



## ENERGY INSTITUTE BLOG

# High Costs and Few Benefits from California's Proposed Sustainable Aviation Fuel Tax Credit

*This credit would reduce road funding, raise gasoline and diesel prices, and deliver small and expensive carbon emissions reductions.*

*This blog is co-authored with Kristen McCormack, William Scott, James Stock, Mengying Wu, and Jingran Zhang.*

In California, road construction, maintenance, and repairs are funded primarily through excise taxes on gasoline and diesel. The Governor's latest budget includes a [proposal](https://trailerbill.dof.ca.gov/public/trailerBill/pdf/1365) (<https://trailerbill.dof.ca.gov/public/trailerBill/pdf/1365>) that would diminish this dedicated source of revenue. It would allow fuel suppliers to reduce their diesel excise tax liability by selling sustainable aviation fuel (SAF).

Deciphering the implications of this proposal is tricky because SAF is closely related to renewable diesel (RD), the main biofuel substitute for petroleum diesel that [now comprises 70% of diesel in California](https://energyathaas.wordpress.com/2023/10/02/petroleum-diesel-is-disappearing-from-california/) (<https://energyathaas.wordpress.com/2023/10/02/petroleum-diesel-is-disappearing-from-california/>). Moreover, the proposed tax credit would exist in a complex web of regulations and tax credits at the Federal level, in California, and in other states.

The Newsom Administration [estimates](https://advancedbiofuelsusa.info/quick-summary-governor-s-2026-27-january-budget-proposal) (<https://advancedbiofuelsusa.info/quick-summary-governor-s-2026-27-january-budget-proposal>) the SAF tax credit would reduce diesel excise tax receipts by about 10% (\$165m). We have [analyzed](https://haas.berkeley.edu/wp-content/uploads/WP-357.pdf) (<https://haas.berkeley.edu/wp-content/uploads/WP-357.pdf>) this proposal in the broader context of national and state biofuel policies.

Based on our analysis, we project three outcomes.

1. The tax credit will incentivize much more SAF than projected by the administration.
2. That increase in SAF comes at a cost: diesel excise tax receipts decrease by at least 20% and as much as 75% within a few years, and the prices of gasoline and diesel increase by 10–15 cents because of interactions with existing policies.
3. Because the SAF largely would come from diverting biofuels from surface transport to aviation, the net reductions in carbon emissions would be small and expensive.

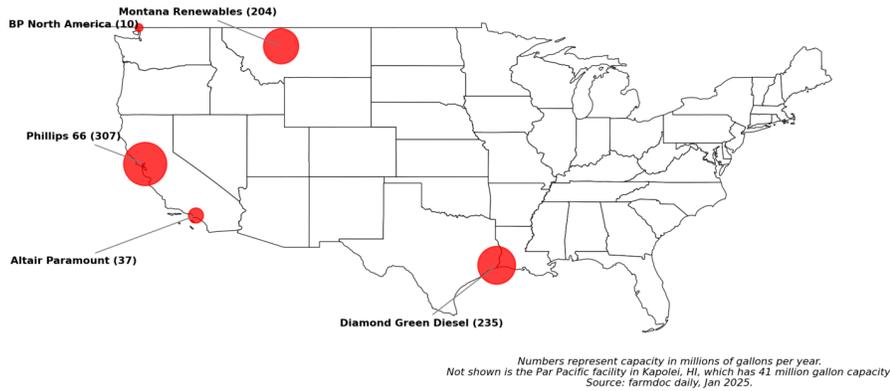


([https://energyathaas.wordpress.com/wp-content/uploads/2026/02/rodeo\\_san\\_francisco\\_refinery.jpg](https://energyathaas.wordpress.com/wp-content/uploads/2026/02/rodeo_san_francisco_refinery.jpg))

Phillips 66 Refinery in Rodeo CA. Source: [Wikipedia](https://en.wikipedia.org/wiki/Rodeo_San_Francisco_Refinery) ([https://en.wikipedia.org/wiki/Rodeo\\_San\\_Francisco\\_Refinery](https://en.wikipedia.org/wiki/Rodeo_San_Francisco_Refinery)).

