ENERGY: POWERED BY NORTH DAKOTA

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4th Grade North Dakota Content Standards in Science and Social Studies.

8th Grade North Dakota Content Standards in Science and Social Studies.
How Petroleum and Natural Gas are Recovered in North Dakota

- Billions of barrels of oil and natural gas are trapped in rock far below the surface of the Williston Basin.
- For many years, oil companies knew about this supply but were unable to get the oil out.
- In 2005, the first successful Bakken well was drilled in North Dakota using horizontal drilling and hydraulic fracturing.

Hydraulic fracturing, or fracking, is the process of using pressurized water to fracture, or crack, deep underground rock so that trapped petroleum can be released.

- Horizontal wells are drilled in order to reach the pockets of trapped oil.
- Water makes up about 90 percent of the fracking fluid, and sand makes up about 9.5 percent. The other half-percent consists of chemical additives.
- Some of the water used in hydraulic fracturing is cleaned of chemical and rock debris and is then used to frack additional wells. This is an enormous cost-saver.
- North Dakota is one of nearly 20 states that requires oil companies to list on a public website – www.fracfocus.org – the chemicals used in the fracking process.
Fossil Fuels

What petroleum and natural gas are:

- **Petroleum** is a flammable liquid mixture of hydrocarbons and other organic compounds found beneath the surface of the earth.
- Petroleum is commonly called **crude oil** or **oil**.
- **Natural gas** is a gaseous mixture of hydrocarbons, primarily methane, a colorless, odorless, flammable gas.
  - A hydrocarbon is a combination of hydrogen and carbon molecules.
- Natural gas and petroleum are fossil fuels that are often found together.
- Natural gas is the cleanest-burning fossil fuel.

Petroleum and natural gas are fossil fuels. The other fossil fuel is coal. In North Dakota, oil and gas are found primarily in rocks that are 300 to 500 million years old. Lignite (a type of coal) in North Dakota is roughly 82 million years old. The North Dakota Geological Survey estimates that oil in the Bakken Formation began forming 70 million years ago.

How fossil fuels were formed:

- Fossil fuels were created by anaerobic (without oxygen) decay of organic matter deep below the surface of the earth.
- Petroleum and natural gas were created from minicocol aquatic organisms such as zooplankton and algae. (Coal primarily formed from plants that grew on land.)
  - The enormous weight and pressure, together with very high heat, "cooked" the marine organisms into the liquid called petroleum.
  - As the heat increased, natural gas was created.
COAL/NATURAL GAS GENERATION

Instructions: Click on each component to learn more.
Locating Coal and Mining Challenges

Where coal is found:

- Western North Dakota contains about 351 billion (351,000,000,000) tons of lignite.
- The largest lignite mines are in Marior, McLean, and Oliver counties, near Beulah, Underwood, and Center.
- The Freedom Mine near Beulah is the largest lignite mine in the world.

Challenges of coal production:

- Surface mining temporarily changes the landscape.
- After the coal has been removed, the mined area needs to be reclaimed.
  - The rocks and dirt are returned to the area, the topsoil and subsoil are replaced, and the area is replanted.
    - Mining companies must prove that the reclaimed land is as good as or better than it was before coal was removed.
    - It costs mining companies from $30,000 to $60,000 to reclaim one acre of land.
    - Between 1,500 and 2,000 acres of land are disturbed and reclaimed in North Dakota each year.

Map courtesy of Lignite Energy Council.

Maps

During Mining Activity: [Image 1 of 2] - Aerial view photos show the
In addition to activities for each module, a READY-BUILT, FULL TWO-WEEK lesson plan package is available for download for Level One and Level Two!

Activities available in Word so teachers can edit as needed!
Mobile Friendly
Supplement with *Spotlight on ND Energy* – updated annually with all energy statistics and data!

Electronic copy available at [www.energynd.com/spotlight](http://www.energynd.com/spotlight)
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