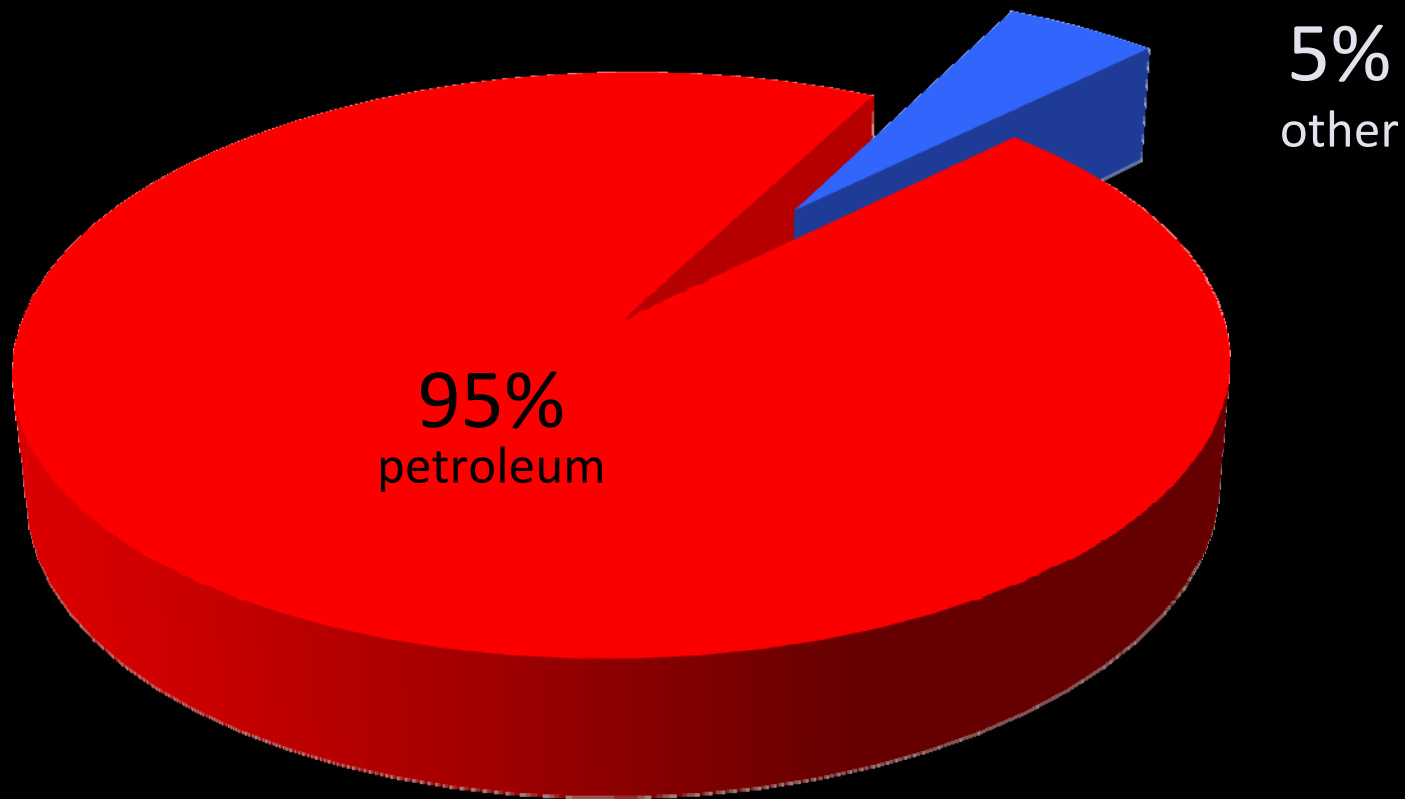


How We Use Petroleum

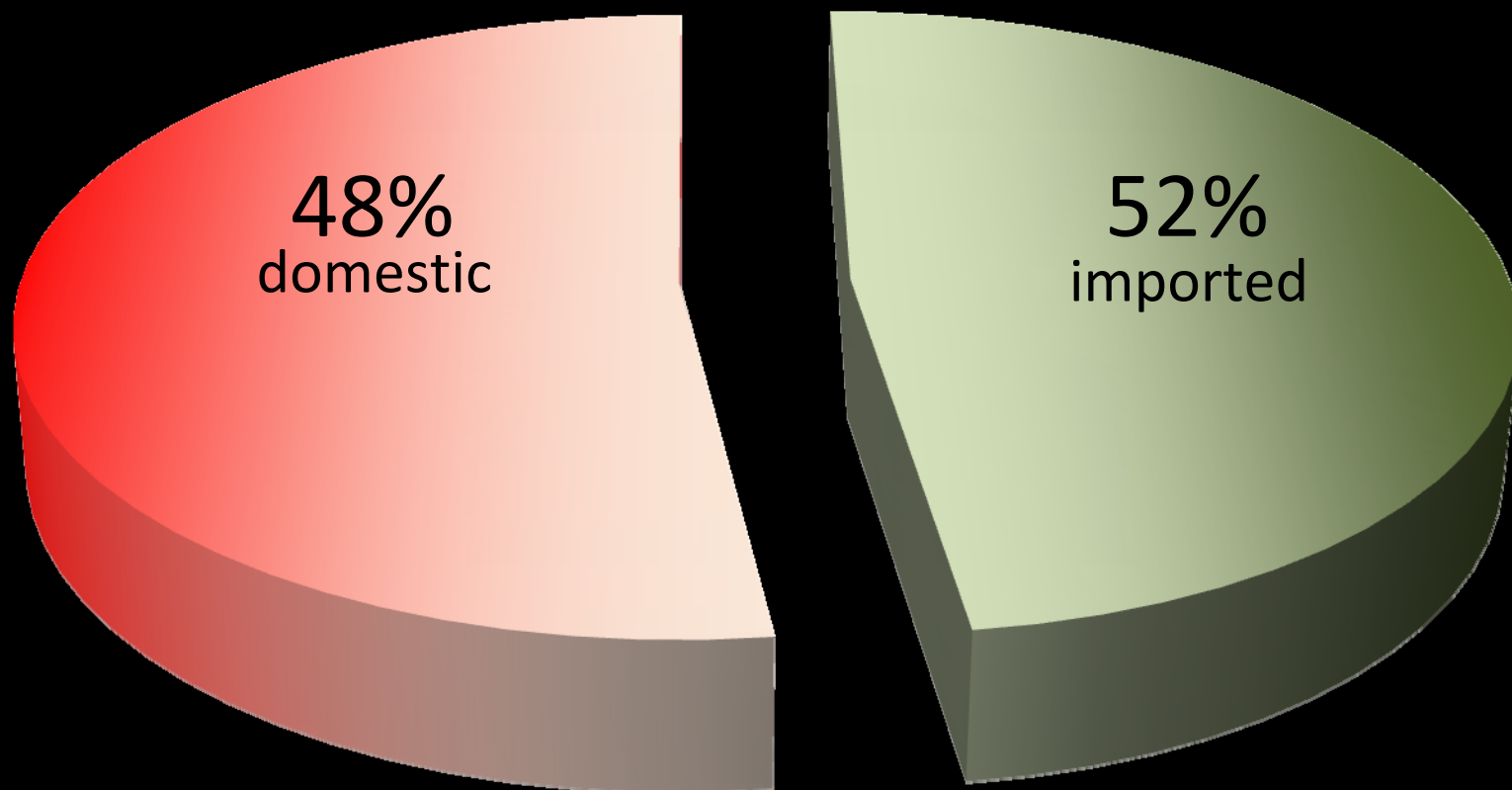
US Petroleum Consumption by End Use Sector – 2009



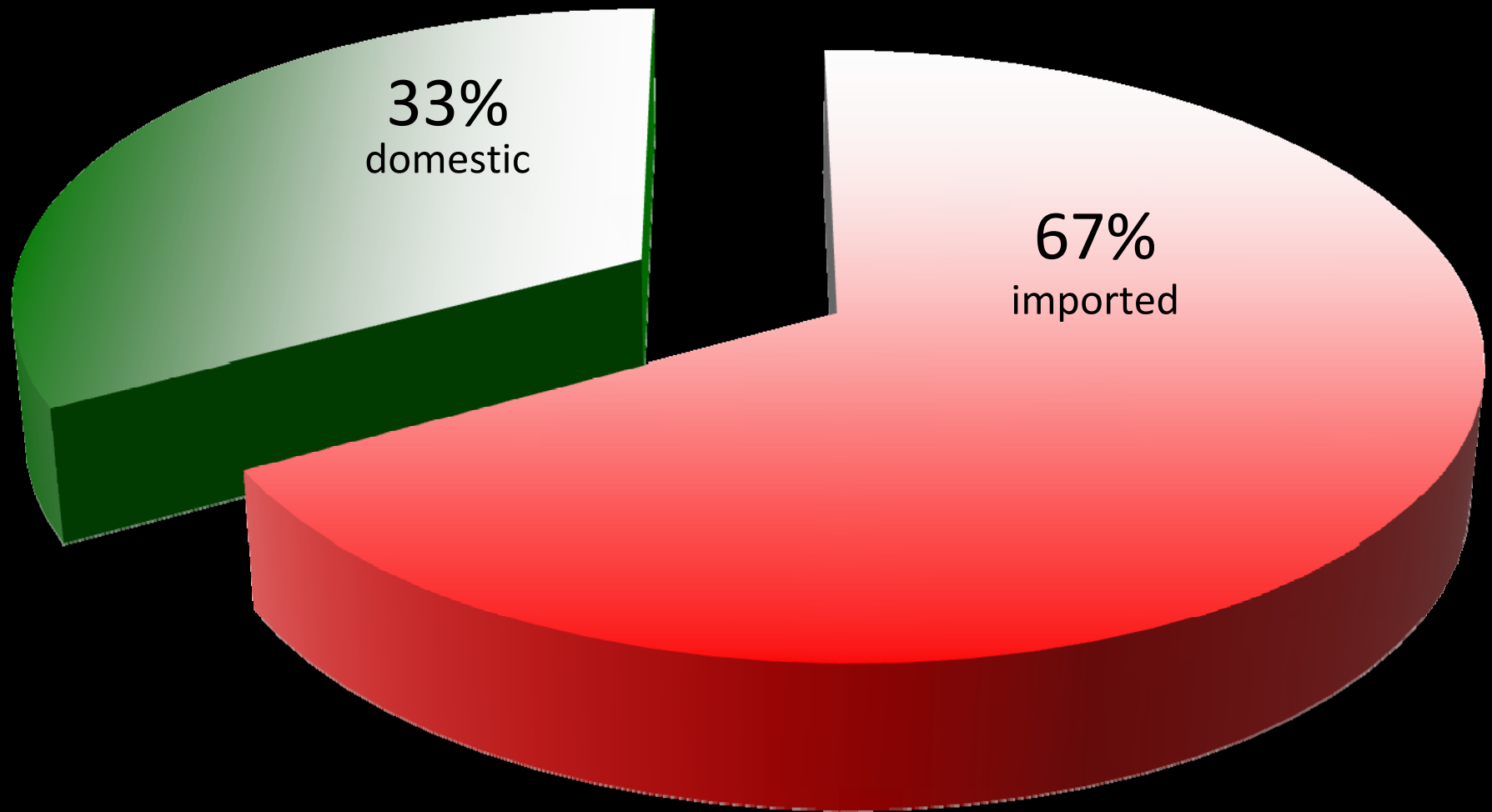
US Transportation Energy Consumption – 2009



