

California ARB's QM for CCS, and Cap-and-Trade vs. LCFS

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Sacramento

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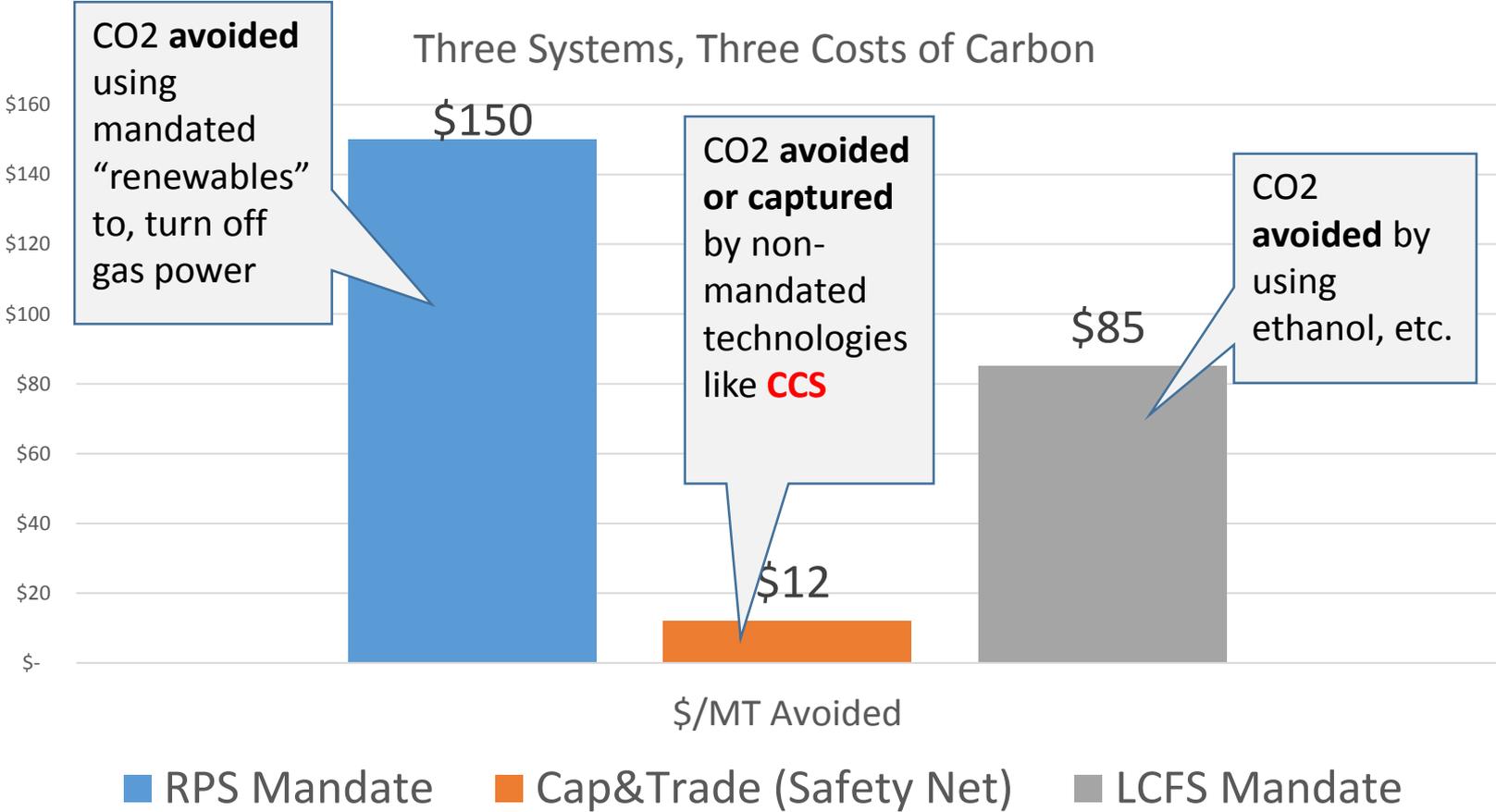
Steyer-Taylor Center for Energy Policy and Finance*

Main Points

- Staff’s Concept Paper (p. 3/9) states *“Under the LCFS, staff plans to draw a system boundary that includes the substantial sources of emissions for CCS projects, essentially, capture, compression, transport, and injection.”* As explained on May 8, 2017 by staff, this appears to track the CO₂ emissions associated with moving/injecting CO₂. It does not specifically address the policy issue of, *“In which industry should we credit the sequestration of the CO₂ itself?”*—a question critical to successful adoption of CCS.
- More pointedly, where should credit be taken for CO₂ emissions captured from a non-crude oil production process *solely for the purpose of supplying CO₂ as a production input to CO₂-EOR?* Based on typical CO₂ flood data, using CO₂ in EOR will ultimately cause sequestration of 0.36-0.45 MT/bbl oil produced.
- California has at least three different CO₂ emissions valuations systems operating mostly in independent silos: LCFS, RPS, AB32 Cap-and-Trade. CCS activities, without a change in LCFS rules, fall between the cracks—not mandated by any rule, and if used, generating “allowances” for industries that don’t particularly need such allowances.
- CCS has the potential to avoid tens of millions of tons of CO₂ emissions generated in **non-oil** industries* for which there is no other large scale abatement mechanism other than CCS. In most cases the particular non-oil emitters are in no way compelled, and not meaningfully incentivized, to install CO₂ capture by federal or state regulations.
- Therefore, unless LCFS credits can be generated by capture outside the oilfield for the purpose of generating low carbon intensity crude at the oil field, CO₂ capture investments are unlikely to be made. Commercial and physical boundaries must be crossed.
- → CO₂ purchased by the oil industry that would otherwise be emitted in non-oil industries should be accounted for as an input in the fuel “life cycle analysis”, therefore having the effect of lowering the carbon intensity of oil produced.

