Hydraulic Fracturing
What Does it Mean for America?

Isaac Orr
America First Energy Conference
Overview

• Where Do We Get Our Energy?
• What is Fracking?
• Environmental Impacts
• Economic Impacts
Imagine Your Phone Battery

- Imagine our total energy use is represented by your phone battery.
- If your phone could be charged to any percentage, which percentage would you pick?
- Where does our energy come from?
Solar

0.6%
Wind

2.2%
Wood

1.9%
Hydro

2.4%
Nuclear
Coal

15%
Natural Gas

29%
Oil

37%
U.S. energy consumption by energy source, 2016

Total = 97.4 quadrillion British thermal units (Btu)

- **Petroleum**: 37%
- **Natural gas**: 29%
- **Coal**: 15%
- **Nuclear electric power**: 9%
- **Renewable energy**: 10%

Total = 10.2 quadrillion Btu
- **Geothermal**: 2%
- **Solar**: 6%
- **Wind**: 21%
- **Biomass waste**: 5%
- **Biofuels**: 22%
- **Wood**: 19%
- **Hydroelectric**: 24%

Note: Sum of components may not equal 100% because of independent rounding.

Source: U.S. Energy Information Administration, *Monthly Energy Review*, Table 1.3 and 10.1, April 2017, preliminary data
What if We Run Out?

US CRUDE OIL & NATURAL GAS PRODUCTION
1946 - 2014

SOURCE: IEA ANALYSIS, DATA: US ENERGY INFORMATION ADMINISTRATION
We’re Not Running Out
Natural Gas From Fracking


- From hydraulically fractured wells (67% in 2015)
- From nonhydraulically fractured wells (33% in 2015)
Oil From Fracking

Oil production in the United States (2000-2015)

- from hydraulically fractured wells (51% in 2015)
- from nonhydraulically fractured wells (49% in 2015)
Shale Energy: Don’t Take it for Granite

Shale Plays, Lower 48 States
This change is driven by production from unconventional reserves using fracking and horizontal drilling.

**Shale And Tight Oil Production**

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<th>Year</th>
<th>Eagle Ford (TX)</th>
<th>Bakken (MT and ND)</th>
<th>Spraberry (TX and NM Permian)</th>
<th>Bone Spring (TX and NM Permian)</th>
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Source: EIA.

**Dry Shale Gas Production**

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US Oil and Gas Production
America Energy Independent?

Total U.S. Crude Production vs Imports
(Excludes NGL's & Biofuels)

- Crude Production
- Crude Imports

U.S. Imports Falling!
U.S. Supply Up ~4 MMBpd in 5 yrs???
U.S. Supply Down ~4 MMBpd in 35 yrs.

Source: EIA, RJ estimates
America - Net Energy Exporter
Explaining Porosity and Permeability

Conventional Reservoir
Sandstone

Unconventional Reservoir
Shale
Shale is Kind of Like Bubble Wrap
Conventional and Unconventional Drilling
Fractures & Sand
Environmental Impacts

- WATER CONTAMINATION
- CHEMICALS
- EARTHQUAKES
- OH, MY!
Will There Be Impacts?

- Yes! Everything has an impact. Even tourism can spread invasive species.
- Nothing is black and white, must weigh costs vs the benefits. No free lunches etc.
- Are the environmental risks manageable?
- Engineers, geologists, hydrologists, environmental quality consultants are good at their jobs.
- State regulators have oversight to enforce environmental protection.
- States are often more effective regulators due to extensive knowledge of local geology.
Water Contamination
Gasland, Not Factland

- Well was drilled into a coal bed, a natural source of methane gas.
Five Year Study By EPA

- We did not find evidence that these mechanisms have led to widespread, systemic impacts on drinking water resources in the United States. –U.S. EPA
We Finally Agree on Something!

After today's @epa #fracking headline spin- it is clear that EPA is a political agency not a scientific one. Watch #gasland2 for more...

6/4/15, 11:47 AM

11 RETWEETS  6 FAVORITES

Mike Cortese @drebin25
.@gaslandmovie @EPA ROTFLMAO, gasbag

Reply to Josh Fox
Water Contamination

- Hydraulic fracturing process does not contaminate groundwater.
- Rapid upward migration of HF fluids are not physically plausible, (Flewelling and Sharma 2014).
- Well casings and cement can leak, how often this happens is a matter for discussion.
- Best estimates suggest approximately .33 PERCENT of wells leak.
- No HF chemicals found in groundwater.
Water Contamination

Shielding ensures safety

In the hydraulic fracturing process, they go far below underground aquifers. 10
That's comparable to an armored bank vault.

Ten inches of steel and concrete: it's protecting Mother Nature as well as clean-burning natural gas from deformations from Pennsylvania to Texas.

This vault-thick armor isn't just on top of gas wells, it's the industry standard. Fractured wells have multiple layers of cement to protect underground at the wellbores. On top of this protective armor, regulators and the industry are also well constructed means in addition to safety standards.
Chemicals
Some 3.3 billion barrels of wastewater were pumped into Oklahoma’s disposal wells from 2011 to 2013. That’s like redirecting the Mississippi River to pour water underneath Oklahoma for eight and a half hours, and scientists have linked that water to an increase in potentially damaging earthquakes.

A study published in Science last year concluded that four high-volume wells in southeast Oklahoma City may have contributed to a spate of earthquakes.
Earthquakes

- “We have concluded that hydraulic fracturing is not a significant mechanism for inducing felt earthquakes. It is extremely unlikely that any of us will ever be able to feel an earthquake caused by fracking.” - Richard Davies Ph.D. Durham Earth Sciences.
- Wastewater disposal from the fracking process can cause man-made earthquakes in certain circumstances.
- No injuries or property damage, but an issue that requires more study.
Wastewater, Not Frack Fluid
Fixing the Problem

- State regulators implement rules to make oil and gas producers in central Oklahoma to restrict wastewater disposal.

- The Oklahoma Corporation Commission says the new cuts should reduce disposal volumes by 40 percent from 2014 levels.

- The number of earthquakes with a magnitude 3.0 or greater has skyrocketed in Oklahoma, from a few dozen in 2012 to more than 900 in 2015.
OKLAHOMA M-2.8 AND GREATER EARTHQUAKES:
JUNE 2015 TO SEPTEMBER 2017

Sources: Oklahoma Geological Survey & Tulsa World
Economic Impacts

- Rising oil and gas production has created 1.7 million jobs in the U.S.
- Low energy prices have saved consumers millions.
- Low energy price have given manufacturers a competitive advantage.
Consumer Savings Means Real-Life Benefits

• Average family will has saved about $675 per year on gasoline compared to 2013 prices.

• Low natural gas prices have saved families anywhere from $181 to $432 per person, depending on geographic area.

• Imagine a single mother with two children living in Detroit. She will save $777 on natural gas alone, incorporating her savings at the pump, she could potentially save up to $1452 this year. In Mississippi, the state with the highest poverty rate, a family of four would save $1631 between lower gasoline and natural gas prices.

• Equivalent of working 225 hours at the Federal Minimum wage.
Human Impacts

• Reading to your kids is one of the most important ways to improve their educational performance, and according to the organization Reading Is Fundamental, a smaller percentage of children in poverty were read to, or told stories by a member of their family than children who were at, or above poverty.

• Childhood obesity rates are highest among low-income families. A study by the University of California, Davis, found that people who worked more hours were more likely to go to both fast-food and full-service restaurants.
Conclusion

- Hydraulic fracturing has greatly increased oil and natural gas production.
- This has cut energy imports dramatically.
- It is not harming the environment.
- It is spurring job creation and saving consumers money.