

The BOOM: How Fracking Ignited the American Energy Revolution and Changed the World. By, Russell Gold

Introduction

Three key issues of our day are Energy, Water, and Global Warming. This book reviews how they are intertwined and how they impact our future.

Important Energy Facts

1. Every day, the world consumes 90 million barrels of oil.
2. In 1970 10 million barrels of oil came from US wells. It then began a period of long, slow decline. By 2008 it was half the level at peak'. By 2020, US oil production will grow to an all-time high of 11.1 million barrels a day.
3. Much of our energy comes from overseas. Without thinking about it, we have exported the dirty work of finding and developing oil fields, along with the environmental and social costs, to other nations.
4. Burning coal generates 42% more carbon dioxide (CO₂) than crude oil, which itself generates 18% more CO₂ than natural gas.
5. Wind provided 0.3% of US power a decade ago. It is now about 4%.
6. Gasoline and diesel are hard to replace as transportation fuels because of there high energy densities. A battery requires 80 times more space and weight as gasoline and diesel.

History of Fracking

1. In the beginning, not fracking Shale, but more pourous rock to increase production.
2. The Roberts petroleum torpedo developed in 1866 and used to increase the production of wells.
3. 1901 Spindletop, Texas and others "gushers" in California and Oklahoma, the torpedo dwindled in importance
4. 1967, scientists detonated a 20-kiloton bomb outside Farmington, NM. Called Project Gasbuggy, it worked but the gas contained radioactive materials
5. 1977, Unconventional Gas Research Program (UGR) began and over the next 20 years contributed to the development of various ideas about how to produce gas
6. Mitchell Energy became interested in the Barnett Shale in Texas in the early 1980s. By mid-2012, rigs had drilled more than 15,000 Barnett wells, mostly in the four or five counties close to Fort Worth.
7. From a dribble of gas from Mitchell Energy's first well in 1982, it took 26 years for the fracking industry to reach an annual production of 1.84 trillion cubic feet of natural gas from shale. It took 2 more years to double to 3.68 trillion cubic feet and less than 2 more years to double again to 7.36 trillion cubic feet.
8. 1998, Nick Steinsberger suggests a revolutionary idea of using water instead of gel. His first well required 1.2 million gallons of water. Some modern wells use 5 times as much water.
9. 2001 Devon Energy bought Mitchell Energy for \$3.1 billion.
10. The current Bakken boom began in 2008,
11. 2004 EOG Resources introduced 'swell packers" a rubbery membrane. They seal off a section of the horizontal drill and allow the fracking of a shorter section.
12. 2008 Brigham Exploration used swell packers on a 2-mile long horizontal well and fracked the well in 20 segments. In 2006 it cost Brigham about \$40 per barrel from its Bakken wells, segmented fracking lowered the

cost to below \$16 per barrel. Output on wells increased from 100,000 barrels per well to about 500,000. Brigham eventually went to 40 fracks per well.

13. Fracking uses pressures of between 7,000 and 8,000 pounds per square inch, 200x the pressure in your car tires.
14. Nearly every well drilled in the US is fracked, that's 100 wells a day.

Why Fracking Developed in America

1. The decidedly pro-drilling legal framework is one of the reasons fracking was an American invention.
2. In many countries from Saudi Arabia to Mexico, in Europe and Africa, oil and gas belong to the state. America's private ownership of mineral rights turned out to be remarkably useful in the petroleum age

Oil & Gas Well Integrity

1. A steel pipe, called a casing, is inserted into wells. It is then cemented to secure the pipes and achieve "zonal isolation".
2. Only a tiny fraction of the \$5 billion spent on cementing is used to evaluate the cement itself.
3. According to the book, the reason that oil industry doesn't pay more attention to the cementing problem is because it costs money and there is no pressure to do anything.

What are the Key Issues

Development in Populated Areas

1. As of 2013, more than 15 million Americans lived within a mile of a well that had been fracked in the past few years.
2. There are concerns about the impact of fracking on water supplies, air quality and greenhouse gases.
3. Some nations require proof that a new technology will not cause public harm before companies can engage in it. The United States does not subscribe to this approach.

Development of Alternative Energy

4. The availability of inexpensive natural gas is replacing coal as a fuel for electric power generation, however, it is also making it harder for new wind and solar plants to compete. The glut of cheap natural gas is directly competing with renewable energy sources.

Climate Change

5. Fracking extends the age of fossil fuels for decades, a profound challenge to the climate.
6. Methane, the primary ingredient in natural gas, is a more potent greenhouse gas than CO₂. although it does break down in decades rather than centuries.

Water Use & Water Pollution

7. Improper well cementing is contributing to ground water contamination.

Earthquakes

8. Disposal wells are used by many companies to dispose of fracking fluid. These wells have two problems, they dispose of potentially drinkable water and they can lubricate existing faults and cause man-made earthquakes.