Legal and Regulatory Frameworks and Incentives for CCS/CCUS

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United States Energy Association (USEA)

Consensus Program Briefing
CO_2 Storage – Optimizing Large Volume First Mover Projects by Managing Short and Long Term Security and Liabilities

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Environmental, Regulatory and Policy Issues

Successful implementation of CCS/CCUS will require addressing critical environmental regulatory issues and keeping abreast of emerging policy issues, including:

- Taking advantage of 45Q tax credits
- Demonstrating "secure geologic storage"
  - EPA reporting requirements for storage with CO_2 EOR.
  - International (ISO) standards for establishing secure storage sites
- Obtaining storage site construction, injection, and operating permits
- Complying with Class II and/or Class VI injection and post-injection monitoring requirements

Main U.S. Efforts to Incentivize CCS

- **Bipartisan Budget Act of 2018 (BBA)**
  - **Enhancements to IRC Section 45Q**
- California Low Carbon Fuel Standards (LCFS)
- State Incentives/Regulatory Frameworks

CCUS Economics 101 – 45Q Example

Cost of Capture
- Equipment x Financing % Rate
- O&M
- Energy penalties

↳ **Less than:**

CO_2-EOR Storage

Total of: **45Q Tax Credit $35/ton** plus **EOR Sales Revenues** minus **Transport Cost to EOR field**

OR

Saline Storage

Total of: **45Q Tax Credit $50/ton** minus **Storage Charges by Saline Operator** minus **Transport Cost to Saline Reservoir**

IRS Section 45Q -- Highlights

Bipartisan Budget Act of 2018
▪ New facilities need to **"break ground" by EOY 2025.**
▪ Credit goes to the **owner of the capture equipment but** allows **transfer** of qualified credits.
▪ **$50/mt for geologic storage and $35/mt for EOR (reaches maximum value in 2026, increasing thereafter with inflation**).
▪ Capture > **500,000** metric tons CO_2/year for electric generating units; > **100,000** metric tons CO_2 /year for other industrial facilities.
▪ Available for **12 years** from date carbon capture equipment is placed in service.

Issues of Concern with 45Q

- Is 12 years of credits enough for commercial viability?
- What types of business models will involve?
- What will be the role and appetite for financial institutions and tax equity players?
- Is the 12/31/2025 deadline achievable for large, complex (e.g., power generation or direct air capture) projects?
- What impact will CCS have on electricity dispatch? Can 45Q enhance dispatch by lowering marginal costs?
- What if the tax credits are converted to “direct pay”?

Possible Federal Enhancements to Section 45Q Tax Credits -- Highlights

Carbon Capture, Utilization, and Storage Tax Credit Amendments Acts

- Extends the commence construction window to the end of 2030.
- Provides a direct pay option, rather than just a tax credit.
- Increases the 45Q credit value (different bills have different value targets)
  - To as much as $120 per metric ton for saline formations (some propose smaller increases).
  - To as much as $75 per ton for storage in oil and gas fields (some propose smaller increases).
- Amends other conflicting and disincentivizing provisions of the tax code.

SCALE Act

- Establishes the CO_2 Infrastructure Finance and Innovation Act (CIFIA) program to finance shared CO_2 transport infrastructure.

American Jobs Plan

- Establish ten “pioneer” facilities that demonstrate carbon capture retrofits; $15 billion in demonstration projects, including, but not exclusive to, CCS projects.
- Extends the commence construction window to the end of 2030.

Several bills also lower the threshold capture amount for various categories of facilities.

What Additional Support can States Provide?

- **Clear and supportive state regulatory policies**
- **Clear rules for long term storage**
  - CO_2 storage trust funds; rules for CO_2/pore space ownership, responsibility, and liability
- **CO_2 pipelines – common carrier/eminent domain**
- **Financial incentives for carbon capture**
  - Financial assistance, off-take priority, cost recovery, eligibility under “clean energy” standards, assumption of long-term liability
- **Tax incentives/optimization**
  - Additional tax credits for CO_2-EOR + storage, tax exemptions for “pollution control equipment” associated with CO_2 capture

