From Renewable Fuels to Clean Fuels

The RFS After 2022, and Other Ways the Biden Administration Can Drive the Transition to Cleaner Transportation Fuels

By Rachel Patterson, Sam Ricketts & Trevor Dolan - May 2022

Acknowledgments

For their contributions that helped inform this paper the authors and Evergreen Collaborative would like to thank Will Dobbs-Allsopp, Rachael Klarman and Governing for Impact; Aman George and Democracy Forward; David Degennaro and the National Wildlife Federation; Brian Sui and the National Resources Defense Council; Jeremy Martin, Alyssa Tsuchiya, Jonna Hamilton and the Union of Concerned Scientists; Leilani Gonzalez and the Zero Emissions Transportation Association; Trevor Higgins and the Center for American Progress; Sonum Nerurkar and the Equity Fund; Deborah Behles and the Just Solutions Collective; Brian Bonlender and Lodestar Strategic; Washington State Representative Joe Fitzgibbon.

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Executive Summary

The climate crisis is upon us and the Biden administration has committed to using all available tools to cut greenhouse gas pollution at the scale required to meet ambitious, necessary, and science-based national targets. Curbing emissions from the transportation sector is one of the most important steps for the nation to take to cut greenhouse gas pollution by 50-52% by 2030. That's because transportation emissions account for nearly a third of all such emissions in the United States, and represent the single largest source of such pollution in our economy. The transportation sector is also a major source of local and criteria air pollution, with significant adverse effects on public health, and a major contributor to environmental injustice. To help confront these challenges, the U.S. must make an urgent shift to using more clean and secure transportation fuels. This paper provides actionable federal policy recommendations to the Biden administration, focusing on existing executive authorities.

Within the transportation sector, on-road light- medium- and heavy-duty vehicles make up the vast majority of US greenhouse gas pollution, contributing over 80% of emissions in 2019. In the last few decades, federal policymakers have taken some initial steps to reduce vehicle emissions, mostly by regulating the fuel efficiency and tailpipe pollution from motor vehicles. However, much more can be done to confront the climate change and public health impacts caused by the fuels we use to power vehicles. Furthermore, the clear dangers of U.S. and worldwide dependence on a volatile global oil market, and on nefarious nations like Russia and Saudi Arabia that benefit from it, has this year come rocketing to the fore in the minds of the American public and federal policymakers. This has caused a new focus on ways to bolster energy security by limiting U.S. dependence on oil.

Currently, the Renewable Fuel Standard (RFS) is the dominant federal policy that governs transportation fuels. It requires fuel providers (i.e. oil companies) to incorporate bio-based renewable fuels, like ethanol, in their production each year. This paper explores the background and effectiveness of the RFS, its relevance in the current needs of the country's energy policy, and what other tools the Biden administration should consider in order to promote low-carbon or "clean" fuels as part of its "whole-of-government" climate agenda.

Specifically, this paper recommends certain reforms that the Biden administration should embrace as it sets new policy targets under the RFS, with the greater statutory discretion that the administration can exercise in program implementation beginning in 2023. It recommends that the administration look to lessons and successes from states, which have implemented clean and low-carbon fuel

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standards. And it calls on the Biden administration to pursue use of further authority given in the Clean Air Act to regulate fuels that contribute to pollution and harm public health, with options for implementation of a federal Clean Fuel Standard. Confronting the climate crisis calls for significant investments in zero- and low-carbon fuels, particularly electricity, which will require existing programs to focus on drawing down vehicle emissions to the greatest extent possible. This paper also provides recommendations on additional policy opportunities in the transportation sector to reduce emissions and enhance domestic energy security, by promoting alternatives to fossil and liquid fuels.

Already in 2022, the Biden administration has announced short-term actions related to the blending of renewable and petroleum fuels to deal with oil price spikes. The Biden administration has also indicated that it plans to propose new RFS regulations in 2022, which provides the first major opportunity to improve the implementation of the program. This inflection point also provides the administration with the opportunity to think holistically about policies, and its existing authorities, that can drive greater emissions reductions and limit dependence on unsustainable, unsecure transportation fuels. This paper is intended to provide timely, actionable policy recommendations for the federal policymakers towards a clean fuel future for America.

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I. Introduction

Meaningfully reducing emissions from the transportation sector in the next decade requires a shift from internal combustion engines to zero-emission vehicles, and reduced reliance on passenger vehicles altogether. Passenger vehicles, along with light-duty trucks (SUVs, pick-up trucks and minivans) produce nearly 60% of the greenhouse gas pollution in the U.S. transportation sector. Medium- and heavy-duty trucks (18-wheelers, delivery vans, etc), contribute another 24% of the nation's

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transportation emissions. And, in addition to being the majority contributor to the nation's largest source of climate pollution, emissions from on-road vehicles also contribute massively to local ozone and particle air pollution, and the epidemic of lung and heart disease and mortality that they cause. These impacts disproportionately affect communities of color–a significant cause of environmental injustice in the United States.

Confronting these challenges requires a range of policy solutions, from standards and incentives that promote innovation and deployment of electric vehicles, low-carbon fuels and better fuel economy, to investments in systemic solutions like more public transit, affordable housing, smart growth, and better land-use management. Diversifying on-road vehicle fuels, through modernized implementation of federal fuel standards, is one piece of a holistic approach to clean transportation that is called for in the Evergreen Action Plan.

For decades, lawmakers have sought to diversify the technologies and fuels that power transportation, not primarily because they are a significant source of air pollution, but mostly because transportation fuels are an important economic and political resource. Control over oil and over energy resources is a major strategic advantage, especially given petroleum's practical historical monopoly in transportation fuel. It is one of the most significant drivers of international conflict in the modern world. As has been demonstrated by Russia's war in Ukraine, reducing dependence on oil is of paramount geopolitical importance, because petro-states derive their wealth and power from the global oil trade. These nations also have the ability to manipulate markets and raise oil and gas prices. The interconnected nature of global oil markets is a persistent risk that will continue to impose massive direct and indirect costs on households across America, and on communities throughout the world. Dependence on oil means that nefarious petro-states will continue to influence the American economy.

Many administrations have attempted to reduce reliance on foreign oil, and U.S. oil imports have decreased by nearly half in the last two decades, due in part to clean car standards that result in more efficient fuel consumption. Clean car standards have reduced oil consumption by roughly 25% since first being implemented in 1975. However, the primary cause of reduced oil imports is attributed to increased domestic production, which has led the U.S.to becoming a major oil exporter. Overall, domestic oil consumption has grown in the last 20 years, with declines in oil consumption closely following periods of economic downturn. Even though the U.S. has increased domestic production of oil and fossil gas, this has limited impact on lowering gasoline prices for Americans. This is because oil is a global commodity, with prices set on the

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international market. It will always be subject to fluctuations caused by international supply and demand.

Furthermore, just as increased production of oil and gas has proven to be ineffectual in delivering true energy security for Americans, so too have past policies aimed at diversifying fuels proved insufficient to the country's needs. Federal policies promoting renewable fuels have delivered some cost reductions for American consumers at the gas pump. However, their implementation to date has demonstrated an inability to deliver pollution reductions in the transportation sector or transform liquid fuel markets and prices that have and will remain overwhelmingly dominated by oil. Critically, the volumetric obligations currently required of fuel producers in the RFS, and the nature of their deployment as a blend with petroleum fuels, mean that this policy itself is not enough to transform the transportation sector in the ways that the climate and public health require, and that energy security demands.

These shortcomings in federal fuels policy help to illuminate the path before the Biden administration: to optimize the implementation of the RFS to reduce greenhouse gas pollution in the short-term, and to look to other existing federal statutes and policy mechanisms that can provide more significant transformation of the transportation sector toward clean fuels over the long-term.

Ultimately, the path to a healthier, more secure clean energy economy runs squarely through the transition to 100% zero-emission cars and trucks, which will free the sector from both massive tailpipe pollution and from its unsustainable dependence on oil. And even as other forms of transport, such as aviation and shipping, may continue to rely upon advanced biofuels, clean hydrogen, and other low-carbon fuels. This shift to zero-emission vehicles has begun, slowly but steadily, in the U.S. However, the complete transition to electric vehicles (EVs) and other zero-emission vehicles will take time, as less than 1% of vehicles on the road in the U.S. today are electric. And given that new light duty vehicles stay on the road for roughly 10-15 years, even when electric vehicles make up 100% of new car sales, it will still take years for zero-emission vehicles to dominate the domestic fleet. This gradual transition means we will continue to rely on liquid fuels in the meantime, and federal lawmakers—starting with the Biden administration's EPA—should ensure that fuel providers deliver the cleanest fuels possible.

