How will regulations impact the economics of CO$_2$-EOR and CO$_2$ storage in Ohio?

Economic Analysis (Task 5.2):
Economic Impacts of EPA UIC Class II to Class VI Well Transition

Objectives
Laws, regulations, and compliance measures enforced by federal and local governing agencies play a significant role in the process and strategy to develop a CCUS project. The objectives of this subtask are to examine the U.S. Environmental Protection Agency’s (EPA) Underground Injection Control (UIC) well-class definitions, distinctions, and existing studies on Class II to VI well transitioning, and determine the potential impact of CCUS-related regulations and policies on the overall economic feasibility of specific source-sink scenarios in Ohio.

Analysis Methods and Data Sources
The potential financial impact of Class II to VI well transitioning and other CCUS-related policies was assessed by evaluating relevant well permitting processes and requirements established by the state-level ODNR regulatory framework as well as the federal EPA jurisdiction, and determining the primary differences between UIC Class II and Class VI well requirements (regulatory and permit). Federal EPA guidance documents were also reviewed to determine the potential technical requirements and economic impacts of transitioning from a Class II EOR well to a Class VI geologic storage well.$^{1,2,3,4}$ Estimated credits and costs of CO$_2$ storage conducted in association with EOR operations were derived from section 45Q of the U.S. Internal Revenue Service tax code$^5$, the Bipartisan Budget Act of 2018$^6$, and Advanced Resources International$^7$. Unit costs and credits were then incorporated into the CO$_2$-EOR cost models for the East Canton (ECOF), Morrow (MCOF), and Core (GCOF) consolidated oilfields.

---


Results

The EPA UIC Program designates Class II wells as those wells used for the injection of fluids associated with oil and gas production and Class VI wells as wells used for injection of CO₂ into subsurface rock formations for long-term geologic sequestration. The Ohio Department of Natural Resources (ODNR) Division of Oil and Gas Resources is the regulatory authority for Class II wells in Ohio. Over two-thousand Class II wells have been permitted in Ohio, with approximately 415 Class II wells reported as active in 2017. The federal EPA has direct permitting and oversight authority of Class VI wells in forty-nine states. North Dakota is the only state to have primacy over the UIC Class VI well program for geologic CO₂ injection and storage. As of 2017, seven Class VI well permit applications have been submitted in association with geologic CO₂ storage projects in the U.S., including six wells in IL and one well in KS.

Guidance documents provided by the EPA indicate a Class VI well permit is required if hydrocarbon recovery is no longer the objective of the operation and permanent CO₂ injection and storage is the primary purpose of the well. There were no cases of a UIC Class II to Class VI well transition reported as of 2017. A comparison of Ohio Class II and federal EPA Class VI well permit components is provided in Table 1. The primary differences between the two classifications reflect more stringent permit and regulatory requirements for Class VI wells relative to Class II wells, and include:

- submission of a long-term testing and monitoring plan
- reporting and record keeping requirements (pre-construction to post-injection phases)
- post-injection site care (PISC) and closure requirements
- submission and approval of an Emergency and Remediation plan
- permitting time-frame/duration of permit process

CO₂ storage credit is reported to be a key factor impacting an EOR operator’s decision to pursue CO₂ storage. As defined in Section 45Q of the U.S. Internal Revenue Code and the Bipartisan Budget Act of 2018, tax credit for storage of industrially-sourced CO₂ used as a tertiary injectant in EOR was approximately $11 USD/t CO₂ in 2016. A higher tax credit can be earned for a period of 12 years for CCUS projects that begin construction before year 2024, with the credit value calculated via linear interpolation between $12.83 and $35.00 for calendar years 2017 through 2025 and inflation adjustment thereafter. Estimated costs range from $0.79 to $4.02 USD/t of CO₂ for verifying CO₂ storage during EOR operations, and from $5.21 to $21.13 USD/t CO₂ for transitioning to dedicated CO₂ storage after EOR.

Table 1. Differences between UIC Class II and Class VI well permit components/requirements.


**Significance**

The significance of this work includes the following:

- A review of existing literature published by the Federal EPA and other industry experts determined CO₂ storage credit to be a key factor impacting an EOR operator’s decision to pursue storage, and the costs of verifying CO₂ storage during EOR are likely to be lower than the costs of fully transitioning to Class VI storage after EOR.

- The costs and credits associated with CO₂ storage during EOR were incorporated into the CO₂-EOR cost models for the three oil fields of interest to estimate the potential impact of CCUS-related regulations and policies on the overall economic feasibility of source-sink scenarios in Ohio.

For more information, refer to: "CO₂ Utilization for Enhanced Oil Recovery and Geologic Storage in Ohio, Task 5: Economic Analysis Topical Report.," OCDO Grant/Agreement OER-CDO-D-15-08, Columbus, 2018.