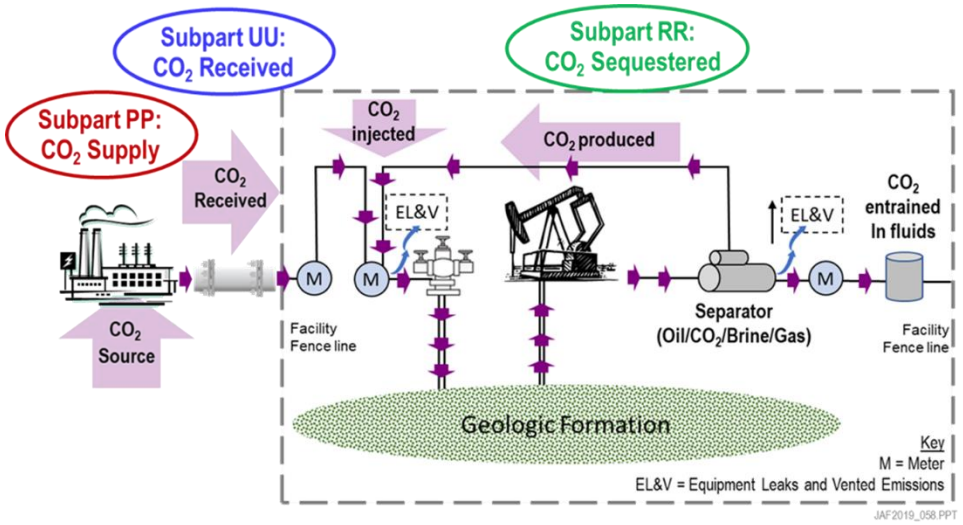
Steps in Pursuit of CCS with 45Q Credits

Achieving IRS certification for Section 45Q credits is the LAST step in a multi-step process. Working backwards:

- Getting the 45Q credits simply involves claiming the credits on IRS Form 8933.
- Entities claiming credits need to demonstrate that the CO_2 is injected into "secure geological storage."
  - Several methods are available for this demonstration.
- The MRV Plan generally presumes that permit applications for all injection wells have already been approved or have at least been submitted for approval.
  - This is not a trivial process.

Establishing "Secure Geologic Storage"

- EPA Greenhouse Gas Reporting Program (GHGRP) Subpart RR and federal/state Underground Injection Control (UIC) program rules are the status quo.
- For storage with EOR, accepted alternative to Subpart RR is the use of standards for EOR published by the International Standards Organization (ISO)
- Subpart RR:
  - Accounting framework only – no authority for containment assurance.
  - For CO_2-EOR, not required to report under Subpart RR unless operator chooses to opt-in
  - To get 45Q credits for EOR, operator must opt in.
  - Facilities reporting under Subpart RR must have an EPA-approved, site-specific monitoring, reporting and verification (MRV) plan.



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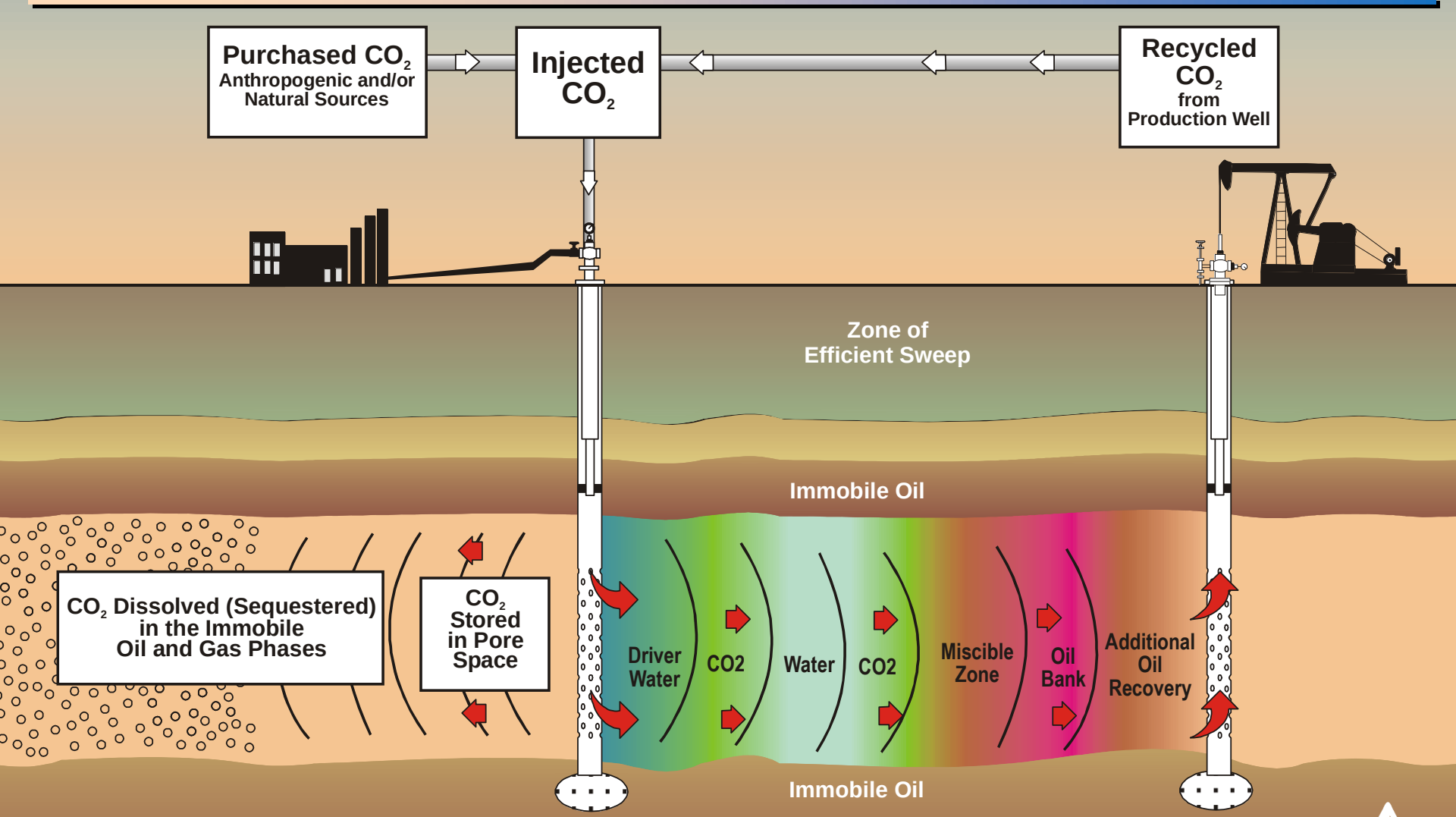
CO_2-EOR Technology: A Closed-Loop System