Net Petroleum Imports – 2009



Source of Transportation Petroleum, 2009



Our transportation systems are
dependent on petroleum

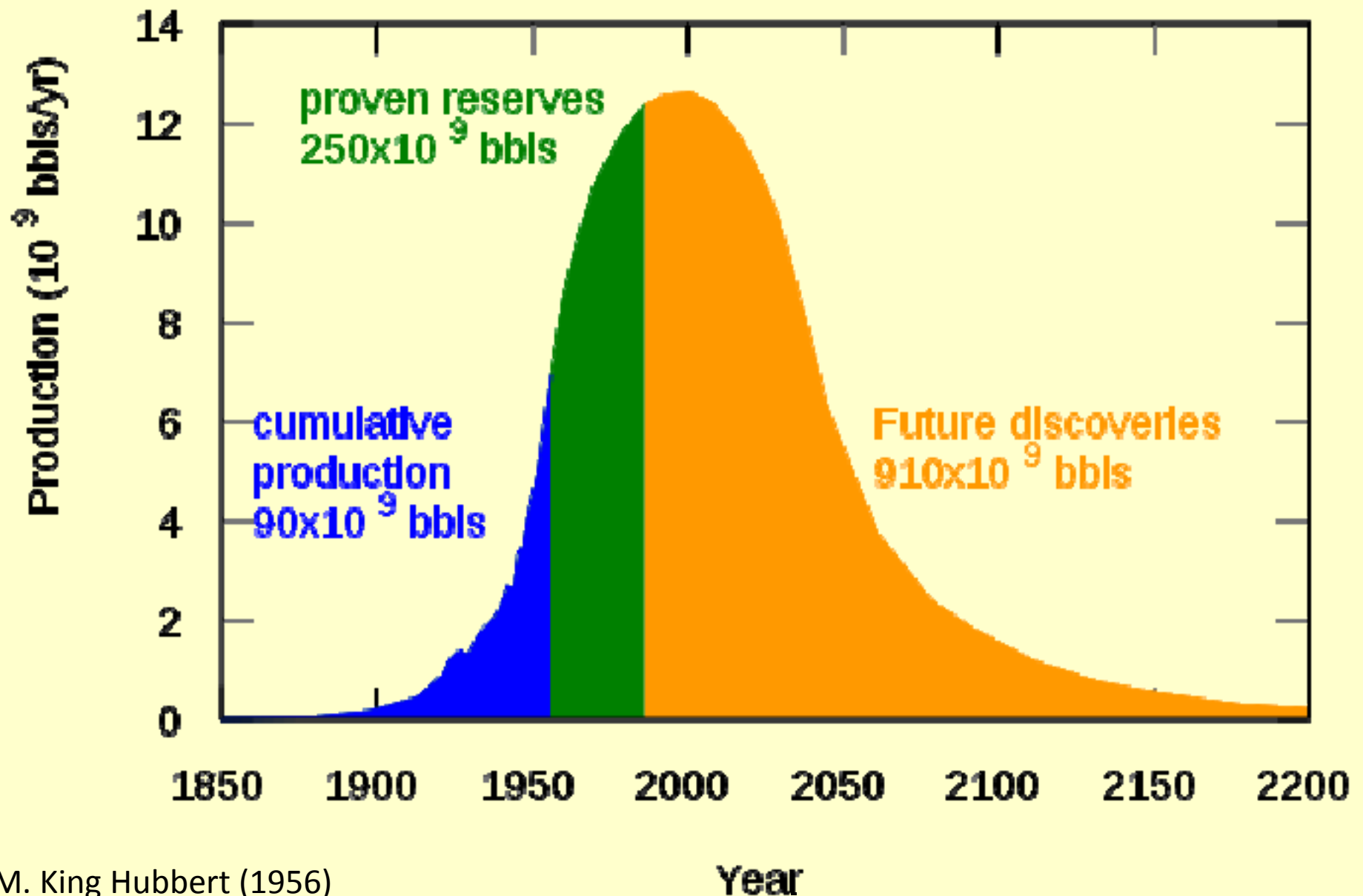

imported

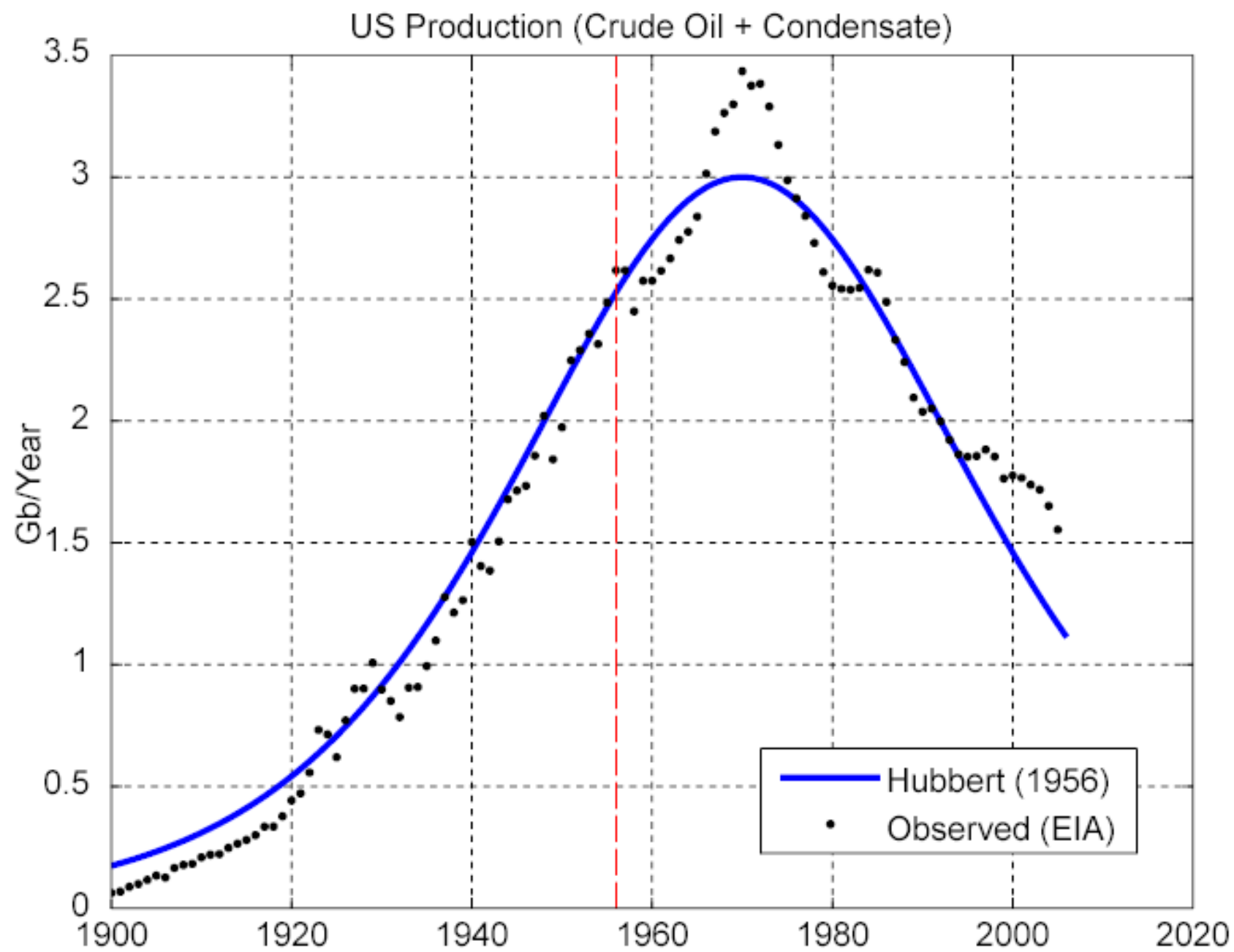
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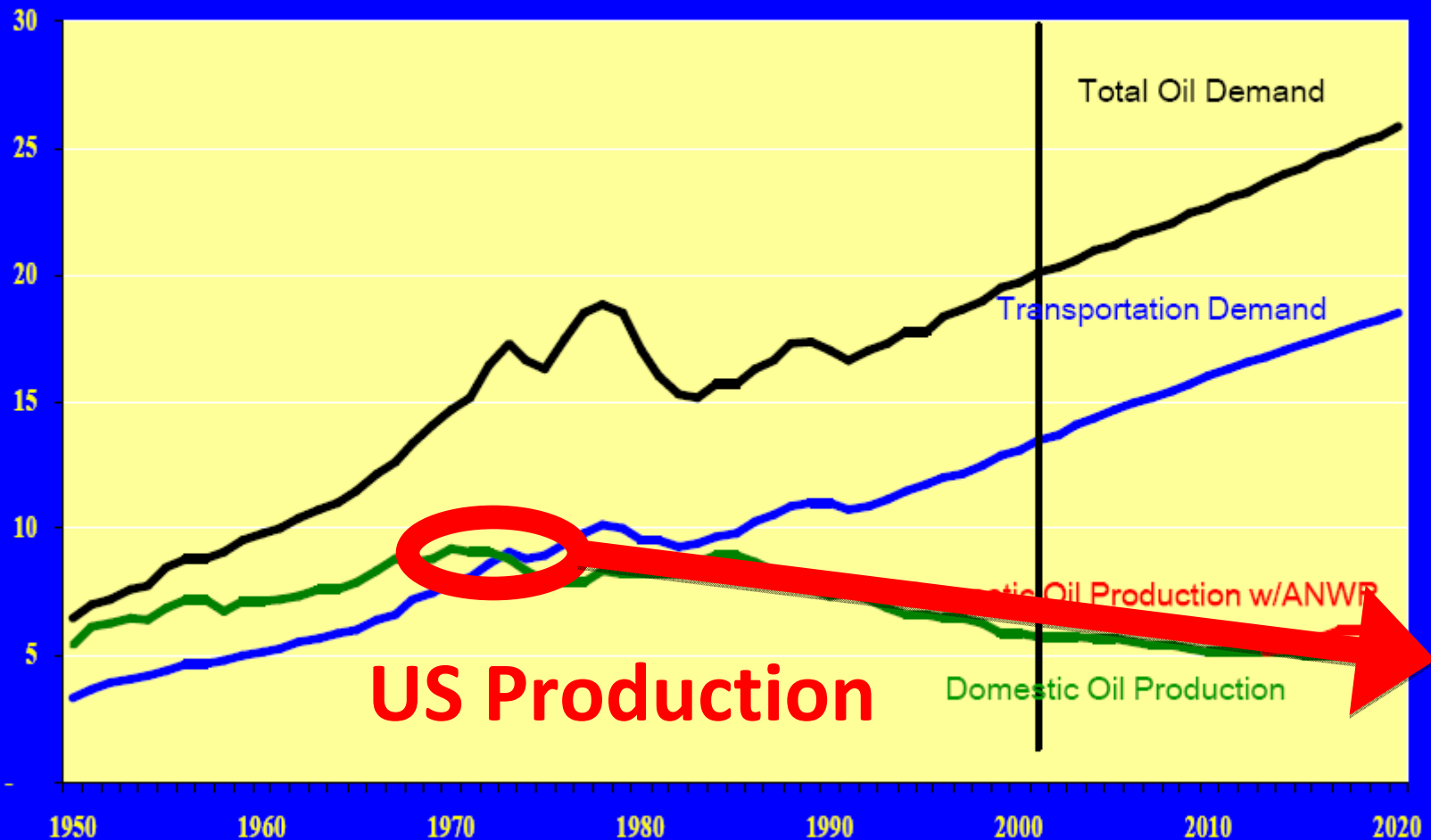
“Peak Oil”

The Original Hubbert Curve





US Oil Consumption (million barrels per day)



ELA, Annual Energy Outlook 2001; "Potential Oil Production from the Coastal Plain of ANWR," - ELA Reserves & Production Division

3



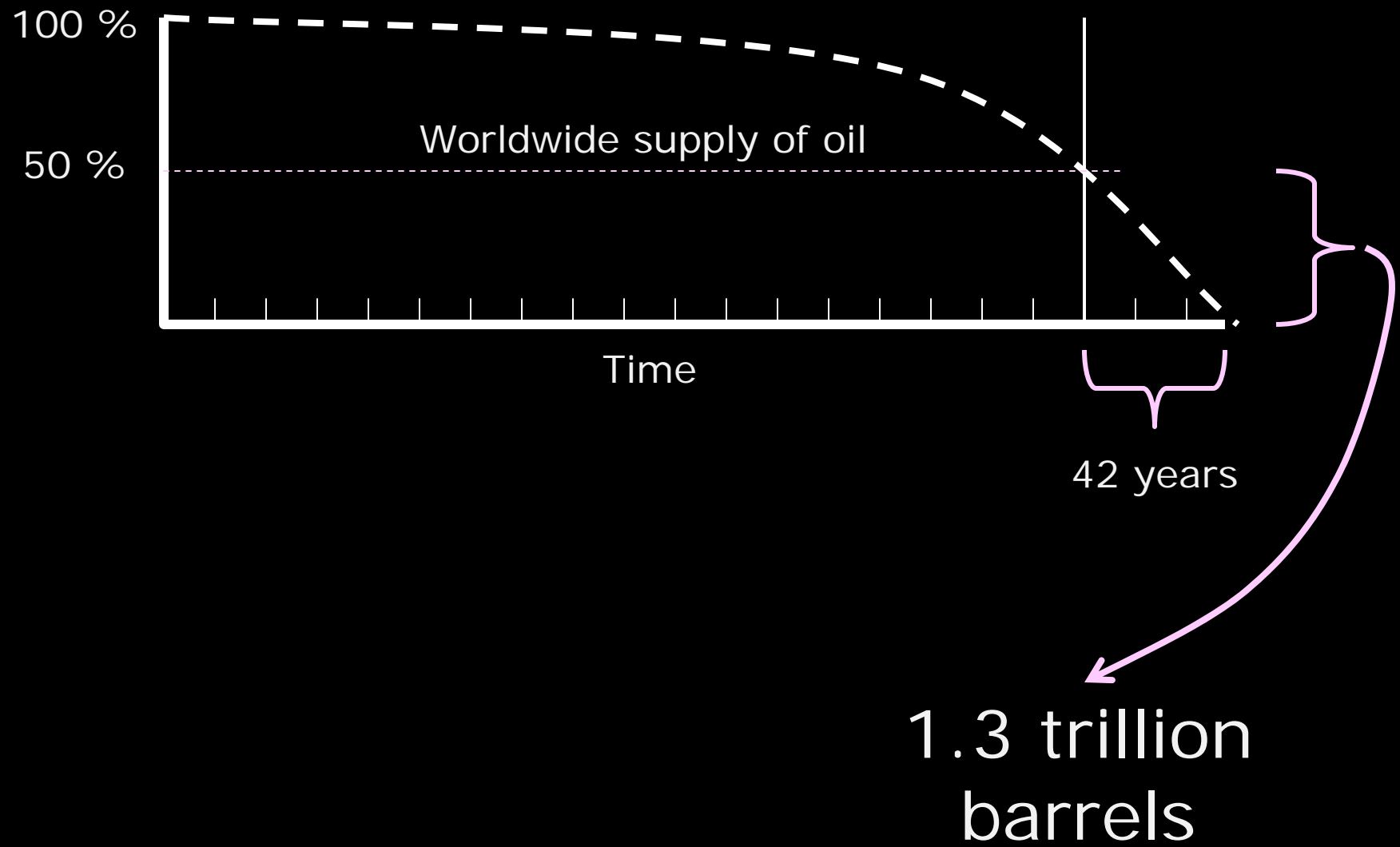
Cost of Petroleum

We have not “run out of” oil



The stone age did not end...
...because we ran out of stones





100 %

50 %

Worldwide supply of oil

Time

mbls/day

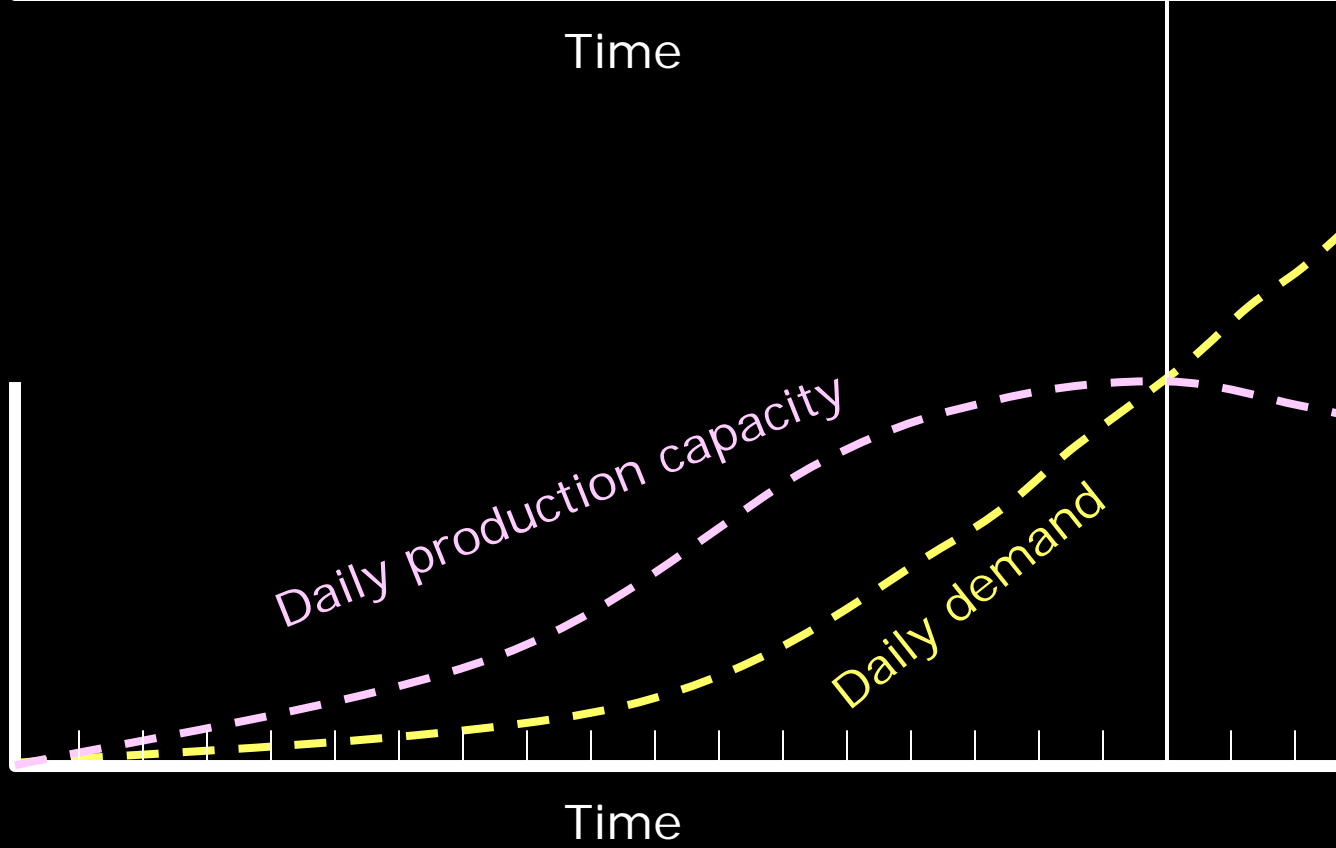
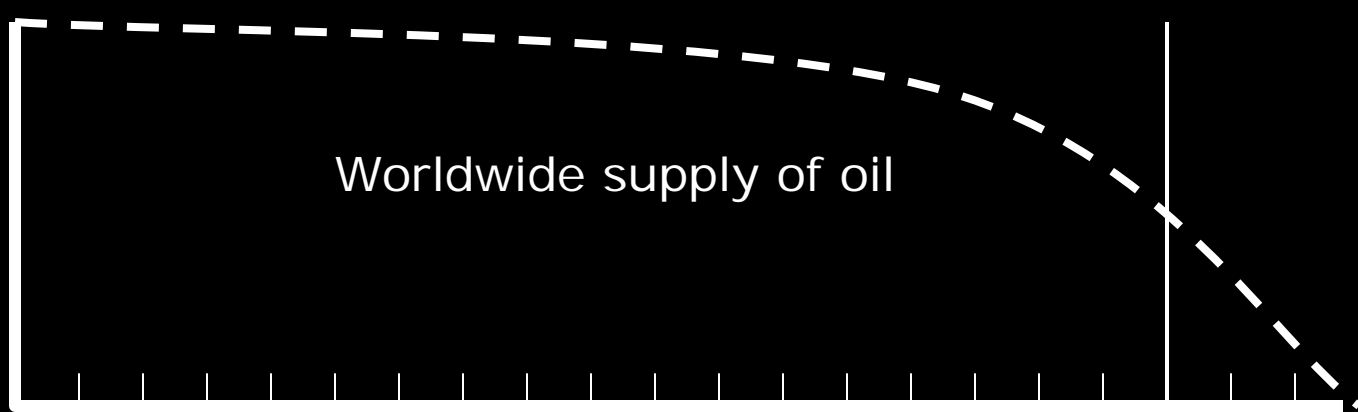
90

