The Lies We've Been Told

Or

How Not To Transition to the Fuels of the Future

December 10, 2008
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University of Iceland
Reykjavik

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Washington, DC

www.eprinc.org
Introduction

Energy Policy Research Foundation Inc. (EPRINC), formerly the Petroleum Industry Research Foundation Inc. (PIRINC)

Founded in NY in 1944

- Moved to Washington from NYC in Feb 2007
- EPRINC brings policy analysis and industry economics to bear on current energy issues

Note: All data in this presentation are from EIA unless otherwise noted. Summary conclusions, comments, etc, are the sole responsibility of EPRINC.
EPRINC

Fighting Ignorance About Oil Markets Since 1944*

* It’s taking longer than we thought.
Alternative Titles

- High Cost of Pandering
- “Hey, Am I the Only Person Who was Alive in the 70s?”
- What happens when you ask the wrong questions?
- Where’s the Humility?
- Everything you think you know about the oil market is wrong
- The Black Swan (silent evidence, know-how vs. know-what, turkeys)
A Turkey Before and After Thanksgiving (Hume's Problem)

Consecutive Days Fed by Friendly Humans

Happiness Index

A Thanksgiving Surprise!
THE TAKE AWAYS

or

EPRINC’s UNIFIED THEORY

• Expectations Matter (and sometimes they come true)

• Recent Run Up in Oil Prices Was A Supply Disruption (no one saw it because it wasn’t in the briefing book)

• Peak Oil is for Sissies

• What Things Cost are Important (especially if there are no benefits)

• Lower Imports Will Not Buy a Lot of Energy Security (within the likely range)

• Petroleum Products, i.e., gasoline, diesel, jet fuel are made from Crude Oil (this is more important than you think)
Why Did Oil Prices Climb So High?
NOT AN EMBARGO, but instead a

• Structural Shift in Ownership and Control of the Resources of the Middle East

• Fundamental Change in Expectations on Production from Middle East Producers

As an Embargo it was a failure, market was integrated (lesson not yet learned by Chavez)
Oil Price, Production, Consumption – 1970 - 1990

1974-75: production declined 4.85%
1979 Price Shock

- Oil market was not fragile, but instead there was a shift in:
  - expectations regarding regional risk; i.e. more risky
  - Prospects for future output from Iran and Iraq were reduced substantially, i.e., access to those reserves would now be delayed
1986 Price Collapse

• Saudi Arabia abandons role as swing producer at low levels of net demand for SA crude

• Shift in expectations on Saudi decision making within OPEC and as regulator of world oil market

• Sustained reduction in oil use as a percentage of GNP in major Western countries
1986 Price Collapse

Source: EIA Data,
1998 Price Collapse: Six Central Issues

- Asian economic crisis brings a collapse in net demand
- OPEC misreads the oil market
- Warm 1997-98 summers in N. America, Europe, Asia
- Increase in Russian oil exports as Ruble collapses
- Chinese authorities decrease imports in Q4 of 1998
- UN authorizes increase in Iraqi exportation in 1998
- Asian economic crisis brings a collapse in net demand
A Series of Unfortunate Events Leading to New Expectations

- Positive Expectations
- Expectations Shift
- Negative Expectations

Global Production, million b/d

- Oil development in Iraq delayed
- Yukos -- Kremlin taking control of Russian oil development
- Russia takes over Sakhalin II, Chavez Nationalizes Projects
- Iraq invasion: outlook positive for new oil field rehabilitation
- Continuing civil strife in Sudan, Nigeria
- Congress continues ban on ANWR and offshore development
- Nigeria rebels hurt output
- OPEC Excess Capacity remains limited
- Outlook positive for expanded output from Nigeria, Mexico, Venezuela, Russia, North Slope
- World Oil Production (EIA)
- Expected Production (EIA 2001 Predictions)
- OPEC Excess Capacity (EIA)
- Crude Oil Price

*Note: The chart illustrates the impact of various events on global oil production and crude oil price expectations.*
Expectations and Reality

EIA 2001 price projections (on par with those of PIRA, Deutsche Bank, IEA, etc.)

Supply/Demand relationship returning to equilibrium
## A Series of Unfortunate Events, by country:

<table>
<thead>
<tr>
<th>Country</th>
<th>Positive Expectations</th>
<th>Negative Events</th>
<th>Lost Production (bpd)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iraq</td>
<td>Promise of investment in oil sector after war, increased production.</td>
<td>Sustained turmoil drops output below pre-war levels</td>
<td>600,000</td>
</tr>
<tr>
<td>Nigeria</td>
<td>4 mbd expected by 2010</td>
<td>Civil strife and attacks on infrastructure, 2005-2007 saw decline to 2.1 mbd</td>
<td>500-700,000</td>
</tr>
<tr>
<td>Venezuela</td>
<td>Potential for growth after stagnant production</td>
<td>Nationalization of oil industry, production nosedive</td>
<td>800,000</td>
</tr>
<tr>
<td>Russia</td>
<td>Projection seen at 12 mbd by 2010 after privatization of industry brought western influence, $ and new production</td>
<td>Re-nationalization leads to decreased production and investment</td>
<td>200,000</td>
</tr>
<tr>
<td>Sudan</td>
<td>Additional proven reserves and access to new fields</td>
<td>Civil strife, attacks on infrastructure, new fields remain inaccessible</td>
<td>200,000-250,000</td>
</tr>
</tbody>
</table>
# A Series of Unfortunate Events (cont.)