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Alternative Approaches for Establishing "Secure Geologic Storage" with CO_2-EOR

- Subpart RR of the EPA Greenhouse Gas Reporting Program (GHGRP)
- International Standards Organization (ISO) 27916: 2019
- The California Low Carbon Fuel Standard (LCFS) and associated CCS Protocol.

Subpart RR: Geologic Sequestration of Carbon Dioxide

- Accounting framework only – to report CO_2 sequestered on an annual basis – no authority for containment assurance.
- EOR facilities not required to report under Subpart RR unless operator chooses to opt-in, or wells are permitted as Class VI
  - To get 45Q credits for EOR, operator must opt in.
- Facilities reporting under Subpart RR must have an EPA-approved site-specific monitoring, reporting and verification (MRV) plan.

Major Elements of a Subpart RR MRV Plan

- Delineation of active and maximum monitoring areas
- Identification of potential surface leakage pathways for CO_2
- Strategy for detecting and quantifying surface leakage of CO_2
- Strategy for establishing the baseline for monitoring CO_2 leakage
- Site-specific variables that will be used for estimating leakage

Once the facility has an approved MRV plan, the following are required to be reported to EPA annually:

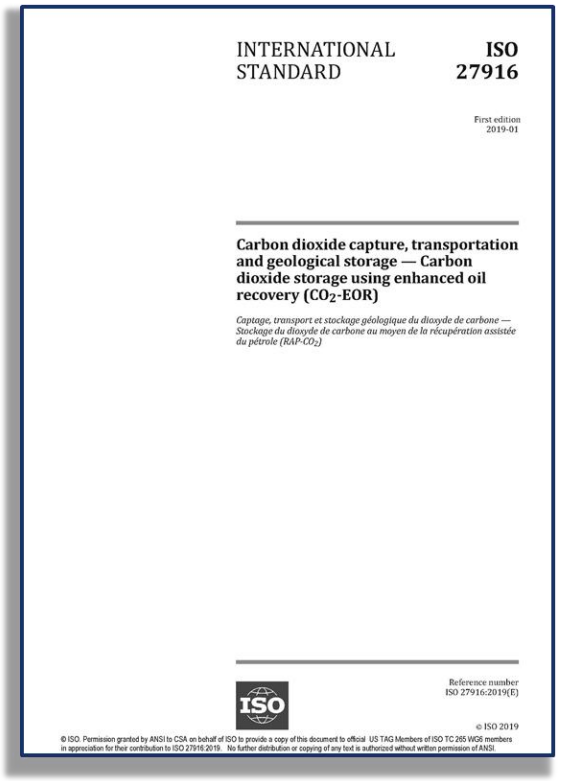
- Amount of CO_2 received, data used to calculate the amount, and the source of the received CO_2.
- Mass balance equation inputs used to calculate the amount of CO_2 sequestered.

