Energy Independence

Security – Environment - Economy

Dr. Sam Shelton
Strategic Energy Institute
Georgia Institute of Technology
Mission

• Develop technologies, policies and educational programs that have the potential for offering high impact solutions to near-term energy issues

• Engage in fundamental energy research that will have a long–term, transformative effect on our nation’s energy future
US Energy Independence
Energy Independence?

Origin:

- OPEC Oil Embargo, Oct 1972 – Mar 1973
  - 40 Year Anniversary
- Crippled Our Society
- Energy Independence Declared as Policy Goal
  - Every President since Pres. Nixon
## Oil Independence Progress

<table>
<thead>
<tr>
<th>Year</th>
<th>Oil Imports</th>
<th>% of US Oil Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>1972</td>
<td>2.2 million bbls/day</td>
<td>19%</td>
</tr>
<tr>
<td>2011</td>
<td>8.9 million bbls/day</td>
<td>61%</td>
</tr>
</tbody>
</table>
Million Barrels per Day

- U.S. Oil Consumption
- Alaska EIA
- Lower 48 EIA
## Oil Drilling Activity vs Production

<table>
<thead>
<tr>
<th></th>
<th>Active Drilling Rigs</th>
<th>Oil Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saudi Arabia</td>
<td>50</td>
<td>11 million Bbls/day</td>
</tr>
<tr>
<td>United States</td>
<td>1,500</td>
<td>5.5 million Bbls/day</td>
</tr>
</tbody>
</table>
US Oil Imports are Greater than Production
Oil Imports

US Imports or North America Imports?
N. America Oil Independence

- Outside N. Amerian Imports: 34%
- N America Oil Produced: 66%
Transportation Fuels

- Gasoline: 72%
- Diesel: 23%
- Ethanol: 5%
- CNG/Propane: 0%

Oil is About Transportation
What about other Fuels?

- Oil
- Natural Gas
- Coal
- Renewable
Energy Independence is still About Oil
Liquid Petroleum
US Liq Petroleum Sources

- Oil Imports: 50%
- Oil Produced: 32%
- NG Liq: 13%
- Ethanol: 5%
<table>
<thead>
<tr>
<th>NGL Component</th>
<th>NGLs Percent</th>
<th>Utilization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethane</td>
<td>42%</td>
<td>Manufacturing Plastics</td>
</tr>
<tr>
<td>Propane</td>
<td>28%</td>
<td>Dominantly Building Heating, Transportation</td>
</tr>
<tr>
<td>Butane</td>
<td>7%</td>
<td>Manufacturing, LPG, Transportation</td>
</tr>
<tr>
<td>Isobutane</td>
<td>10%</td>
<td>Manufacturing</td>
</tr>
<tr>
<td>Pentanes</td>
<td>14%</td>
<td>Transportation</td>
</tr>
</tbody>
</table>
Natural Gas Production
Shale Gas Reserves Estimate

- US DOE Energy Information Agency:
  - Shale Gas Reserves Reduced 827 to 482 TCF (2011)
Natural Gas Vehicles

Direct Gas Displacement for Oil

$12,500 Incremental Cost (ARPA-E)
Economics
Southeast Clean Energy Opportunities

Southern Pine Cellulosic Ethanol Potential

Displace 15% of Georgia Gasoline
Summary

- US Energy Independence is about Oil
  - ~$1 Billion/day for Imported Oil

- US is Independent for Electric Power
  - Gas, Coal, Wind, Solar, Nuclear Fueled
Summary (Cont.)

- Corn Ethanol Displaces ~0.7 million Bbls Oil/day
- Southern Pine is SE Ethanol Resource
Summary (Cont.)

- Must have Energy Policy to Move to Energy Independence
Thank You