<table>
<thead>
<tr>
<th>Country</th>
<th>Event</th>
<th>Outcome</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Argentina</td>
<td>Huge production gains from 1991-2001</td>
<td>Oil industry nationalized in 2004, production and investment dropped</td>
<td>100,000</td>
</tr>
<tr>
<td>Kazakhstan</td>
<td>Production from Kashagan was expected to begin in 2005</td>
<td>Technical difficulties with some political disagreements</td>
<td>TBD</td>
</tr>
<tr>
<td>US</td>
<td>ANWR was part of Bush's energy policy when he took office in 2000</td>
<td>Currently no access to ANWR or OCS</td>
<td>up to 1,000,000</td>
</tr>
<tr>
<td>Canada (Alberta)</td>
<td>Oil sands contain 95% of Canada's 179 billion barrels of reserves</td>
<td>In 2007 new taxes and royalty rates helped to reduce lease sale revenues by 50% compared to 2006</td>
<td>TBD</td>
</tr>
<tr>
<td>Mexico</td>
<td>Production expected to reach 4 mbd by 2005</td>
<td>Production in decline since 2004. Cantarell declining and PEMEX needs funding.</td>
<td>500,000 +</td>
</tr>
</tbody>
</table>

Estimated loss of supplies to the world market, 2005-2010: 2.5-4.5 mbd
Demand Destruction Worldwide

- Global demand down slightly so far this year, OECD decline has been greater than demand growth in non-OECD countries.

2008 OECD consumption declined 1.5 mbd from 2007.

2008 world consumption has declined 200,000 bpd from 2007.
Highlights from EIA November STEO

• 2008 consumption to grow by only 100,000 bd
• 2009 consumption to remain flat
  – 2007 – 2009 OECD consumption to drop by 2.2 mbd
  – 2007 – 2009 Non-OECD growth of 2.3 mbd
• Non-OPEC production to grow by 500,000 bd in 2009
  – 450,000 bd growth in the U.S.
• OPEC Surplus Capacity to grow
  • With production cuts and new projects coming online, surplus capacity could reach 4 mbd in 2009 compared to 1.6 mbd in Q2 2008.
World Oil Production - Significant Post-2006 Growth

Source: EIA Data
What’s Happened Since 2007?

2 mbd swing in 3 quarters

Source: EIA Data, EPRINC Calculations: All Figures Indexed to 2007

Recent Production Declines - 1997-2008

Russian declines to continue, some had expected 12 mbd by 2010

Note recovery - 2004-2008
Some Production Bright Spots

Other Notable Gains (mbd)
2007 Average -> July, 2008:
- Iran: 0.1
- U.S.: 0.25
- UAE: 0.1
- Sudan: 0.06
Total: 0.51 mbd
.....Led by OPEC Production
What About Peak Oil

The Wrong Question!!!
The Peak Oil Problem:
New Supplies Will Be More Expensive, but We Are Not Running Out of Oil

"One thing is clear: the era of easy oil is over. What we all do next will determine how well we meet the energy needs of the entire world in this century and beyond."
- David J O'Reilly, Chairman & CEO, Chevron Corporation, July 2005
## San Joaquin Valley
Testing Hubbard-Method Predictions for Reserves and Production
(Billions of Barrels)

<table>
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<tr>
<th></th>
<th>1964</th>
<th>1982</th>
<th>2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cumulative Discoveries</td>
<td>7.7</td>
<td>11.8</td>
<td>16.1</td>
</tr>
<tr>
<td>Percent Attributable to 1915</td>
<td>49%</td>
<td>69%</td>
<td>76%</td>
</tr>
<tr>
<td>Cumulative production as of</td>
<td>8.0-9.5</td>
<td>11.9-12.1</td>
<td>16.1-16.2</td>
</tr>
<tr>
<td>Year 2000 production projected in: (mb/d)</td>
<td>44-112</td>
<td>189</td>
<td>597(actual)</td>
</tr>
</tbody>
</table>

Source: EPRINC, October 2006. *Does the Hubbard Method Provide a Reliable Means for Predicting Future Oil Production*, Richard Nehring, October 2006,
Permian Basin
Testing Hubbard-Method Predictions for Reserves and Production
(Billions of Barrels)

