U.S. and World Oil Dependence: Problems and Solutions

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UTK Make Orange Green
The Basics - Why Alternative Fuels

- Reduces vehicle pollution
- **Reduces oil dependence**
- Helps create jobs in the USA
- Reduces global warming
- Reduces national security risks due to importing oil from not-so-friendly countries (Iran, Venezuela)
- Promotes renewable resource use
World’s Oil Reserves/Peak
World Oil Peak – New Data (2004)

Energy Information Administration work from 2000 – no data to significantly alter results since

- More carefully modeled supply and demand
- Assumed 2% growth; used R/P ratio of 10, which assumes “very mature” state of production world-wide
- “ultimate recovery appreciation”
- They believe they’re analysis is “conservative” (NOT!)
- More explicit than implicit with previous supply data
- Explicitly included uncertainty

World Oil Peak – New Data (2004)

“Adding 900 billion barrels -- more oil than had been produced at the time this was made -- to the mean USGS resource estimate, in the 2% growth case only delays the estimated production peak by 10 years.”

“Given the long lead times required for significant mass-market penetration of new energy technologies, this result in no way justifies complacency about both supply- and demand-side research and development.”
Long-term U.S. Energy Data
Really Long-term U.S. Energy Data & Where Fossil Fuels Come From
National Energy Dependence/Security - the Balance is Tilted Against Us

In 2000, the U.S. contains about 4.5% of the world’s population.
Long-term data tells us that if we don’t start curbing our addiction, we will be buying that oil from the Middle East.

**Figure 2: Crude Oil Reserves by Region as of January 1999**

**Fig. 2 Percentage Breakdown**
*(numbers approximated from Figure 2)*

<table>
<thead>
<tr>
<th>Region</th>
<th>(Bil. Bbl)</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Am.</td>
<td>55</td>
<td>5.1%</td>
</tr>
<tr>
<td>South Am.</td>
<td>100</td>
<td>9.3%</td>
</tr>
<tr>
<td>Europe/U.S.S.R</td>
<td>95</td>
<td>8.8%</td>
</tr>
<tr>
<td>Middle East</td>
<td>700</td>
<td>64.8%</td>
</tr>
<tr>
<td>Asia</td>
<td>40</td>
<td>3.7%</td>
</tr>
<tr>
<td>Africa</td>
<td>90</td>
<td>8.3%</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>1,080</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

Note: Countries included within each column are listed at the top of that column. Countries whose reserves were less than 5 billion barrels were placed in “Others.” The world’s total reserves are roughly 1 trillion barrels.

Source: USDOE, Energy Information Administration, International Energy Annual 1999, Table 8.1
Updating the last chart to reflect newer data (through 2005), here’s how it changes:
(data compiled by EIA and averaged from three sources: *BP Statistical Review, Oil & Gas Journal, and World Oil*)

"Proven" World Oil Reserves -- Through 2005

<table>
<thead>
<tr>
<th>Regions</th>
<th>Billion Barrels</th>
</tr>
</thead>
<tbody>
<tr>
<td>North America</td>
<td>100</td>
</tr>
<tr>
<td>Central &amp; South America</td>
<td>100</td>
</tr>
<tr>
<td>Europe &amp; Eurasia</td>
<td>100</td>
</tr>
<tr>
<td>Middle East</td>
<td>700</td>
</tr>
<tr>
<td>Asia &amp; Oceania</td>
<td>10</td>
</tr>
<tr>
<td>Africa</td>
<td>100</td>
</tr>
</tbody>
</table>
Transportation sector is almost entirely dependent on oil; it accounts for ~68% of U.S. oil use now, and will increase significantly in the future.

Alternative Fuels and Improved Fuel Economy can reduce Oil Dependence

- Alternative fuels: 10% of total vehicle population
- 42 mpg combined cars & trucks
- Fuel cell vehicles: 10% of new sales by 2020

Domestic Oil Production
Highway Vehicle Oil Use

Million Barrels Per Day

1970
1982
1984
1986
1988
1990
1992
1994
1996
1997
1998
1999
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
Fuel Use Within Sectors: Diversity, or Lack Thereof

Graph courtesy of the Central Ohio Clean Fuels Coalition (COCFC)
This is why improving fuel economy and using hybrids is important!
Economic Benefits of Alternative Fuels

We spend over $300 million/day
~ approx. $2+ billion/wk ~ overseas for foreign oil.

Why not put that money back into the U.S. economy?
AF101 - What percentages of these alt fuels are **domestically produced**?

- Biodiesel: 100%
- Electricity: 95%
- Ethanol: 100%
- Natural gas: 90%
- Propane: 95%

**VS.**

- Gasoline + Diesel = 40%

In 1945, we were 0% dependent on foreign countries for oil; now we are 60% dependent. ~60 years = 0-60% reliance on others for oil~
Alternative fuels cannot do it alone.

They must be teamed with significantly improving vehicle fuel efficiency and energy conservation to really achieve the ultimate goal of foreign oil, or oil period, independence.
The Clean Cities Program

A voluntary, locally based partnership designed to advance the use of alternative fuels and alternative fuel vehicles (AFVs).