45

Daily production capacity

Daily demand

Time



mbbl/day

\$900

\$450

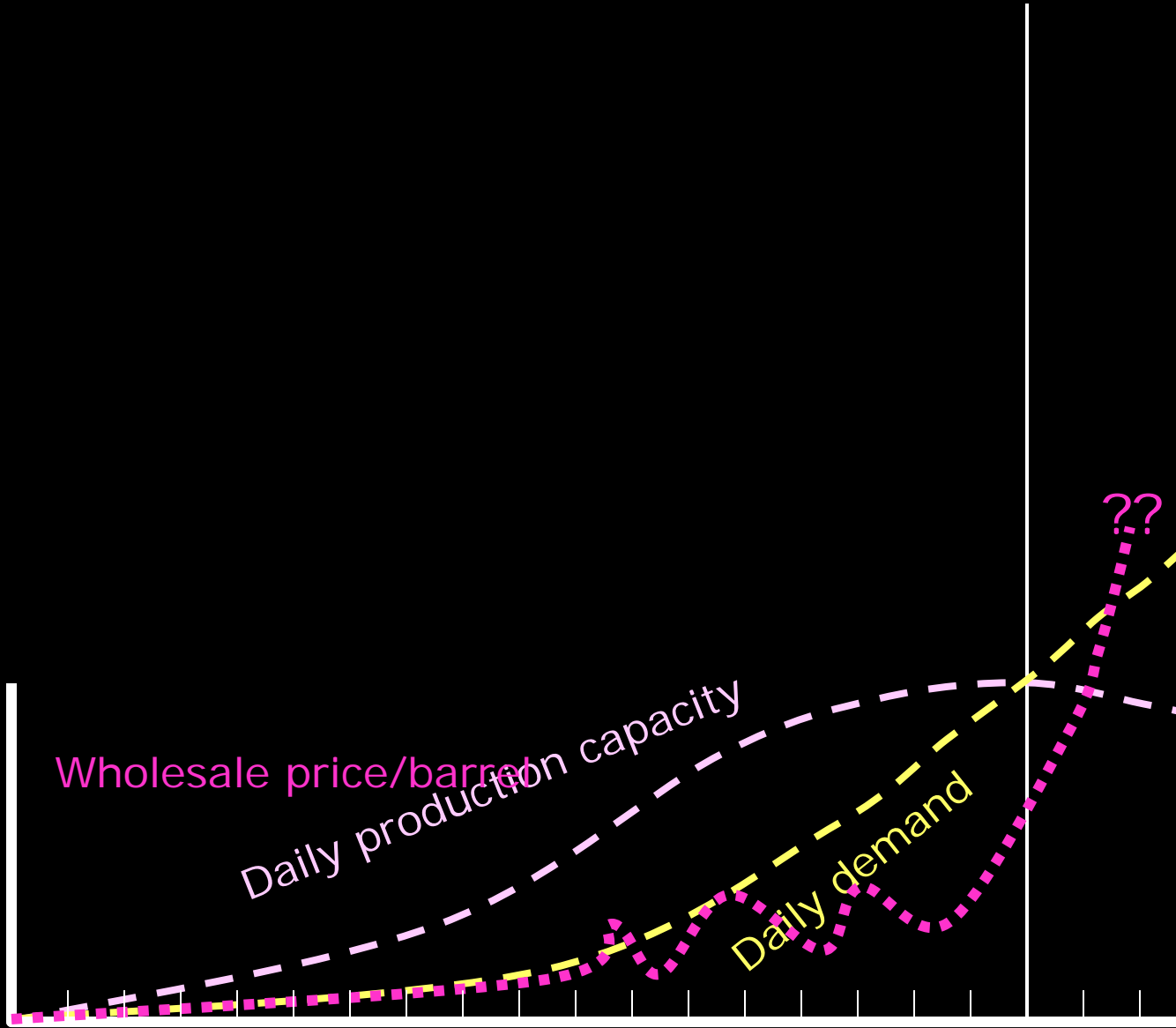
Wholesale price/barrel

Daily production capacity

Daily demand

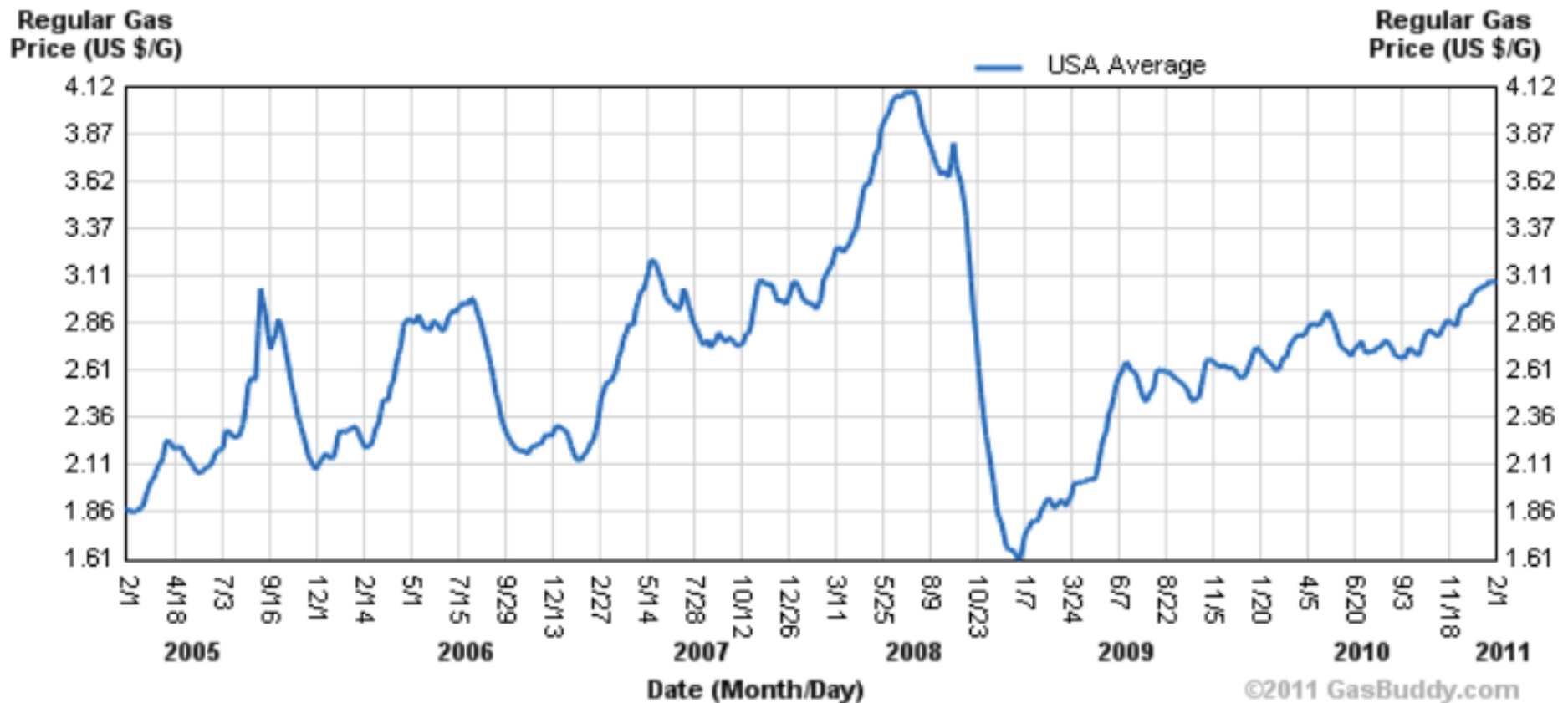
Time

??

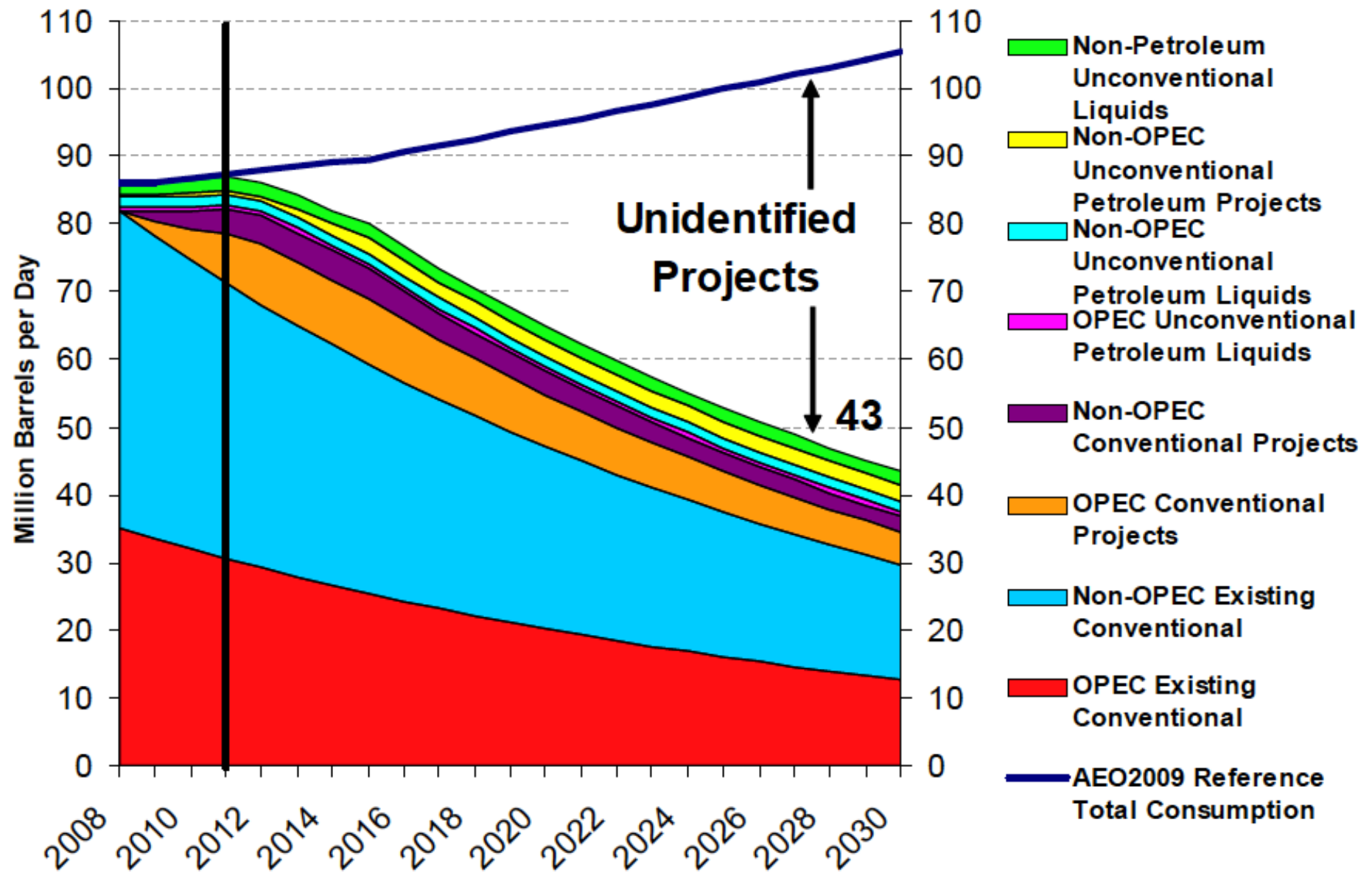


As Demand Exceeds Supply: Volatile Gas Prices

72 Month Average Retail Price Chart



World's Liquid Fuels Supply



Source: EIA, AEO2009

This is not a supply issue...

...it is an economic issue.

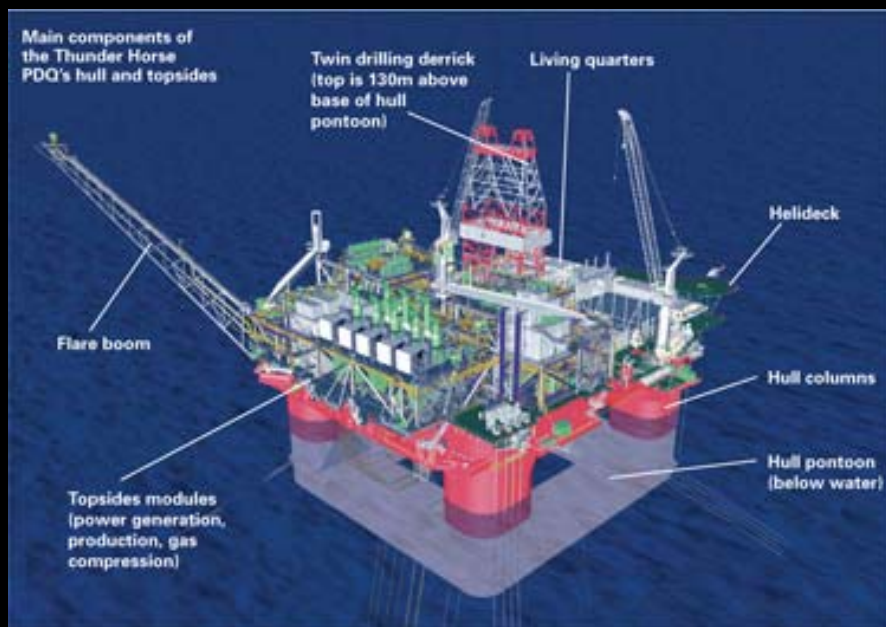
Those were
the days!

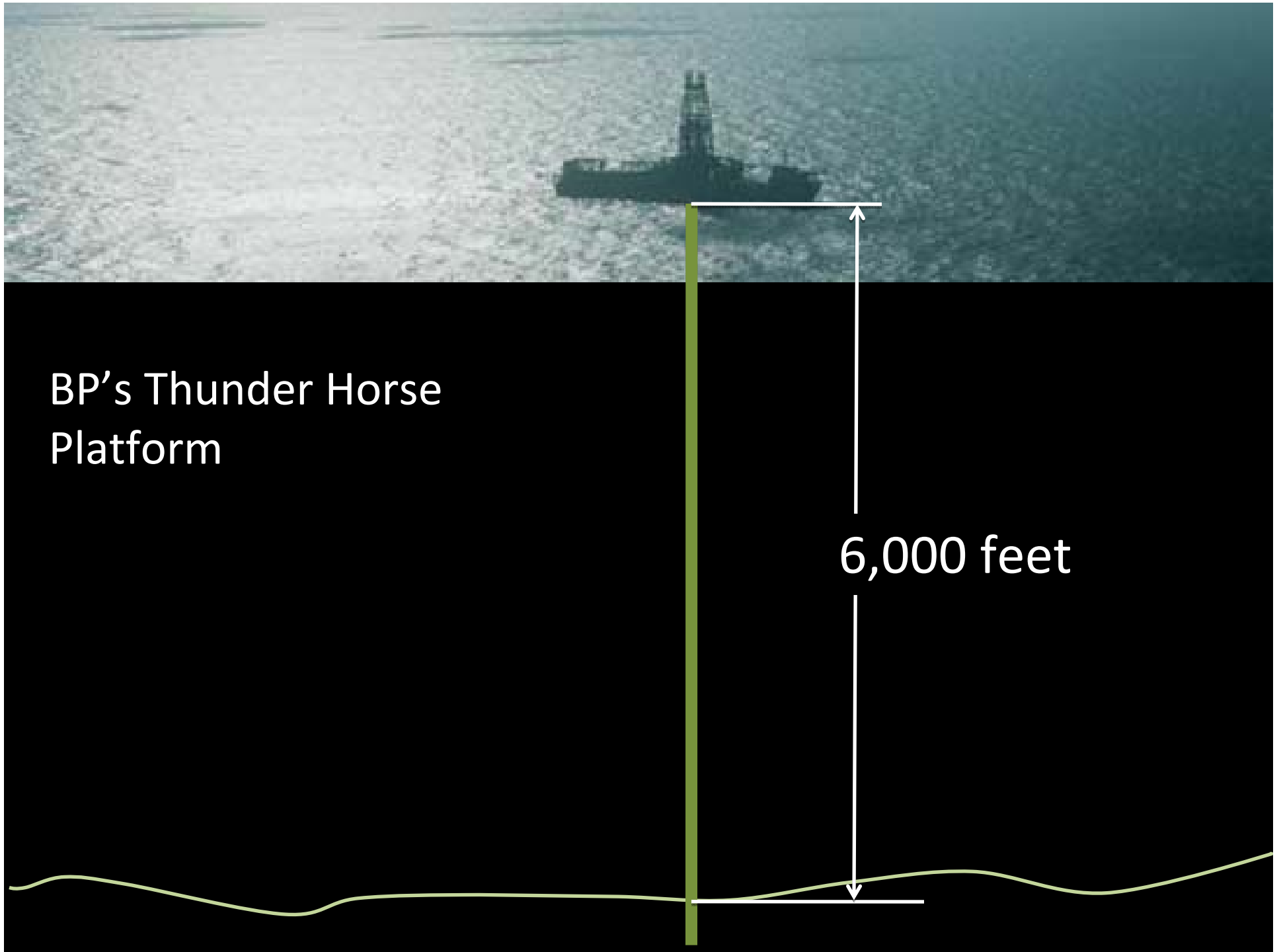






BP's Thunder Horse Field
Production Facility Cost:
\$1 billion





BP's Thunder Horse
Platform

6,000 feet

A diagram illustrating the vertical distance between a deep-sea oil field and the Earth's surface. On the left, a brown, jagged shape represents a mountain. To its right, a horizontal blue line at the top represents the sea surface. Below this, a wavy white line represents the seafloor. At the bottom right, a brown oval represents an oil field. A vertical yellow line with arrows at both ends connects the surface to the oil field. A second vertical white line with arrows at both ends connects the seafloor to the oil field. The distance between the surface and the seafloor is labeled '6,000 feet', and the distance between the seafloor and the oil field is labeled '26,000 feet'.