This paper reflects on the efficacy of the RFS, which has been the primary method for diversifying vehicle fuels in the U.S., and it recommends reforms that the Biden administration should implement to maximize emissions reductions, should it elect to continue to set Renewable Volume Obligations (RVOs) under the program. Additionally,

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the paper assesses state policy actions to reduce vehicle pollution including the use of clean and low-carbon fuel standards. And it calls on the administration to leverage existing authority given in the Clean Air Act to regulate fuels that contribute to pollution and endanger public health, with options for implementation of a federal Clean Fuel Standard. It also provides recommendations on further policy opportunities that can help deliver cleaner fuels and transform the transportation sector, including in implementation of the Infrastructure Investment & Jobs Act of 2021, and final passage of federal budget reconciliation legislation containing major investments in clean transportation fuels, in 2022.

Renewable Fuel Standard Background

In 2005, Congress passed the Energy Policy Act (EPAct '05) which established the Renewable Fuel Standard (RFS), as an amendment to the Clean Air Act (CAA). The RFS requires transportation fuel providers to incorporate certain volumes of bio-based renewable fuels like soybean, corn ethanol or canola oil into their fuels. Four renewable fuel categories were defined under the RFS: biomass-based diesel, cellulosic biofuel, advanced biofuels and total renewable fuel.

The intent of the program is to reduce reliance on foreign oil, expand the domestic renewable fuels sector by bolstering national agricultural supplies that support biofuels production, and reduce greenhouse gas emissions. The RFS provides the opportunity to reduce greenhouse gas pollution by requiring petroleum refiners and importers to blend their product with lower-emission renewable fuels. Congress then expanded the program in the 2007 Energy Independence and Security Act (EISA), which established annual targets for the volume of fuels required in each of the four renewable fuel categories, through 2022.

Under the RFS, fuel sources are considered renewable if they come from natural and replenishable sources such as crops, plants, forest products, solid waste and biogas. Renewable fuels must be approved for use by the Environmental Protection Agency (EPA), and each renewable fuel must be assessed through EPA's life-cycle analysis to achieve a certain percentage of greenhouse gas emissions reduction as compared to a 2005 petroleum fuel baseline standard. Under the RFS, the term "renewable fuels" refers only to biofuels.

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How the Renewable Fuel Standard Works

Refineries, blenders, distributors, and importers of petroleum products (referred to in the RFS as obligated parties) are required to achieve a minimum volume of renewable fuels within the market each year by blending their product with renewable fuels. The total volume of renewable fuels required by the program began at 4 billion gallons for the 2006 compliance year, and fuel volumes were updated in 2007, gradually increasing each year to 36 billion gallons by 2022, as demonstrated by figure 1. The EPA determines the appropriate amount of renewable fuels to blend in the coming year based on the Department of Energy's (DOE) forecasted gasoline sales and production in that year.

FIGURE 1
Renewable Fuel Volumes Set by Congress through 2022

Volume Standards as Set Forth in EISA

Year	Cellulosic Biofuel	Biomass-Based Diesel	Advanced Biofuel	Total Renewable Fuel	"Conventional" Biofuel
2009	NA	0.5	0.6	11.1	10.5
2010	0.1	0.65	0.95	12.95	12.0
2011	0.25	0.8	1.35	13.95	12.6
2012	0.5	1.0	2.0	15.2	13.2
2013	1.0	*	2.75	16.55	13.8
2014	1.75	*	3.75	18.15	14.4
2015	3.0	*	5.5	20.5	15.0
2016	4.25	*	7.25	22.25	15.0
2017	5.5	*	9.0	24.0	15.0
2018	7.0	*	11.0	26.0	15.0
2019	8.5	*	13.0	28.0	15.0
2020	10.5	*	15.0	30.0	15.0
2021	13.5	*	18.0	33.0	15.0
2022	16.0	*	21.0	36.0	15.0

*statute sets 1 billion gallons minimum, but EPA may raise requirement

Note: There is no statutory volume requirement for "conventional" biofuel. The conventional volumes in the table are calculated (total - advanced) and are certain biofuels that do not qualify as advanced.

https://www.epa.gov/renewable-fuel-standard-program/overview-renewable-fuel-standard

Obligated parties determine how much renewable fuel they must blend each year by multiplying the volume of annually required renewable fuels by the volume of petroleum fuel that they plan to produce or import. Obligated parties then receive credits, or Renewable Identification Numbers, for each gallon of blended fuel they produce. Credits can be traded between participants or purchased outright, and 20% of the credits can be carried over between compliance years. Credits are assigned to each of the four fuel types based on the amount of greenhouse gas reduction that the fuel produces, according to the EPA's greenhouse gas life-cycle analysis. The credit system has been a crutch for blenders and refiners in recent years as obligated parties have failed to meet blending requirements year after year.

While there is an annual increase in the amount of renewable fuels required to be blended with petroleum, there is not an obligation for each fuel refiner or blender to add a certain ratio of renewable fuel per gallon of petroleum. That means that even though more renewable fuels must be produced each year, a given barrel of oil may not have a greater blend of renewable fuels each year. If oil consumption increases

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annually, while the total volume of renewable fuels also increases, the ratio of the renewable fuel in each barrel of oil may not change. There are also complications with progressively blending more renewable fuels into petroleum because of regulatory and infrastructure barriers to using ethanol blends greater than 10%.

The RFS After 2022

As noted above, Congress explicitly stipulated the amount of renewable fuels that are required by the RFS every year from 2005 to 2022. However, after 2022, the EPA, working with the White House Office of Management and Budget (OMB) and other agencies, has the chance to improve the RFS to achieve emissions reductions in the transportation sector, and, in particular, drive greater investments into low- and zero-carbon fuels, that are needed to confront the climate crisis and improve public health.

While Congress did not dictate the required volume standards beyond compliance year 2022, the RFS will still apply to transportation fuels, and the EPA has a number of options for proceeding with the program. The EPA can choose to increase the annual volume requirements for renewable fuels across the board, increase volume requirements for specific renewable fuel categories, or maintain the 2022 standards.

Before updating the volume requirements for the RFS, the EPA, with support from the Department of Energy (DOE) and the Department of Agriculture (USDA), must analyze several factors, including the impact of production and use of renewable fuels on the environment, specifically on air quality, climate change, water quality and water supply. Since the program began, several studies have shown that first generation biofuels, like corn ethanol, actively contribute to water pollution, and will not mitigate greenhouse gas emissions as initially expected. The EPA must do a thorough analysis to ensure that new regulations reflect the current scientific knowledge and the true climate impacts of each type of biofuel. Based on the results of that reevaluation, the EPA must provide greater incentives for producing fuels with the lowest environmental impacts.

In addition to those environmental considerations, program administrators must also weigh the impacts of these fuels on the energy security of the nation, the impact on infrastructure, effects on jobs and rural economic development, and the cost to consumers for transportation and food prices, among other factors. The RFS has undoubtedly been a boon for crop farmers, bringing millions of dollars to the agriculture sector over the life of the program. However, this must be weighed against the impacts to consumers at large, as the U.S. biofuels market has been cited as a reason for higher crop prices domestically and around the globe, which leads to an

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overall increase in the cost of food. Food prices are already increasing with inflation and are not expected to go down in the short term.

The EPA also has the authority to waive RFS requirements wholly or partially if implementing the program would cause severe economic or environmental harm. In light of this waiver authority, some - oil producers and refiners, in particular - have regularly advocated for the EPA to waive biofuels blending requirements. Indeed, in 2021, many of these actors tried to seize on rising oil and gasoline prices to argue that RFS waivers could alleviate prices at the pump. The EPA rejected those claims and has proposed denying all exemptions for small refineries. However, the EPA has also proposed reducing volume requirements for the 2021 and 2022 compliance years, which is consistent with the fact that blending goals have not been achieved in recent years. In light of recent research demonstrating the harmful environmental impacts caused by first generation biofuels, waivers should be considered as a tool to reduce market demand for environmentally harmful biofuels by waiving their required fuel volumes.