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<th>1964</th>
<th>1982</th>
<th>2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cumulative</td>
<td>17.6</td>
<td>27.9</td>
<td>35.2</td>
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<tr>
<td>Discoveries</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percent</td>
<td>85%</td>
<td>86%</td>
<td>84%</td>
</tr>
<tr>
<td>Attributable to</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1950</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Cumulative</td>
<td>19-27.5</td>
<td>28.5-30.5</td>
<td>35.8-37.5</td>
</tr>
<tr>
<td>production as of</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 2000</td>
<td>162-479</td>
<td>326-479</td>
<td>910(actual)</td>
</tr>
<tr>
<td>production</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>projected in:</td>
<td></td>
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<tr>
<td>(mb/d)</td>
<td></td>
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</table>

Source: EPRINC, October 2006. Does the Hubbard Method Provide a Reliable Means for Predicting Future Oil Production, Richard Nehring, October 2006,
Real Imported Crude Oil Prices – 1980 - 2008

Source: EIA Data
Real Imported Crude Price, November 2008 STEO
Why You Should Stop Worrying About Peak Oil

• You’ll never get the right answer
• Put your effort into something useful, such as the backstop price
• Congress has already decided that any alternative fuel, no matter how expensive, is worth supporting as an alternative to petroleum
ETHANOL

A CAUTIONARY TALE
US Ethanol Consumption:
2006 - Present

Mandate requirement assumes 750 million gallons per month for 12 months to reach the 9 billion gallon mandate for 2008.

Source: Renewable Fuels Association
Ethanol’s Share of Crude Products and Gasoline
Ethanol and Gasoline

Source: EIA Data, Bloomberg, CME Group, EPRINC Calculations
The Cost of Ethanol and the Gasoline Pool

Reflects ethanol’s value as an oxygenate and octane booster.

Blender’s Credit = $0.51, current ethanol – RBOB spread = $0.53

Once the gasoline pool hits 10% ethanol, additions must come from E85 sales.

Source: Bloomberg, CBOT. Futures prices for front month contracts as of November 17, 2008.
Break-even point represents break-even for short-term operating costs, not capital costs.

Source: CBOT, Iowa Ag Review – Iowa State
Cost of Ethanol Subsidies

- $7 billion per year (Economist, 2007)
  - About $1.90/gallon.
- More than 200 types of subsidies
  - $11.2bn+ since 2005 on tax breaks for companies that blend ethanol into petrol (Financial Times)
  - Billions of dollars of subsidies for ethanol producers
- Tariff on ethanol imports
  - Aimed at preventing imports from Brazil
  - 54 cents/gallon

Source: The Economist, Financial Times
U.S. Retail Prices: Gasoline vs. Diesel
2006 - 2008

Source: http://tonto.eia.doe.gov/dnav/pet/pet_pri_gnd_dcus_nus_w.htm
Synfuels Corp

- Synthetic Fuels Corp. (SFC) - 1979
  - Use coal to produce 2 mbdoe by 1992
  - New jobs and revenues expected, “The new Office of Coal Commerce in the Illinois Department of Commerce and Community Affairs calculates that every 4 million tons' annual increase in coal output creates 4,013 new jobs, producing a $76 million annual increase in personal income in the state, $6.7 million of which ends up in state and local tax coffers.”
  - Cost would be $88 billion over 10 years, partially funded by a windfall profits tax on oil companies.
  - Reagan eventually ended the project in 1986 as oil prices collapsed.


*TIME* Magazine
SHOULD WE DRILL FOR OIL*

*AKA, BIG OIL SHOULD USE IT OR LOSE IT
A Future of Imports...

All estimates from the EIA’s 2008 Annual Energy Outlook. EIA estimates assume EISA2007 biofuel production levels are met.
U.S. Crude Oil Net Imports

Worst-Case Economic Scenario: 0% Annual GDP Growth Through 2020
With Crude Oil Prices Rising 3% Annually

Positive Economic Growth, GDP +2.5%/yr
No Economic Growth, GDP +0%/yr
<table>
<thead>
<tr>
<th>Lease Year</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>.</td>
<td>Pre-leasing evaluation</td>
</tr>
<tr>
<td>-3</td>
<td>Lease Sale</td>
</tr>
<tr>
<td>-2</td>
<td>Lease Sale</td>
</tr>
<tr>
<td>-1</td>
<td>Lease Sale</td>
</tr>
<tr>
<td>0</td>
<td>Lease Sale</td>
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<tr>
<td>1</td>
<td>Lease Sale</td>
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<tr>
<td>2</td>
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<td>3</td>
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<td>4</td>
<td>Lease Sale</td>
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<td>5</td>
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<td>6</td>
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<td>7</td>
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<td>8</td>
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<td>9</td>
<td>Lease Sale</td>
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<tr>
<td>10</td>
<td>Lease Sale</td>
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<tr>
<td>11</td>
<td>Lease Sale</td>
</tr>
<tr>
<td>12</td>
<td>Lease Sale</td>
</tr>
<tr>
<td>13</td>
<td>Lease Sale</td>
</tr>
</tbody>
</table>