6,000 feet

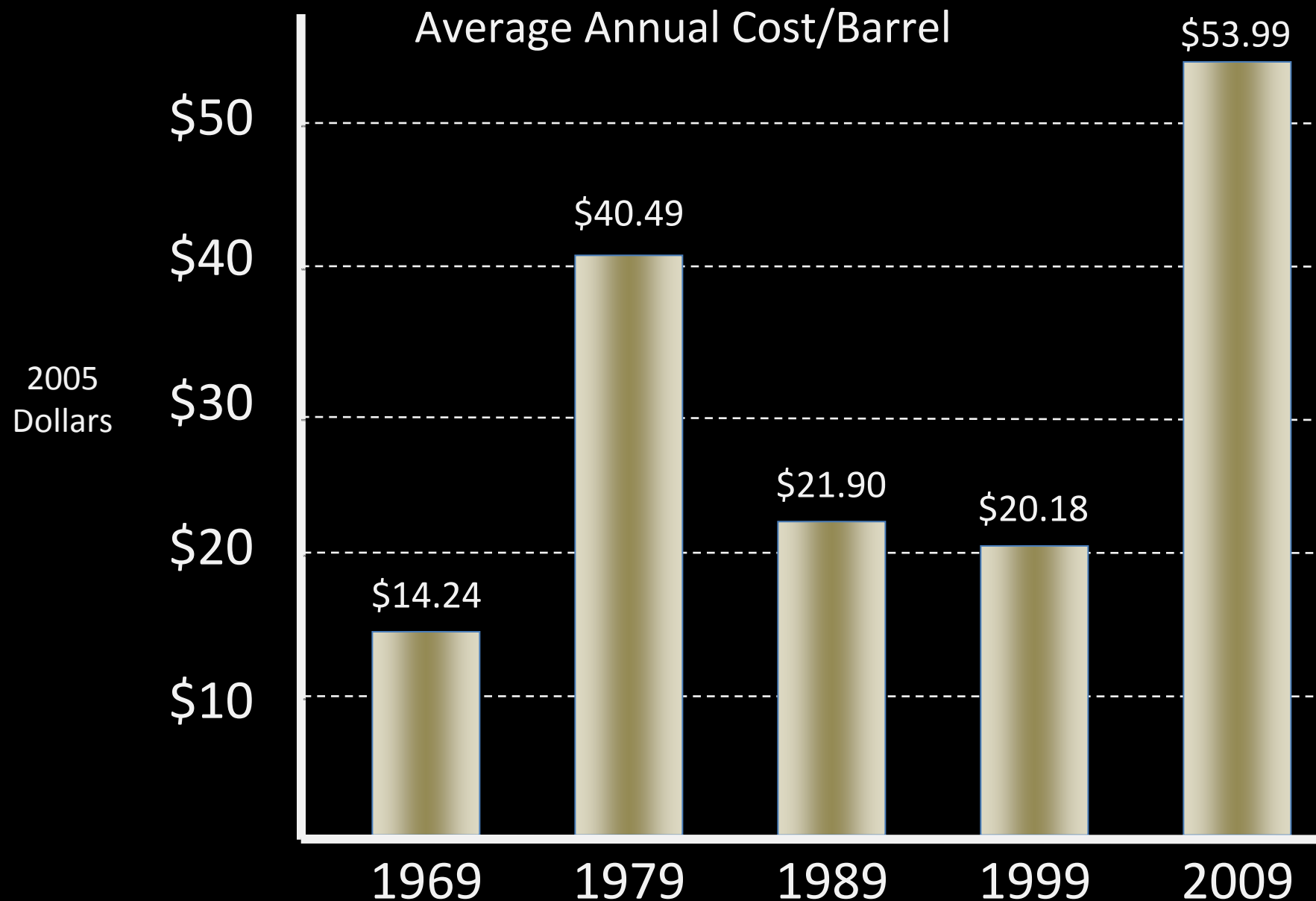
26,000 feet

Mt. Everest

BP's Thunder Horse Field

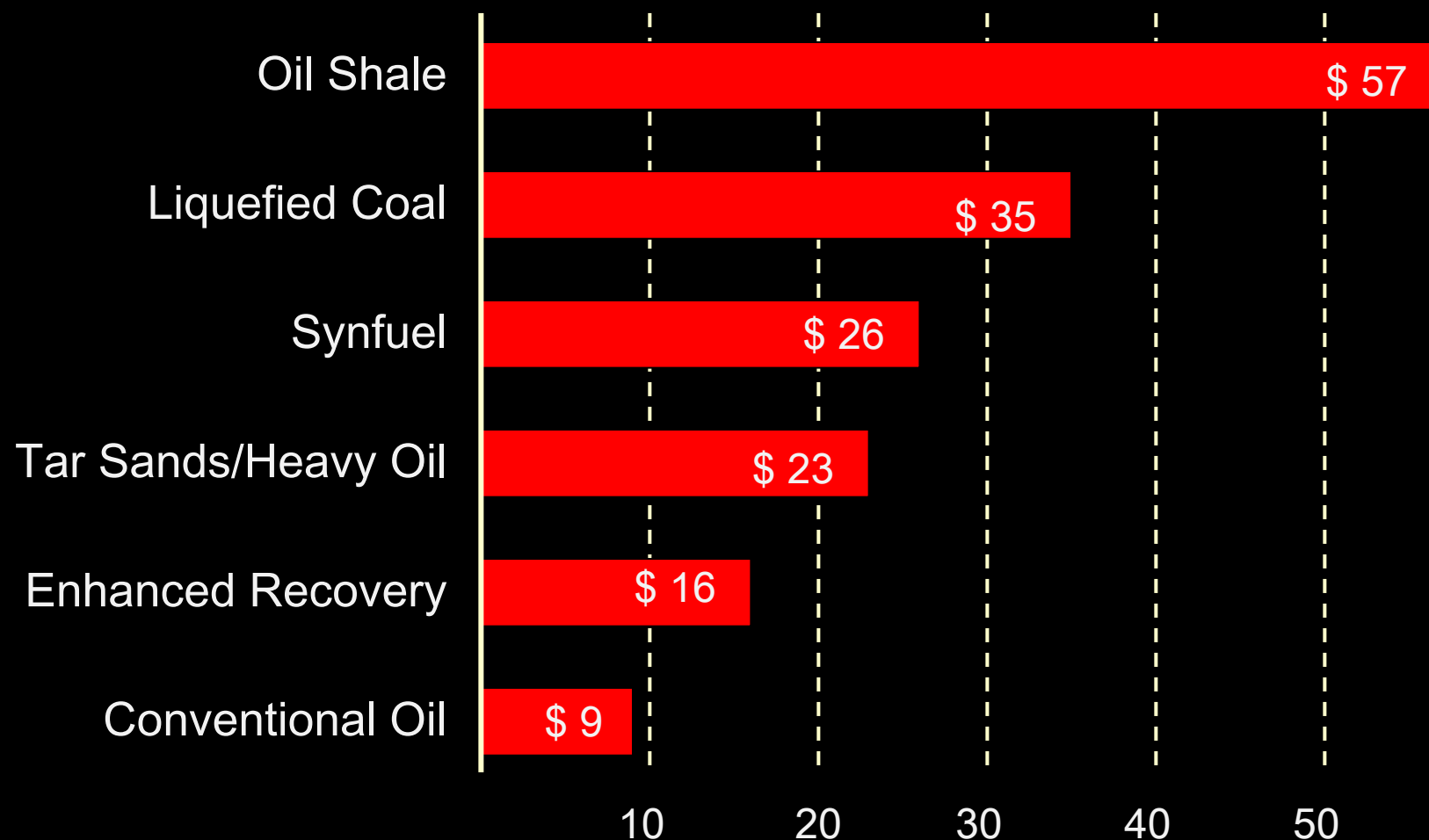
275°

Cost of Crude Oil to Refineries



Production Cost – Sources of Oil

Production Cost Per Barrel of Oil - 2007



Source: Brandt & Farrell, UC Berkeley

Alberta Tar Sands

Carbon Pollution:
Tar Sands = 3x carbon pollution
per barrel of conventional crude*

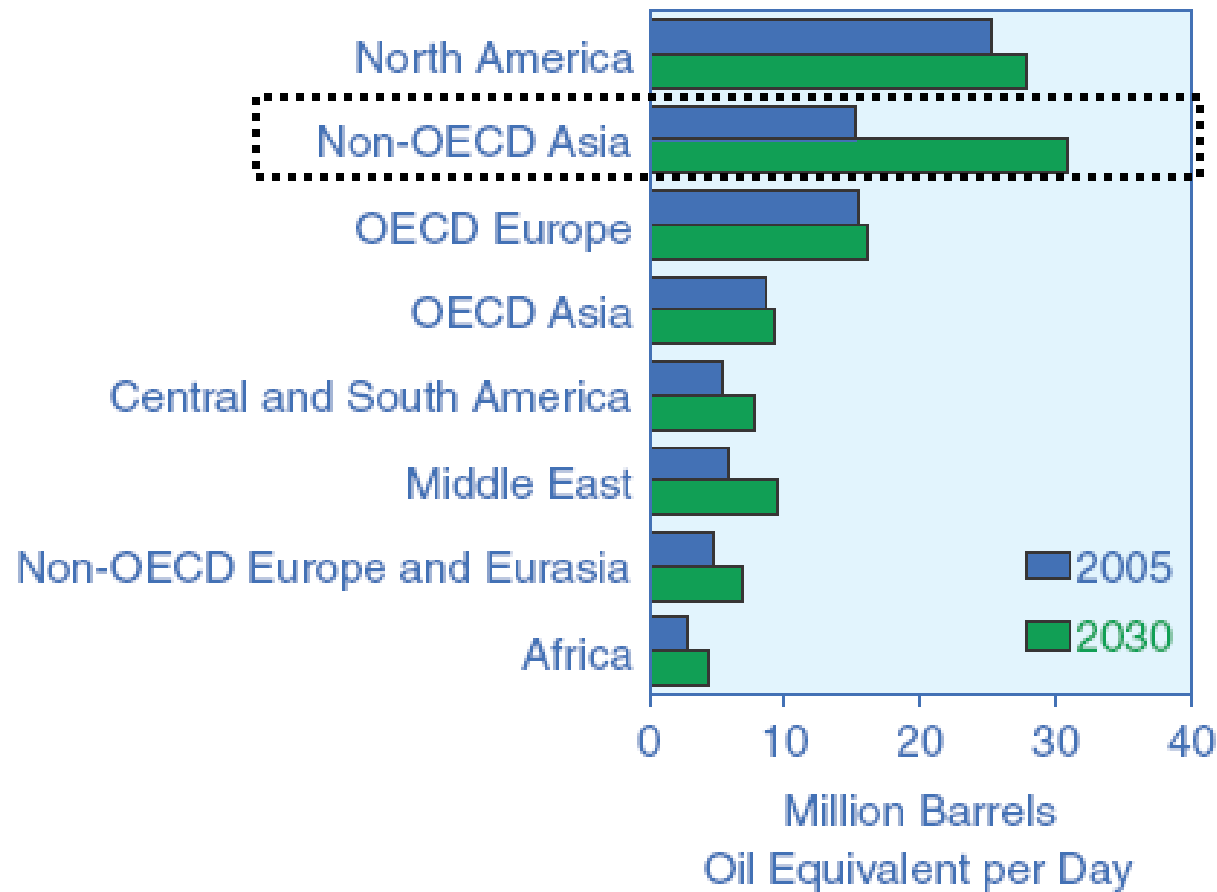
*Source: NRDC

The
oil
is not gone

The
cheap oil
is gone

Petroleum Demand by World Region

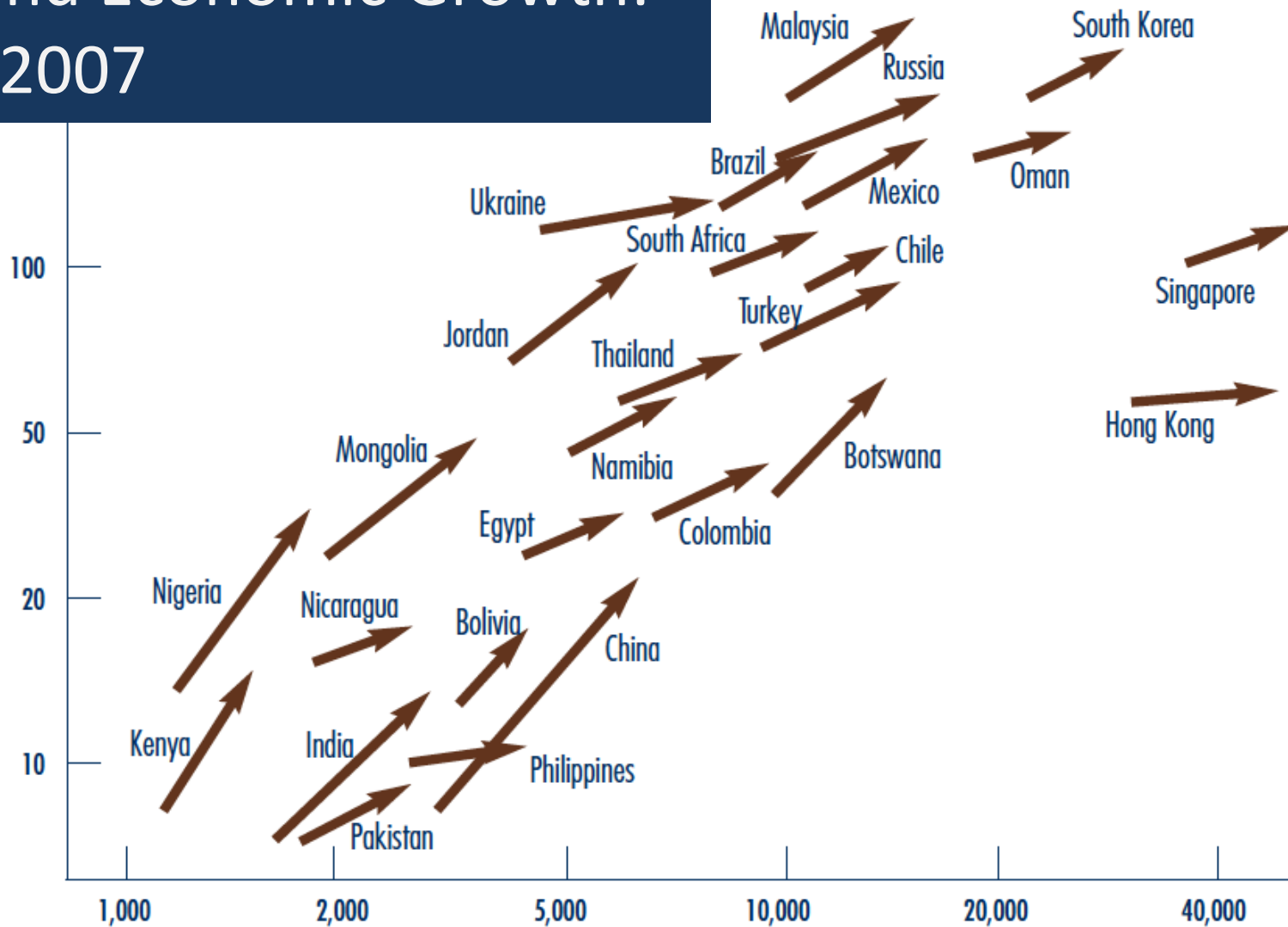
Figure 29. World Liquids Consumption by Region and Country Group, 2005 and 2030



India & China
will double
their demand
for petroleum
by 2030

Autos and Economic Growth: 2002 – 2007

PASSENGER CARS PER 1,000 PEOPLE



INCOME PER-CAPITA (PURCHASING-POWER ADJUSTED US DOLLARS)

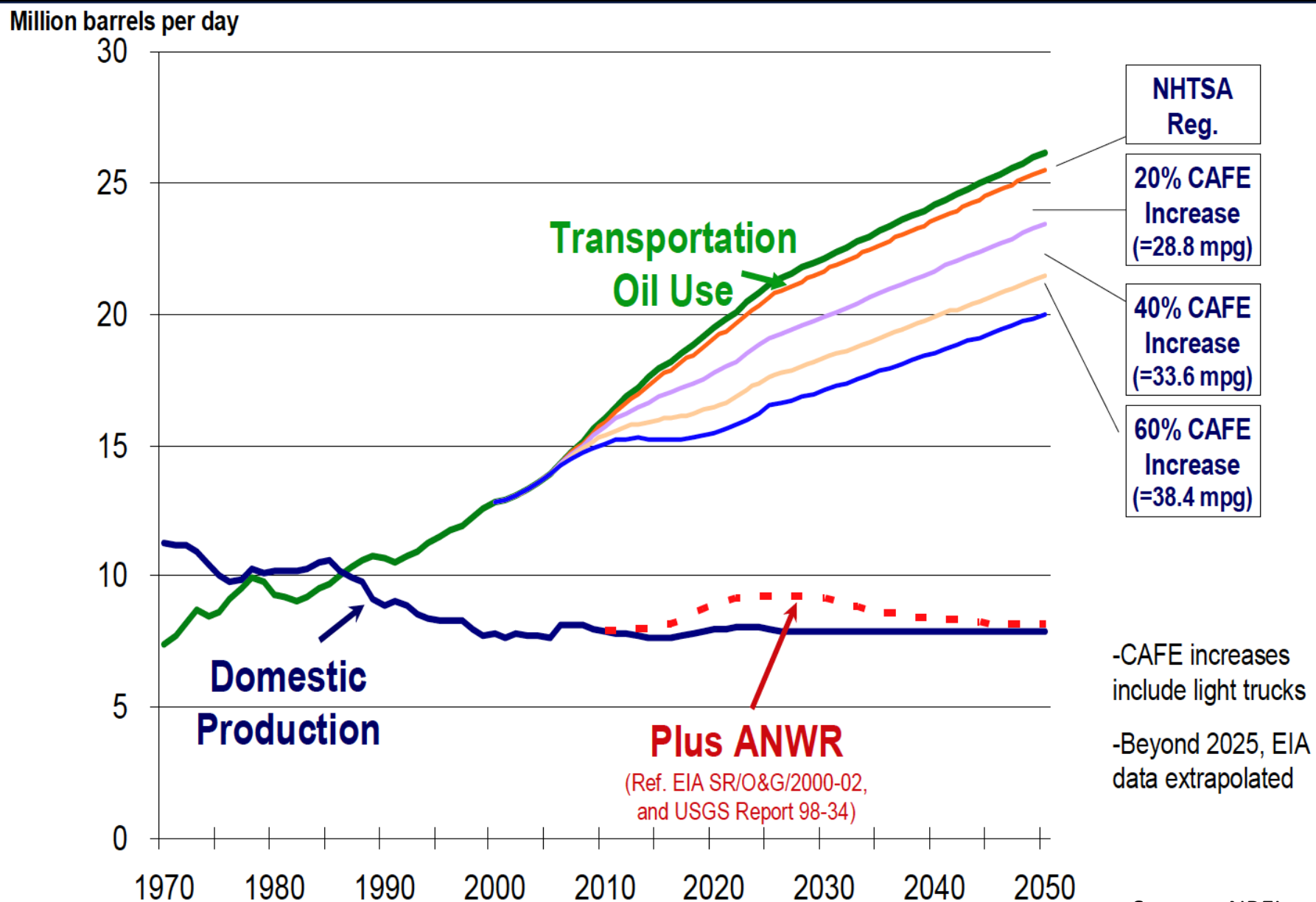
ACCESS

No 37, Fall 2010

“We’ll become more efficient.”

