Carbon Capture

Carbon capture is the separation of carbon dioxide (CO_2) from emissions sources — such as power plants or industrial facilities — or from the atmosphere. The capturing of a concentrated stream of CO_2 makes it possible to store or reuse the gas; therefore limiting its impact as a greenhouse gas. Current research efforts are focused on systems for capturing CO_2 from coal-fired power plants, although the technologies will also be applicable to natural-gas-fired power plants, industrial CO_2 sources, and other applications.

How is CO_2 Captured?

CO_2 is separated from coal either before or after it is burned to produce energy. There are three basic types of technology for capturing CO_2 from power plants:

- **Post-combustion:** Applies mainly to conventional coal-fired power generation, but can also be used with combustion turbines fired by natural gas. This technology separates CO_2 from combustion exhaust gases in air and achieves capture using a liquid solvent. This technology is relatively well-known and is used to a limited degree.
- **Pre-combustion:** Converts fuel into a gaseous mixture of hydrogen and CO_2. The two gases are then separated and the hydrogen can be burned without producing any carbon dioxide in the exhaust gas. This technology is widely used in chemical production and some power plants.
- **Oxy-combustion:** In this process, coal is burned in oxygen instead of air, resulting in exhaust containing mainly CO_2 and water vapor. Because it yields an almost 100 percent CO_2 stream that is readily transportable, oxy-combustion has strong potential, but is extremely energy-intensive.

What Can You Do With the Captured Carbon?

Generally speaking, there are three possibilities:

1. **Use the carbon dioxide as a value-added commodity.** This can result in a portion of the CO_2 being permanently stored, such as in Enhanced Oil Recovery (EOR). In this process, captured CO_2 is injected into depleted oil formations to help push out some of the remaining oil that cannot be extracted through traditional techniques. EOR has been successfully used for at least 40 years. Oil companies currently inject about 48 million metric tons of carbon dioxide per year into depleted oil reservoirs.
2. **Convert the carbon dioxide to methane, biomass, mineral carbonates or other substances.** Concepts for converting CO_2 to other chemicals, especially fuels, are in the very early stages of research and not yet at commercial scale.

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3. **Store the carbon dioxide in underground formations**. Supercritical CO_2, behaving like a liquid, is injected into and stored in large porous formations in the sub-surface. There are decades of operational experience from several large-scale CO_2 storage projects with no resulting safety, health, or environmental effects. Scientists believe the earth has extensive capacity for safely and permanently storing injected carbon dioxide.