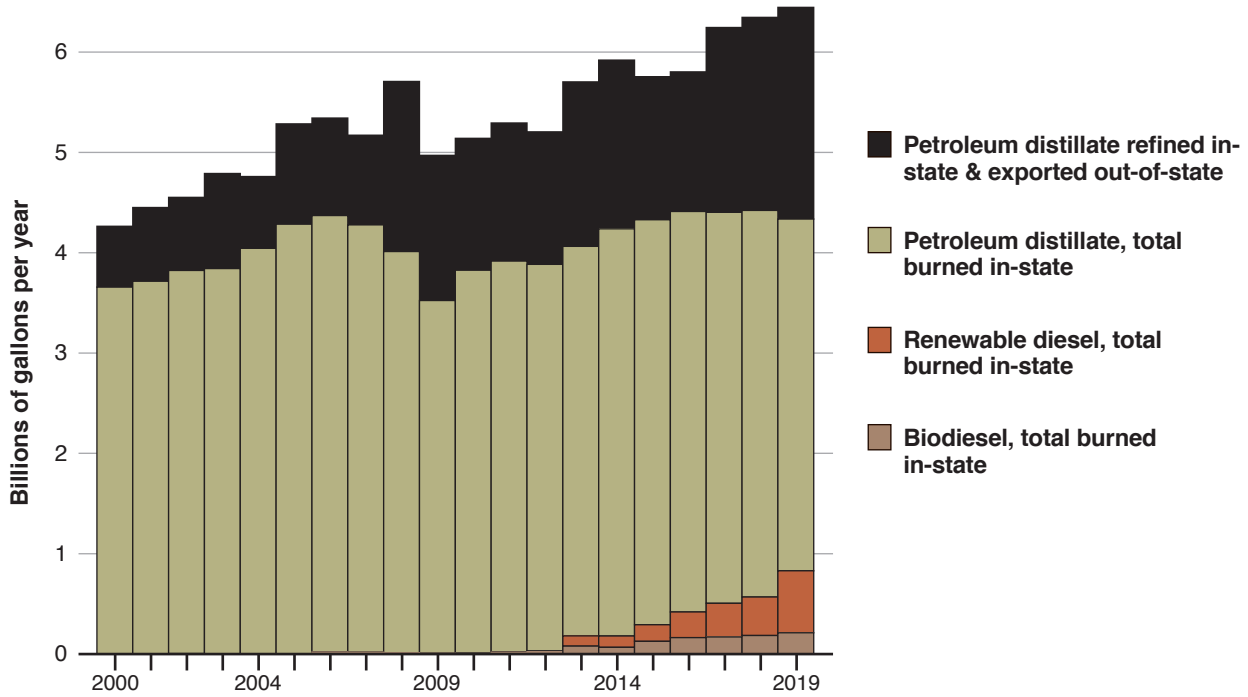
Throwing [bio]fuel on the fire

Distillate fuels refining for export continued to expand in California as biofuels that were expected to replace fossil fuels added a new source of carbon to the liquid combustion fuel chain. Total distillate volumes, including diesel biofuels burned in-state, petroleum distillates burned in-state, and petroleum distillates refined in-state and exported to other states and nations, increased from approximately 4.3 to 6.4 billion gallons per year between 2000 and 2019.[1, 2] *See* Chart.



Distillate fuel shares associated with all activities in California, 2000–2019.
Growth in total distillates excluding jet fuel and kerosene from State data.[1, 2]

Crude refining for export (black) expanded after in-state burning of petroleum distillate (olive) peaked in 2006, and the exports expanded again from 2012 to 2019 with more in-state use of diesel biofuels (dark red and brown). From 2000 to 2012 petroleum drove an increase in total distillates combustion of nearly one billion gallons per year. Then total distillates combustion increased again, by more than a billion gallons/year from 2012 to 2019, with biofuels accounting for more than half that increment.[1, 2]

Clearly, these biofuels did not replace petroleum. Burning more biofuel *along with* the petroleum fuel it was supposed to replace emitted more carbon. State emission factors for these fuels and the feedstocks they were made from suggest that total fuel chain carbon emissions associated with all distillates shown in the chart increased by approximately 21.6 million tons per year from 2000 to 2019. *See* the table below. Biofuels accounted for 22 percent of this emission increment. *Id*.