Proponents of petroleum fuels are concerned that the inability of refineries to blend enough renewable fuel is causing the cost of compliance to rise, given that participants must purchase credits if they fail to meet blending requirements. They suggest that the volume of renewable fuels should be reduced in future years so that petroleum blenders will be able to meet the program requirements and the cost of compliance will stabilize. The petroleum industry insists that reducing blend requirements will also drop the price of gasoline, which has shot up over the last year. This claim is unfounded, as higher gas prices are a direct result of the price of crude oil, which is entirely unrelated to tradable credits in the RFS. Additionally, one report found that higher ethanol blends likely save consumers money at the pump for 98% of all vehicle miles traveled in the U.S., and gasoline that hasn't been blended results in higher gas prices for consumers. While reducing the volume requirements for future compliance years will not impact gasoline prices, it may reduce emissions if waivers are targeted at fuels with the highest life-cycle greenhouse gas emissions.

By seizing the discretionary authority provided through the RFS after 2022, the EPA could use the program to more effectively lessen transportation emission while offsetting oil use. Given the negative impacts of combustible fuels on the climate and public health, and the economic vulnerability of relying on global markets such as oil, domestic policy–and additional federal policy tools—should focus on reducing reliance on liquid fuels in the long term. And as the nation undergoes a transition to zero emissions vehicles, the RFS can be used as a bridge to ensure that liquid fuels are as clean as possible in the short term.

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Climate Benefits and Limitations of the RFS

Benefits

By requiring petroleum to be blended with renewable fuels, the RFS has purportedly mitigated climate change by avoiding as much as 589.33 million metric tons of carbon pollution over the first ten years of the program—the equivalent of taking 149 coal plants offline for a year. Recent research calls this into question given what is now known about the impacts of land use change and variations in carbon counting.

In addition to potentially reducing carbon emissions, renewable fuels are reputed to reduce co-pollution such as particulate matter, also known as soot. While renewable fuels are not a silver bullet for eliminating pollution from the transportation sector, the RFS can be leveraged to reduce emissions that cause climate change and impact public health.

Limitations

While the RFS has abated greenhouse gas pollution to some extent over the past 17 years, the implementation of the policy is outdated with respect to President Biden's ambitious goal of reducing emissions by 50-52% by 2030. The RFS is also limited in its ability to address the health and energy security concerns of America's continued dependence on fossil and liquid transportation fuels. Four major concerns of the RFS as enacted are: (1) it centers around the use of liquid fuels and does not address the major adverse health impacts of such fuels; (2) its focus is volumetric; (3) biofuels are unable to meet the present need for zero-emissions and geopolitically-secure energy resources; and 4) land use changes associated with first generation, non-cellulosic biofuels contribute significantly to greenhouse gas emissions.

First, the RFS has gained criticism for its now-outdated focus on liquid fuel sources. When the RFS was developed in 2005, renewable fuels were viewed as a promising means of reducing greenhouse gas pollution from the transportation sector. But since 2005, America's energy and transportation systems have undergone dramatic changes and it has since become clear that electric vehicles powered by clean energy are the cheapest and most effective way to reduce vehicle pollution. Continuing to focus on combustible, liquid fuels ignores the reality that emissions reductions must be realized at a much faster pace than anticipated when the RFS became law. Updates to the program must include incentives for transitioning away from fuels that produce greenhouse gas emissions and towards zero emission energy sources.

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CHART 1: PUBLIC HEALTH IMPACTS CAUSED BY FUELS APPROVED UNDER THE RENEWABLE FUEL STANDARD

Fuel Type	Pollution/Waste	Health Impact	Case Study
Ethanol	▸ Increased PM and ozone emissions in warmer seasons ▸ Polluted wastewater ▸ Increased pesticide exposure	▸ PM and ground level ozone impact the respiratory system and exacerbate lung diseases ▸ Pesticide exposure can cause nervous system damage, skin and eye irritation, or cancer depending on exposure duration and the pesticide used ▸ Wastewater with pesticides degrades water quality and result in hormone disruption and neurological impacts in humans	Mead, Nebraska Ethanol Plant
Biodiesel	▸ Produces smaller PM emissions than gasoline ▸ Increased NOx emissions	▸ Smaller PM emissions result in deeper lung penetration ▸ NOx emissions impair the lungs and heart	Biodiesel refinery in Barrio Logan, San Diego trap residents in their homes
Biomass	▸ Emissions of PM 2.5, NOx and ammonia	▸ NOx emissions reduce lung function ▸ Ammonia is a respiratory irritant that can result in lung damage, blindness and premature death with extended exposure ▸ PM 2.5 exposure even at low concentrations can result in lung and heart disease	Biomass extraction harms low-income communities, and forests in the south
Biogas (animal waste)	▸ Hydrogen sulfide and Ammonia emissions ▸ Increased runoff of phosphorus and nitrates	▸ Higher mortality rates for populations with pre-existing conditions ▸ Increased respiratory diseases	North Carolina biogas produced from hog waste

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Even though biofuels can be cleaner than gasoline, the process of burning liquid fuels still produces emissions that harm communities and the environment. While the RFS encourages innovative transportation fuels, replacements for gasoline should not continue to put public health at risk. Some renewable fuels are harmful to human health even before combustion in a vehicle engine, due to the pollution generated in the production of the fuel. Chart 1 details some of the public health impacts caused by the production and use of fuels that are approved for use under the RFS. In many cases the communities most impacted by the negative emissions and waste associated with biofuel production are low-income communities and communities of color.

A second criticism leveled at the RFS is that it focuses on the per gallon volume of the fuel. This means that rather than phasing out liquid fuels over time or reducing overall fuel use, the success metric is instead an increased volume of renewable fuels each year. Centering the program on the volume of renewable fuel generation does not directly address greenhouse gas and other pollution reductions because it doesn't take into account increased vehicle sales, total vehicle miles traveled, or total volume of fuels combusted. Even if the amount of renewable fuel within gasoline increases, if the total amount of gasoline used also increases, the RFS might not have the mitigation impact it assumes. Without a focus on reducing the total combustion of fuels that produce greenhouse gases, renewable fuel quotas have limited capacity to mitigate climate change.

The focus on the total volume of renewable fuels, used in fuel blends, rather than the reduction of gasoline also means continued reliance on petroleum for the greatest part of U.S. transportation fuel. This leaves the nation at risk from its long-term dependence on oil, which is already more expensive and geopolitically destabilizing than zero-emission alternatives. Even when electricity prices rise, powering a vehicle with electricity is more cost-effective for consumers than using gasoline. More importantly, electricity prices are set by wholesale markets and regulated by state or region, which allows direct control over the market. In contrast, oil prices are subject to international supply and demand, with 71% of oil reserves currently controlled by the Organization of Petroleum Exporting Countries (OPEC) - which the U.S. is not a member of. This means the U.S. must continuously balance delicate relationships with foreign nations to secure reasonable oil prices. Given this disadvantage, it is not in the public interest to have national policies tied to the ongoing use of oil. And in combating the power of petro-states like Russia, rapidly producing renewable fuels will not be a winning solution because petroleum itself is a component of the fuel. Furthermore, expansion of renewable fuels is not a short term solution to blunting the power of petro-states because crops do not grow instantaneously, and

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investments would be required to build out facilities and pipelines to support the efficient transportation of biofuels. Federal lawmakers would do well to instead focus on promoting truly secure and clean fuel resources, such as zero emission electricity.

A third significant concern with the program is that it regards renewable fuels as a source of clean energy. While the fuels covered by the RFS come from sources that can be replenished, they still produce greenhouse gas emissions, including carbon dioxide, carbon monoxide, and methane. Methane production and combustion pose a particular concern, given that methane is a significantly more potent greenhouse gas than carbon dioxide. Renewable fuel combustion also results in the formation of co-pollutants, such as sulfur dioxide, nitrogen oxides and particulate matter (PM) 2.5 that adversely impact local air quality. Co-pollutants are harmful to human health, and disproportionately impact Black, Brown and low-income communities. Renewable diesel blends in particular have been shown to increase the formation of nitrogen oxides that form smog, while still producing emissions of hydrocarbons, carbon monoxide and PM 2.5.

The fourth and perhaps most notable challenge posed by the RFS is farmland conversion. The expansion of the biofuels market in the U.S and Europe has been linked to land use change that can result in increased greenhouse gas pollution. The growing demand for biofuels has led to traditional cropland being converted into biofuel feedstock production as well as the expansion of farmlands, known as direct land use change. Developing new farmlands in forests and wetlands, which serve as natural carbon sinks, results in the loss of the ability to store carbon in the natural environment. Relatedly, the expansion of biofuel use can result in land use change abroad as economies that produce agricultural exports stake a claim in the biofuels market, a process known as indirect land use change. The loss of natural carbon sinks through indirect land use change must be considered if the RFS is to be used as a tool to reduce emissions. Additionally, the demand for biofuels and their feedstocks naturally increased the value and therefore price of feedstocks such as corn, soybean and sugar. The United States, Brazil and Europe have proven to be the biggest contributors to the increase in crop prices, resulting in an increase in global food prices. These economic impacts must be weighed as the RFS continues to drive investment in biofuels.