## Where would SAF come from?

The easiest and most immediate way to scale up SAF production involves using the [hydroprocessed esters and fatty acids \(HEFA\)](https://www.safinvestor.com/news/142447/how-is-sustainable-aviation-fuel-hefa-saf-made/) process to convert vegetable oils and waste fats into fuel. Refiners in the United States currently produce three billion gallons of RD per year using this process. [At least six of these refineries](https://farmdocdaily.illinois.edu/2025/01/estimates-of-sustainable-aviation-fuel-production-capacity-at-u-s-renewable-diesel-plants-through-2026.html) are already equipped to produce SAF alongside RD if given a sufficient financial incentive, including the [Phillips 66 refinery in Rodeo, CA](https://energyathaas.wordpress.com/2025/06/02/build-it-and-hope-they-mandate-it/) (see the map below).

**HEFA SAF Facility Locations**

([https://energyathaas.wordpress.com/wp-content/uploads/2026/02/us\\_map\\_circles.png](https://energyathaas.wordpress.com/wp-content/uploads/2026/02/us_map_circles.png))

**As we wrote last fall**

(<https://energyathaas.wordpress.com/2025/10/06/what-if-we-required-airplanes-to-use-more-biofuels/>), current policies will yield very little SAF because it costs at least three times as much to produce as petroleum jet fuel. Although SAF currently earns substantial incentives, including credits in the federal renewable fuel standard, low carbon fuel standard (LCFS) credits from California, and federal tax credits, it does not receive enough to make up for its higher production cost relative to fossil jet fuel. At the same time, RD costs somewhat less to produce than SAF, benefits from a more favorable subsidy stack, and faces a smaller price gap with petroleum diesel, while also competing with SAF for feedstocks and production capacity.

SAF produced at a carbon intensity at least 50% below that of jet fuel would be eligible for California's proposed tax credit, which is \$1 per gallon of SAF, plus 2 cents per gallon for each additional percentage point of reduction beyond this 50% threshold, up to a maximum \$2 per gallon. Based on CARB's existing carbon intensity models, the tax credit would apply to SAF produced from waste oils and fats such as used cooking oil, tallow, and distiller's corn oil. Crop-based oils such as soybean or canola oil would not qualify, which is a good thing given that increasing demand for these oils [causes substantial carbon losses through tropical deforestation](#)

[https://open.substack.com/pub/agdatanews/p/using-vegetable-oils-for-biofuel?r=i2qe&utm\\_campaign=post&utm\\_medium=web](https://open.substack.com/pub/agdatanews/p/using-vegetable-oils-for-biofuel?r=i2qe&utm_campaign=post&utm_medium=web)).

The other viable way to produce SAF is **alcohol-to-jet (ATJ)** (<https://www.energy.gov/eere/bioenergy/articles/first-ethanol-alcohol-jet-sustainable-aviation-fuel-production-facility>), which involves refining ethanol or isobutanol made from corn or sugarcane into jet fuel. Although cost estimates vary, this production process is widely understood to be more expensive and nascent relative to HEFA SAF. **LanzaJet** (<https://www.lanzajet.com/>) owns the only ATJ plant currently operating in the United States. In addition, CARB's existing carbon intensity models imply that ATJ would face an additional hurdle to claiming the tax credit because it would likely need to integrate carbon capture and storage (CCS) to meet the 50% reduction threshold.

If the six current HEFA refineries that are equipped for SAF were to produce at maximum capacity, they would crank out **834 million gallons per year** (<https://farmdocdaily.illinois.edu/2025/01/estimates-of-sustainable-aviation-fuel-production-capacity-at-u-s-renewable-diesel-plants-through-2026.html>). At \$1.25 per gallon, that is \$1.04b in tax credits, or 65% of diesel excise tax receipts. Adding ATJ SAF would generate even more tax credits, as would more RD facilities retooling to produce SAF.

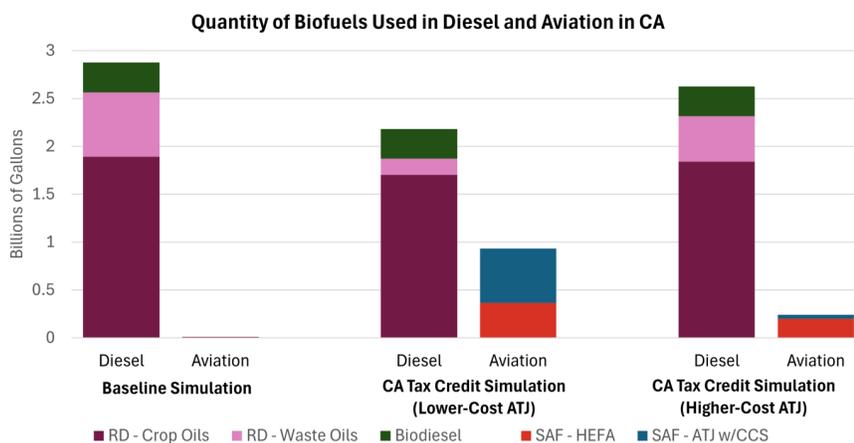
### **What is the likely effect of the California SAF tax credit?**

