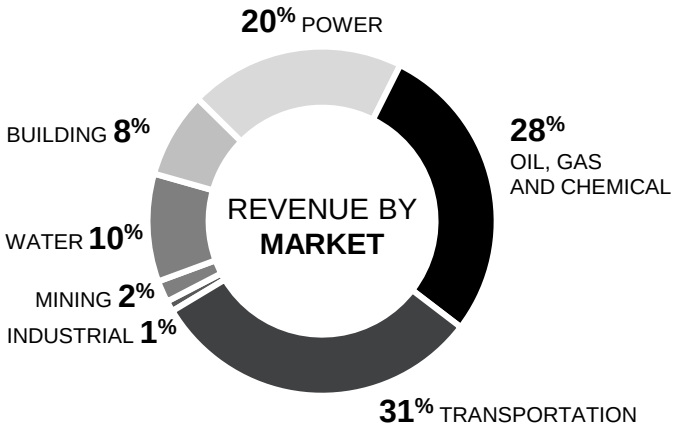
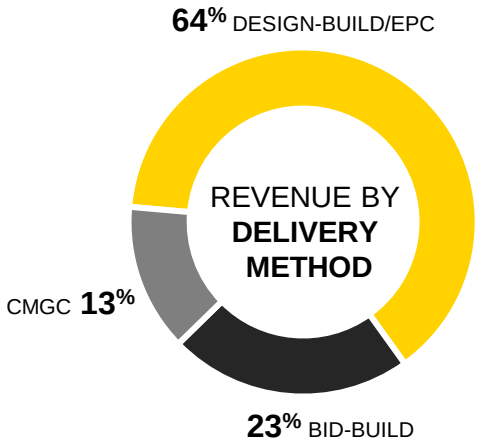
Kiewit

CARBON CAPTURE & UTILIZATION/SEQUESTRATION AN EPC'S PERSPECTIVE

BOB SLETTEHAUGH

KIEWIT OVERVIEW





$12.1 billion earned revenue in 2021.

$10.3 billion yearly average over the past 10 years.

Fortune 500 company for 20+ years.

One of the largest employee-owned construction and engineering firms in North America.

50+ million direct-hire manhours annually.

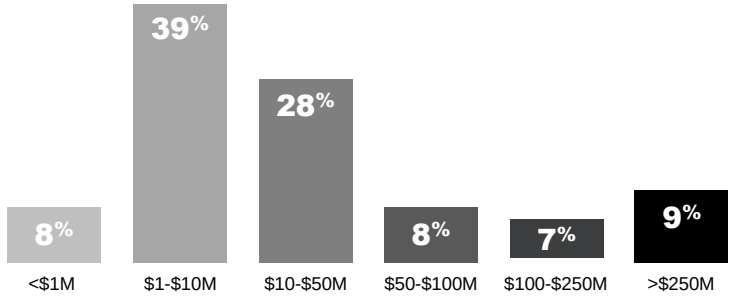
Self-performing scopes of work provides significant safety, quality and schedule advantages to our projects.

28,800 employees of mobile workforce.

16,400 craft
12,400 staff

PROJECTS BY **CONTRACT VALUE**

No job is too large or too small. We deliver world-class solutions to projects of every size



ENERGY TRANSITION MARKETS

Offshore wind
Onshore wind
Solar
Geothermal
Hydropower

Renewable diesel
Sustainable Aviation Fuel (SAF)
Renewable natural gas

Post-combustion
Direct Air Capture (DAC)
Utilization
Gathering/Purification
Other

Hydrogen
Ammonia
Electrification

Battery (BESS)
Hydroelectric energy storage
Other storage

Pyrolysis
Solvent

PETRA NOVA CARBON CAPTURE

Thompsons, Texas

OWNER

A joint venture of NRG Energy and JX Nippon Oil & Gas Exploration Corp with DOE funding

EPC TEAM

MHI and Kiewit subsidiary, TIC – The Industrial Company

CONTRACT

EPC, Lump Sum

KIEWIT'S SCOPE

General construction and balance-of-plant engineering for CO2 capture from 240 MW slipstream from coal power plant.