“We’ll use alternative fuels.”

Potential Reduction in Petroleum Consumption Through Technology





Total Motor Vehicles
in Service in US in 2010

250,000,000

Total Electric Autos in
Service by End of 2012

100,000

0.04%

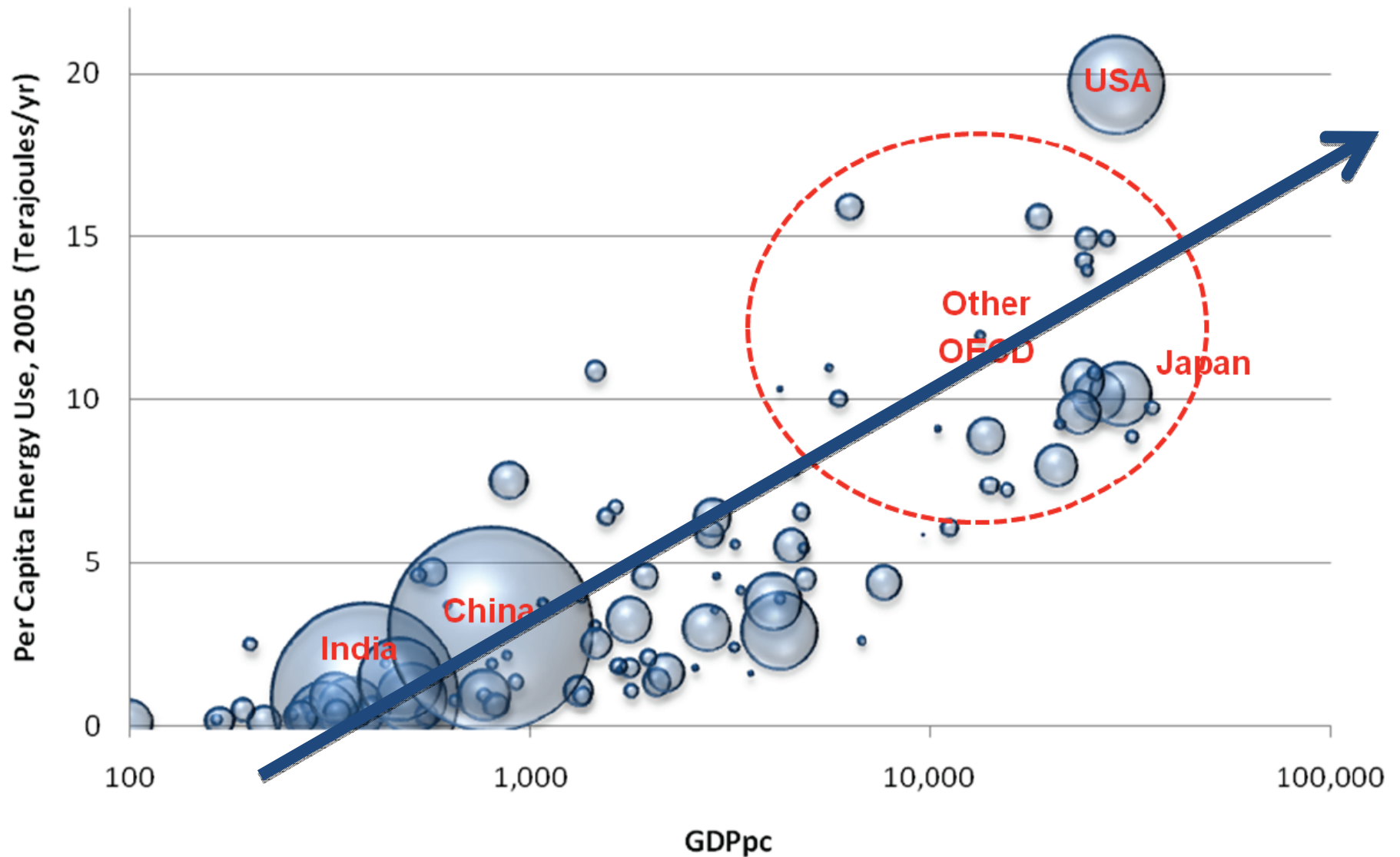
Technology will not save the day...
...for a couple of decades.

4



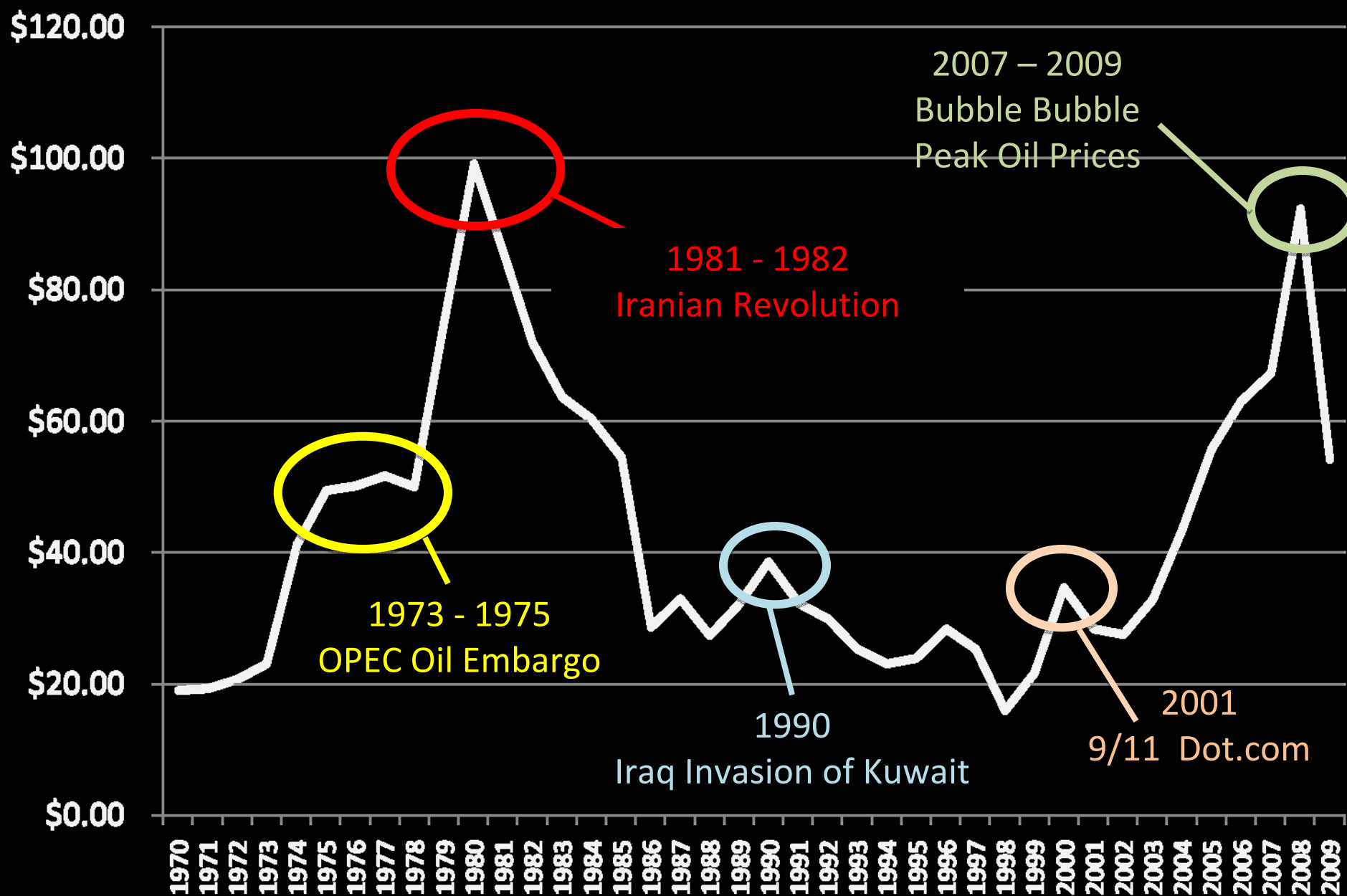
Petroleum and the US Economy

Figure 3: Energy and Income, by Country, Income, and Population (2005)

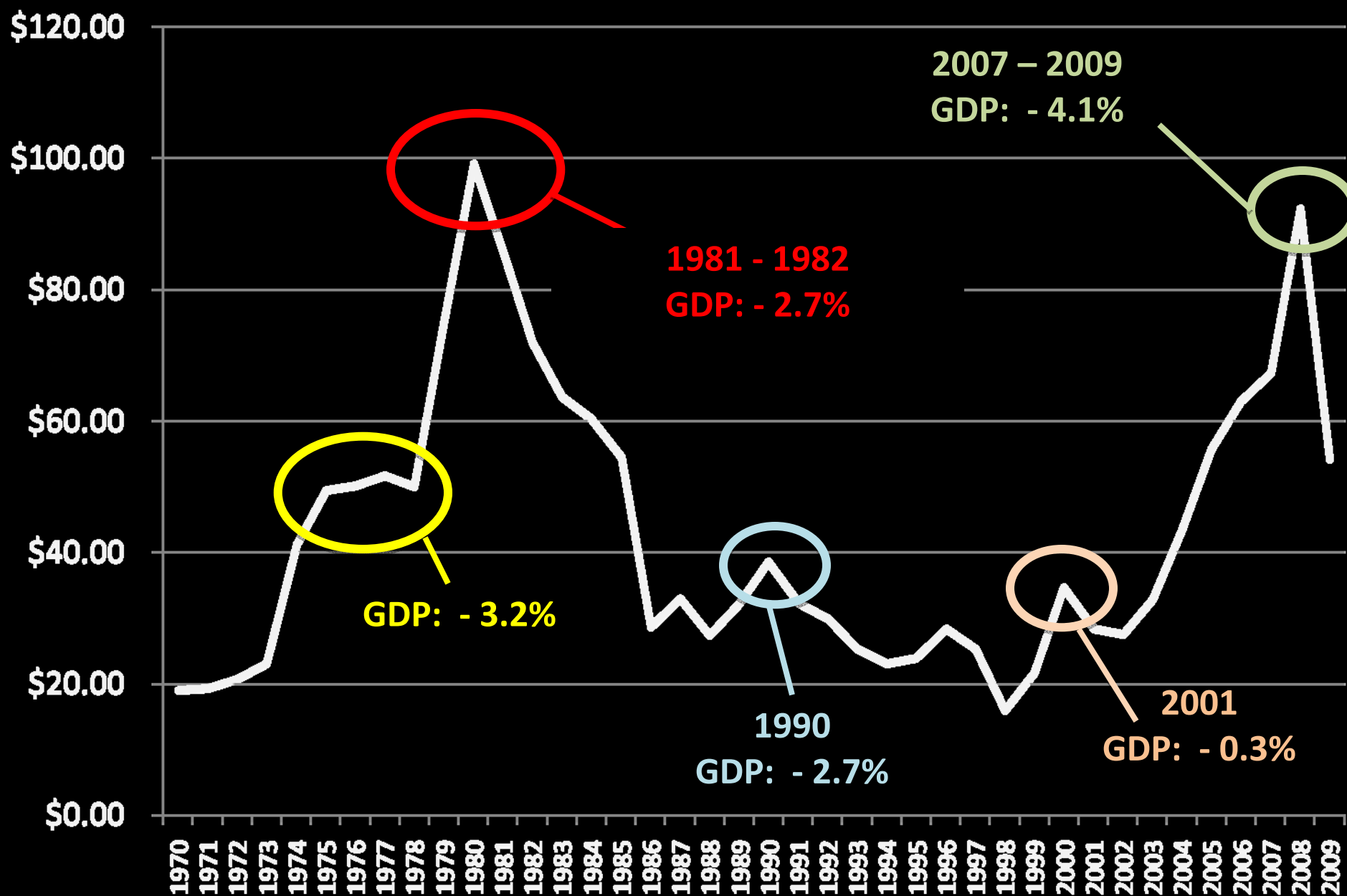


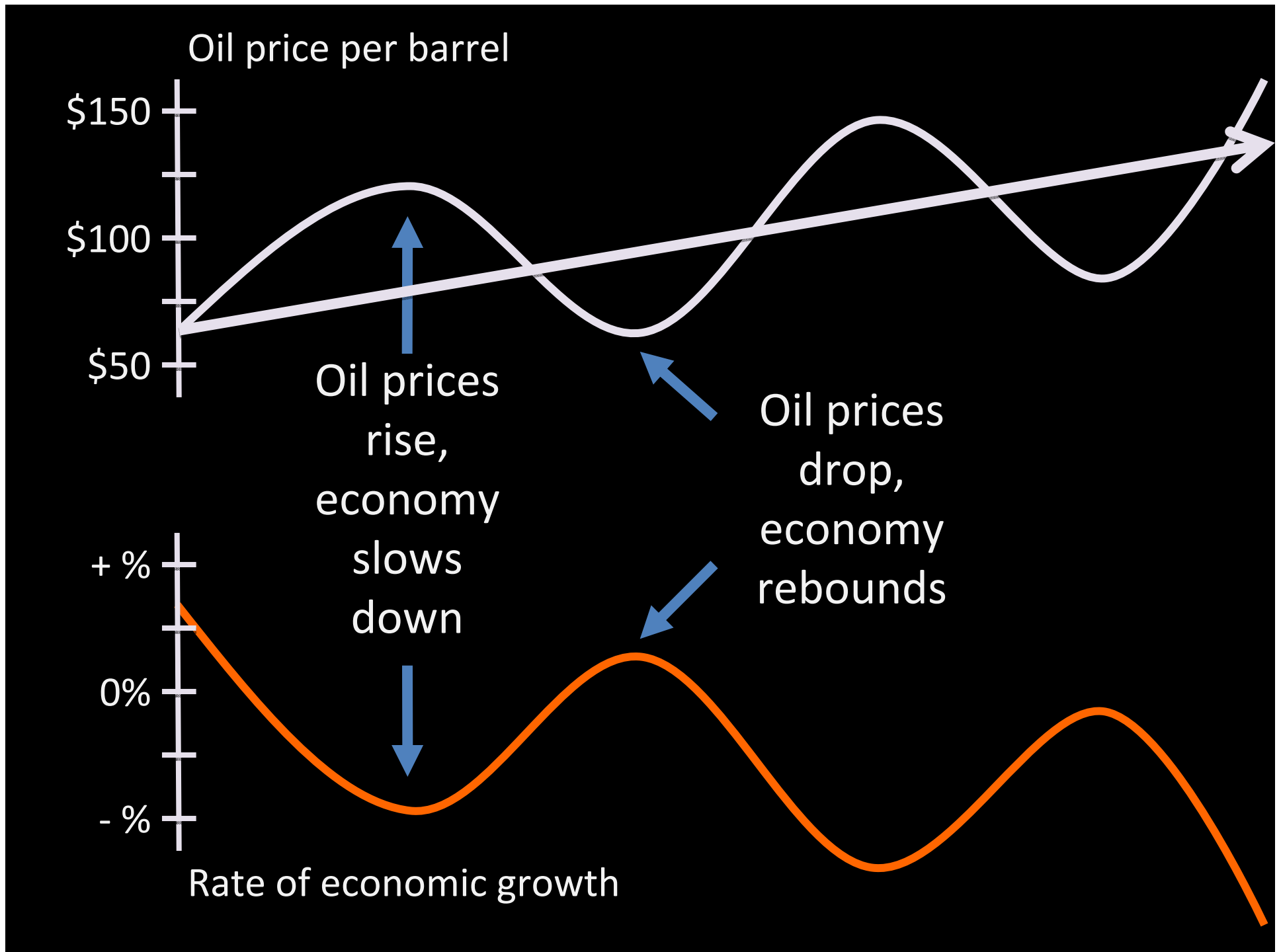
Source: Energy Pathways for the California Economy, UC Berkeley, June 2009