This question cannot be answered without accounting for all the complex interactions created by existing fuel policies. In a **recent working paper** (<https://www.nber.org/papers/w34326>), we developed a detailed model to do just that. Last week, we **added the proposed CA tax credit to the model** ([https://drive.google.com/file/d/1f7JN2mhKt3dBqJ-96KiZA2vnrjGa3CC/view?usp=drive\\_link](https://drive.google.com/file/d/1f7JN2mhKt3dBqJ-96KiZA2vnrjGa3CC/view?usp=drive_link)).

We consider two policy scenarios, reflecting different potential costs of producing ATJ. The lower-cost scenario uses estimated

production costs provided by industry analysts, and it implies that ATJ with CCS is competitive with HEFA for SAF production. However, given that ATJ technology has yet to prove itself viable at scale, we also present a higher-cost scenario in which the marginal cost of ATJ production is 25% higher. We view the higher-cost scenario as a conservative projection for 2030.

Under the lower-cost scenario, we find an increase in both HEFA SAF and ATJ SAF, totaling close to 1 billion gallons annually and split between the two technologies. Some, but not all, of the SAF production comes out of renewable diesel, which decreases by 700 million gallons. The higher-cost scenario generates a quarter of a billion gallons of SAF annually, almost all of which is from HEFA. We plot these outcomes in the chart below.



(<https://energyathaas.wordpress.com/wp-content/uploads/2026/02/picture2-1.png>)

The two SAF technologies (HEFA with waste oils and ATJ with CCS) generate tax credits of about \$1.25 per gallon. Thus, our two scenarios imply potential tax credits between \$300m and \$1.2b annually, or between 20% and 75% of diesel excise tax receipts.

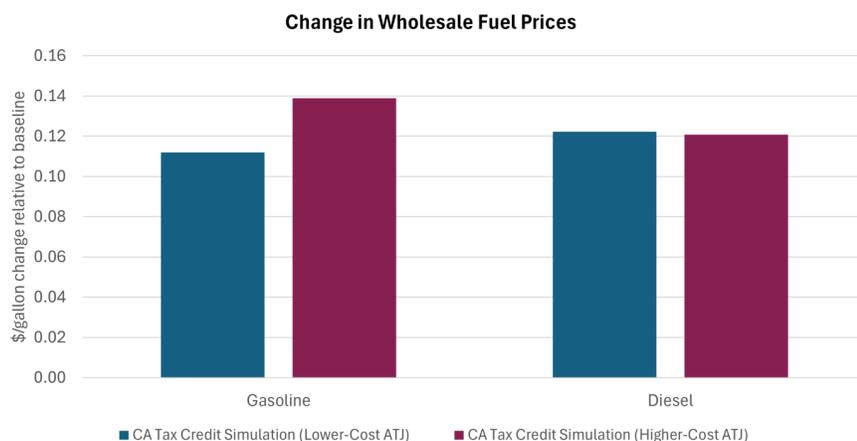
### How would the SAF proposal change fuel prices?

As a result of this policy, we estimate that both gasoline and diesel prices would rise in California. Gasoline prices would increase by 11–14c and diesel prices by 12c. Californians use

about 13 billion gallons of gasoline and 4 billion gallons of diesel per year, so these price increases imply that annual costs to consumers would rise by between \$1.9 and \$2.3 billion.

Fuel prices rise because of complex interactions between the tax credit and existing policies. In particular, California's low carbon fuel standard requires that every gallon of fossil gasoline and diesel be matched by some amount of cleaner (i.e., lower carbon intensity) fuel such as RD or SAF.

When California fuel suppliers reduce RD in favor of SAF, the lost RD has to be backfilled with fossil diesel to meet road transportation fuel demand. But, more fossil diesel means that more low-carbon fuel has to enter the system to meet the low carbon fuel standard goal. This is why the tax credits cause a smaller decline in RD than the increase in SAF, as shown above. The additional required low-carbon fuels raise costs.



