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DEVELOPMENT AND ANALYSIS OF A DURABLE LOW-CARBON FUEL INVESTMENT POLICY FOR CALIFORNIA

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EXECUTIVE SUMMARY

In order to meet California's ambitious climate change goals, a substantial portion of the state's emissions reductions must come from the transportation sector. While a transition away from petroleum and first-generation biofuels must come in part from increasing use of ultralow-carbon liquid fuels, defined as fuels with a carbon intensity of 30 grams of carbon dioxide equivalent per megajoule (gCO_2e/MJ) or less, the production of these fuels has thus far fallen far short of volumes needed to substantively reduce transport sector emissions. Despite proof-of-concept technical demonstrations for a variety of ultralow-carbon fuels, economic barriers hamper their commercialization and widespread adoption. Existing policies for low carbon fuels, including the Low Carbon Fuel Standard, the Renewable Fuel Standard, and the Second Generation Biofuel Producers Tax Credit, should substantially mitigate these economic barriers in theory. However, policy uncertainty and fluctuating credit values have reduced the effective support seen by investors.

This report introduces a durable policy mechanism for supporting the production of ultralow-carbon fuels in California that uses contracts for difference (CfDs) to provide a guaranteed 10-year price floor for ultralow-carbon fuel producers. A *strike price*, or price floor, is established for low-carbon fuel producers through a reverse auction: projects competitively bid for the lowest break-even price for their fuel production. The winning projects with the lowest bids then enter a contract for a 10-year period with a guaranteed price floor that would begin after a short period to allow for construction time. The market value of the fuel, which consists of its sales price plus the value of all existing incentives it qualifies for, is then subtracted from the strike price. If the market value is lower than the strike price, then California would pay the difference. Thus, whenever market or policy shifts occur that drop the market value of a finished fuel below the agreed-upon strike price, the policy would pay out the difference such that the price floor is reached. In effect, existing incentives provide the bulk of the benefit while the CfD provides a measure of policy insurance.

Developing a new fuel production plant is a long-term investment with significant upfront capital costs, so securing a price floor for a long period of time greatly increases investor confidence. The proposed California Climate Investment Fuels Program (CCIFP), through a CfD approach, would act as a hedge against policy and market uncertainty for in-state producers. This approach would provide a measure of insurance against risk for investors and help to bridge the commercialization gap for new technologies, thereby bringing new projects into operation. Expanding in-state capacity for ultralow-carbon fuel production not only contributes to California's greenhouse gas reduction goals but also showcases its global leadership in the alternative fuels sector.

Implementing a CfD program would minimize spending by leveraging existing financial incentives for low-carbon fuel production. By leaning on other, existing programs for support, the proposed program acts more as insurance against policy and market uncertainty than as a primary financing mechanism. Unlike a flat per-gallon subsidy, the CCIFP would only make payments when the market value of fuel plus the total support from other policies falls short of the level necessary for financial viability of the producers. The proposed policy incorporates other mechanisms to maximize its cost-effectiveness, most importantly a reverse auction to determine a guaranteed minimum price (i.e., a price floor) for the CfD. The reverse auction drives the price floor downward by having projects bid against one another to offer their lowest break-even price. Limiting the program to only ultralow-carbon fuels in conjunction with a price floor established competitively through reverse auctions helps to ensure that the program supports only the most cost-effective (i.e., lowest cost per ton carbon abated) fuel projects. Further, if the program incorporates payments back into the fund by producers when the market value exceeds the price floor, the fund is then able to grow on its own and support additional projects.

We emphasize that the use of CfD to provide greater long-term certainty on 10-year investments also puts greater importance on ensuring long-term climate and sustainability benefits of the fuels are met well into the future. Therefore, the provisions for such a program should only include fuel projects that reliably offer ultralow carbon intensity (i.e., a maximum 30g CO_2e/MJ carbon intensity) and meet the utmost sustainability criteria. To ensure quality, the qualifying projects under the CCIFP would need to demonstrate their readiness, production capacity, carbon intensity (CI) and sustainability and social benefits before participating in an auction. Factors such as the use of waste or demonstration of benefits to economically disadvantaged communities in California could function as tiebreakers in a reverse auction or provide additional benefits, such as additional guarantees, to winning projects.