Inflation-Adjusted Crude Oil Prices



Inflation-Adjusted Crude Oil Prices





Yesterday

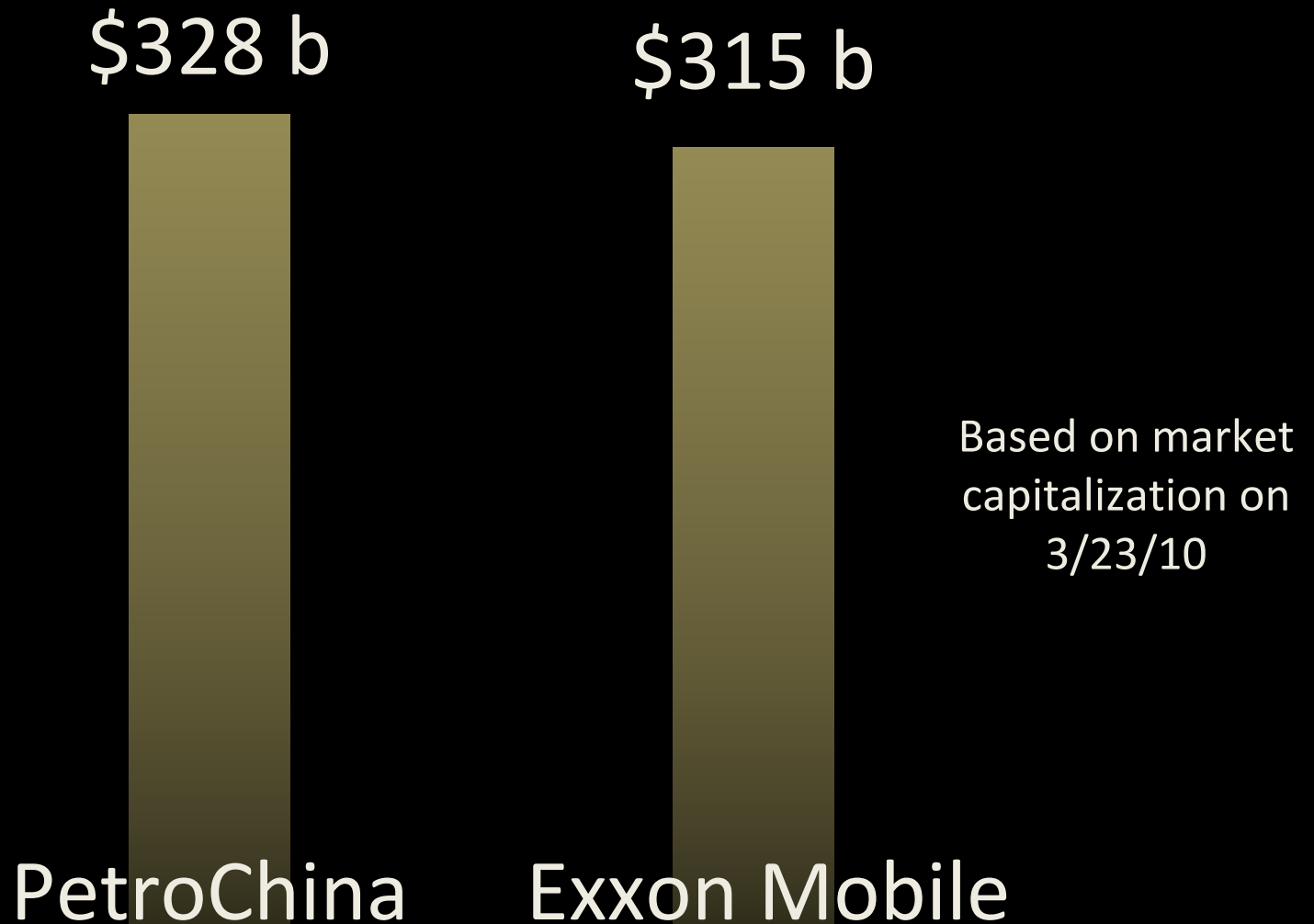
Crude Oil* \$ 89 / barrel

Gasoline \$3.12 / gallon



* WTI Crude Spot Market

World's Two Largest Companies



Source: New York Times 3/24/10

5



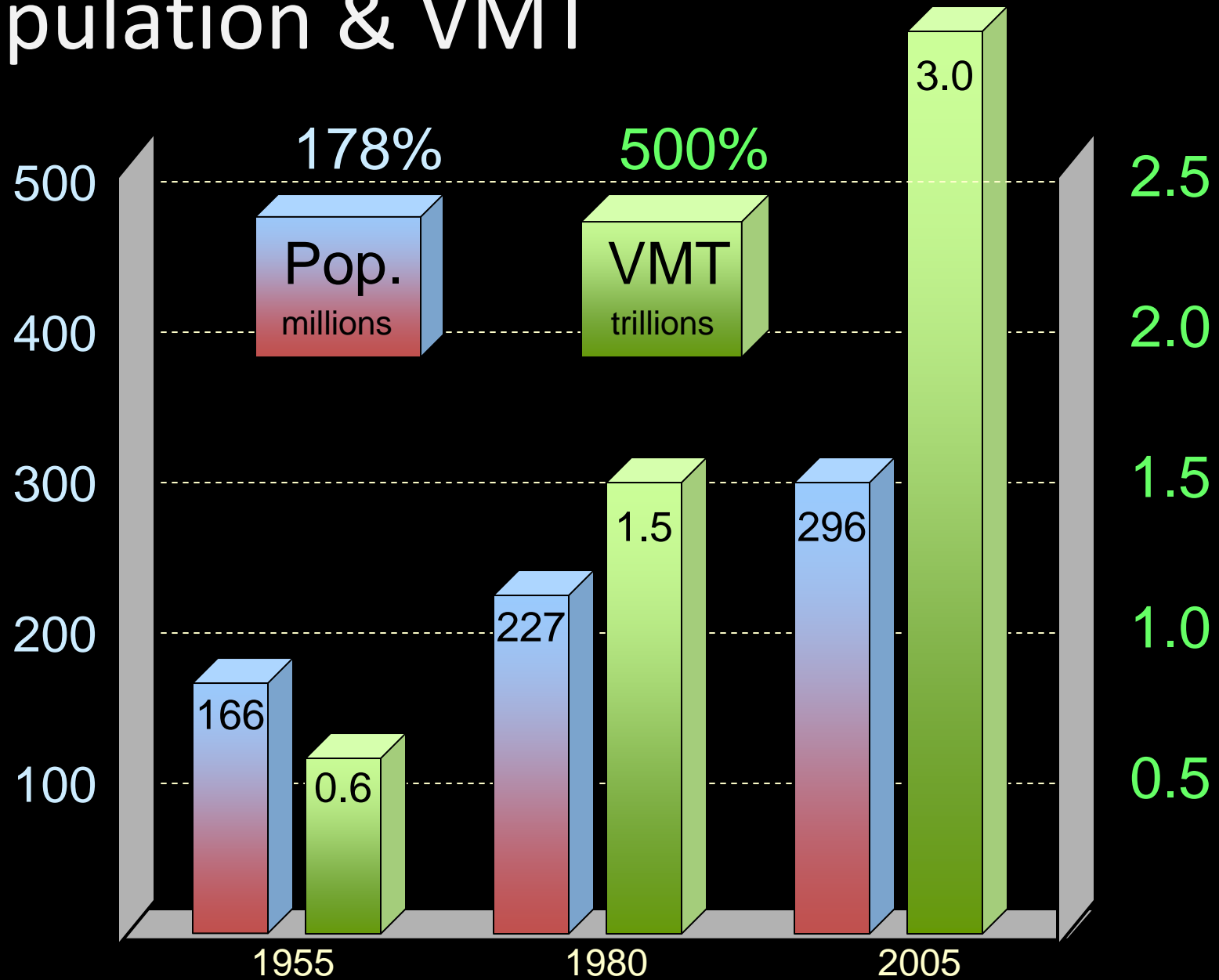
Transportation

Vehicle Miles of Travel



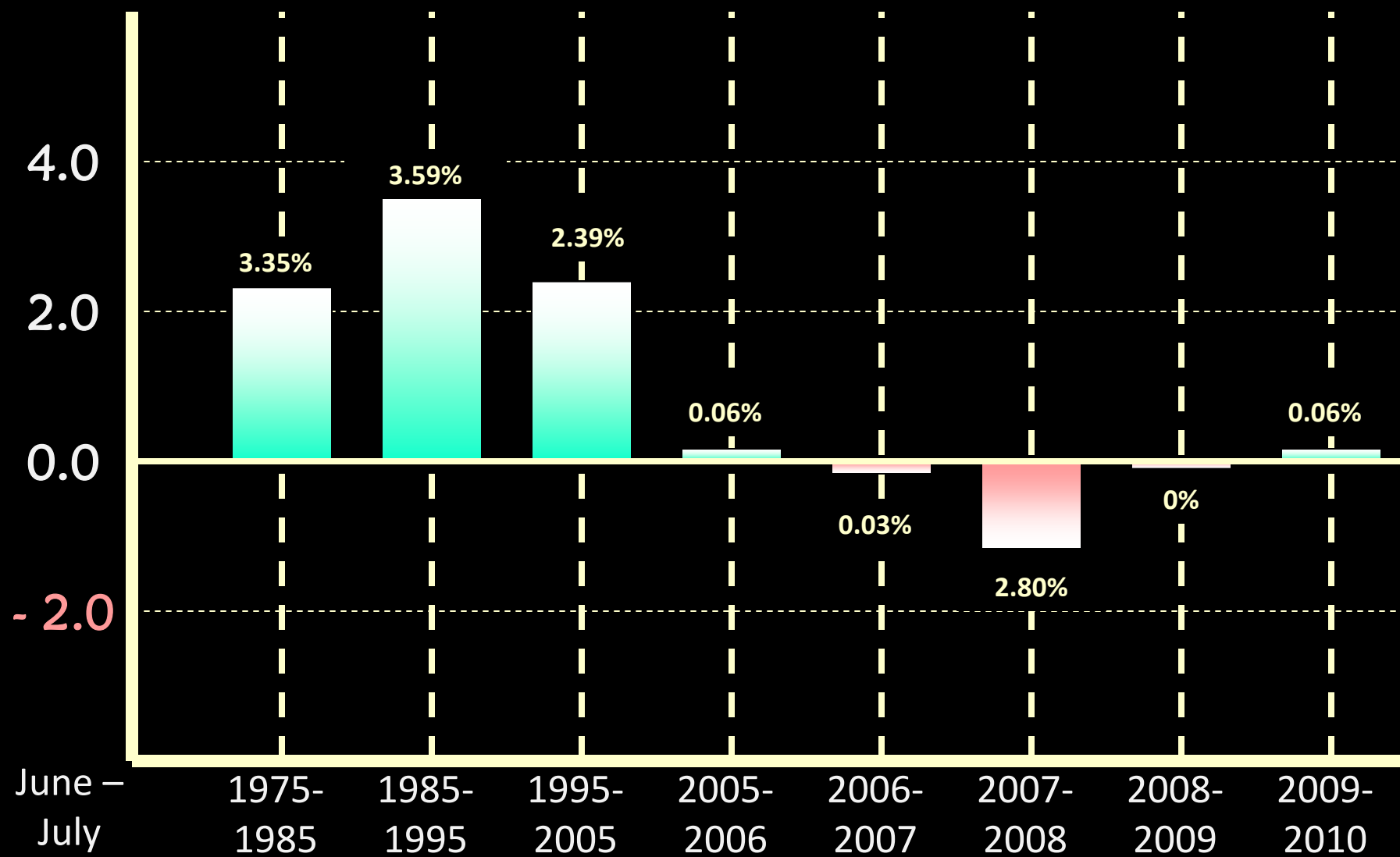
United States

Population & VMT

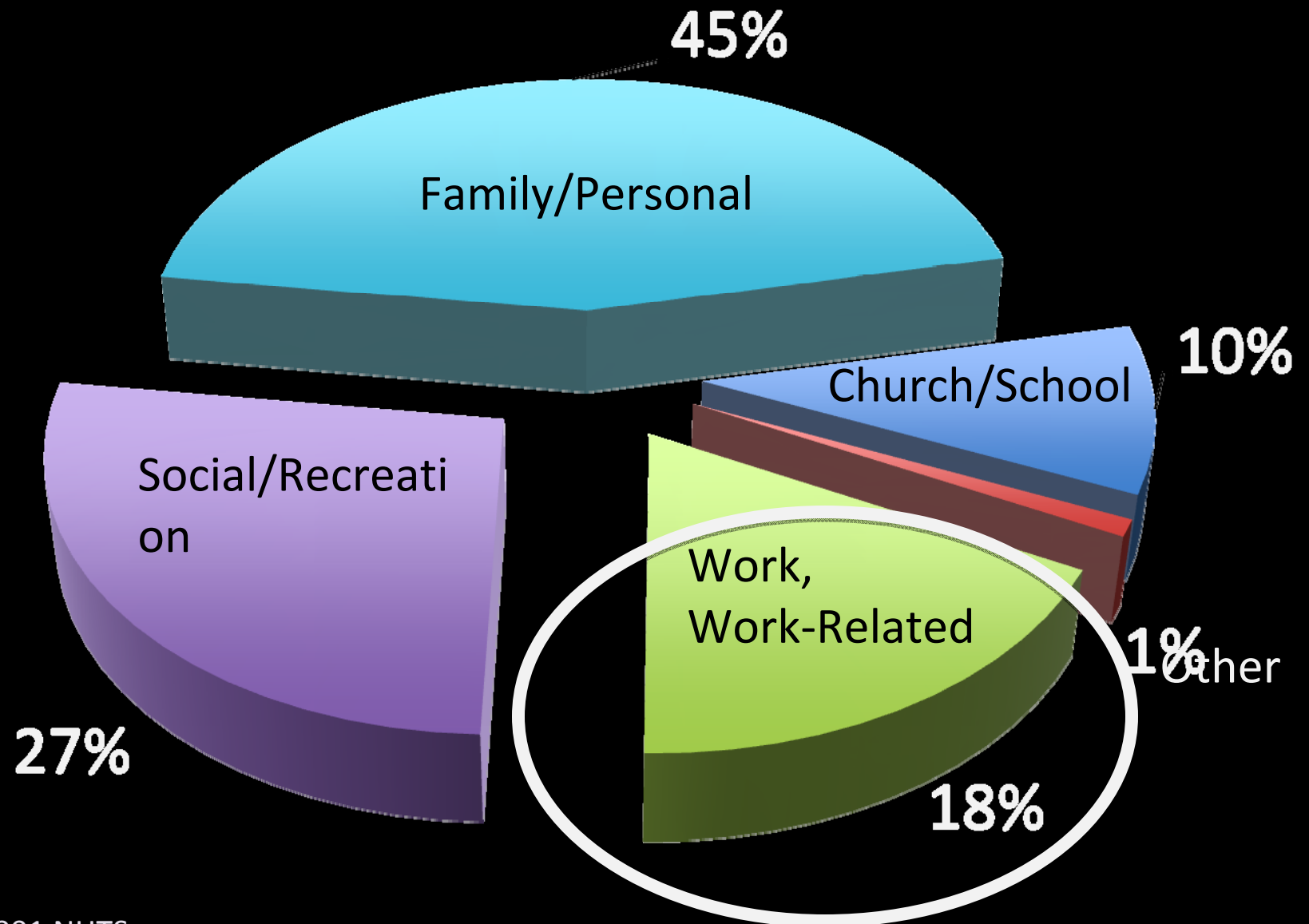


United States

Annual Rate of Change in VMT



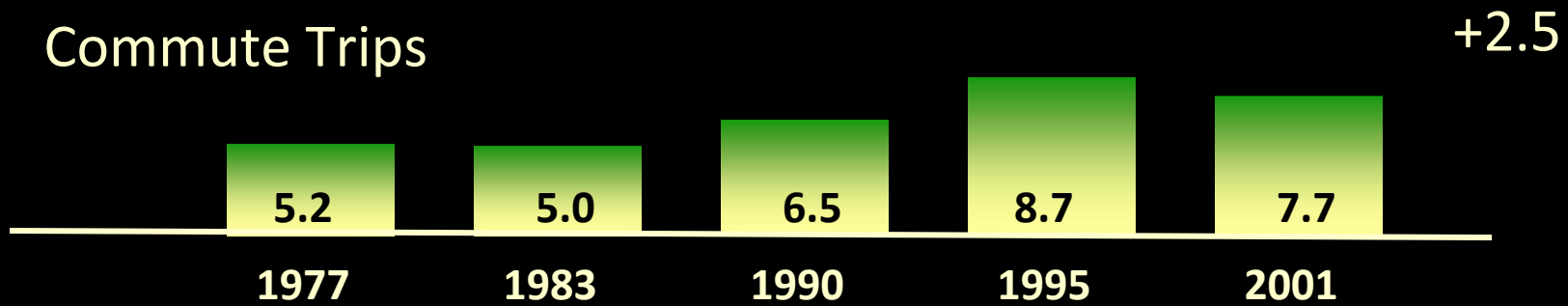