CO_2 CAPTURED

- ~4,700 tonne/day CO_2 Capacity
- 3.54 million tonne (2017 – 2019)
- 90+% capture efficiency (3-year average)

BASELINE AND FINANCIAL CHALLENGES

BASELINE – 2021

- Projects financially challenged with current 45Q
- Client expectations vs. Reality
- Risk profile for finance is challenged

FINANCIAL CHALLENGES

- Credit vs. direct pay
  - 15% impact
- Capex/ Opex tradeoffs drive uncertainties into the future
- Scale drives down $/tonne but can limit pool of investors

IN FOCUS

Congressional Research Service
Informing the legislative debate since 1914

Updated June 8, 2021

The Tax Credit for Carbon Sequestration (Section 45Q)

Carbon capture and sequestration (CCS) technologies are being proposed as an option to reduce greenhouse gas (GHG) emissions from coal- and natural-gas-fired power plants, as well as other large industrial sources. The tax credit for carbon oxide sequestration (Internal Revenue Code [IRC] Section 45Q) is intended to incentivize investment in carbon capture and sequestration.

What Is Carbon Sequestration?

Geological sequestration of carbon is the process of injecting carbon oxides into underground geological formations, where they are either permanently trapped or transformed. Usually this process involves carbon dioxide (CO_2), although injection and sequestration of other carbon oxides (e.g., carbon monoxide) is also possible. Geological sequestration is the final step in a CCS system. Geological sequestration is intended to permanently trap CO_2 emitted from anthropogenic sources, such as power plants or industrial facilities, thereby reducing net emissions of this GHG into the atmosphere. CO_2 can also be sequestered when injected underground for "tertiary" oil recovery, also known as enhanced oil recovery (EOR), from aging oil fields, a process used in the United States since the 1970s. Currently, CO_2 used for EOR comes predominantly from natural underground CO_2 reservoirs, although small quantities also come from anthropogenic sources.

An emerging technology to capture CO_2 directly from the atmosphere—"direct air capture" (DAC)—could also serve as a source of CO_2 injected for geological sequestration or EOR. For additional information on the technical aspects of CCS, see CRS Report R44902, *Carbon Capture and Sequestration (CCS) in the United States*.

The Sequestration Tax Credit (45Q)

The tax credit for carbon oxide sequestration—often referred to using its IRC section, 45Q—is computed per metric ton of qualified carbon oxide captured and sequestered. (Before 2018, the tax credit was exclusively for CO_2.) The amount of the credit, as well as various features of the credit, depend on when the qualifying capture equipment is placed in service (**Table 1**). The Bipartisan Budget Act of 2018 (P.L. 115-123), which was signed into law on February 9, 2018, made numerous changes to the Section 45Q tax credit, as discussed below.

For the purposes of the tax credit, qualified carbon oxide is a carbon oxide that would have been released into the atmosphere if not for the qualifying equipment. To claim a tax credit, the emissions must be measured at the point of capture as well as at the point of disposal, injection, or other use. If the captured carbon oxide is intended to be sequestered, it must be disposed of in "secure geological storage." Per IRC Section 45Q, secure geological storage includes "storage at deep saline formations, oil and gas reservoirs, and unmineable coal seams." The taxpayer has to repay the tax credit (credit recapture) to the Treasury if the carbon oxide ceases to be captured, disposed of, or used in a qualifying manner (i.e., if it escapes into the atmosphere).