This report analyzes the amount of ultralow-carbon fuel production that could be supported by the CCIFP under a variety of policy and funding scenarios. While a one-time infusion of money from the Greenhouse Gas Reduction Fund (GGRF) funded through California's cap-and-trade program would be sufficient to support at least one smaller-scale demonstration or bolt-on fuel project, recurring annual funding from the GGRF would help to grow the fund and support larger, subsequent auctions. While this program has the potential to support substantial new production, its costs would be low: annual funding would comprise only 3% of the GGRF fund at its 2015 level. As the CfD program grows over time, the minimum bid unit for participation could also grow in turn, so that the program steers from supporting smaller facilities toward full-scale, commercial facilities over the first 10 years of the program. Depending on the number of bidders and their project size, a single auction could support one or more projects.

In the case that funding is provided to the CCIFP annually, but is not guaranteed from year to year, the program still could support substantial volumes of ultralow-carbon fuel. This report develops a business-as-usual baseline policy scenario that assumes the Renewable Fuel Standard (RFS) and Low-Carbon Fuel Standard (LCFS) exist through 2030, with an expanded CCIFP program that underspends its annual funding and allows the CfD program to accrue revenue and support more and larger projects over time. Figure ES-1 illustrates such a scenario for a potential 2018-2030 CCIFP program that employs the proposed CfD policy mechanism. The figure shows that the program grows in that business-as-usual scenario from supporting 4 million gasoline gallon-equivalents (GGE) of cellulosic ethanol in the first auction to nearly 50 million GGE of annual production by 2028. This leaves a substantial amount of money in the fund to protect against high liabilities if policy support for biofuels suddenly decreases. As the projects that would be supported through the program would likely be dependent on the contracts in order to secure investment, a CfD program could be a prime driver for significant expansion of ultralow-carbon fuel production in California.

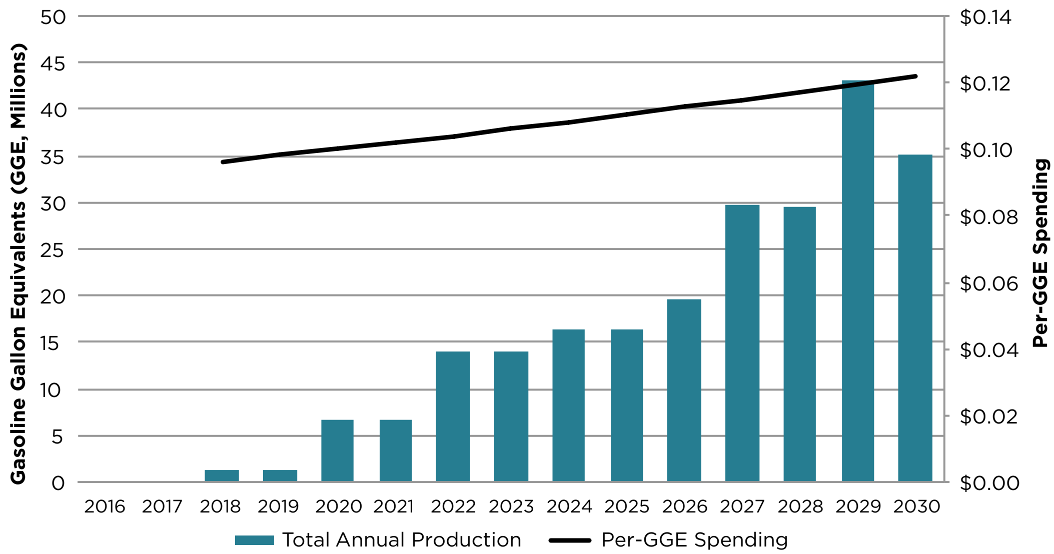

Figure ES-1. Annual production and per-GGE spending for multiple rounds of cellulosic ethanol auctions in a baseline policy scenario under the proposed CCIFP

ABBREVIATIONS USED

BEIS	Department for Business, Energy and Industrial Strategy
CARB	California Air Resources Board
CBOT	Chicago Board of Trade
CfD	Contract for Difference
CO_2e	Carbon Dioxide Equivalent
CWC	Cellulosic Waiver Credit
DoE	Department of Energy
EIA	Energy Information Administration
EPA	United States Environmental Protection Agency
GGE	Gasoline Gallon Equivalent
GGRF	Greenhouse Gas Reduction Fund
GHG	Greenhouse Gas
ICCT	International Council on Clean Transportation
LCA	Life-Cycle Assessment
LCFS	Low-Carbon Fuel Standard
RFS	Renewable Fuel Standard
RIN	Renewable Identification Number
SGBPTC	Second-Generation Biofuel Producers Tax Credit
USDA	United States Department of Agriculture

1 INTRODUCTION

In April 2015, California Governor Jerry Brown issued an executive order to reduce California's greenhouse gas (GHG) emissions by 40% relative to 1990 levels by 2030. This vigorous goal supplements a variety of existing state and federal level policies and programs to reduce GHG emissions and the carbon intensity of transportation fuels.

