The Petroleum Problem
The Perfect Fuel

- Abundant
- Inexpensive
- Transportable
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How We Use Petroleum
US Petroleum Consumption by End Use Sector – 2009

29% other

71% transportation

EIA, 2009
US Transportation Energy Consumption – 2009

95% petroleum

5% other

EIA, 2009
Net Petroleum Imports – 2009

48% domestic

52% imported

EIA, 2009
Source of Transportation Petroleum, 2009

33% domestic

67% imported

Charlier Associates, Inc. Estimate
Our transportation systems are dependent on petroleum imported
“Peak Oil”
The Original Hubbert Curve

M. King Hubbert (1956)
US Oil Consumption (million barrels per day)

- Total Oil Demand
- Transportation Demand
- US Production
- Domestic Oil Production
- Potential Oil Production from the Coastal Plain of ANWR

EIA, Annual Energy Outlook 2001; “Potential Oil Production from the Coastal Plain of ANWR,” - EIA Reserves & Production Division
3 Cost of Petroleum
Worldwide supply of oil

1.3 trillion barrels

42 years
Worldwide supply of oil

Time

mbls/day

Daily production capacity

Daily demand

Time
As Demand Exceeds Supply: Volatile Gas Prices
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
Cost of Crude Oil to Refineries

Average Annual Cost/Barrel

2005 Dollars

- 1969: $14.24
- 1979: $40.49
- 1989: $21.90
- 1999: $20.18
- 2009: $53.99
Production Cost – Sources of Oil

Production Cost Per Barrel of Oil - 2007

- Oil Shale: $57
- Liquefied Coal: $35
- Synfuel: $26
- Tar Sands/Heavy Oil: $23
- Enhanced Recovery: $16
- Conventional Oil: $9

Source: Brandt & Farrell, UC Berkeley
Carbon Pollution: Tar Sands = 3x carbon pollution per barrel of conventional crude*
The oil is not gone
The cheap oil is gone
India & China will double their demand for petroleum by 2030


ACCESS
No 37, Fall 2010
“We’ll become more efficient.”

“We’ll use alternative fuels.”
Potential Reduction in Petroleum Consumption Through Technology

Million barrels per day

NHTSA Reg.
20% CAFE Increase (=28.8 mpg)
40% CAFE Increase (=33.6 mpg)
60% CAFE Increase (=38.4 mpg)

Transportation Oil Use

Domestic Production

Plus ANWR

(Ref. EIA SR/O&G/2000-02, and USGS Report 98-34)

Source: NREL
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.
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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
Oil price per barrel

Oil prices rise, economy slows down

Rate of economic growth

Oil prices drop, economy rebounds
Yesterday

Crude Oil*  $ 89 / barrel

Gasoline  $3.12 / gallon

* WTI Crude Spot Market
World’s Two Largest Companies

PetroChina: $328 b
Exxon Mobile: $315 b

Based on market capitalization on 3/23/10

Source: New York Times 3/24/10
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Transportation
Vehicle Miles of Travel
Daily Per Capita Travel

- **Family/Personal**: 45%
- **Social/Recreation**: 27%
- **Work, Work-Related**: 18%
- **Church/School**: 10%
- **Other**: 1%

Source: 2001 NHTS
Daily Miles of Travel Per Capita

Commute Trips

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<tr>
<th>Year</th>
<th>Miles</th>
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Change: +2.5

Discretionary Trips

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<td>2001</td>
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Change: +11.8

(NHTS)
Millennials Are Driving Less

18 – 24 Years of Age

1995

- Percent of Population: 13.3%
- Percent of Driving: 20.8%

2009

- Percent of Population: 13.9%
- Percent of Driving: 13.7%
% With Driver’s Licenses by Age

- **1978**
  - 16: 50%
  - 17: 31%
  - 18: 86%
  - 19: 92%

- **2008**
  - 16: 31%
  - 17: 49%
  - 18: 68%
  - 19: 77%
Annual Sales: New Motor Vehicles

Millions

<table>
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<th>Year</th>
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<th>China</th>
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<td>2009</td>
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</table>

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
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Local Policy
Transportation Freedom Day

March

- Bay Area
- Denver
- Austin
- San Diego
- Portland
- Dallas
- Phoenix, Sacramento
- Houston
- San Antonio
- Tucson

April

- Stockton

2009 Data – US PIRG
How Cities Will Compete

• Embedded daily VMT
• Vulnerability to petroleum prices
Strategies for Reducing Oil Dependence

- New Domestic Sources of Oil
- 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

Impact on Cost of Travel
NOT
Your Father’s Land Use Pattern
Thank You