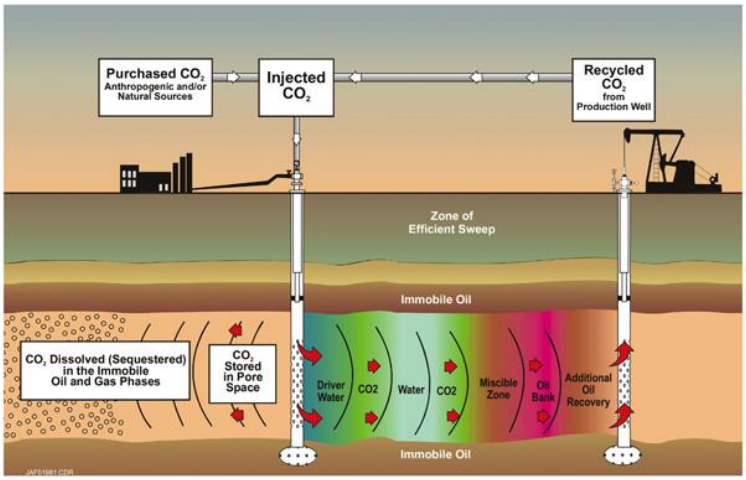
How does enhanced oil recovery (EOR) work?

Oil drilling is often an inefficient process. Conventional methods can leave behind 50-70% of oil in the ground. To tap more of the 'leftovers', oil companies developed a set of techniques called "enhanced oil recovery".

Carbon dioxide enhanced oil recovery is the most common form. It is a time tested method that pumps carbon dioxide underground to stimulate more oil production. For this reason, it's been championed by a diverse coalition of oil companies, coal producers, and some environmental groups.



Source: Advanced Resources International and Melzer Consulting, Optimization of CO_2 Storage in CO_2 Enhanced Oil Recovery Projects, prepared for UK Department of Energy & Climate Change, November 2010.

When pumped underground, carbon dioxide helps lubricate the oil (enabling it to flow more easily through pores) and it pushes the oil toward extraction wells, as shown in the diagram above. For more on the science, this video has a clear explanation for a proposed CO2-EOR project in California.

The oil industry (such as Shell, Chevron and Occidental Petroleum) have been independently researching and using CO2-EOR for more than four decades without issue. However, the companies have little experience in using *manmade* carbon dioxide. To date, the majority of carbon dioxide used in enhanced oil recovery has been from naturally occurring, concentrated sources underground.

Although power plants and industrial sources produce billions of tons of carbon dioxide each year, human carbon dioxide emissions were unsuitable for enhanced oil recovery because the carbon dioxide concentration was too low, on the order of 7-15%. Enhanced oil recovery also requires a highly pressurized gas, which is not readily generated from conventional power plants.

A few plants have recently come online that concentrate and pressurize manmade carbon dioxide are now online, such as Illinois' Archer Daniels Midland biofuel facility and Oklahoma's Enid fertilizer plant. The carbon capture technologies are still cost-prohibitive, but more advanced technologies are coming down the pipeline such as the ExxonMobil-backed FuelCell Energy and NETPower's Allam cycle technology. These types of next generation technologies would benefit from an extension of the 45Q tax credit, which provides a financial incentive to capture and sequester manmade carbon dioxide.