Table 1. Key Elements of the Section 45Q Credit

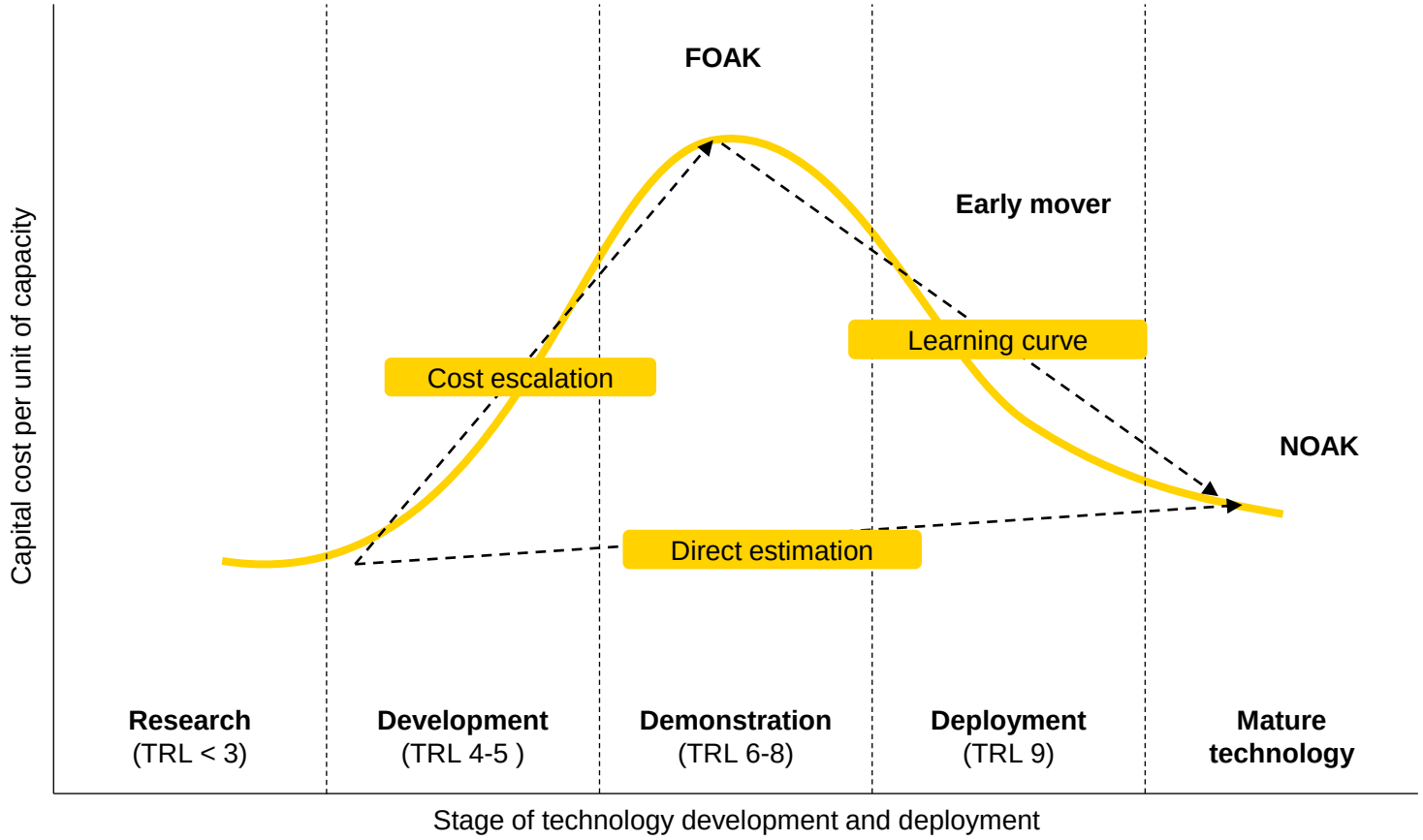
	Equipment Placed in Service Before 2/9/2018	Equipment Placed in Service on 2/9/2018 or Later
Credit Amount (per Metric Ton of CO_2)[a]		
Geologically Sequestered CO_2	$23.82 in 2020. Inflation-adjusted annually.	$31.77 in 2020. Increasing to $50 by 2026, then inflation-adjusted.
Geologically Sequestered CO_2 with EOR	$11.91 in 2020. Inflation-adjusted annually.	$20.22 in 2020. Increasing to $35 by 2026, then inflation-adjusted.
Other Qualified Use of CO_2	None.	$20.22 in 2020. Increasing to $35 by 2026, then inflation-adjusted.
Claim Period	Available until 75 million tons of CO_2 have been captured and sequestered.	12-year period once facility is placed in service.
Qualifying Facilities	Capture carbon after 10/3/2008.	Begin construction before 1/1/2026.
Annual Capture Requirements	Capture at least 500,000 metric tons.	Power plants: capture at least 500,000 metric tons. Facilities that emit no more than 500,000 metric tons per year: capture at least 25,000 metric tons. *DAC and other capture facilities*: capture at least 100,000 metric tons.
Eligibility to Claim Credit	Person who captures and physically or contractually ensures the disposal, utilization, or use as a tertiary injectant of the CO_2.	Person who owns the capture equipment and physically or contractually ensures the disposal, utilization, or use as a tertiary injectant of the CO_2.