The core of California's climate strategy—as it relates to transportation emissions—includes the Cap and Trade Program (authorized through AB 32 and SB 32), vehicle GHG regulations, and the Low-Carbon Fuel Standard (LCFS). The largest contributing sectors to California's total GHG emissions are regulated through its Cap and Trade Program, which imposes a decreasing annual cap on state GHG emissions in conjunction with a trading scheme for emissions allowances. The California LCFS in turn seeks to reduce the carbon intensities of transport fuels consumed in California, creating a market for low-carbon fuel credits as the annual carbon intensity target of fuels decreases. These two programs coexist by having slightly different objectives and means. Whereas the cap and trade system targets emissions on an annual basis within most economic sectors that are located within the state of California, the LCFS uses life-cycle methodology to target the total cradle-to-grave GHG emissions intensity of transport fuels consumed in California, even if they are produced outside of the state.

Together these programs have been somewhat effective in establishing a market for alternatives to petroleum-derived transportation fuels, in addition to federal programs such as the Renewable Fuel Standard's (RFS) supply mandate and the second-generation biofuel producer's tax credit. These programs are further supplemented with more targeted efforts at funding individual projects, such as the U.S. Department of Energy's (DoE) grant program and loan guarantees from U.S. Department of Agriculture's (USDA) biorefinery assistance program. Furthermore, states and localities have also provided support for the first-generation biofuel industry. Incentives for first-generation biofuels have led to a massive expansion of the industry nationwide. For example, California has expanded production from 10 million gallons of biodiesel produced in 2010 to having six biodiesel producers with a capacity of 58 million gallons per year as of December 2015.

Despite the success of first-generation biofuels, incentives have proved insufficient to date at stimulating the necessary production of the ultralow-carbon fuels needed to meet more ambitious climate goals (EIA, 2016b). For the purposes of this report, these fuels are defined as those with a carbon intensity (CI) below 30 grams of carbon dioxide equivalent per megajoule (g CO_2e/MJ), reducing emissions approximately 70% from a fossil fuel baseline. California currently purchases much of its advanced, ultralow-carbon fuels from outside the state due to low in-state production (Hall, 2016). Only about 2.0 million gallons of cellulosic ethanol were produced in the entire U.S. in 2015, while production volumes of cellulosic drop-in biofuels (i.e., synthetic fossil fuels made from biomass) were even lower (Schwab et al., 2016).

To meet its challenging targets to reduce emissions and reliance on petroleum in the transportation sector, California must increase its consumption of cellulosic biofuels, such as fuels produced from agricultural residues or waste feedstocks (e.g., cellulosic ethanol, renewable diesel) and other advanced low-carbon fuels from waste or other non-food feedstocks produced via advanced conversion processes such as pyrolysis. While the estimated GHG reductions depend on life-cycle assessment methodology and study assumptions, there is a consensus that these types of fuels can offer substantial benefits over baseline petroleum emissions, if appropriately produced. Estimates from life-cycle analyses of cellulosic biofuels indicate that they have the potential to reduce life-cycle GHG emissions by a range of 50% to 80% of the baseline GHG compared to petroleum-based fuels (ICCT, 2014; CARB, 2016a).

Despite the urgent need to expand low carbon fuel production and the implementation of a variety of incentives, the alternative fuel industry has struggled to scale up the production of these fuels for a variety of reasons. It is generally understood in the industry that the most significant barriers to the commercial deployment of cellulosic biofuels are economic rather than technological (Miller et al., 2013). Proof of concept for a variety of ultralow-carbon fuels has already been shown in demonstration-scale facilities, but scaling up production of low-carbon biofuels to commercial facilities requires both high initial capital investment and long-term market certainty for producers to maintain production. Investors are uncertain that expensive capital outlays for new facilities will be recouped over a 10-plus year timespan, due to uncertainty both about market values and demand for the product as well as political uncertainty.