II. 5 Updates to RFS Implementation to Drive More Emissions Reductions

The EPA has an opportunity to achieve more emissions reductions through the RFS program by improving and updating the program in 5 key ways:

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1. Improving the life-cycle analysis calculations used to determine the relative impacts of each fuel type;
2. Establishing maximum standards for acceptable land use changes associated with the program;
3. Imposing tighter restrictions on fuel pathways;
4. Right sizing the required fuel volumes; and
5. Capping credits

1. Life-Cycle Analysis

Improve the accuracy of EPA's life-cycle analysis by considering a greater variety of data inputs, accounting for environmental impacts other than greenhouse gas emissions, and updating the standard for the global warming potential, in particular for methane emissions.

Before the EPA determines that a fuel qualifies as renewable under the RFS program, the fuel must undergo a life-cycle analysis which takes into account the greenhouse gas emissions that are generated at every stage, from feedstock production to combustion of the fuel. Each of the four fuel types must meet a certain life-cycle greenhouse gas reduction threshold as compared to a 2005 petroleum baseline. The required emissions reductions are 20% for total renewable fuel, 50% reduction for advanced and biomass-based fuels, and 60% for cellulosic fuels. The inputs used to calculate the life-cycle emissions are critical to determining the true environmental benefit of each fuel.

The EPA may also have the opportunity to better assess life-cycle emissions by harmonizing modeling methods with varying underlying estimates for emissions of each fuel category. Studies suggest that by harmonizing various models, and analyzing the emissions range provided across the models, there will be more transparency in the assumptions and calculations within the models. Variations in calculations can be from a variety of factors including shipping emissions, and processing of fuels particularly from the coproduct treatment phase of production. Emissions estimates may also be improved by using broader calculation inputs including up to date agricultural and industrial sector data, as well as direct effects of producing and burning fuels and indirect effects such as land use changes as is done through California's Low Carbon Fuel Standard life-cycle analysis.

The EPA recently held a workshop to solicit input on the greenhouse modeling for biofuels based on the current scientific data, and this input should be fully incorporated into future accounting for the RFS program. The **EPA should update the**

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life-cycle analysis calculations to reflect the current scientific knowledge on biofuel emissions impacts, which will raise the bar for meeting life-cycle greenhouse gas thresholds for each fuel type. Ultimately this will result in greater pollution abatement because biofuels will fall out of compliance if they do not meet the greenhouse gas reduction threshold under a more accurate life-cycle analysis assessment.

Life-cycle analyses calculate emissions impacts using a greenhouse gas' global warming potential (GWP), which measures the heat trapped by a gas over a period of time, relative to carbon dioxide as the baseline measurement. The higher the GWP, the more that gas warms the planet as compared to carbon dioxide. The EPA currently uses a 100-year GWP, but there is a case for using a 20-year GWP for gases that persist in the atmosphere for shorter periods of time or with increased potency. For example, methane only persists in the atmosphere for about a decade, but it is a significantly more potent greenhouse gas than carbon dioxide in the short term. Because methane typically degrades in the atmosphere within 12-15 years, evaluating it on a 100-year timeline undervalues its potency as a contributor to climate change—estimates vary, but the Intergovernmental Panel on Climate Changes quantifies methane's 20-year GWP at more than 2.5x its 100-year GWP. By using a 20-year GWP to calculate methane emissions, the life-cycle analysis would more rigorously account for greenhouse gas emissions produced by biofuels. Accurately accounting for the impacts of methane is critical to assessing the true impact of biofuels, given that methane is the second largest contributor to greenhouse gas emissions after carbon dioxide, and methane emissions have increased at a record pace in recent years.

Furthermore, implementing fuel policies like the RFS, and Low-Carbon Fuel Standards (LCFS) at the state level, could more precisely assess the emissions impact of biofuel feedstock production across different farms. Currently, the lifecycle carbon intensity of most biofuels are assessed through an average score assigned to feedstocks grouped by region. But a closer examination shows that actual carbon and nitrogen oxide emissions associated with production can vary significantly from farm to farm, due to variance in agricultural practices, including adoption best practices like conservation tillage, reduced use of nitrogen fertilizer, and implementation of cover crops. It could also further vary based upon a farm's use of zero-emission renewable energy to power on-site processes. Capturing this variance through Farm-Level Carbon Accounting provides the EPA, and its sister agencies like USDA, with the opportunity to achieve greater emissions reductions through the RFS, to standardize carbon accounting for ease of use by more state LCFS programs, and to encourage more biofuel producers to maximize their emissions reductions.

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While the RFS life-cycle analysis is intended only to measure greenhouse gas emissions, the model used by the EPA should also take into account other environmental impacts, such as: air pollution other than greenhouse gases, water pollution and soil degradation. In addition to releasing greenhouse gas, biofuels also produce what the EPA calls criteria pollutants such as nitrogen oxides, hydrocarbons, carbon monoxide and particulate matter that harm public health and the environment. Criteria pollutants continue to unequally burden communities of color, with Black Americans three times more likely to die from PM pollution than white Americans. Given that the EPA already has the authority to regulate criteria pollutants, they should be considered as environmental harms in the RFS life-cycle analysis. With respect to water and soil quality, the goal of reducing emissions through the use of biofuels should not create other environmental burdens, particularly when it is well-recorded that the increase in production of biofuels increases the use of fertilizers and pesticides, which lead to soil erosion and water pollution. Each of these factors should be considered in an expanded life-cycle analysis.

2. Fuel Pathways

Limit fuel pathways to those that achieve maximum greenhouse gas and co-pollution reduction.

Under the RFS there are “fuel pathways” which describe the process of converting the raw materials into renewable fuels. Fuel pathways contain three components: the type of feedstock, the production process, and the type of fuel that is ultimately produced. The specific fuel pathway changes depending on each of the three components, and the pathways are graded based on their life-cycle greenhouse emissions percentage relative to the 2005 petroleum baseline. There are many approved fuel pathways for each of the four fuel types, which result in a variation in the amount of emissions produced by different feedstocks and through use of various production methods for developing renewable fuels. By limiting fuel pathways to those that achieved the maximum greenhouse gas and co-pollution reduction, the RFS could maximize program benefits.

The RFS could first mitigate fuel pathway emissions by limiting the allowable feedstocks to those that generate the least greenhouse gas in the process of growing, farming or extraction. Virgin materials are the primary feedstock source for biofuels in the U.S., and the greenhouse gas impact of feedstocks can vary. For example, one study compared the farming activities of soybeans and canola, (which are common U.S. feedstocks) and found that canola produced nearly twice the amount of greenhouse gas emissions in the farming process as soybeans. Additionally, second

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generation biofuels, which are derived from nonfood crops, have a lower environmental impact than corn crops because the farming practices used to maintain non-food crops store more carbon and use less fertilizer.

CHART 2: BIOFUELS BREAKDOWN

Biofuel Type	Source material
1st generation biofuels	Made from food crops. In the US this is mainly **corn and soybeans**
2nd generation biofuels (advanced biofuels)	Generally made from non food crops, typically grasses, inedible crop waste or other waste products
Cellulosic biofuels	Made from cellulosic parts of plants, including the leaves, stems and other fibrous parts
Non-cellulosic biofuels	Made from any organic source and can be a wide variety of materials including food and non food crops, biogas, waste products, forest products, etc.

The processing of feedstock to convert them to biofuels is also an energy-intensive process that releases emissions. As with feedstock production, the emissions impact of processing biofuels can vary significantly depending upon the type of feedstock used, and upon the agricultural practices deployed by the producer. This presents another opportunity to reduce overall emissions if feedstocks that produce the least amount of greenhouse emissions during the processing stage are the only acceptable pathways.

3. Land Use Change Threshold

Develop a maximum threshold for feedstocks that contribute to land use change.

The fuel pathways analysis takes into account the life-cycle greenhouse gas pollution of each fuel, which includes the emissions generated by land use change. Due to the demand for biofuels, pasturelands and forests—both natural carbon sinks—have been converted into farmland, which has a negative impact on the global capacity to store and process carbon dioxide. The emissions impact of land use change depends on whether the land was previously a forest or pasture, which crop the land was converted to producing, and how much land was converted. When converting land for

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biofuels feedstocks, second generation biofuel crops result in lower land use change impacts than corn and other food crops, and converting grasslands results in lower emissions impacts than converting forested land. A maximum allowable standard for land use change would regulate several of those variables that influence the emissions associated with land use change for biofuel feedstocks.