*Or at oilfields, but with emissions apparently allocated to non-crude oil generation activities such as supplying electricity to the CAISO grid.

California's Three Main CO2 Valuation/Regulation Systems



Adding CCS is a Big Risky Step, vs. Incremental per C&T

- AB32 and Cap-and-Trade ask for gradual, incremental declines of **3% per year**
 - An emitter of 1 million TPY, at current allowance prices, would be facing an allowance purchase budget rising by **\$360,000 a year** to buy allowances
- Implementing **90% CO₂** capture for a major industry (like gas power plant), would be an investment of ~\$500 million, a financing bill of **~\$60 million per year**

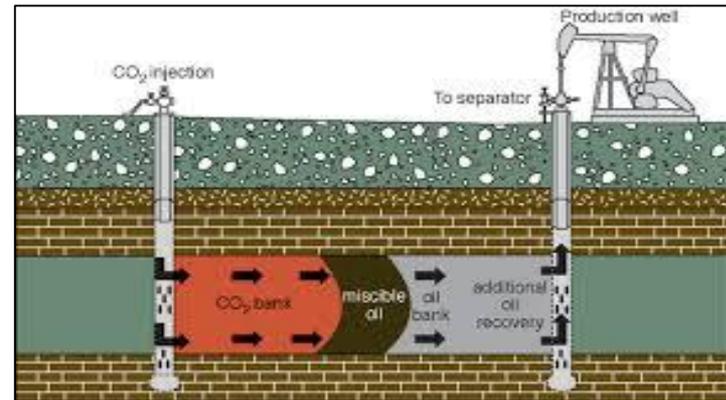
Millions of Tons of CO2 Could be Missed

(Emitters either near but not at oilfields, or located at oilfields but major portion of CO2 emissions likely “not allocable to fuel life cycle” per LCFS innovative crude definitions)

Facility	Emitter Covered MT (000s)	City	Industry	Issue
Sycamore Co-gen*	837	Bakersfield	Fossil Power Gen	~60% allocable to electric power (EPA 2012) sold to grid
Kern River Co-gen*	475	Bakersfield	Fossil Power Gen	~62% allocable to electric power (EPA 2012) sold to grid
Calpine Pastoria	1,778	Lebec	Fossil Power Gen	No association with oilfield
National Cement	681	Lebec	Cement	No association with oilfield
High Desert Power	1,442	Victorville	Fossil Power Gen	No association with oilfield
Cal Resources 35R Gas Processing Plant and Power Plants*	2,029	Tupman	Fossil Power Gen and Natural Gas Processing Plant	Two power plants (45MW & 550MW) with HRSG steam partially used for natural gas processing—not for oil; the 550MW plant supply of steam for gas processing ~2% of energy output; CRC electric load per CAISO (2014) is 90-200MW.
CalPortland Mojave	1,033	Mojave	Cement	No association with oilfield
	8,311*			

*Total “Emitter Covered Emissions” per ARB 2015. We understand that some minority portions of Sycamore, Kern or 35R power plant emissions might be treated as relating to ‘eligible activities’ if CO2 were captured.

Boundary Crossing is Inevitable and Beneficial



Industry won't capture unless oilfield will enter into long-term contract to accept the CO2.

Industry can't afford to capture unless the oilfield can pay a high, stable price for the CO2.

Oilfield won't start a CO2-flood unless it has a solid long-term source of CO2.

Oilfield can't pay a high price for CO2 unless its QM-verified sequestration will earn monetizable credit value.

LCFS Has Sought to Define Fuel “Life-Cycle” in the Past

- Some parties have thought it is advantageous to define “fuel life-cycle” narrowly, *putting a geographic border around an economic and industrial phenomenon*
- That led to current rule that to be an “innovative method” then “Carbon capture must take place onsite at the crude oil production facilities.” (LCFS Final Order p. 99/148)
- This restriction does not make sense if a main goal of LCFS is to encourage innovations that reduce carbon intensity of petroleum-derived liquid transportation fuels. Oilfields inevitably purchase required inputs from outside the physical boundaries of a field. Those inputs could increase, decrease, or leave unaffected the carbon footprint of produced crudes:
 - A carbon intensive input for oil production (coal powered electricity to drive pumps) → should raise CI
 - A carbon neutral input (nitrogen gas to raise well pressure for EOR) → ~neutral
 - A carbon negative input (CO₂ that would otherwise be emitted in a non-oil industry) → should decrease CI
- Where the emissions take place or are avoided shouldn’t matter as long as the purchased input is indispensable to oil production.

Electricity from Natural Gas with CO₂ Capture for Enhanced Oil Recovery Emission accounting under Cap-&-Trade and LCFS

California Council on Science and Technology

January 2015

- This paper makes a strong argument that if a non-oilfield facility captures CO₂ and delivers the CO₂ to an oilfield for CO₂-EOR:
 - The capturing facility should be able to treat the CO₂ as not emitted for purposes of calculating allowances it needs for the year; **AND**
 - The injecting oilfield should also be able to use the CO₂ sequestered (subject to MVR) as a reduction of CI (or to generate an LCFS credit for sale to a “regulated party”) in its life cycle analysis for the LCFS

<https://ccst.us/publications/2015/2015ccs.pdf>