The long-term risk associated with commercializing new fuel technologies reduces the effectiveness of existing, shorter-term financial incentives and incentives with an uncertain value proposition. Even with per-unit production subsidies and credits in place for advanced fuels, investors are wary that these incentives may not exist for the duration of a given facility's operational lifetime (i.e., regulatory uncertainty). There is a widespread perception that fiscal incentives are more vulnerable than other types of policies because they are funded directly by the government rather than by consumers at the fuel pump (Peters et al., 2015). For example, the federal tax credit for second-generation biofuel tends to expire and be reinstated for one or two years at a time, sometimes retroactively. While the LCFS and RFS offer the benefit of a longer-term incentive to build certainty, the credit values under both these programs fluctuate over time. Investors value credit trading programs with long timelines higher than short-term per-gallon subsidies, however, the value of these policies to an alternative fuel producer at a future point in time cannot be reliably predicted. Therefore, investors tend to discount the future value of credits to below present-day levels. Even though the available policy support mechanisms should in theory allow profitable production of second-generation alternative fuels, in practice they do not offset the risks of high up-front capital investment.

It is apparent that a new type of policy approach is necessary if the goal is to spark near-term production of these fuels at volume. In order to cost-effectively produce the lowest-carbon fuels needed to meet California's climate goals, this report outlines a proposal for a new program in California that would support ultralow-carbon alternative fuels via a Contract for Difference (CfD) program called the California Climate Investment Fuels Program (CCIFP).

A CfD program functions like a policy insurance program for low-carbon fuel investors, allowing them to develop facilities knowing that they would be protected should some element of policy support disappear overnight. Ultralow-carbon fuel producers in California would bid to be included in the program through a reverse auction process wherein projects competitively bid to offer the lowest price at which they could successfully deliver commercial scale low-carbon fuel production. Upon winning a reverse auction, an ultralow-carbon fuel producer would enter into a CCIFP contract, which would consist of a private legal contract between that fuel producer and the California state government. The successful bidders would be supported by the policy, with their bids establishing a *strike price*, or price floor, for their fuel. The winning projects then have their price floor guaranteed by California for a 10-year period through a contract, thus mitigating the policy and market risks faced by that project's investors. Whenever market or policy shifts occur that drop the value of a finished fuel below the agreed-upon strike price, the policy would pay out the difference such that the price floor is reached.

The strike price would be guaranteed for a fixed number of gallons over 10 years and presumably, in a successful reverse auction, would reflect the minimum value an alternative fuel project would need to be commercially viable. The market value would be expected to include the quoted price for a gasoline gallon-equivalents (GGE) of that fuel type, as well as support from the following policies, if they remain active and are applicable to the pathways in question:

» The price of relevant Renewable Identification Numbers (RINs) under the RFS program
» Cellulosic Waiver Credit (CWC) value
» The LCFS credit value
» Second Generation Biofuel Production Tax Credit (SGBPTC)

Should the sum of the value of the fuel price itself and the specified incentives fall short of the strike price, then fuel producers would receive funding from the state based on the difference between the estimated market value and the strike price. The value of any co-products would not be taken into account in the calculation of market value – the fuel producers would be expected to factor co-product value and value risk into their bids in the reverse auction phase.

The incentives listed above primarily target cellulosic biofuel production and may not provide the same level of incentive to other, low-carbon fuels developed from other feedstocks. Additionally, some types of low carbon technologies, such as cellulosic drop-in renewable diesel or jet fuel, may be more expensive to produce than others. These disparities may need to be factored into CCIFP design by holding separate auctions for different pools of fuel (e.g., gasoline substitutes) to ensure that relatively low cost fuels with greater existing policy support don't crowd out support for other novel fuel technologies. A review of the current values of existing policy incentives (see 3.2.3 below) indicates that their sum at present-day value may be high enough to exceed strike prices that could be expected to be offered through a competitive reverse auction for some fuels. Therefore, if current policy incentives remain active, the CCIFP may not need to pay out to producers, thus acting only as a hedge or an insurance against shifting markets and policy uncertainty in the longer-term. The program therefore has potential to be a highly efficient way of leveraging limited cap and trade funds.

This report explores the CfD concept by first evaluating the extent to which existing incentives support ultralow-carbon fuels and where they fall short, followed by a review of CfD programs for other sectors and their implementation. From there, we develop a proposed approach for implementing a CfD program in California that provides durable support against market and political uncertainty in conjunction with application requirements that ensure participating projects produce fuels that meet California's environmental and social goals. The final section projects how much ultralow-carbon fuel production can be supported through the CfD program while estimating the program's costs across a variety of different policy mixes and funding schemes.

2 POLICY CONTEXT

The CCIFP is intended to maximize the impact of existing low-carbon fuels policies at the state and federal level in order to expand California's production of the lowest carbon fuels and maximize their in-state production in the most cost-effective way. Due to the high upfront costs and market uncertainty that come with the introduction of new fuel production technologies, policy intervention typically is needed to reassure investors and make alternative fuels more financially competitive. However, the design of these policies themselves may create uncertainty: The duration and incentive value of policies is generally not guaranteed for the operational lifetime of a project. Therefore, investors are likely to discount the nominal value of policies when estimating the financial viability of alternative fuel projects.