To reduce emissions associated with biofuel crops and land use change, the EPA should set standards to limit the agricultural impact on climate change to ensure that biofuels are only being produced at the rate that they will be consumed. Specifically, the EPA should work closely with the USDA to determine how much crop land is required to meet current fuel standards. USDA should also survey how much land is being used for first generation biofuel crops rather than second generation biofuel crops, as well as the percentage of land use conversion annually. Tracking land use change caused by the biofuel market will allow for a more precise calculation of emissions impacts from each feedstock.

The EPA should also improve the structure of the credit system to establish a more defined price differential for feedstocks and pathways that result in the least emissions from land use change. Currently the RFS provides slightly more credit value to advanced biofuels, but there is significant overlap between credit prices across the four biofuel categories. The categories should be made more distinct with a transparent weighted value for each fuel type to standardize prices and allow for increased predictability within the market. And, the RFS program should require certification that feedstock crops are not contributing to deforestation to verify a thorough and accurate account of carbon abatement.

4. Right Sizing Required Fuel Volumes

Fuel volumes should be right sized by using real time production and consumption data, which could drive greater emissions reductions and stabilize the credit system.

The RFS has four defined categories of renewable fuels: cellulosic biofuel, advanced biofuel, biomass-based diesel, and total renewable fuel. The required volume of cellulosic biofuels, advanced biofuels, conventional biofuels and total renewable fuels are all specified by Congress through 2022, while the EPA has had the freedom to adjust the required amount of biomass-based diesel. The agency has further ability to adjust required fuel volumes beginning in 2023. Advanced and cellulosic biofuels have been slow to gain traction in the market due to economic barriers resulting from high production costs of developing and processing these fuels, as well as slow movement by the EPA in approving new fuel pathways. As a result, total renewable fuel and

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conventional biofuels, derived from corn and other food crops, make up the majority of renewable fuels on the market.

CHART 3: LIFE-CYCLE GHG THRESHOLD OF RENEWABLE FUELS

Fuel	Definition of source material	life-cycle GHG threshold
Cellulosic biofuels	Leaves, stems and fibrous parts of plants	60% less emissions than baseline
Advanced biofuels/ second generation biofuels	Generally non food-based crops (grasses, agricultural waste, other waste products, biogas, cellulosic ethanol)	50% less emissions than baseline
Biomass-based diesel	Non-petroleum renewable sources (plants, crop products and waste materials)	50% less emissions than baseline
Total renewable fuels	Combination of advanced and conventional fuels	20% less emissions than baseline
Conventional fuel	Ethanol from corn starch. (Calculated as total renewable fuel - advanced fuel)	20% less emissions than baseline

While the current fuel volumes established by Congress must be adhered to through 2022, the statute is clear that beyond 2022 advanced biofuels cannot decrease below 2022 targets, and biomass-based diesel cannot be reduced below 2012 targets. This gives EPA the opportunity to reduce the required volume of total renewable fuels, which only require a 20% emissions reduction over petroleum, while maintaining volume requirements for advanced and biomass-based diesel fuels which require greater emissions reductions.

Maintaining or increasing the fuel volumes across the board would be out of touch with the reality that biofuel producers have not met the volume requirements in multiple years. According to the Congressional Research Service, the total renewable fuel target has not been met since 2014, and the advanced biofuel target has not been achieved since 2015. Despite the inability to achieve blending targets, producers are still expected to comply with the program, causing the cost of compliance to skyrocket, due to the need to purchase RINs.

Though certain fuel types cannot be set below the current target, the EPA does have the ability to waive RFS requirements if the implementation of the program would harm the economy or environment, or there is not adequate domestic supply of

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renewable fuels. The EPA exercised this waiver authority in 2022 by retroactively reducing the required volumes for the 2020 and 2021 compliance years. The environmental harm caused by the reliance on corn ethanol and first generation biofuels should give cause for the EPA to be able to consistently waive environmentally unsustainable fuel volumes. Following a more robust lifecycle analysis, as recommended above, the EPA should exercise its waiver authority for first generation biofuels that have significant environmental impacts.

Using a waiver authority, the **EPA could right size fuel volumes each year and maximize emissions reductions by decreasing volume requirements for total renewable fuels and non-cellulosic fuels which contribute to the greatest greenhouse gas emissions. At the same time, the program should scale up the requirement for advanced cellulosic fuels as they result in less greenhouse gas pollution and provide benefits for soil health and water quality.** It is clear from the gradually increasing statutory requirements for cellulosic fuels that they were expected to grow over time, and the EPA should lean into this by supporting the expansion of advanced cellulosic fuels. The EPA, and the rest of the Biden administration including DOE and USDA, can accelerate the rate of advanced cellulosic biofuels used in the market by approving additional fuel pathways for advanced cellulosic fuels and investing in programs and technologies that help produce advanced cellulosic biofuels. Program participants can then be encouraged to use advanced cellulosic fuels by weighing the credit system such that advanced cellulosic biofuels earn more credits than other fuels.

5. Capping Credits

Once fuel volumes are "right sized", the amount of Renewable Identification Numbers on the market can be capped and reduced over time to guarantee that emissions reductions are being achieved by as many program participants as possible.

The RFS program tracks renewable fuel production through the use of credits called Renewable Identification Numbers (RINs). These credits are given for each gallon of renewable fuel produced, and RINs "retire" within 12 months to demonstrate compliance with the program. Fuel producers generate RINs that can be traded among market participants in two ways: through the purchase of a batch of fuel with associated RINs, or through direct RIN trading that allows underperforming producers to meet program requirements. Each year 20% of RINs can be carried over into the following compliance year if they were not used, and then will expire at the end of the second year. Credits are given different codes based on the fuel type, with cellulosic fuels being the most expensive credits and total renewable fuel as the least expensive.

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If the RFS aims to reduce greenhouse gas pollution that is generated by transportation fuels, a system of tradable credits does not adequately advance that goal. While the concern with the total emissions produced domestically is important, individual refiners and importers should also focus on cleaning up their specific operations to reduce harmful emissions. By allowing credits to be traded and purchased, the program provides an opportunity for refiners and importers to skirt the requirement to reduce the volume of petroleum in their particular product. Instead, the EPA should be pushing all producers to reduce emissions to the greatest extent possible.

The EPA should limit the opportunity for credits to be used to meet compliance by putting a cap on the number of credits that are available in the market. This would need to be done in conjunction with right sizing the amount of renewable fuels required each year, so that achieving the blending requirements is feasible for large and small refiners. **Once fuel volumes are "right sized" to account for actual fuel production and consumption, the EPA can cap the number of credits and gradually decrease available credits to ensure that emissions reductions are truly being met by as many program participants as possible.**

The credit system should also be updated to provide additional value to credits for advanced cellulosic biofuels to encourage their use over first generation fuels. **The RFS has a proven ability to shift the agricultural market, and that power should be leveraged to drive the market towards advanced cellulosic biofuels and away from first generation food crops** by appropriately weighing credits.

III. Advancing Clean Fuel Standards

While there are clear and definite ways that the Biden administration can optimize implementation of the RFS to deliver fuels that reduce climate and local air pollution, the limitations in the statute should also drive the Biden administration to look to other fuels policy opportunities to drive greater transformation in the transportation sector. The RFS is primarily intended to promote renewable fuels. But the urgent demands of the climate crisis, public health, and energy security in 2022 should lead federal lawmakers toward policies with goals that more directly focus on the reduction of carbon and conventional air pollution from the nation's transportation fuels, and the promotion of clean fuel alternatives—especially electricity.

States have a history of leadership implementing Low-Carbon Fuel Standards (LCFS), also known as Clean Fuel Standards (CFS), which force fuel providers to reduce the carbon intensity of their products, and have the effect of promoting lower-carbon

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fuels, including electrification. California was the first state to implement such a policy, with its adoption by the California Air Resources Board (CARB), under the authority of state AB32, in 2009. It has since been joined by two other states, while others are actively considering similar action. The Biden administration should support the proliferation of LCFS/CFS policies at the state level, and it could have some opportunities to do so directly, as it reforms its implementation of the RFS.

Even more pertinently for the Biden administration, the EPA should explore the use of Clean Air Act Section 211(c) to promulgate further regulations on the pollution produced by transportation fuels, through a federal Clean Fuel Standard. Such a federal policy could, like state clean fuel standards, reduce smog, soot and carbon pollution, and levy responsibility upon fuel providers to promote more low- and non-polluting alternatives. This policy could be implemented alongside or in supersession to the RFS, and would better support the transformation of the U.S. transportation sector urgently away from polluting fuels. Finally, one other option is for Congress, as it continues to debate the future of the RFS, to create its own LCFS/CFS, either out of whole cloth as a new program, or as an amended form of the RFS.