Source: CRS analysis of IRC Section 45Q.

https://crsreports.congress.gov

COST EXPECTATION IMPACTS

COST CURVE VS. TECHNOLOGY READINESS LEVEL



Source: https://www.sciencedirect.com/science/article/pii/S0306261917313405

INFRASTRACTURE INVESTMNET & JOBS ACT / BUILD BACK POTENTIAL IMPACTS

CONCEPT	COST	SCHEDULE
Prevailing wage	↑	—
DOE loan	↓	↑ (NEPA)
75% of facility emissions	↑	↑ $/tonne may scale better

RISK PROFILE AND PROJECT FINANCE

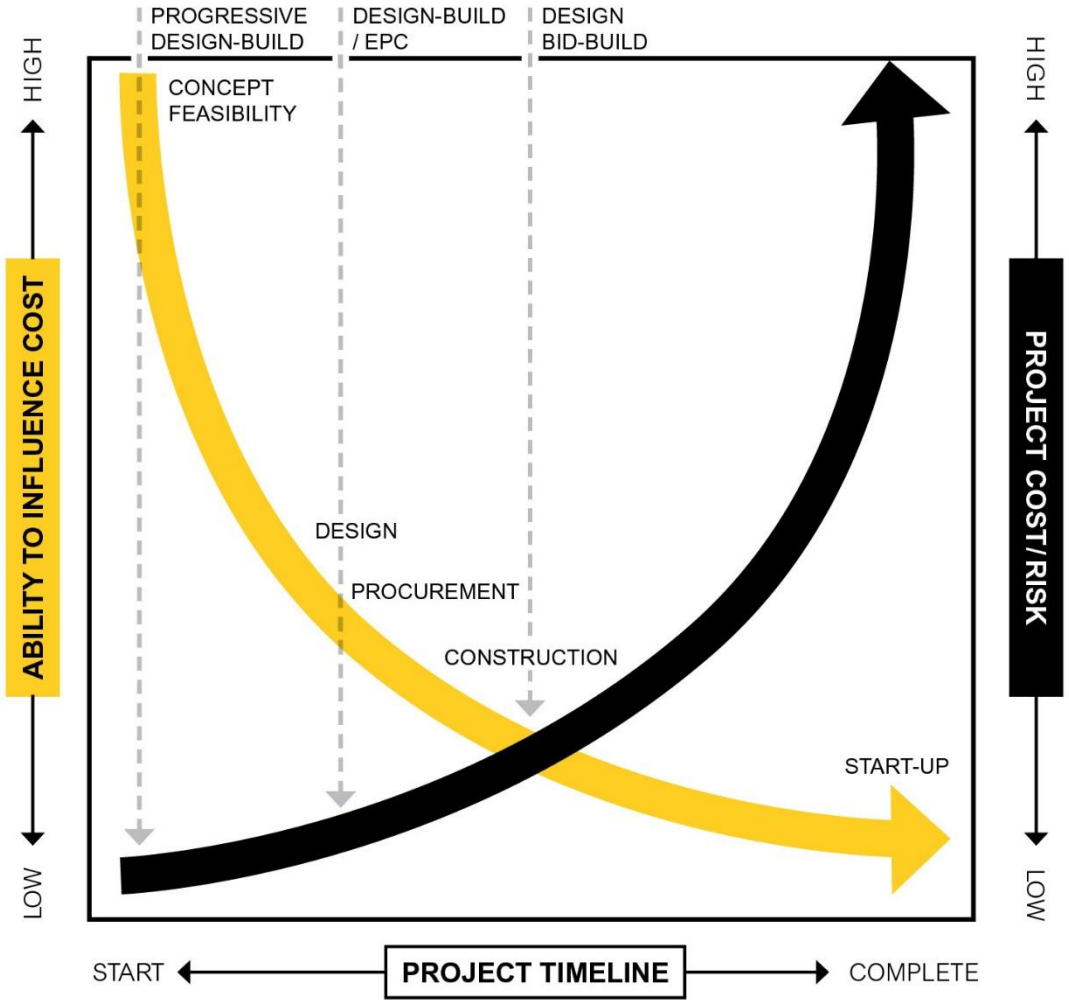
RISK PROFILE

- Competing for revenue with onshore / offshore wind and solar
- ESG exposure
- 45Q / CCUS / offset market
- Well known and understood technology and markets (renewables) vs. niche
- Power | No secondary product driving investment → CCUS competes with renewables + storage

PROJECT FINANCE

- Non-recourse, money available
- Risk transfer at well / storage and claw back potential

EARLY CONTRACTOR INVOLVEMENT



Uses the knowledge and experience of the contractor in early development stages of a project.