This chapter provides an overview of how investors evaluate risk and uncertainty when financing potential alternative fuel projects, given the policy context. Existing incentives and policies are assessed according to their contribution to the value of a single unit of fuel, as well as their value certainty throughout the potential lifetime of a fuel project.

2.1 PRICING OF LOW-CARBON FUELS

The revenue earned by an alternative fuel producer depends on a variety of factors, including the actual market value for the finished fuel as well as any financial incentives provided through policies. A combination of state and federal level production incentives can be leveraged to support production of fuel that otherwise would not be economically competitive with incumbent fuels. This section provides an overview of the impact of these factors on the spot price for low-carbon fuels and the uncertainty associated with each incentive, as well as a discussion of how investors are likely to perceive the value of policy support.

2.1.1 Relationship to fossil fuel price

The value of low-carbon fuels is inherently coupled to the fossil fuel market. The Chicago Board of Trade (CBOT) per gallon price of ethanol tends to fall short of the price of gasoline, largely due to ethanol's lower energy density, but closely tracks the changes in gasoline prices. Gasoline price increases will drive up the demand and price of other fuels—such as cellulosic ethanol—as a competing commodity. Conversely, low gasoline prices depress the price of ethanol. Likewise, the baseline price of both gasoline and diesel fuel directly affects the financial viability of drop-in low-carbon fuels such as renewable diesel. Fuel price changes lead to market uncertainty for alternative fuel producers and investors. The price of ethanol fluctuates in relation to the underlying gasoline price, as shown in Figure 1. The fossil fuel market shifts constantly, generating substantial fluctuations in annual and even daily prices.

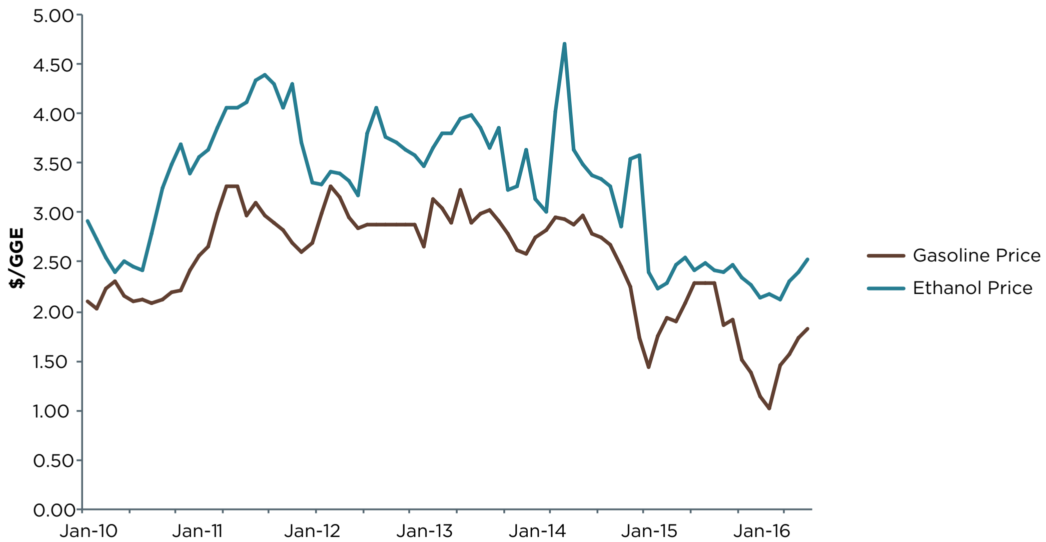

Figure 1. U.S. gasoline and ethanol prices, 2010 to 2016

Source: USDA, 2016

2.2.2 Renewable Fuel Standard (Federal)

The RFS establishes volume targets for renewable fuel production in the U.S. Renewable Identification Numbers (RINs) are generated for each ethanol-equivalent gallon of renewable fuel. Obligated parties, including refiners and blenders, must submit a number of RINs, corresponding to their annual obligation, to the U.S. EPA to demonstrate compliance at the end of each year. RINs can be sold and traded, establishing a marketplace and value driver for renewable fuel production.

