National Enhanced Oil Recovery Initiative

CO_2-EOR and Agriculture

The National Enhanced Oil Recovery Initiative brings together diverse public and private leaders to increase U.S. domestic oil production, energy security, and reduce emissions by capturing carbon dioxide (CO_2) from power plants and industrial facilities[1] and safely storing it in oil fields.

Launched in July 2011, the National Enhanced Oil Recovery Initiative's purpose is to develop policy recommendations to increase U.S. domestic oil production from existing oil fields through enhanced oil recovery (EOR) and to store CO_2 captured from power plants and industrial facilities. The private sector, government and NGO leaders participating in this initiative aim to enhance U.S. energy security, promote job and economic growth, and reduce CO_2 emissions.

The U.S. needs to capture more CO_2 to increase domestic oil production.

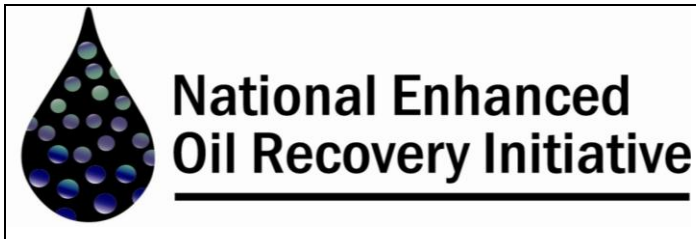
CO_2-EOR projects use CO_2 to access and mobilize oil that otherwise would not be produced using conventional technologies. One study states that with an increase in CO_2 supply and by applying existing best practices, CO_2-EOR has the potential to add as much as 60 billion barrels of oil to U.S. domestic oil production.[2]

Agricultural industries and communities can benefit from selling CO_2 to meet the growing demand for CO_2 to boost domestic oil production.

The agriculture sector can supply high purity, manmade CO_2 to access domestic oil resources in existing oil fields. Agriculture industry opportunities for capturing CO_2 to spur EOR expansion include:

- Ethanol production: The capture of biogenic emissions from ethanol production is technologically straightforward given the pure stream of CO_2 produced in the fermentation process. Many ethanol plants sell CO_2 to the food and beverage industry, but CO_2-EOR represents a much larger market.
- Domestic fertilizer production: CO_2 capture from fertilizer production is fully commercial and relies on the same proven technology platform used in compressing and dehydrating natural gas.
- Gasification of biomass with fossil fuels: CO_2 capture from gasification of biomass, by itself or with fossil feedstocks for production of electricity and liquid fuels, holds promise for increasing both domestic energy production and reducing carbon emissions.

Agricultural industries present an important, early opportunity to provide CO_2 for EOR because of the relatively low cost of capturing CO_2 from these types of facilities.



Build-out of pipeline infrastructure is required to support expansion of CO_2-EOR.
CO_2 pipelines have operated in the US for decades and there are currently over 3,900 miles of CO_2 pipelines. Additional infrastructure is required to expand domestic oil production by gathering CO_2 from sources such as ethanol and fertilizer facilities and transporting the CO_2 to EOR operations by pipeline.

Integrating CO_2-EOR with agricultural industries provides an opportunity for lowering the carbon intensity of agricultural products.
The environmental benefits of CO_2-EOR provides agricultural industries a commercially proven option for complying with emerging and expected state, regional and international low-carbon fuels policies. For example, capturing CO_2 from ethanol plants and permanently storing it in EOR formations significantly lowers the carbon intensity of the ethanol plant operation, and potentially commands higher prices in states with Low Carbon Fuel Standards and other policies that create incentives for lower carbon intensity fuels.

Agricultural industries are working to advance and integrate technologies that can contribute to expanding CO_2-EOR.
For example, ADM's Illinois Industrial Carbon Capture and Sequestration (ICCS) Project will be a commercial-scale example of a CO_2 capture and storage project at an ethanol facility and builds on ADM's experience with a smaller-scale project. ADM will capture one million tons of CO_2 per year at their ethanol production plant using dehydration and compression for transport, injection and geologic storage in the Mt. Simon Sandstone Formation. The ICCS project is carried out in partnership with the U.S. Department of Energy's National Energy Technology Laboratory.

Another example is Chaparral Energy, which has CO_2-EOR projects in Kansas, Oklahoma and Texas. Since 1982, the Chaparral and Merit Enid Fertilizer Project has captured and transported CO_2 from an ammonia nitrogen fertilizer plant in Enid, Oklahoma to EOR fields in southern Oklahoma. Every year, about 600,000 tons of CO_2 are captured and injected, demonstrating the longevity of manmade CO_2-EOR projects. Looking ahead to 2013, Chaparral will begin capturing about 850,000 tons of CO_2 per year from an ammonia nitrogen fertilizer plant in Coffeyville, Kansas, and will transport the CO_2 via pipeline approximately 70 miles to an EOR field for CO_2-EOR recovery and simultaneous carbon storage. This project will be the largest CO_2 capture and injection operation in N. America involving CO_2 emissions from a fertilizer facility.

[1] Examples of industrial facilities include fertilizer production, ethanol production, cement and steel plants.
[2] ARI, *Improving Domestic Energy Security and Lowering CO_2 Emissions with "Next Generation" CO_2-Enhanced Oil Recovery (CO_2-EOR)*, June 20, 2011, DOE/NETL-2011/1504.