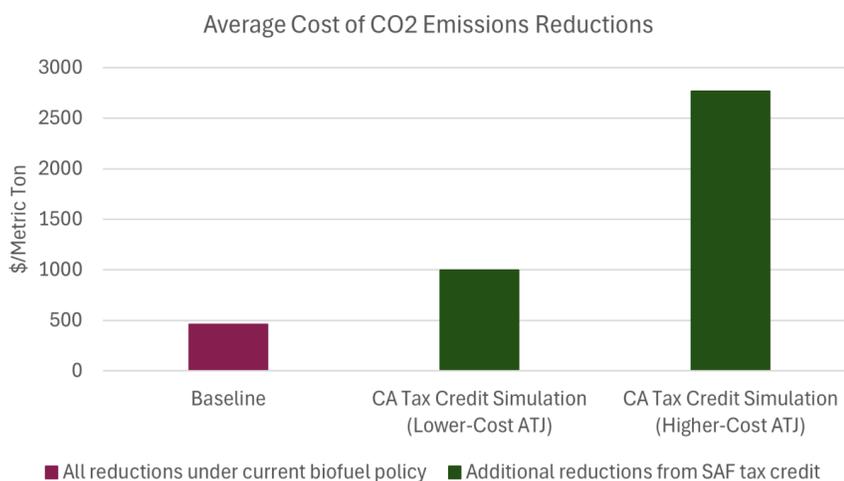
<https://energyathaas.wordpress.com/wp-content/uploads/2026/02/picture3-1.png>

### How much emissions reduction and at what cost?

Carbon emissions decrease because the SAF is produced using relatively low-carbon processes compared to crop-based RD. In the lower-cost ATJ scenario, annual US carbon dioxide emissions fall by 2.1 million metric tons (MMT) relative to current policy, which is the equivalent of taking 1.5% of California's gasoline-powered cars off the road. This net reduction, however, obscures substantial leakage: California

emissions would decline by 3.6 MMT and emissions in the rest of the US would increase by 1.5 MMT as lower fuel prices in other states spur consumption there. The net reductions cost \$997 per ton, which is about **five times the social cost of carbon.** (<https://www.nature.com/articles/s41586-022-05224-9>)

The higher-cost ATJ scenario sees smaller emissions reductions because less SAF enters the system. The emissions reduction is 0.5 MMT, or the equivalent of taking 0.4% of California's gasoline-powered cars off the road. Again, there is substantial leakage, with California emissions declining by 2.0 MMT and rest-of-the-US emissions increasing by 1.5 MMT. The average abatement cost in this scenario is exorbitant at \$2768 per ton.



(<https://energyathaas.wordpress.com/wp-content/uploads/2026/02/picture1-1.png>)

## Potential Complications

First, can all the tax credits be claimed? Firms that sell wholesale diesel pay the diesel excise tax. If those firms sell SAF, then they can claim credits against their excise tax liability (for example, Phillips 66 sells both SAF and diesel). If the firms selling SAF don't have (much) excise tax liability, then they may not be able to claim all of the credit (e.g. Lanzajet). If enough money is on the line, we would expect firms to engage in some

financial engineering to align tax liabilities with available credits, e.g., mergers or joint ventures.

Second, what about the state's cap-and-invest program? As discussed in our [recent paper](https://www.nber.org/papers/w34326) (<https://www.nber.org/papers/w34326>), accounting methods and emissions covered by California's LCFS and cap-and-invest program differ, so in some cases, the additional fossil diesel consumed in California might be offset by a decrease in emissions in non-transportation sectors. The magnitude of these effects is relatively [small](https://drive.google.com/file/d/1f7JN2mhKt3dBqJ-96KiZA2vnrjiGa3CC/view?usp=drive_link) ([https://drive.google.com/file/d/1f7JN2mhKt3dBqJ-96KiZA2vnrjiGa3CC/view?usp=drive\\_link](https://drive.google.com/file/d/1f7JN2mhKt3dBqJ-96KiZA2vnrjiGa3CC/view?usp=drive_link)).

### **A Series of Unintended Consequences**

Any expansion of biofuels into SAF will conflict with the regulations and tax credits that currently incentivize their use in surface transportation. These policy interactions make trying to do something that seems simple, like incentivizing SAF, hard to do without unintended consequences.

We predict that the proposed tax credit would increase SAF adoption more than expected and generate some additional emissions reductions, but at a high cost through lost road funding and higher fuel prices. If incentivizing SAF were to spur future cost reductions through new technologies, then it may be worth paying a high price, but there is [limited evidence](https://www.sciencedirect.com/science/article/pii/S0301421524004361) (<https://www.sciencedirect.com/science/article/pii/S0301421524004361>) for significant cost declines in the biofuels sector so far.

