How does fracking work?

ADDISON ANDERSON: Deep underground lie stores of once-inaccessible natural gas. This gas was likely formed over millions of years, as layers of decaying organisms were exposed to intense heat and pressure under the earth's crust. There's a technology called hydraulic fracturing, or fracking, that can extract this natural gas, potentially powering us for decades to come.

So how does fracking work? And why is it a source of such heated controversy? A fracking site can be anywhere with natural gas, from a remote desert to several hundred feet from your backyard.

It starts out with a long vertical hole, known as a wellbore, drilled down through layers of sediment. When the well reaches 2,500 to 3,000 meters, it's at its kickoff point, where it can begin the process of horizontal drilling. It turns 90 degrees and extends horizontally for about 1.5 kilometers through a compressed, black layer called the shale rock formation. A specialized perforating gun is then lowered and fired, creating a series of small inch-long holes that burst through the well's casing into the rock layer.

About three to four months after the initial drilling, the well is ready for fracking to begin. Fracking fluid is pumped down into the well at a pressure so high it cracks the shale rock, creating fractures through which the trapped gas and oil can escape. The fluid itself is more than 90% water. The rest is made up of concentrated chemical additives.

These vary depending on the specific characteristics of the fracking site, but usually fall into three categories-- acids for clearing debris and dissolving minerals, friction-reducing compounds to create a slippery form of water known as slickwater, and disinfectant to prevent bacteria growth. Sand or clay is also mixed into the water to prop open the fissures so the gas and oil can keep leaking out even after the pressure is released.

It's estimated that all of fracking's intense pumping and flushing uses an average of three to six million gallons of water per well. That's actually not a lot compared to agriculture, power plants, or even golf-course maintenance. But it can have a notable impact on local water supply.

And disposing of used fracking water is also an issue. Along with the trapped gas that's pumped up to the surface, millions of gallons of flowback liquid come gushing up. This liquid containing contaminants like radioactive material, salts, heavy metals, and hydrocarbons needs to be stored and disposed of. That's usually done in pits on site in deep wells or off-site at water treatment facilities.

Another option is to recycle the flowback liquid. But the recycling process can actually increase levels of contamination since the water is more toxic with each use. Wells are typically encased in steel and cement to prevent contaminants from leaking into groundwater. But any negligence or fracking-related accidents can have devastating effects. Fracturing directly into underground water, hazardous underground seepage and leakage, and inadequate treatment and disposal of highly toxic wastewater can potentially contaminate drinking water around a fracking site.

There's also concern about the threat of earthquakes and damage to infrastructure from pressure and wastewater injection. Links between fracking and increased seismic activity leave unresolved questions about long-term pressure imbalances that might be happening beneath our feet.

Fracking's biggest controversy, though, is happening above the ground. The general consensus is that burning natural gas is better for the environment than burning coal since the gas collected from fracking emits only half the carbon dioxide as coal per unit of energy. The pollution caused by the fracking itself, though, isn't negligible. Methane that leaks out during the drilling and pumping process is many times more potent than carbon dioxide as a greenhouse gas. Some scientists argue that methane eventually dissipates, so has a relatively low long-term impact.

But a greater question hangs in the air. Does fracking take time, money, and research away from the development of cleaner, renewable energy sources? Natural gas is nonrenewable. And the short-run economic interests supporting fracking may fall short in the face of global climate change. Experts are still examining fracking's overarching effects.

Although modern fracking has been around since the 1940s, it's boomed in the last few decades. As other sources of natural gas decrease, the costs of nonrenewable energies rise. And cutting-edge technologies make it so accessible. But many countries and regions have already banned fracking in response to environmental concerns. It's undeniable that fracking has reshaped the energy landscape around the world. But for what long term benefit and at what cost?