Continued State Leadership in Low-Carbon Fuel Standards

The federal government should follow the lead of states in pursuing policies that promote not just renewable fuels, but clean and low-carbon fuels. And the Biden administration should actively support the proliferation of state clean fuel standard policies.

As noted above, the LCFS first adopted by California has driven significant transportation emissions reductions by setting a carbon intensity threshold for fuels and ratcheting it down over time. Fuel suppliers and transporters are required to participate in the program, and each fuel type is rated based on its carbon intensity. Fuel suppliers must comply with the reductions target each year based on their fuel supply. If the carbon intensity threshold is not met, suppliers must purchase credits from other program participants, or they will receive financial penalties for credit deficits.

California's LCFS has successfully reduced transportation emissions, in some cases exceeding program targets, and has grown the alternative fuels market within the state. Some of the proceeds from the program are required to be spent on electrification efforts, which provide utility customers access to electric vehicle charging stations, and additional rebates for electric vehicles. This program goes much further than the RFS in promoting low-carbon fuels, in that electrification is

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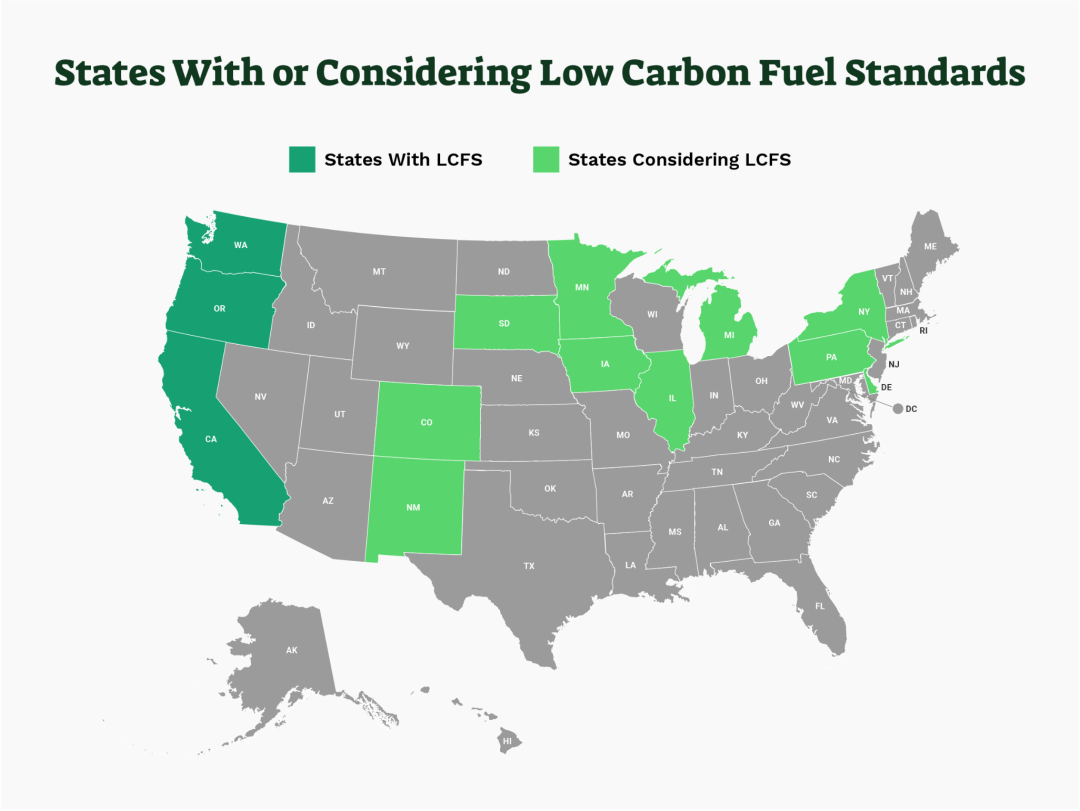
incentivized, along with low-carbon liquid fuels, through the credit system that favors fuels with lower carbon emissions. Unlike the RFS, electricity is rated as a fuel option under the LCFS, meaning fuel providers can earn credits by producing electricity as well as liquid fuels. This policy design levies meaningful responsibility on fuel providers to participate in reducing the carbon intensity of their products and the state's fuels market.

California has since been joined by its West Coast neighbors, Oregon and Washington, in the creation of LCFS/CFS policies. And additional states are actively considering the policy. In New York, efforts are ongoing towards passing LCFS legislation. Minnesota's departments of agriculture and transportation have conducted extensive stakeholder and public engagement around a CFS in their state. In April 2022, Gov. Gretchen Whitmer proposed enacting a CFS as part of her Michigan Healthy Climate Plan. And Midwestern advocates have organized themselves into the Future Fuels Coalition and are working to advance the policy in additional states, like Ohio and Nebraska, and throughout the region.

FIGURE 2



The Biden Administration has the opportunity to support state LCFS/CFS policies through the ways that it chooses to modernize implementation of the RFS. For

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example, researchers and advocates have shown that state clean fuels policies could better promote lower-carbon biofuels through the incorporation of Farm-Level Carbon Accounting. At current these policies mostly grade the carbon intensity of biofuels through an average score assigned to feedstocks grouped by region. But a closer examination shows that actual emissions in biofuel production can vary significantly, driven by on-farm agricultural practices. As discussed in section 2 of this paper, federal agencies like the EPA and USDA can take a leadership role in incorporating more precise farm-level accounting of carbon intensity into the RFS. The federal government can then also standardize and disseminate this information to inform state-level LCFS/CFS programs. Furthermore, these federal agencies have the opportunity to engage directly with state agencies in the provision of technical assistance.

Establishing a Federal Clean Fuel Standard Under the Clean Air Act

The Biden administration should pursue use of the Clean Air Act to establish a federal Clean Fuel Standard regulating the air pollution associated with transportation fuels and promoting clean, non-polluting alternatives, such as electricity.

Since its enactment in 1970, the Clean Air Act has been an important and popular tool for reducing emissions and improving public health outcomes through regulation of air pollution. In its 52 year history, the Clean Air Act (CAA) has successfully threaded the needle of reducing pollution while providing immense economic benefits, resulting in combined emissions reductions of 78% since 1970 among major air pollutants. By requiring the use of new, lower emissions technologies for power plants and vehicles, the CAA has also encouraged technological and industry innovation. The CAA has an established history of successfully and cost-effectively reducing air pollution from the transportation sector.

While the 2005 Energy Policy Act established the RFS under a new Section 111(o) of the CAA, other provisions of this federal law can also be leveraged for modern federal fuels policy. Specifically, under section 211(c) of the CAA, the EPA is given the authority to regulate or outright prohibit the sale of fuels that contribute to air or water pollution and result in endangerment of public health or welfare. The agency has successfully deployed this authority in the past, perhaps most notably in its efforts to regulate lead content in gasoline—culminating in its 1973 decision to require gas stations to offer unleaded gasoline, and to require gasoline manufacturers to gradually reduce the amount of lead contained in the fuel. The EPA should now pursue the use of this authority to regulate gasoline and biofuels for their

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contributions to soot, smog and greenhouse gas pollution, through a federal Clean Fuel Standard.

The air pollution associated with burning gasoline in motor vehicles is well-known for its adverse impacts on public health, as well as the climate. Gasoline combustion produces nitrogen oxides that are a major contributor in smog pollution, and particulate matter. Gasoline burned in vehicles also produces both carbon monoxide and carbon dioxide. Biofuels, meanwhile, often produce more nitrogen oxide pollution than gasoline, although they produce less particulates and carbon dioxide. This excess nitrogen oxide pollution contributes to the smog that especially harms environmental justice communities. The EPA has a long history of regulating these pollutants. Since 1971, the EPA has regulated six different criteria pollutants from mobile sources (transportation vehicles): ground-level ozone, particulate matter, carbon monoxide, lead, sulfur dioxide, and nitrogen oxide. Given this, these pollutants are already the subject of extensive and regularly-updated analyses identifying their adverse effects on public health. And because the first step in regulation under Clean Air Act section 211(c) is the Administrator's issuance of a finding that such pollution may "cause or contribute to air pollution which may reasonably be anticipated to endanger public health or welfare," the agency has arguably already made the requisite finding for regulating certain of these pollutants from gasoline via Section 211(c). In addition, by targeting soot and smog-forming criteria pollutants, the EPA could also produce co-benefit reductions in carbon dioxide pollution.

