**Energy future**

### Topics:
- Reserves vs. Resources
- US production history
- Global oil supply
- Oil prices
- Non-conventional oil

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### U.S. Energy Use

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>Percentage</th>
</tr>
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<tbody>
<tr>
<td>Oil</td>
<td>39%</td>
</tr>
<tr>
<td>Gas</td>
<td>24%</td>
</tr>
<tr>
<td>Coal</td>
<td>23%</td>
</tr>
<tr>
<td>Nuclear</td>
<td>8%</td>
</tr>
<tr>
<td>Renewable</td>
<td>6%</td>
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</tbody>
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**Non-renewable**

**Petroleum 63%**

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### How long will oil last?
- We don’t know exactly
- How do you measure something you can’t see?
- We are using oil faster than we are discovering it.

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### Resources vs. Reserves
- Resource
  - Petroleum *believed* to exist on the basis of geological parameters
- Reserves
  - Petroleum *known* to exist and which can be produced economically.

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### US Oil Production History
- The oil industry started in the USA
- The US is the biggest oil market
- The US is the best explored part of the world
- Therefore….
  …we can use the US history as an analogue for the rest of the world
US Oil Production

Discoveries v. Consumption

- Since 1970
  - Consumption 4
  - Discoveries 1
- 90% of today’s oil was discovered more than 30 years ago

What about the future?

- You can’t produce oil that you have not discovered yet
- This allows us to forecast future production

The area under the two curves must be the same
**Annual Oil Discovery**

*Figure 3: Exxon-Mobil annual oil discovery*

<table>
<thead>
<tr>
<th>Billions of Oil-Equivalent Barrels</th>
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- Annual oil discoveries between 1900 and 2000.

**World Oil Supply**

*Figure 5: World oil supply*

- Discoveries vs. Production over time.

**Will we run out of oil soon?**

- No, there is a lot of oil out there.
- However, demand will keep increasing.
- As shortages develop, prices shoot up.
- We are already experiencing this process.

**What about the market place?**

- Price of oil is tied to short term supply and demand.
- Price of oil is deeply tied to global politics.
- The price of oil determines how much exploration is done at any given time.
Why did the price increase in the last three years?

- Global demand increased due to economic growth in China
- OPEC is producing at full capacity
- There were lost of disruptions of the supply chain
- Hurricanes in the Gulf, messy politics in Venezuela, unrest in Nigeria, war in Iraq, etc

Oil Tanker

Sources of US Oil

- US imported 58% of its oil (as of 2004)
- Canada (17%)
- Saudi Arabia (14.5%)
- Mexico (13%)
- Venezuela (11%)

The investment in Exploration has not paid off recently

- EXXONMobil exploration = “Wealth destruction”
- Shell: Cut their reserves estimate by 20% in 2004
- Most recent big discoveries are gas not oil
- Most recent big discoveries are in deep water (expensive)

What is going to happen?

- Reserves depend on economics
- Reserves=
  - Petroleum known to exist and which can be produced economically
- As price increases more expensive methods of extraction are possible
Non-Conventional Petroleum Resources

- These could add a large amount to the resource base:
  - Tar sands
  - Shale oil
  - Gas hydrates
  - Coal to liquids
- As price increases technology to develop these resources becomes economical

Better efficiency will extend the life of the resource

Oil Rig

What about us?

Are we doing a better job?