» ***Efficient execution in a collaborative environment across:***

- *Planning*
- *Design*
- *Procurement*
- *Execution*

PROJECT DELIVERY FROM FEASIBILITY TO COMMISSIONING

STAGE GATES

EPC CONTRACT

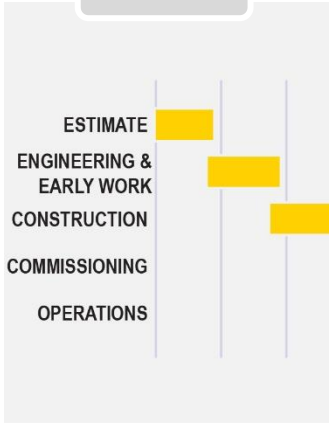
SUBSTANTIAL COMPLETION

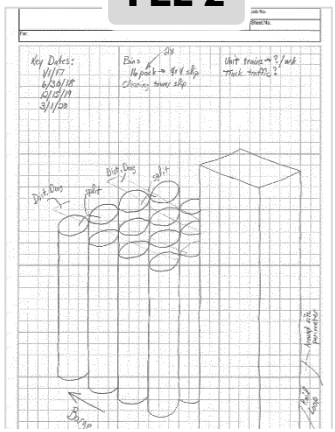
FEL-0/1

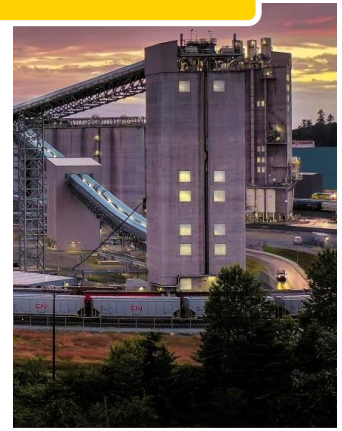
FEL-2

FEL-3

EPCC PHASES



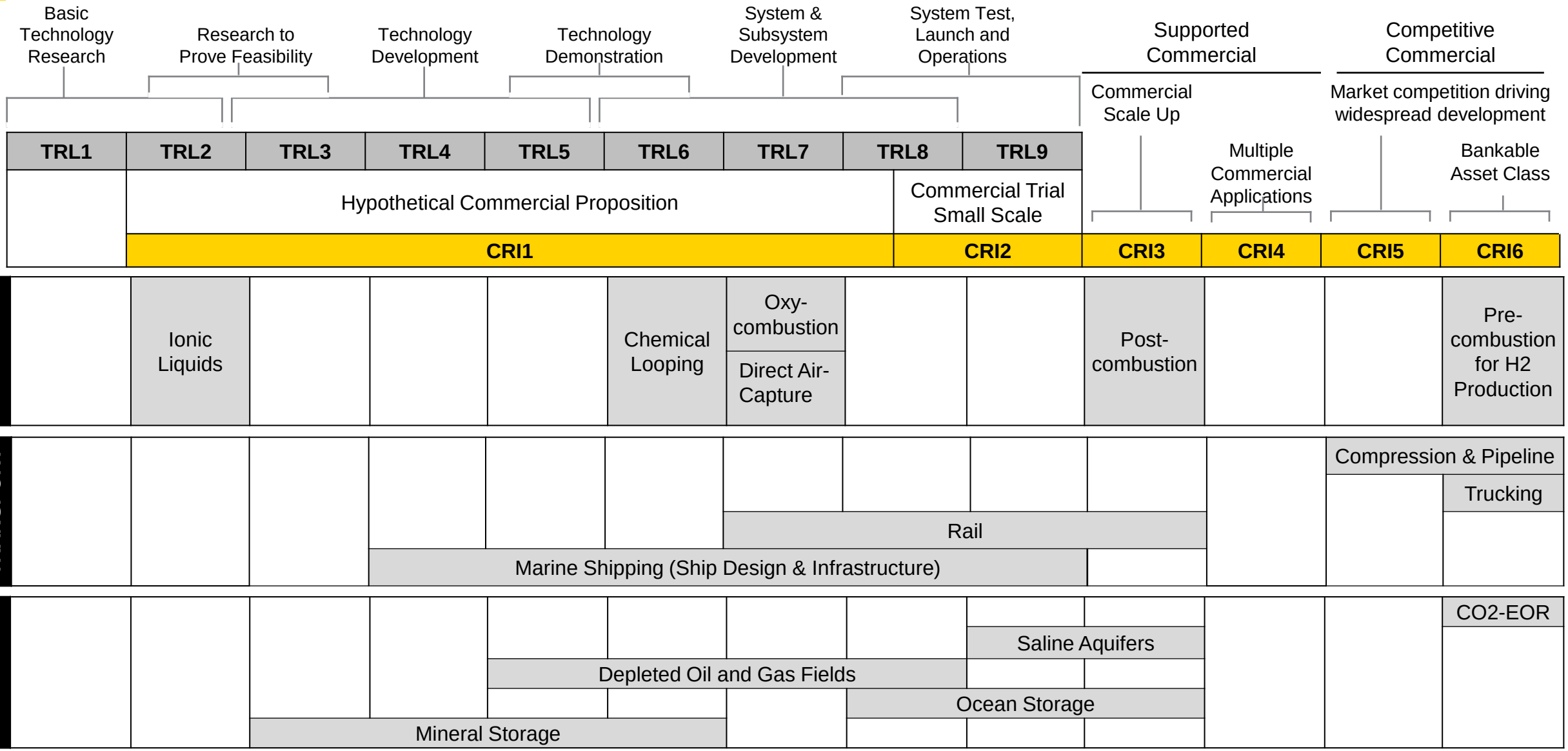




IDENTIFICATION & FEASIBILITY	PRELIMINARY DESIGN	DEFINITION / FEED	DETAILED DESIGN	CONSTRUCTION & INSTALLATION	COMMISSIONING & STARTUP	OPERATIONS
• Strategic business assessment & risk identification • Site selection • Develop preliminary plot plan, BFD's, equipment list and overarching project timeline • Perform key studies • Identify strategic partners	• Develop preliminary process flow diagram and utility flow diagram • Align basis of design and overall strategy • Develop permitting and project execution strategies • Freeze scope	• Develop preliminary 3D model • Finalize plot plans and equipment layout • P&ID's • Modularization studies • Detailed EPC Execution Plan • Cost certainty (+/- 10% EPC cost estimate)	• Deliver issue for construction documents and process control plan • Equipment requisitions	• Prepare work packages • Review field condition • Schedule operator training	• Optimize process controls • Perform acceptance testing • Provide classroom operator training	• Integrate into enterprise resource planning software • Optimize equipment and processes • Review key performance

CO2 CAPTURE SUPPLY CHAIN

Technology Readiness Level and Commercial Readiness Index



Source: "Technology status for CO2 capture, transport and storage", Gassnova, 2019.