ISO 27916-2019 --- Alternative to Subpart RR

***ISO 27916-2019* addresses three principal issues:**

- Safe, long-term containment of CO_2 stored in association with CO_2-EOR.
- Periodic / cumulative quantification of associated storage.
- Documentation provisions for operational management, containment assurance, quantification of storage, and termination.

Some stakeholders claim that ISO 27916-2019 addresses concerns with Subpart RR.


INTERNATIONAL STANDARD

ISO 27916

First edition
2019-01

Carbon dioxide capture, transportation and geological storage — Carbon dioxide storage using enhanced oil recovery (CO_2-EOR)

Captage, transport et stockage géologique du dioxyde de carbone — Stockage du dioxyde de carbone au moyen de la récupération assistée du pétrole (RAP-CO_2)

Reference number
ISO 27916:2019(E)

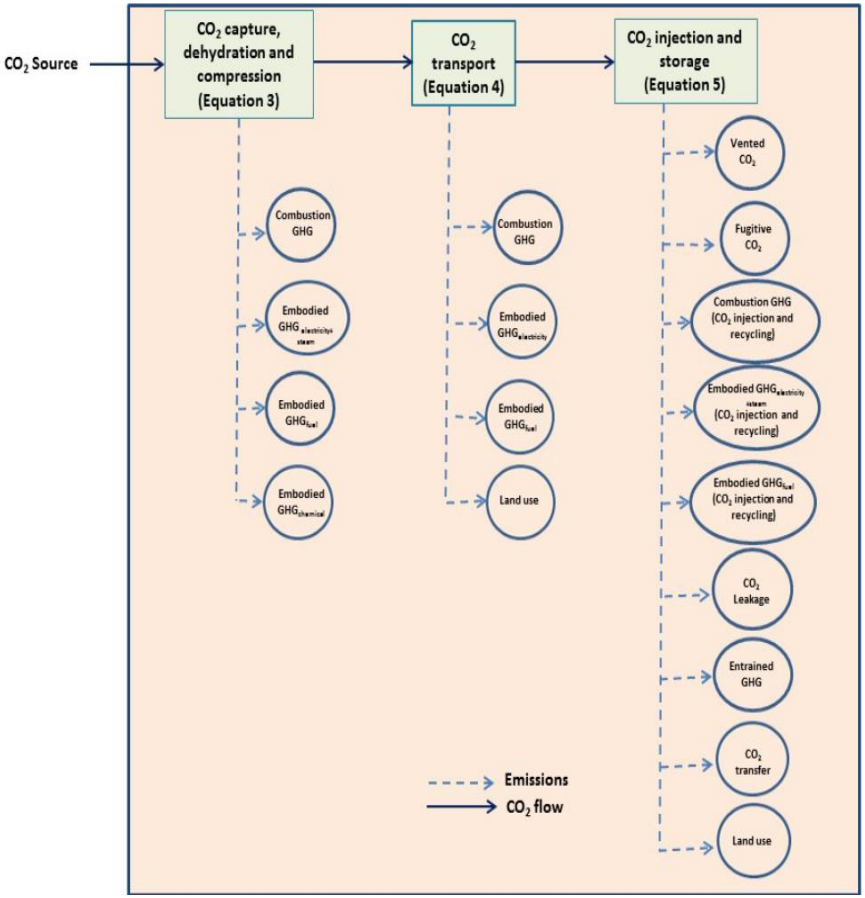
© ISO 2019

California Low Carbon Fuels Standard (LCFS)/CCS Protocol

Along with minimum site selection criteria, project must satisfy expansive set of requirements throughout its lifetime:

- Maintaining, updating and submitting changes to plans as necessary
- Constructing wells in accordance with specified standards
- Undertaking monitoring to ensure site integrity is maintained; no leakage
- Plugging wells that protect against leaks
- Monitoring the site for at least 100 years pos injection.

Requirements remain until site closure has been granted.



Highlights of Similarities and Differences

- **Mechanisms apply to different operational/storage situations:**
  - Subpart RR applies to saline storage & CO_2-EOR projects that "opt in"
  - ISO 27916 only applies to CO_2-EOR
  - LCFS/ Protocol applies to saline storage and CO_2-EOR
- **Responsible regulatory authorities vary:**
  - Subpart RR a reporting requirement, EPA enforcement applies only to reporting, and not containment assurance.
  - ISO 27916 is voluntary, cannot conflict with or override existing requirements or law; can only become binding if codified.
  - LCFS/CCS Protocol applies to anyone seeking credits under the LCFS, regardless of whether project is in California.