Of course, gasoline and biofuels could also be regulated for their carbon dioxide pollution that causes climate change. The EPA regulates both criteria and carbon pollution from vehicle tailpipes under section 202 of the CAA. This approach to regulation of fuels would borrow even more directly from state LCFS policies. It is also well within the scope of the EPA's authority under the CAA, and worthy of the agency's exploration. The ongoing progress and diverse range of support for state clean fuel standards policies has trod a path for the federal government to follow. Importantly, however, as the agency examines this option, it should consider ways to avoid or mitigate potentially pre-emptory interactions with state LCFS policies, which generally govern carbon but not soot or smog pollution. Both state and federal policies have an important role to play in driving forward America's clean fuel future.

In implementing a new section 211(c) standard aimed to reduce air pollution associated with transportation fuels, the EPA could require fuel sellers and/or manufacturers to reduce such pollution from their own products or provide more clean alternatives. The agency could require them to do so directly, by requiring them to produce gasoline and biofuel that does not cause, or causes less pollution, or by requiring, for example, that fuel retailers like gas stations also provide clean

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alternative fuels, like electricity. Or, the agency could establish a more flexible regulatory mechanism that allows fuel providers either to limit the pollution from their own products or else invest in clean alternatives. Such a system could, like state clean fuel standards, reduce pollution by driving investment in the deployment of low-carbon fuels and vehicle electrification. If properly constructed, it could help to achieve pollution reductions in smog, soot or carbon pollution from the transportation sector in alignment with the requirements of the Clean Air Act and its mandate to protect public health. While not a silver bullet itself, this policy would provide one more important tool to drive U.S. transportation fuels, and fuel providers, towards clean energy.

Most of the fuel currently used to power cars and trucks is a blend of both gasoline and biofuels. Therefore, the EPA's use of section 211(c) authority to force fuel providers to reduce the air pollution from gasoline should in practice limit pollution from both petroleum and biofuels. It is plain to see that petroleum-based gasoline should be more aggressively regulated based on its disastrous impact on the environment and public welfare, and given that there is available technology to provide low- and non-polluting alternative fuels. It is also clear that pollution caused by biofuels could be more strictly regulated by the federal government. Federal CAA standards can be leveraged, along with and/or following modernized RFS implementation, to steer biofuels industries towards reducing the environmental impact of their fuels.

Congressional Action on a LCFS

Another option is for the Congress to take action to create a federal LCFS/CFS program. This could be considered on its own as a new program, or as part of ongoing congressional debate about the future of the RFS. It is notable, here, that Congress is expected to debate a Farm Bill in 2023, which could implicate this debate. And the opportunity for federal lawmakers to create a low-carbon fuel standard that would simultaneously benefit public health, the climate, energy security, and economic growth.

Congress could amend the RFS or create a federal LCFS that, led by the EPA, could drive investment into lower-carbon biofuels but also into vehicle electrification and other clean alternative fuels, and even public transportation. As this paper has discussed, unlike the LCFS model, the RFS does not require the proceeds from the sale of credits be invested in lowest-emission transportation alternatives. That means that currently, billions of credits are generated by the RFS program annually, which means that the EPA is passing on the chance to use millions of dollars every year for emissions reductions. To truly drive a transformation of the sector, Congress could

revise the statute to allow RFS participants to spend funds generated from the RIN market on vehicle electrification. Directing obligated parties to invest in electric vehicles would better align the RFS with the administration's efforts to reduce emissions and achieve the goal of electric vehicles making up at least 50% of new cars sold in the U.S. by 2030.

The best path forward to achieve clean, renewable, low-emissions energy for the transportation sector is to prioritize mass electrification, which is modeled by LCFS programs. Modernizing the RFS should include efforts to raise capital to invest in electrification efforts, while still supporting the use of biofuels for hard to electrify vehicles such as aviation and watercraft. By strategically investing proceeds into areas of highest need, such as environmental justice communities with high vehicle pollution, or heavy- and medium-duty vehicles that pollute in greater amounts, gains can be made for both public health and toward national emissions reductions goals. Adopting a regulatory framework that invests in electrification, like the LCFS, would provide a much needed ongoing and dedicated revenue source that will be necessary to achieve decarbonization of the transportation sector by mid-century.

IV. Additional Federal Policy Opportunities

In order to achieve President Biden's goal of reducing greenhouse gas pollution by at least 50% by 2030, federal lawmakers must make inroads in emissions reductions in the transportation sector—the largest contributor to domestic climate pollution. This will require a range of tools, and should include many that promote the deployment of low-carbon fuels and that especially transform the sector away from polluting fossil and liquid fuels. These actions implicate responsibility for both the Biden administration and for Congress.

To begin, there are many steps that the Biden administration can take using existing federal funds and authorities to drive towards cleaner fuels. The Infrastructure Investment and Jobs Act (IIJA), which was passed by Congress and signed in 2021, provides down payments on cleaner fuels—particularly electric charging infrastructure and bus electrification—that are needed to reduce the nation's reliance on fossil fuels. This section also explores the need for federal lawmakers to prioritize pollution reductions in disadvantaged and overburdened communities, for Congress to advance major new clean fuel and transportation investments in budget reconciliation legislation, and the Biden administration to promulgate strong clean car and truck standards. Finally, it posits some additional policy options for consideration by federal lawmakers.

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Prioritizing Pollution Reductions in Overburdened Communities

Disadvantaged communities—communities of color, indigenous and low-income communities—are continuing to suffer disproportionately from local air pollution. When it comes to soot and smog pollution from the transportation sector, people of color continue to breathe dirtier air than their white counterparts. **Communities of color should not have to wait for clean air when EPA has the regulatory authority to impose restrictions on fuels that harm public health.** The Biden administration should act on the commitment to address environmental injustice by ensuring that disadvantaged communities that currently suffer the most from poor air quality—are prioritized in standard-setting and in federal investments in zero-emission vehicles and infrastructure.

The Biden administration should support disadvantaged communities by advancing aggressive clean air and water regulations that will reduce pollution and its cumulative impacts. This begins with aggressive clean car and clean truck standards, aimed to reduce their tailpipe pollution. It continues through new regulatory strategies, such as the fuel pollution regulatory actions proposed in this paper. The administration, and states, should do more to confront air pollution "hotspots," to which vehicles are the greatest contributor. This could be required by the EPA under the Clean Air Act and encouraged through the U.S. Department of Transportation (USDOT) performance management rules.

The administration should be intentional about targeting federal investments to reach disadvantaged communities. For example, even as zero-emission vehicles become more accessible, communities of color have been least likely to host electric vehicle charging stations. Meanwhile, to date rebates for electric vehicles overwhelmingly go to high-income buyers, which results in prolonged air pollution for low-income communities and communities of color. The White House Council on Environmental Quality (CEQ) should finalize its Climate & Environmental Justice Screening Tool. And in doing so should ensure race is included as a determining factor in the screening tool, given its central importance in assessing disproportionate environmental burden. The White House should then ensure federal agencies use this tool thoroughly as they deploy federal investments, in alignment with the administration's Justice40 Initiative. The administration should also deepen its engagement with states and communities to ensure that new federal funds are reaching the communities in need.

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Capitalizing on IIJA Programs

The Infrastructure Investment & Jobs Act (IIJA), passed in 2021, makes critical initial investments in electric vehicle charging infrastructure, and in the electrification of buses and ferries that are major sources of pollution. The legislation also provides investment in research, development and demonstration funding to develop other clean fuels, like clean hydrogen, that may support decarbonization such as through the new DOE National Hydrogen Strategy. Using advanced biofuels or clean hydrogen for hard-to-electrify forms of transportation, such as aviation and shipping, while focusing on electrification for on-road cars and trucks, can help drive complementary pollution reductions throughout the entire sector.

Specifically, the IIJA provides $7.5 billion for alternative fuel corridors and to help states deploy charging infrastructure. It provided $5 billion for clean school buses, where half of the funds are required to be spent on zero-emissions buses and the other half are authorized for alternative fuels buses. This program prioritizes rural and low-income communities. The legislation also creates a pilot program to provide $250 million in grants for the purchase of electric or low-emitting ferries.

The Biden administration should deploy each of these investments as rapidly as possible, while prioritizing investments in zero-emission projects in disadvantaged communities that suffer the most from vehicle pollution, in alignment with the administration's Justice40 Initiative. The IIJA contains real opportunities for investment in disadvantaged communities.