KEY TAKEAWAYS

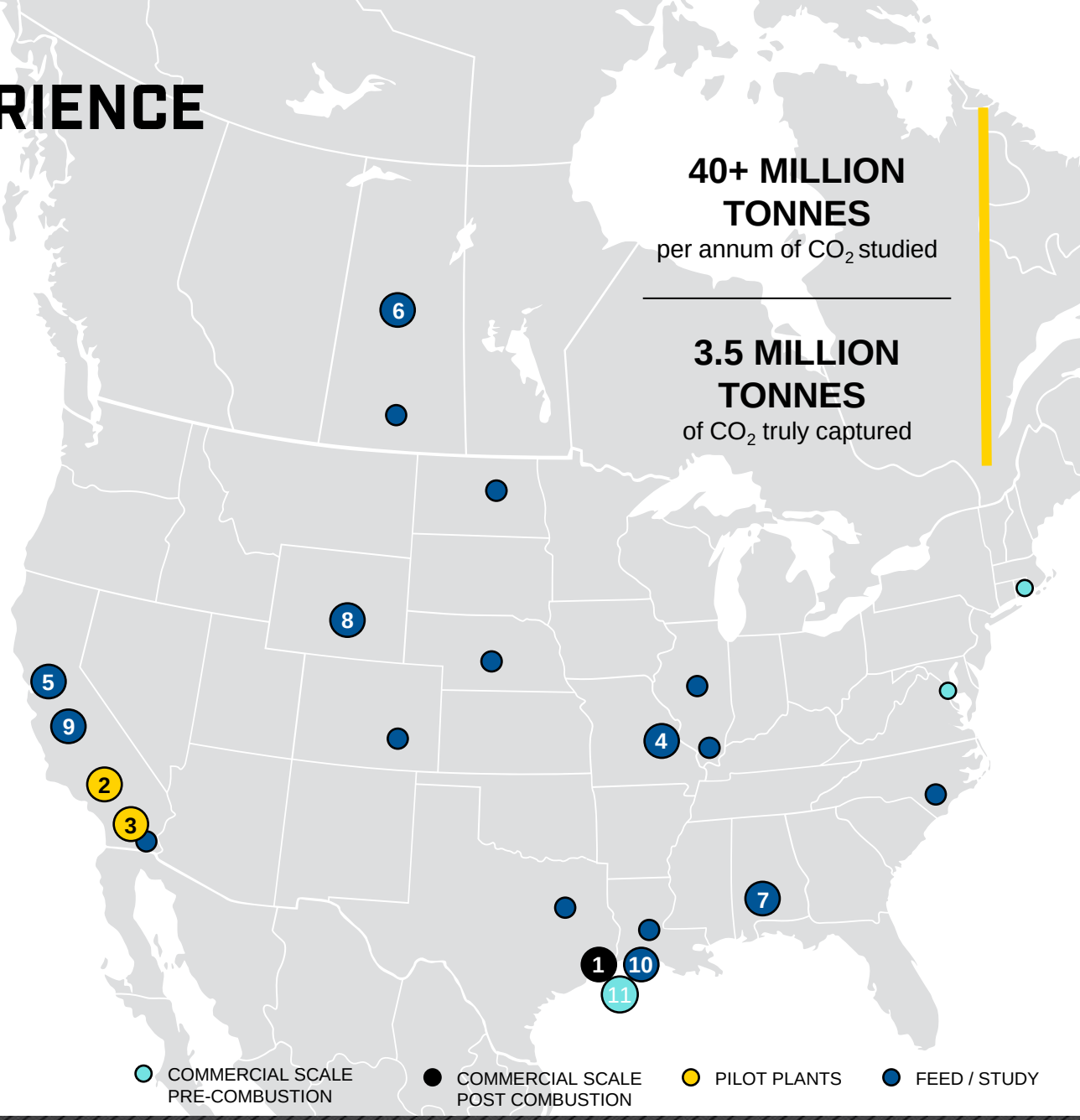
- Early EPC support required
- 2022 is a bridge to projects in 2023
- Small investments / demonstrations underway
- Current 45Q in the US is generally insufficient to finance projects
- We want to spend our time on projects that can get completed
- DOE studies have developed pricing and support market development, but items excluded from the cost of capture have created a gap between expectations and reality
- Competition for tax equity investments is stiff and some markets are more mature and easier investments for large financial institutions
- More innovation is needed in CCUS
- Undisciplined project developments and project execution can do more harm than good to the reputation of the industry if they are not successful

SELECT CARBON CAPTURE EXPERIENCE

	PROJECT NAME	TECHNOLOGY	SIZE
1	NRG Petra Nova Carbon Capture Project	MHI amine	1.6 MTPA
2	Chevron Svante Pilot	Svante solid sorbent	0.01 MTPA
3	Direct Air Capture Pilot	Climeworks DAC	10 TPA
4	DOE 2515 – Holcim/Air Liquide	Air Liquide cryocap	~2.8 MTPA
5	DOE 2515 – Calpine/ION	ION amine	~2.0 MTPA
6	Canadian New NGCC Study	Amine	~2 MTPA
7	DOE 2515 – GE / Linde / Southern	Linde / BASF	~1.4 MPTA
8	Direct Air Capture Plant	Climeworks DAC	0.1 MTPA
9	Mendota Biomass CCUS Study	Confidential	0.35 MTPA
10	LNG CCUS Study	Confidential	Confidential
11	Calcasieu Pass LNG System	UOP Amine	0.4 MTPA

40+ MILLION TONNES
per annum of CO_2 studied

3.5 MILLION TONNES
of CO_2 truly captured



THANK YOU

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