Decarbonizing aviation will be [challenging](https://energyathaas.wordpress.com/2025/10/06/what-if-we-required-airplanes-to-use-more-biofuels/) (<https://energyathaas.wordpress.com/2025/10/06/what-if-we-required-airplanes-to-use-more-biofuels/>). Current batteries are too heavy and hydrogen takes up too much space, which leaves liquid fuels as the dominant energy source for the next few decades. However, promoting SAF only makes sense if it

creates a clear path to future cost reductions and carefully manages the unintended consequences.

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(<https://energyathaas.wordpress.com/2026/02/23/high-costs-and-few-benefits-from-californias-proposed-sustainable-aviation-fuel-tax-credit/>)

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## **Aaron Smith**

[VIEW ALL](#)

Aaron Smith is the Gordon Rausser Distinguished Chair of Agricultural and Resource Economics at the University of California, Berkeley. He joined Cal in Fall 2024 after 23 years as a professor at the University of California, Davis. Originally from New Zealand, he earned his PhD in Economics from the University of California, San Diego. His

research addresses economic and policy challenges related to agriculture, energy, and the environment. He has over 50 publications in refereed journals, including outlets such as the Review of Economics and Statistics, the Journal of Econometrics, the American Journal of Agricultural Economics, and Proceedings of the National Academy of Sciences. His research has won the Quality of Communication, Quality of Research Discovery, and Outstanding American Journal of Agricultural Economics Article Awards from the Agricultural and Applied Economics Association and the Quality of Research Discovery Award from the European Association of Agricultural Economists. He is the cluster lead for socioeconomic and ethics in the AI Institute for the Food System (AIFS). He writes regularly on the Ag Data News blog.

# 6 thoughts on “High Costs and Few Benefits from California’s Proposed Sustainable Aviation Fuel Tax Credit” ≥

Great work by you and your colleagues, Aaron. Arguably the most unsettling of your observations on the negative consequences of the SAF tax credit is the following:

“[D]iesel excise tax receipts decrease by at least 20% and as much as 75% within a few years, and the prices of gasoline and diesel increase by 10–15 cents because of interactions with existing policies.” YIKES!

I’m concerned that this Newsom Administration “proposal” — the unbacked bill accessed through the hyperlink in your first paragraph — will not receive the scrutiny it warrants because it will be in a budget trailer bill and therefore bypass the analysis of a policy committee because it won’t be a stand-alone bill. That said, it should go to a Budget Subcommittee. I’m definitely going to keep my eye on it to make sure this blog post and related studies are considered by the appropriate legislators and staff.

Whatever the good intentions of this proposal may be, in terms of incentivizing viable SAF, it needs to go back to the drawing board. It will be interesting to see if it’s still part of the overall budget proposal in the governor’s May Revise. Hopefully not.

I just got this webinar invite from ICCT: “Closing the SAF cost gap: Policy levers to scale sustainable aviation fuels in Europe”

[https://us06web.zoom.us/webinar/register/WN\\_GMBKYuv1R16yCEkWwyqmOg#/registration](https://us06web.zoom.us/webinar/register/WN_GMBKYuv1R16yCEkWwyqmOg#/registration)

Biofuels are not a climate solution for either ground transport or aviation because they would be inherently unsustainable at scale, and they would be especially unsuitable for ground transport, which can be electrified at much lower cost.

<https://www.wri.org/insights/biofuels-are-not-green-alternative-fossil-fuels>

For aviation, probably the only viable near-term decarbonization solution would be e-fuel.

<https://lee-enterprises.com/the-case-for-e-fuels-use-in-aviation/>

Ken Johnson

Incredibly well done and insightful!

Eventually, massive surplus offshore wind and geothermal resources in the western US will yield cost effective synthetic jet fuel. That's why stalling offshore wind development now is a bad idea. Both offshore wind & geothermal resources will be monopolized by existing BigOil&Gas, because they already have the required financial backing, expertise, trained work force & political clout. Orsted, the Danish offshore wind developer was an oil company 15 years ago.

not too far in the future, population will begin to shrink. Currently, nearly all economies in the world are based upon a growing population. ROI will soon become meaningless. All of these charts, graphs and models, well thought out as they are, fall apart in the face of this reality.

Most climate scientists agree that if we do nothing, we face an existential threat. Of course, since POTUS says it's not true, it must not be true. Those that actively deny this threat make the threat an almost certainty.

Thus, any steps taken towards a sustainable world should be taken. Saving the humans is not going to be cheap.

Is this ever in the weeds. I am an environmental scientist with a minor in economics and I barely understand it. Do you expect most legislators to comprehend it?