Congressional Action on FY22 Reconciliation

As of May 2022 the 117th Congress still has before it the most important actions that it must take, by far, to confront the climate crisis, enhance domestic energy security, and support good jobs and environmental justice. This includes many critical pending investments in electric vehicle consumer incentives and manufacturing investments, along with other policies supporting Sustainable Aviation Fuels, and other clean transportation technologies.

In Fall 2021, the House of Representatives passed the Build Back Better Act containing $555 billion in climate, environmental justice and clean energy investments. However, that legislation was tabled in the U.S. Senate. Nonetheless, key senators and majorities of Democrats in both chambers have indicated their interest in getting these investments over the finish line.

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Enacting the $555 billion in climate investments contained in that bill, through whatever means necessary, is the single most critical step the federal government can take for the climate in 2022. This bill would drive down emissions from the transportation sector by providing, among several other programs, up to $12,500 in tax credits for electric vehicle purchasers, as an accessible refundable credit. These tax credits are critical because they will help push prospective car buyers and the electric vehicle market in the right direction. Currently, the maximum credit for an electric vehicle is $7,500, and this plan would provide an extra $500 if the battery is made in the U.S., and an additional $4,500 if the vehicle is assembled in the country with union labor—thereby supporting the domestic production of electric vehicles, and the good jobs and enhanced energy security that will entail as U.S. finally begins to break its oil addiction.

The House-passed reconciliation bill would also provide a number of investments in low emissions fuels, including $960 million to USDA to provide competitive grants to transportation fueling and distribution facilities for upgrades and retrofits. The bill also includes $10 million to support investments in advanced biofuels, and it would extend the income tax credit for advanced biofuels.

Clean Car and Clean Truck Standards

When it comes to confronting transportation pollution from cars and trucks, and transforming these vehicles away from polluting fuels to clean fuels like electricity, the federal government's strongest tool, by far, continues to be the promulgation of Clean Car Standards and Clean Truck Standards that regulate their tailpipe pollution (and fuel economy). In 2021, the Biden administration's EPA and USDOT National Highway Traffic Safety administration (NHTSA) took the important step of finalizing Clean Car Standards for light-duty vehicles that replaced weak Trump-era standards—so weak that even auto companies did not support them.

This year, the Biden administration has begun to build on that progress, as they've finalized California's waiver to operate its own clean car rules, as it had done for decades prior to the Trump administration. The EPA also promulgated strong draft standards for heavy-duty vehicles (Clean Trucks Rule) that effectively confront carbon and toxic air pollution from large trucks. This year the administration must continue this important work, and begin to build a robust post-2026 regulatory framework for light-duty vehicles that will drive the transition to 100% zero-emission light duty vehicles sales, as called for in the Evergreen Action Plan.

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Additional Legislative Options

As this paper has discussed, for light- and medium-duty vehicles, electrification is the best option to significantly reduce greenhouse gas pollution and decrease the negative public health outcomes associated with the use of combustible fuels. Electrification of vehicles is also the best option for decreasing reliance on foreign oil supplies and stifling the power of petrostates in international markets. National policies should focus on making electrification of transportation and heating systems widely affordable and available to make the transition as rapidly as possible. This section focuses on additional policy options that will accelerate the transformation of the transportation sector towards the cleanest fuels, particularly electricity, and the resulting reduction of greenhouse gas pollution. A combination of the following programs would allow the acceleration of electrification of the transportation sector including: feebate programs, a reduced vehicle miles traveled credit, and expansion of EV rebates.

Feebate

Feebate programs create a fee on the sale of vehicles that have high emissions outputs or are not fuel efficient, which results in lower emission, fuel efficient, and zero-emission vehicles being more affordable. The funds from the fee are then used to expand rebate programs to further incentivize the purchase of zero emission vehicles. Ideally the expansion of these rebate funds would be reserved for consumers in low-income, rural and disadvantaged communities in addition to existing rebates to allow broader adoption of electric vehicles for populations who might otherwise be unable to afford an electric car.

However, feebate models may be seen as regressive due to the fact that newer, lower-emission, and zero-emission vehicles tend to be more expensive and therefore less accessible to low-income populations. This challenge could potentially be overcome by imposing the fee upstream, instead of on consumers themselves. By imposing the fee on manufacturers and dealers of undesirable vehicles, the burden will not fall as heavily on individual consumers. The specific fee applied to high emission vehicles would need to be thoughtfully developed to ensure that currently affordable vehicles don't become inaccessible for low-income populations and that the rebate amount drawn from the fee is substantial enough to incentivize the purchase of an electric vehicle. Feebate policies must also consider the intersection with current vehicle standards.

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Vehicle Miles Traveled Fee

Consumers can be incentivized to reduce their vehicle miles traveled (VMT) by taxing annual miles traveled, also known as VMT reduction programs. By getting drivers to record their VMT in personal vehicles, and taxing by the mile, people will be incentivized to pollute less and potentially rely on other sources for mobility, such as public transportation and micro-mobility modes. VMT programs work by using technology to track location and distance that the vehicle travels, and then calculating the total distance driven in a given year to produce a tax bill. Congress should use the results of the first ever National Motor Vehicle Per-Mile User Fee Pilot Program authorized through the IIJA to inform more expansive VMT legislation. A VMT program would need to be a tiered system to account for the different travel needs of people in cities, suburbs and rural areas such that those who must travel long distances for work are not put at a financial disadvantage.

Rebate Expansion

While electric vehicles continue to become increasingly cost competitive with traditional vehicles, they are still not universally affordable, and charging stations are not widely accessible. Accelerating the transition to electric vehicles will require continued investment and expansion of rebate programs so that all vehicle owners will be able to make the transition as soon as possible. Rebate programs should be doubled from the current amount of $2,500-7,500 to allow for electric vehicles to truly be cost competitive.

And to allow rebates to be more accessible to low and moderate income buyers who have less cash on hand, rebates should be available at the point of sale such that they directly reduce the buying price, rather than rebates operating as a refund after purchase. There should also be an effort to expand electric vehicle rebates for used vehicles to deepen opportunities for low-income individuals to participate in the electric vehicle market, as proposed by the Affordable EVs for Working Families Act. Programs that allow customers to trade in their high emission vehicle in exchange for credit when purchasing a lower emission vehicle, called cash for clunkers, can also support lower and moderate income customers in purchasing electric vehicles, particularly when paired with existing rebates. The Obama era cash for clunkers program can be improved upon by allowing any non-electric vehicle to be traded in (rather than only gas-guzzlers) and by applying trade in credits exclusively to electric vehicles rather than any low emissions vehicle.

In addition to expanding rebates, the federal government should follow California's lead in restructuring incentives to exclude expensive electric vehicles and high-income customers so that rebates can continue to influence the market for

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mid-range and affordable electric models. Rebates should also be expanded to include a larger share of funds for vehicle charging infrastructure. Finally, the current cap on dealership participation in rebate programs should be eliminated and federal agencies should work with states to reduce barriers to accessing direct sales zero emissions vehicle dealers.

VI. Conclusion

Transportation emissions in the U.S. must be addressed to meet the Biden administration's goal of cutting greenhouse gas emissions by 50-52% by the end of the decade. The administration must update regulations and enact new legislation that encourages zero emissions investments while prioritizing emissions reductions for the communities that are most impacted by pollution. By revising the implementation of the RFS, and using the full regulatory capacity of the Clean Air Act, the administration can make concerted gains in reducing the transportation sector pollution that harms millions of Americans each year.

The administration should strengthen the RFS as an air pollution reduction tool by improving the life-cycle analysis calculations, imposing tighter restrictions of fuel pathways, establishing a maximum standard for land use change, right sizing fuel volumes and capping credits. These adjustments to RFS implementation can help reduce emissions from on road vehicles by ensuring that only the cleanest fuels are used. The administration should also look to its existing authorities to better support the transition to clean, low-carbon fuels. This can be done by actively supporting the proliferation of state Clean Fuel Standards, and also using well-established authority under Section 211(c) of the Clean Air Act to regulate pollution from transportation fuels. Historically, using the CAA to protect Americans from pollution has led to technological innovation, and the growth of new domestic industries and jobs, which can help catalyze investment in zero emission fuels and vehicles.

The majority of Americans want the federal government to do more to fight climate change, and the Biden administration must lean into this political opportunity by securing new climate investments as outlined in the Build Back Better Act passed by the House of Representatives in fall 2021. As the devastating realities of climate change begin to impact communities across the country, the administration must take bold action to put the nation on a path to achieving a clean energy future.