Table 1. RFS fuel categories and their corresponding D codes

D CODE	FUEL CATEGORY	RIN COUNTS TOWARD MANDATED VOLUMES	EQUIVALENCE VALUE
D3	Cellulosic Biofuel	Cellulosic Biofuel, Advanced Biofuel, Renewable Biofuel	1
D4	Biomass-based Diesel	Biomass-based Diesel, Advanced Biofuel, Renewable Biofuel	1.5
D5	Advanced Biofuel	Advanced Biofuel, Renewable Biofuel	1
D6	Renewable Biofuel	Only Renewable Biofuel	1
D7	Cellulosic Diesel	Biomass-based Diesel, Cellulosic Biofuel, Advanced Biofuel, Renewable Fuel	1.7

Source: ICCT 2014

As shown in Figure 2, RIN values are prone to fluctuation. RIN prices are sensitive to a variety of factors, including constraints on feedstock supply (e.g., drought), concerns about ethanol volumes approaching the ethanol blend wall for gasoline, and importantly, policy developments surrounding the future direction of the RFS program. Aspects of the RFS program, such as mandated fuel volumes, may be proposed and adopted on an annual basis. Price volatility affects investor confidence in future RIN prices, and uncertainty likely leads investors to use a conservative RIN price when calculating project returns in financial models for a potential project (Miller et al., 2013). Adding to policy uncertainty, the U.S. Congress has recently considered several bills that threatened to modify, defund or even entirely repeal the RFS program (Congressional Committee on Science, Space and Technology, 2015). Thus, while the volumetric mandates from the RFS run through 2022, with volumes thereafter to be determined by EPA, there is always a chance that the program could see substantial programmatic changes before 2022, and investors may discount the expected value of RINs to account for this risk.