Map Date: 9.29.04
Ethanol (E10 + E85) – Pros & Cons

PROS

- Cost competitive most of the time
- Easy to use and handle; any gasoline vehicle can take E10
- With LD market in U.S. heavily leaning toward gas, is alternative option for that market (one of the few countries so heavy on gas)
- Renewable; helps farmers; cellulosic opportunity is huge
- Availability of FFVs growing (GM offers 17 models in ’07!)
- FFVs are affordable, typically costing no more than a gas version
- Higher octane = more power; E85 is typically 100-105

CONS

- Higher blend requires vehicle capable of handling that level of alcohol (silver lining – can adjust non FFV to run on only E85)
- Infrastructure may need some parts replacement, or may have to use new equipment
Biodiesel – Pros & Cons

**PROS**

- Cost competitive most of the time (fuel economy; subsidies)
- *Is the only alt fuel that can yield increased economy* and power
- No new vehicles or infrastructure required
- Fill-n-go option at B20 or less
- Renewable; helps farmers
- Less smoke, smell and noise
- Biodegradable; nontoxic
- Helps equipment last longer; less wear and tear

**CONS**

- Can require fuel filter changes at the onset of usage (easy)
- Gels faster than diesel, so precautions must be taken during wintertime use (easy)
## Biodiesel Emissions Reductions
*(from NREL 2001)*

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>B20</th>
<th>B100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon dioxide (CO2) <em>life-cycle</em></td>
<td>-15%</td>
<td>-75%</td>
</tr>
<tr>
<td>Carbon monoxide (CO)</td>
<td>-13%</td>
<td>-43%</td>
</tr>
<tr>
<td>Hydrocarbons (VOCs)</td>
<td>-11%</td>
<td>-56%</td>
</tr>
<tr>
<td>Nitrogen oxides (NOx)</td>
<td>+1-2%*</td>
<td>+6%</td>
</tr>
<tr>
<td>Sulfur dioxide (SO2)</td>
<td>-19-20%</td>
<td>-99%</td>
</tr>
<tr>
<td>Particulate matter (PM)</td>
<td>-12-18%**</td>
<td>-55%</td>
</tr>
<tr>
<td>Carcinogenic compounds</td>
<td>-20%</td>
<td>-80-90%</td>
</tr>
<tr>
<td>Air toxics</td>
<td>-12-20%</td>
<td>-60-90%</td>
</tr>
</tbody>
</table>

*With a low-NOx additive, can be a 5-40% reduction. Additionally, new studies show reductions in NOx in new engines w/o additives.

**Over 90% of diesel PM is PM-2.5 or smaller, with about 70% being 1 micron or smaller in size.*
Air Quality Benefits of Biodiesel

Complete Life Cycle/Fuel Cycle -
“An Overview of Biodiesel & Petroleum Diesel Life Cycles”
- May 1998, joint DOA + DOE

Figure 13: Life Cycle Air Emissions for B100 and B20 Compared to Petroleum Diesel Life Cycle Air Emissions
Regional Fleets - Biodiesel
Biodiesel Explosion in ET – 3/04
Consumption in 2003: zero gals B100
Biodiesel Explosion in ET
B100 use (gal): ’03-0, ’04-90k, ’05-750k, ’06-1.4m
Public stations: ’03-0, ’04-5, ’05-17, ’06-24
ET Public Biodiesel Stations
(there were none in March 2004)
As of 9/12/06: 24 -- B99 - 2, B20 - 20, B5 - 2

Type of Biodiesel Public Station
B5 - 5% biodiesel in blend
B20 - 20% biodiesel in blend
B99 or B100
B5 or B20 - to open this year
Working toward Alt Fuels Highway Signage in the SEAFFF and in TN

Before

After!
Cookeville Marathon station - potential for B20 here
For me, part of the "why."

Conner, 1.5 years
Options for How Students Can Become Actors for Change

**Presentation to School Bus Drivers** – The ETCFC will help you develop materials to use to bring your case to the school’s bus drivers through a meeting/presentation. You can use our slides as you wish, if you wish. The gist is to tell them you’d appreciate their support and use of cleaner, American fuels that help the country and the community at the same time!

**Presenting our “Station Cards” to Local Stations, or to Bus Drivers**

– Use these FREE cards to show local stations that you want biofuels offered there, or give them to interested bus drivers who can do the same! Using biodiesel is easy, it just takes the desire and a little work!

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**Attention service station owner / operator:**

I am giving you this card to express my interest in clean burning, domestically produced renewable fuels. Biodiesel and ethanol are easily integrated into existing gasoline infrastructure. Ethanol can be blended with gasoline and biodiesel with diesel. I would like to purchase these biofuels at your station. The use of biofuels will help diversify our fuel supply and reduce toxic vehicle emissions which will benefit our economy, health and environment. Use of biodiesel and ethanol can also help reduce our nation’s dependence on foreign oil, which directly affects our national security. Biofuels are an important key to a cleaner and more secure future. I hope that you will ensure your place in this future by selling biodiesel and/or ethanol at your station.

Sincerely,

Name:

Address:

City, State:

For more information, contact:

Jonathan Overly, Executive Director
East Tennessee Clean Fuels Coalition
865-974-3626 – joverly@utk.edu
Visit our Web site: www.etcfc.org
“You must be the change you want to see in the world.”

Ghandi
Leave the World a Better Place than You Found It.

Your Link to Alternative Fuels Information in East Tennessee:

ETCleanFuels.org
(865) 974-3625

Questions?