continued next page

Emission increase from distillates associated with all activities in California, 2019 *v.* 2000.
Estimate based on State activity data and fuel chain emission factors.[1–4]

	Volume (MGD) [a]		CI (kg CO_2e/gallon) [b]		Mass emitted (Mt/y as CO_2e)		
	2000	2019	2000	2019	2000	2019	Change
Petroleum distillates	11.75	15.16			57.94	74.74	+ 16.79
Burned in state	10.01	9.60	13.51	13.51	49.37	47.36	- 2.01
Exported	1.74	5.55	13.51	13.51	8.57	27.38	+ 18.81
Biofuel distillates	< 0.01	2.27			0.01	4.83	+ 4.81
Biodiesel	< 0.01	0.58	7.74	5.78	0.01	1.22	+ 1.21
Renewable diesel	0.00	1.69	5.83	5.83	0.00	3.60	+ 3.60
Total distillates	11.76	17.43			57.96	79.57	+ 21.61

CO_2e: Carbon dioxide equivalents. **Mt/y:** Million metric tons/year. **MGD:** Million gallons/day. **kg:** kilogram.

a. Fuel volumes from California Air Resources Board (CARB)[1] and, for exports, CARB[1] and the California Energy Commission.[2]
b. Fuel chain carbon intensity (CI) emission factors from "lifecycle" default factors established by CARB[3] and, for biofuels, CARB feedstock data (e.g., the petroleum distillate CI, rounded to 13.51 kg/gallon, is from 134.47 MJ/gallon and 100.45 g CO_2e/MJ for ULSD diesel—a conservative estimate for total distillates).[3, 4] Biodiesel CI values shown vary because feedstocks affect CI and CARB reports a different biodiesel feed mix in the early years of its data record.[4] Figures shown may not add due to rounding.

Root causes of this pollution further show the need to replace diesel with solar and wind-powered alternatives in freight and shipping. Oil refiners protected otherwise stranded assets by expanding their liquid fuel combustion footprint.[5] Specifically, instead of retiring oil assets when petroleum demand began to decline in California, they refined more oil for exports, then added biofuels that kept their refineries and fuel distribution systems running closer to full while they further expanded those petroleum distillate exports that burned elsewhere. *See* Chart. Making and burning more biofuel along with more petroleum fuel emitted more carbon.

Crucially, this type of biofuel is made from food crops. Limits on the sustainability of future crop expansion for this biofuel[6] could make it unable to replace even half of petroleum distillates globally.[7] Thus, adding limited supplies of food crop biofuel to the petroleum we get locked into burning along with it could lead to a dead end in our path to climate stabilization. It would throw fuel on the fire.

October 2021

Greg Karras, Community Energy reSource

(1) *Fuel Activity for California's Greenhouse Gas Inventory by Sector & Activity (Fourteenth Edition: 2000 to 2019 – Last updated on 7/28/2021);* Calif. Air Resources Board (CARB): Sacramento, CA. https://ww2.arb.ca.gov/ghg-inventory-data

(2) *Weekly Fuel Watch Report, Refinery Production, Total Distillates;* California Energy Commission: Sacramento, CA. Accessed Sep–Oct 2021 from https://ww2.energy.ca.gov/almanac/petroleum_data/fuels_watch/output.php

(3) *Tables 2, 4, 7-1, 8 and 9, Low Carbon Fuel Standard Regulation;* California Code of Regulations §§ 95484 – 95488.

(4) *Low Carbon Fuel Standard Data Dashboard Figure 10;* linked biodiesel and renewable diesel residue and crop feed-stock data accessed Sep 2021; CARB: Sacramento, CA. https://ww3.arb.ca.gov/fuels/lcfs/dashboard/dashboard.htm

(5) Karras, 2020. *Decommissioning California Refineries;* https://www.energy-re-source.com/decomm

(6) Karras, 2020/2021. *Biofuels: Burning Food?* https://www.energy-re-source.com/latest

(7) Compare U.S. Department of Agriculture, Table 42, at https://www.ers.usda.gov/data-products/oil-crops-yearbook/oil-crops-yearbook with International Energy Agency, World Oil Data and statistics for petroleum distillates ("Gas/Diesel) at https://www.iea.org/data-and-statistics/data-tables/?country=WORLD&energy=Oil&year=2018