Daily Per Capita Travel



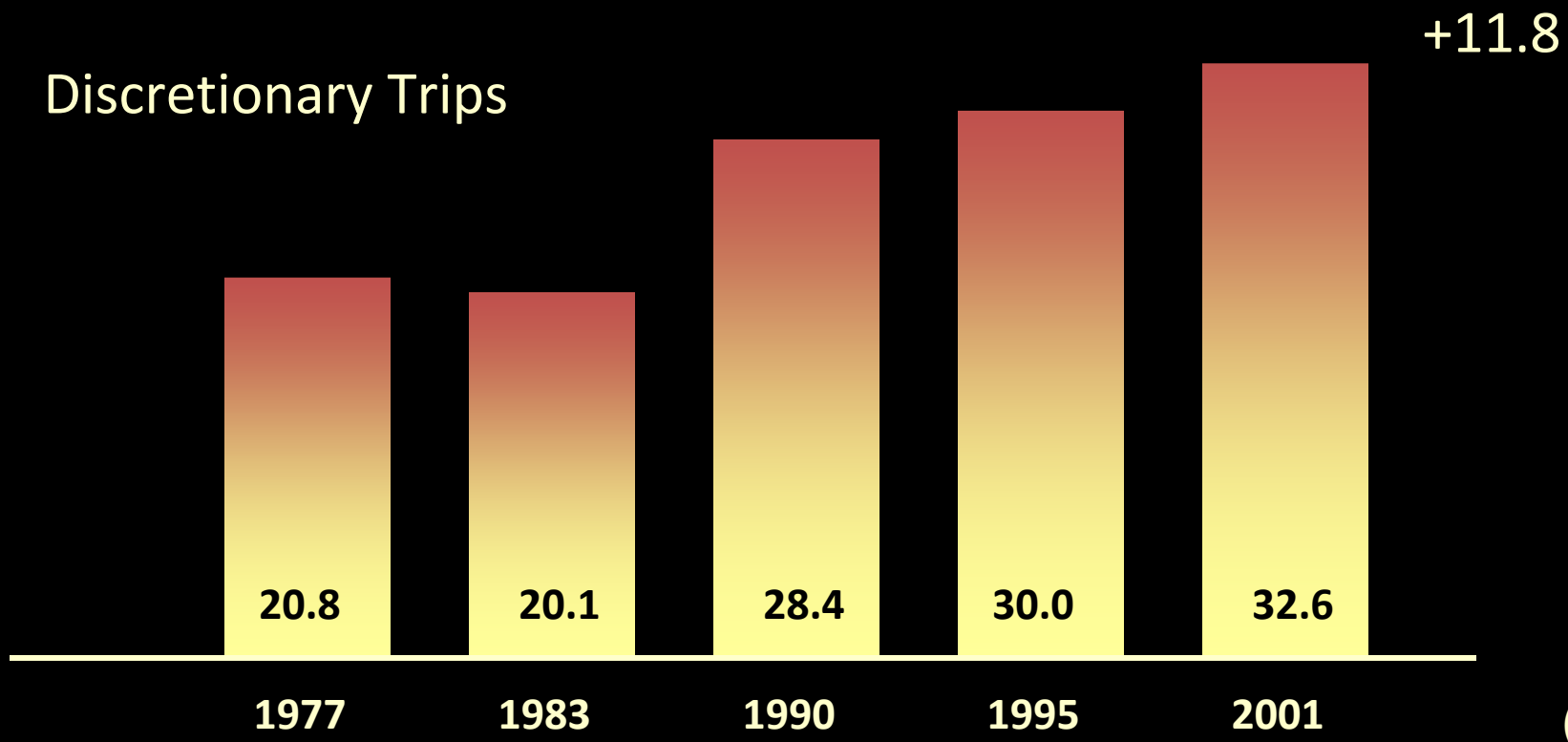
Source: 2001 NHTS

Daily Miles of Travel Per Capita

Commute Trips



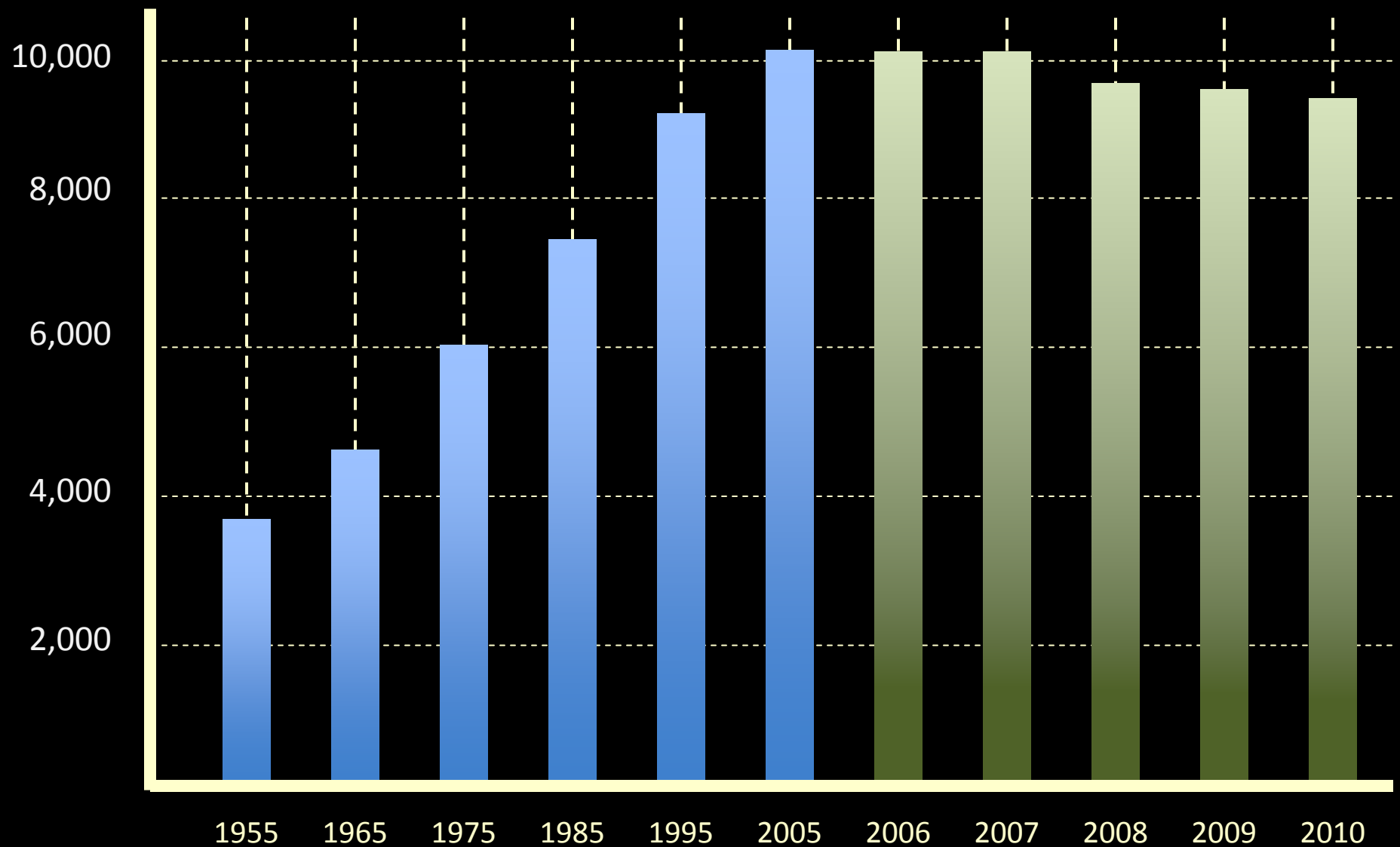
Discretionary Trips



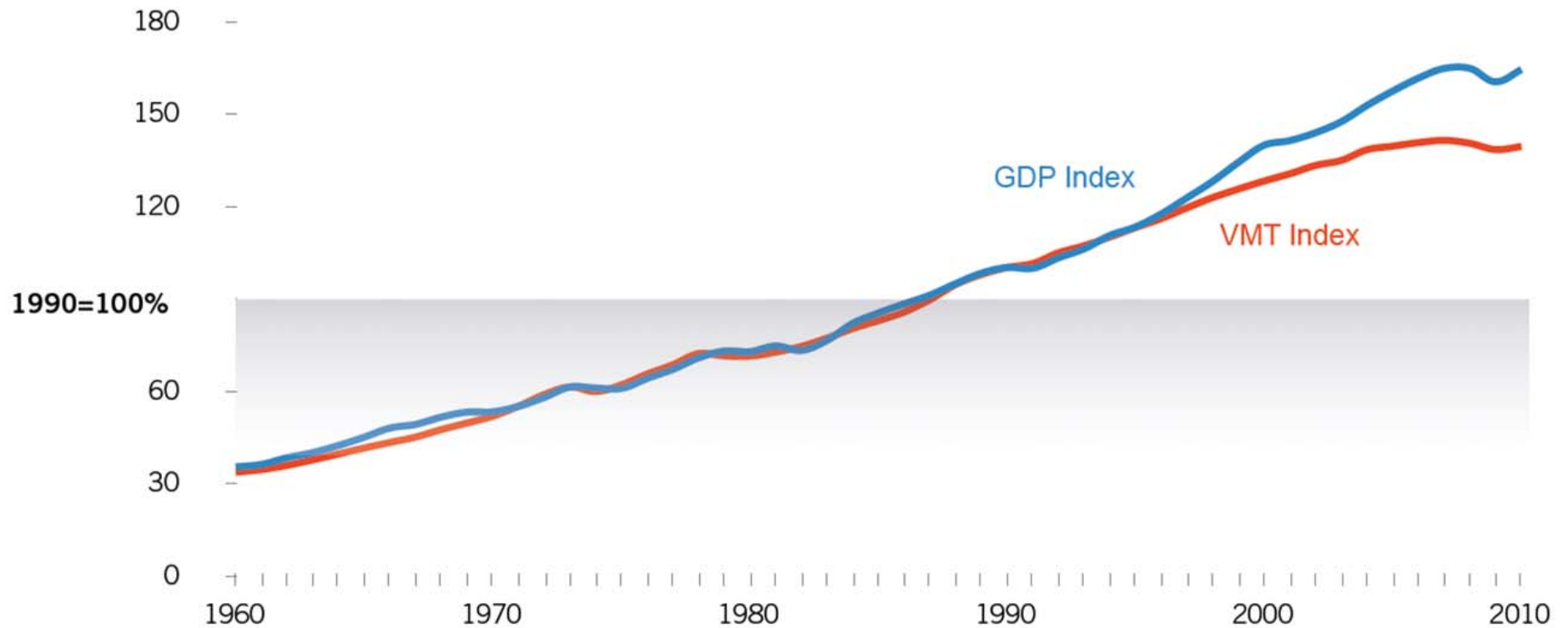
(NHTS)

VMT per Capita

United States



VMT and GDP

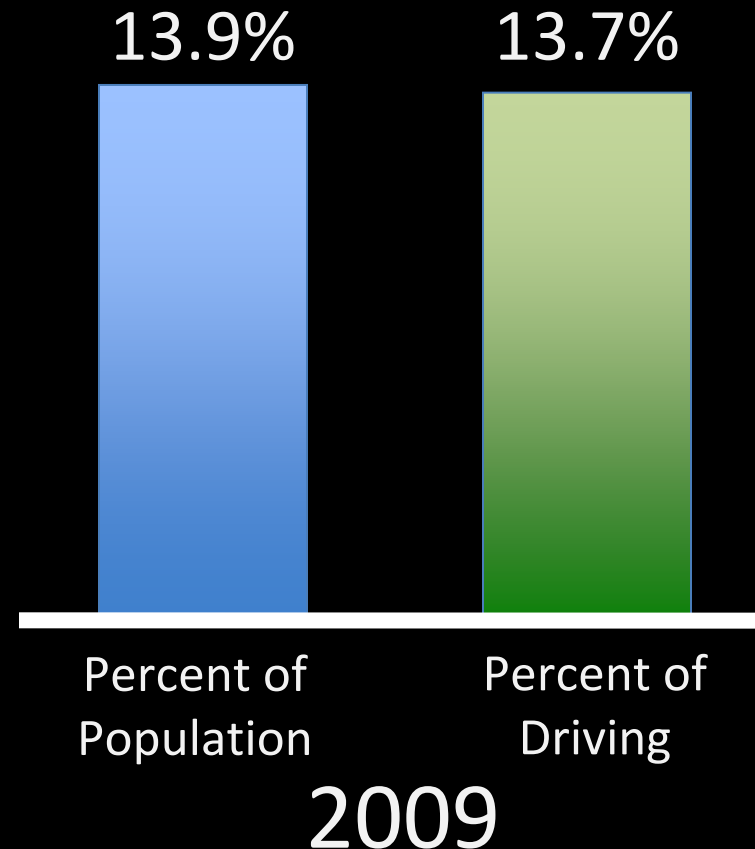
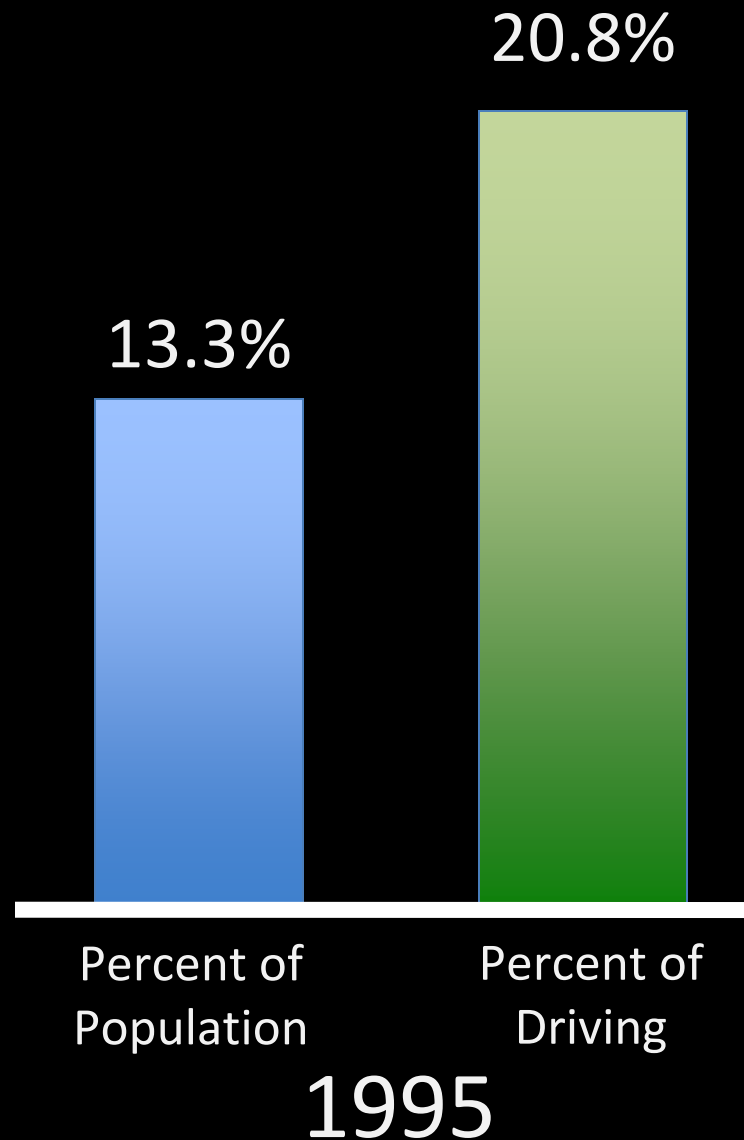


Data Sources: VMT: US DOT, BTS, Table 1-32: US Vehicle Miles, FHWA Traffic Volume Trends August 2010. GDP: BEA National Income and Product Account Table, Table 1.1.6 Real GDP, Chained (2005) Dollars