Highlights of Similarities and Differences

- **Subpart RR and ISO 27916 acknowledge applicability of existing regulatory programs.**
  - CCS Protocol regulates these activities explicitly; and those seeking credits under the LCFS must comply even if other jurisdictions also regulate the same activities.
- **Subpart RR/ISO 27916 are primarily performance-based.**
  - While LCFS/CCS Protocol often provides an extensive list of things that MUST be done.
- **No requirements are specified for post-injection site care and site closure under Subpart RR and ISO 27916; assumed addressed under other compliance requirements.**
  - Under LCFS/CCS Protocol, post monitoring must be at least 100 years after injection has been completed.

U.S. Regulation of CO_2 Injection/Storage

- From 20 years' worth of R&D, a significant foundation of experience regarding CO_2 storage has been established.
- In 2010, U.S. EPA promulgated Underground Injection Control (UIC) well (Class VI) requirements for geologic storage of CO_2.
  - All Class VI CO_2 storage wells permitted to date associated with R&D projects; rule originally not intended to apply to R&D projects.
  - Most of the commercial-scale CO_2 storage wells permitted to date and in operation are Class II wells associated with CO_2-EOR.
- EPA guidance confirms that CO_2-EOR via Class II wells can result in stored CO_2; conversion to Class VI is not required for assuring storage.

Permitting Considerations – Class II vs. Class VI

- Class VI permits for EOR operations are substantially more complicated that Class II permits
- Permitting Class II wells for EOR operations can be done more expeditiously than Class VI for geologic storage
- However, economics may be easier to predict for Class VI
- Some financial firms prefer supporting Class VI-based projects to promote "sustainability"

	Enhanced Oil Recovery	Geologic Sequestration
EPA Well Class	Class II	Class VI
Purpose	Injection for purposes of enhancing oil recovery	Injecting CO_2 into geologic formations for permanent storage
No. of Current Permitted Wells	~ 140,000	2
Vol. of CO_2 Injected	~ 70 million tonnes per year	~ 1.3 million tonnes per year
States with Regulatory Primacy	40	2
Approx. Timeline for Permitting	1-3 months	1- 3 years???

U.S. Regulatory Experience – Class VI

- To date, the timeline for obtaining Class VI permit approval has been long.
- Post injection site care (PISC) required until CO_2 plume is stabilized (regulations have 50-year "default").
- EPA still unclear on how to ensure financial responsibility.
- Process for allowing states to acquire primacy for Class VI well permitting has been slow.
- Need clarity on possible conversion from Class II to Class VI
- Greater Class VI regulatory certainty may be necessary to encourage large numbers of new Class VI projects.
  - However, this certainty may only come with "testing the system."

What Class VI Injection Permits Must Demonstrate

- Injection zone(s) of sufficient areal extent, thickness, porosity, permeability, and TDS concentration < 10,000 mg/l to receive the total anticipated volume of CO_2.
- Confining zone(s) free of transmissive faults/fractures and of sufficient areal extent and integrity to contain the injected CO_2 stream and displaced formation fluids and allow injection at proposed maximum pressures and volumes without initiating or propagating fractures in the confining zone(s).
- Identification of all underground sources of drinking water (USDW) in which the concentration of TDS is less than 10,000 mg/l to ensure that CO_2 from the injection zone will not migrate into any USDW.
- Maintenance of pore pressures in the injection zone at less than 90% of the fracture gradient.

Keys Parts of the Class VI Permit Application

- Summary of Operating and Reporting Requirements
- Area of Review and Corrective Action Plan
- Testing and Monitoring Plan
- Well Plugging Plan
- Post Injection Site Care and Site Closure Plan
- Emergency and Remedial Response Plan
- Well Construction Details
- Financial Assurance Demonstration
- Stimulation Plan

Challenges Faced by Regulators

- Limited developer experience in permitting Class VI wells applies also to regulatory agencies.
- Concerns exist that regulatory agency personnel much increase (and both the state and federal level), to handle the anticipated number of permit applications that could be forthcoming.
- Efforts being pursued in Congress and some states to increase staffing to meet this demand.
- Additionally, efforts are underway to develop training resources to give agency staff the tools and knowledge required.

Concluding Thoughts

- **Recent incentives – 45Q, the CA LCFS, and discussions on regional deployment initiatives – has created a new "buzz" associated with CCS/CCUS in the US:**
  - Coupled with continued strong investment in RD&D
- **However, substantial challenges remain:**
  - Need for clarity on 45Q implementation – early projects will be key indicator.
  - Lack of a track record for expediting approval for CO_2 storage projects.
  - Uncertainty/anxiety concerning the requirements for "certifying and quantifying" volumes stored
  - Are the timelines for commencing construction and receiving credits enough?
- **Nonetheless, if these challenges can be overcome, a major kick-start of CCS deployment could result.**

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