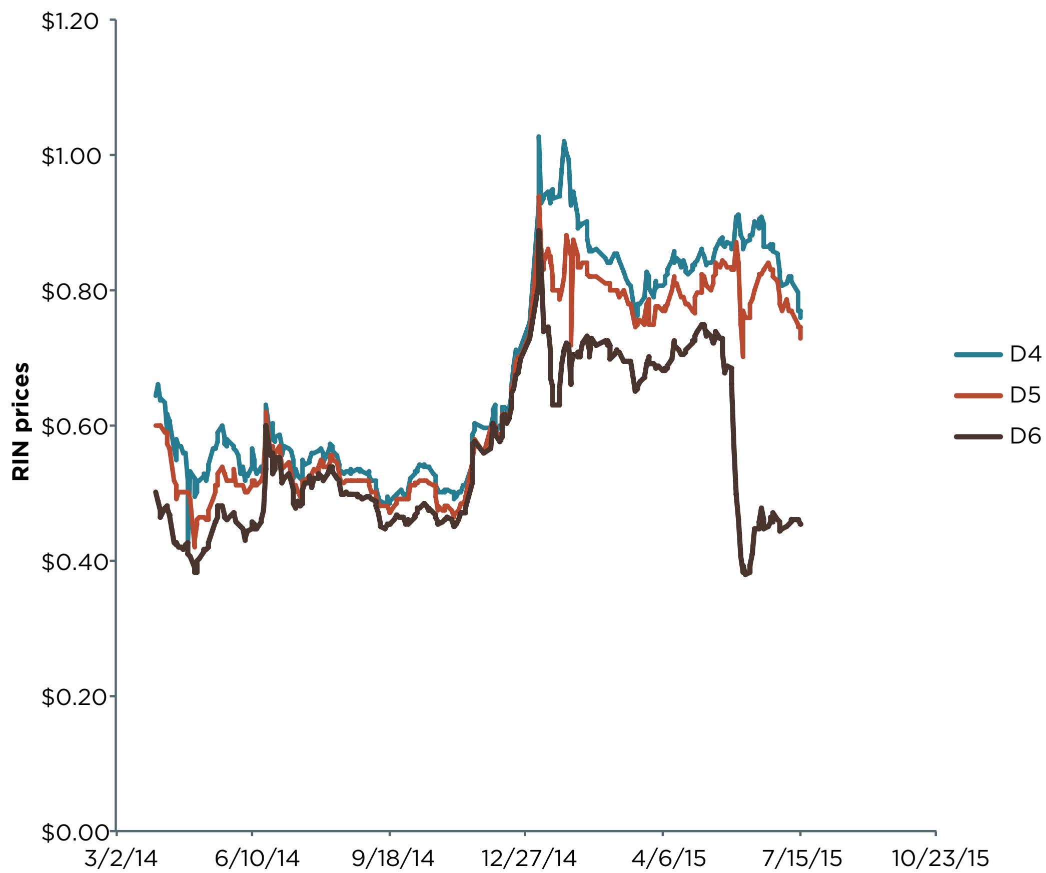

Figure 2. Recent RIN values, 2014-2015

Cellulosic biofuel production has failed to meet the levels mandated in the original RFS statute. In order to help bridge this gap, the EPA has authority to revise the legislated mandates and can grant a number of cellulosic waiver credits (CWCs) corresponding to the revised volume mandate. The CWC price is set to either $3.00, adjusted for inflation since the program's inception, minus the wholesale price of gasoline or $0.25, whichever value is higher. At the end of each year, obligated parties must either retire a cellulosic RIN (D3 or D7) or an advanced RIN (D5) plus a CWC for each gallon of their cellulosic obligations. Essentially, the CWCs act as a cost containment mechanism for cellulosic biofuel by providing an alternative compliance mechanism with a capped price (Bracmort, 2015). The CWC value is set each year depending on the gasoline price over the prior year.

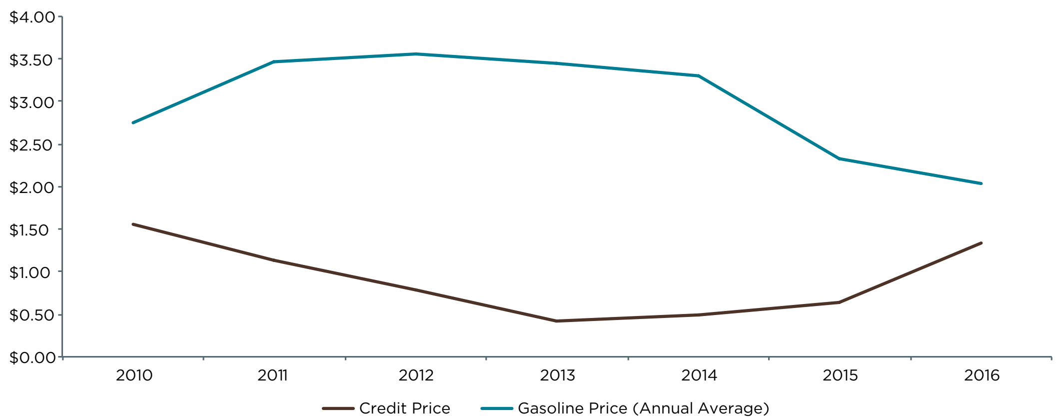

Figure 3. Cellulosic waiver credit price history

Source: EPA, 2016a; EIA, 2016a

2.1.3 Second-Generation Biofuel Producer Tax Credit (Federal)

The Second-Generation Biofuel Producer Tax Credit (SGBPTC) for production of cellulosic biofuel applies to all second-generation biofuel producers registered with the IRS and provides a fixed tax credit of $1.01 per gallon of fuel produced from cellulosic feedstocks (IRS, 2016). As this credit is applied to taxes, its impact on finished fuel prices is somewhat muted—producers are not eligible to receive it until the facility begins generating a profit and a positive tax liability (Miller et al., 2013). Although it may be possible to structure finances to take advantage of the SGBPTC earlier on in a facility's operations, this credit is nevertheless more difficult to access than more straightforward production incentives. Furthermore, unlike the LCFS credits and RINs, which are components of longer-term policy initiatives, the SGBPTC tends to expire and be reinstated by Congress every one to two years, sometimes retroactively. The current version runs through 2016 before expiring.

Of all the financial incentives for low-carbon fuel production discussed in this report, this credit is the least certain and thus most prone to discounting, despite its high per-unit value. This means that in practice investors likely treat the future value of this credit, for the purposes of a new facility operating at some point in the future, as zero or near-zero due to lack of confidence that this incentive would exist to support that project. Financial pro forma models for investments typically only include it for years in which it has already been approved.

2.1.4 Low-Carbon Fuel Standard (California)

The LCFS establishes a long-term commitment to reduce the average CI of fuels consumed in California by 10% from the 2010 baseline CI by 2020. The mechanism for this process is a tradable credit derived from the CI reduction of the fuel relative to the baseline fossil fuel CI. Each credit's value is proportional to the difference between the fuel's CI and that year's CI target, which grows more stringent over time, incentivizing the production of ultralow-carbon fuels. Furthermore, as each credit is tradable, its value also shifts in response to regulatory and market conditions.

LCFS credit prices per ton of emissions avoided as accounted in the program have fluctuated from $20 to over $100 per ton of GHG reductions over the past several years based on a variety of factors, as shown in Figure 4. Credit prices have fluctuated in recent years, likely in part due to regulatory uncertainty stemming from a variety of factors: including a proposal to cap prices, a revised compliance trajectory, and shifting RIN prices from the RFS. The recent increase in credit prices is primarily due to two factors: increased political certainty for the LCFS program in light of victories against legal challenges with respect to the interstate commerce clause; and the relative cost-effectiveness of generating surplus credits in the present day, compared to later in the program when the CI target tightens (CARB, 2015). Thus, generators tend to hold on to credits in the current day in anticipation that they will be needed to meet future goals, increasing spot trading prices. Uncertainty regarding post-2020 LCFS implementation could potentially be a contributing factor.