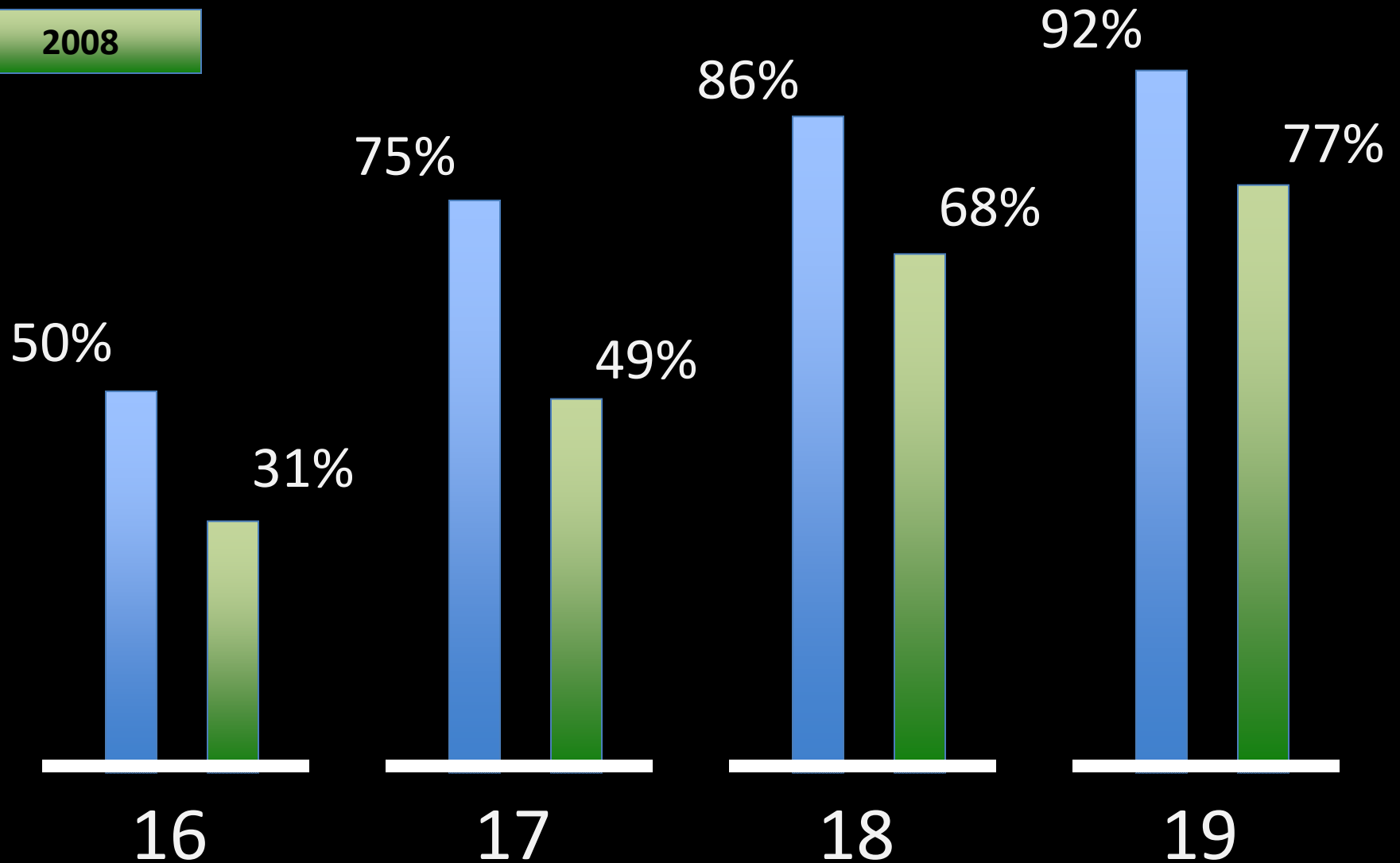
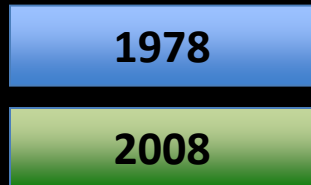
Source: "Growing Wealthier – Smart Growth, Climate Change and Prosperity"
January 2011 Center for Clean Air Policy

Millennials Are Driving Less

18 – 24 Years of Age

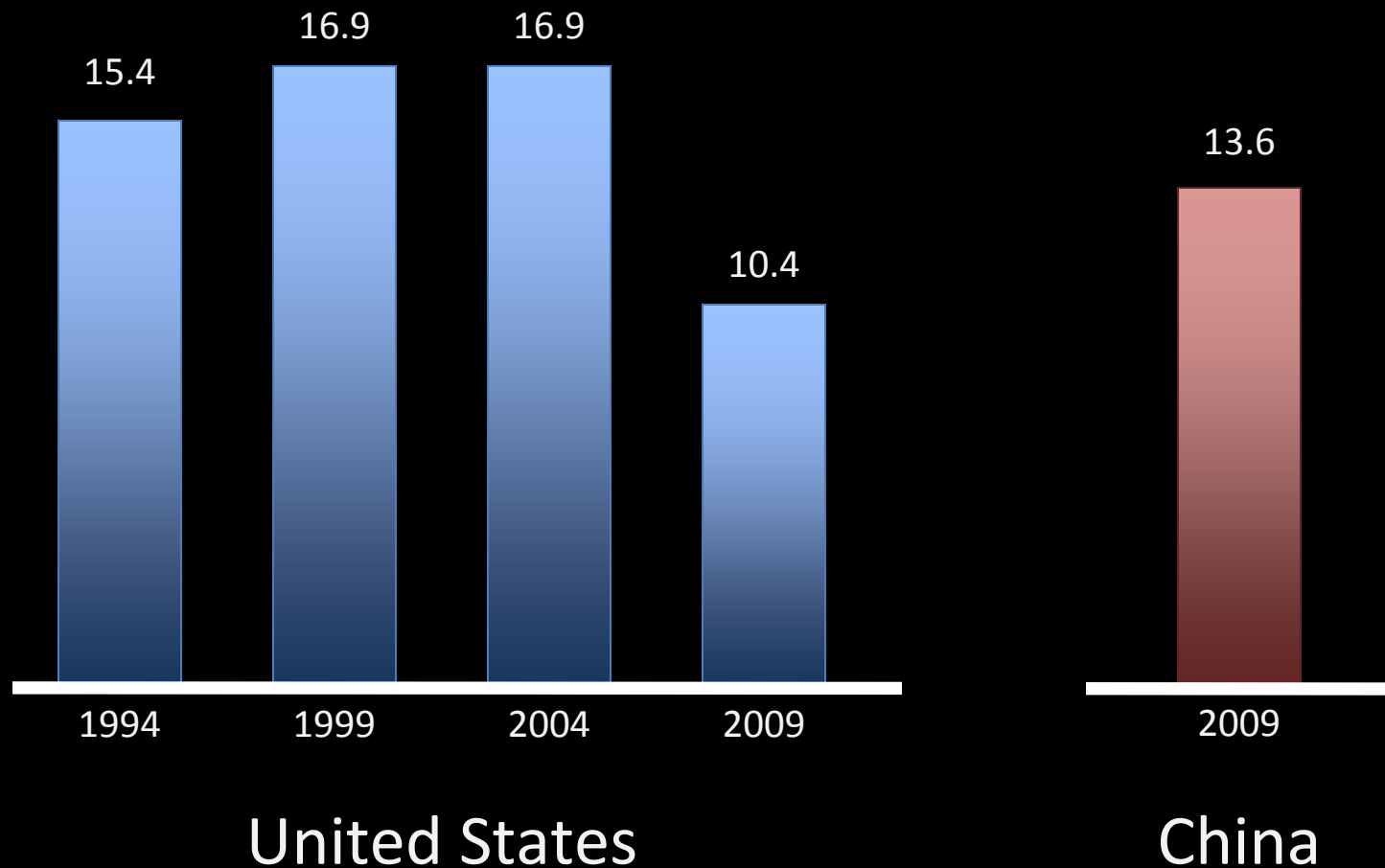


% With Driver's Licenses by Age



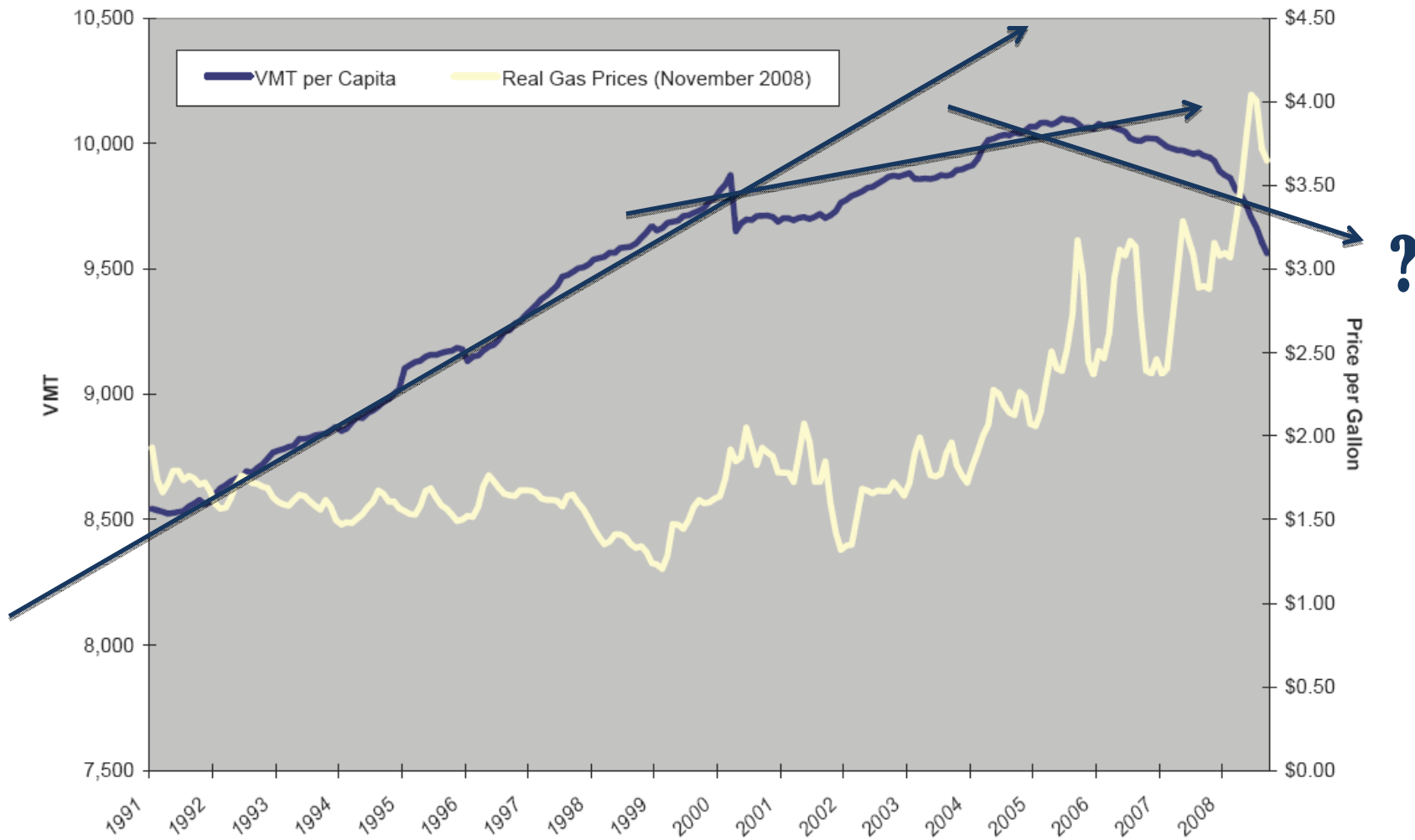
Annual Sales: New Motor Vehicles

Millions



Source: Bureau of Transportation Statistics

**Figure 1b. U.S. Vehicle Miles Traveled Per Capita, Annualized and Real Gasoline Pump Prices,
January 1991–September 2008**



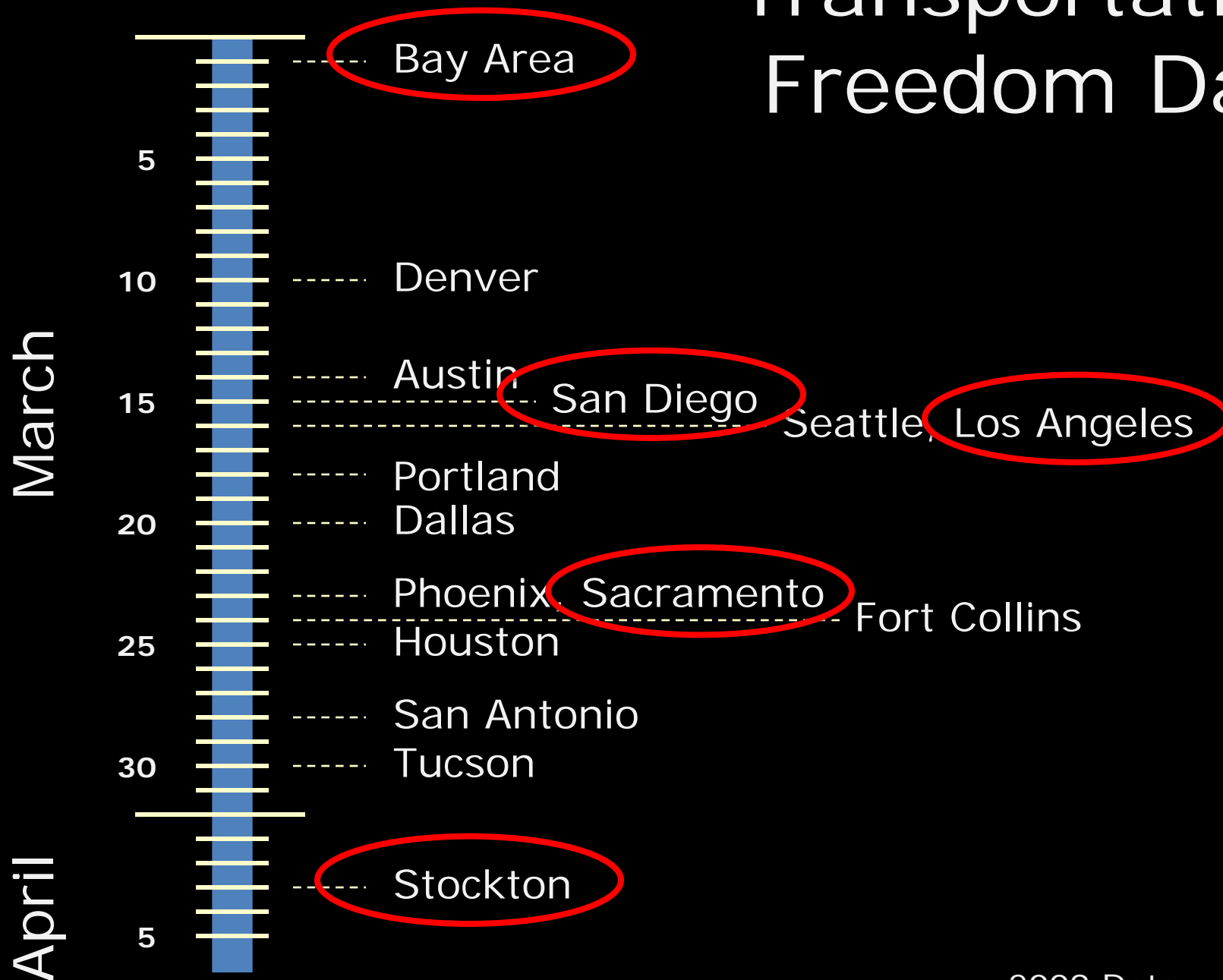
Source: Traffic Volume Trends and Energy Information Administration

7



Local Policy

Transportation Freedom Day



How Cities Will Compete

- Embedded daily VMT
- Vulnerability to petroleum prices



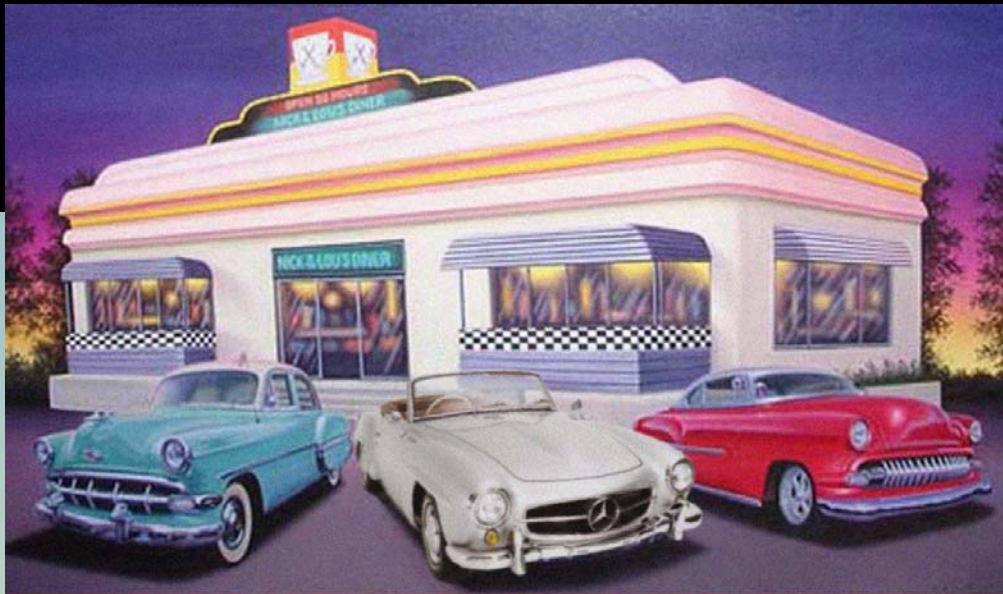
Strategies for Reducing Oil Dependence

• New Domestic Sources of Oil.....	+++	Impact on Cost of Travel
• Better Vehicle Efficiency.....	+	
• Shift to Electric Vehicles.....	++	
• Shift to Hydrogen Vehicles.....	+++	
• Shift to CNG Vehicles.....	++	
• Reduce VMT – Road Pricing.....	++	
• Reduce VMT – Carbon Tax.....	++	
• Mode Shift – Transit.....	++	
• Mode Shift – Walk/Bike.....	-	
• Shift Freight to Rail.....	+	
• Reduce VMT – Land Use.....	---	

NOT Your Father's Transportation Program



NOT Your Father's Land Use Pattern



Thank You