**Legend:**
- Pre-leasing evaluation
- Lease Term
- Exploration Phase
- Development Phase
Highlights from *Oil in the Sea III* (2003)

• “Operational discharges from vessels in general and tankers in particular have substantially declined over the last 25 years.
• Only 1 percent of the oil discharges in North American waters is related to the extraction of petroleum.
• Although large quantities of VOC (volatile organic compounds) are emitted from tankers and production platforms, these consist of mostly lighter compounds and only small amounts deposit to the sea surface.”
Oil’s Tax Bill

Income Taxes Paid in 2006: Oil Companies vs. The Bottom 75% of Individual Taxpayers

- **Oil Company Income Taxes Paid in 2006**: $138B
- **Income Taxes Paid by the Bottom 75% in 2006 (estimate)**: $136B

Source: API
U.S. Gov’t Revenues from Leases

• FY2008 – “Minerals Management Service had distributed a record $23.4 billion to state, American Indian and federal accounts from onshore and offshore energy production”
  – $10 billion from bonus bid payments from lease sales
  – $17.3 billion went to the U.S. Treasury
• 2007 - $11.6 billion
• 2006 - $12.8 billion

Are We Using Too Much Oil?
World GDP vs. Oil Production

Source: CFTC Interim Report on Crude Oil, June 2008

Growth Rates

4-quarter percent change

World GDP

Source: Federal Reserve Board and International Energy Agency. World GDP aggregate weighted by world oil consumption shares.

Levels

Index, 2002:Q1 = 100

World GDP

Oil Production
Oil Intensity of GDP

Source: CFTC Interim Report on Crude Oil, June 2008

Oil Intensity of GDP

Per Capita Oil Consumption

Source: International Monetary Fund and International Energy Agency. GDP is real GDP for each country in billions of 2000 U.S. dollars.
Cost to consumers.....

**PAYING MORE FOR HEAT**

Consumers are expected to pay record prices for heating this winter. Projected average household expenditures and percentage change from 2007-08 costs:

<table>
<thead>
<tr>
<th>Expenditures</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heating oil $2,644</td>
<td>↑ 36.3%</td>
</tr>
<tr>
<td>Natural gas $1,059</td>
<td>↑ 23.8%</td>
</tr>
<tr>
<td>Electricity $939</td>
<td>↑ 9.4%</td>
</tr>
</tbody>
</table>

*Source: Energy Information Administration*

Source: New York Times, USA Today
U.S. Annual Energy Expenditures As Percent of Gross Domestic Product

Forecast

Short-Term Energy Outlook, November 2008
Some Observations on the Market for Middle Distillates
World Oil Consumption

![Graph showing World Oil Consumption with data points for China, United States, and other countries from 2001 to 2009 with a forecast for 2009.]

Short-Term Energy Outlook, November 2008
Oil Prices by Currency

Exchange Value of the Dollar
Index, Jan. 2002 = 100

Source: Federal Reserve Board. The measure of the dollar is the broad nominal index, and the oil price is spot West Texas Intermediate crude oil.

Oil Prices in Several Currencies
Index, Jan. 2002 = 100

- U.S. dollars
- euros
- Japanese yen
- Canadian dollars

Source: CFTC Interim Report on Crude Oil, June 2008
World Oil Consumption

- China: 2.44
- Saudi Arabia: 0.71
- India: 0.46
- Iran: 0.39
- United States: 0.37
- Brazil: 0.31
- Russia: 0.26
- Iraq: 0.20
- Canada: 0.15
- Singapore: 0.15

Source: Energy Information Administration

Source: CFTC Interim Report on Crude Oil, June 2008

Source: EIA Data
Operable Refineries and Capacity

Source: EIA Data
U.S. Total Gasoline Imports

Source: EIA Data
U.S. Distillate Fuel Oil Net Imports

Source: EIA Data
Profitability in Refining and Marketing – 2007-2008
(with year-over-year change)

-----|-----|-----|-----|-----|-----
Net Income for Refining and Marketing

Source: EIA Data and EPRINC Calculations
Refiner Margins vs. ROI

Source: EIA Data
4-Week Average U.S. Finished Motor Gasoline Product Supplied (Thousand Barrels per Day)

Source: EIA Data
Real Gasoline Prices – 1919 – 2009

Source: EIA

Short Term Energy Outlook November 2008

Source: EIA
Real Imported Crude Oil Prices – 1980 - 2008

Source: EIA