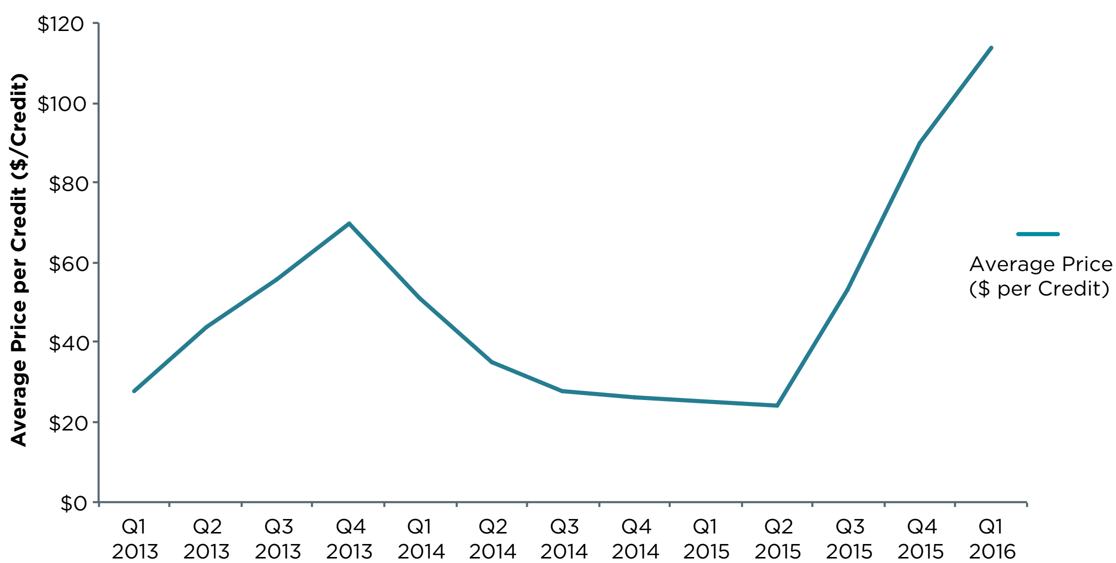

Figure 4. LCFS credit price history, 2013 to present
Source: CARB, 2016b

2.2 EXISTING INVESTMENT RISKS

Emerging ultralow-carbon alternative fuel projects, such as cellulosic ethanol facilities, can be risky endeavors that carry high expenses due to high upfront capital costs, lack of experience producing at a commercial scale, and uncertain demand for their product. Therefore, these projects tend to require policy support to mitigate these risks, assure investors that they will recoup their money, and help to bridge the so-called "valley of death" between an emerging technology and one that is commercialized. This valley of death reference is to a phase in a technology's life cycle where it has already demonstrated proof of concept, but still requires substantial capital infusions to transition to commercial scale (Chen, 2012).

The value of the incentives described in Section 2.1, when taken together, greatly increases the theoretical market value of an alternative fuel relative to its baseline sale price. In the case of cellulosic ethanol, for example, the combined value of the LCFS credits, RINs, and production tax credits increases the value of a given gallon of cellulosic ethanol to as much as $5 per gallon. However, investors discount the nominal value of incentives, and so the de facto value of cellulosic ethanol is much lower for the purposes of investment calculations.

While financial incentives from policy can and do stimulate production of alternative fuels, their inherent uncertainty leaves them prone to discounting by investors. When investors incorporate discounting in a pro forma estimation of a project's finances, they reduce the value of an incentive to compensate for perceived risk that it will disappear during the lifetime of the project. As when estimating the future value of RINs, the variable pricing of LCFS credits can cause investors to assume lower future values as a hedge against uncertainty. Therefore, while the sum value of financial incentives provides a high nominal value for alternative fuels, the true value as calculated by investors for the purposes of running pro forma analyses of economic returns may be much lower.

The two figures below illustrate the effects of discounting by showing the relationship between ethanol values and gasoline values with different levels of investor discounting of financial incentives. This discounting drives down the value of the finished fuel from the theoretical sum of its wholesale market price plus the face value of all incentives. Figure 5 illustrates the effect on ethanol values of the discounting of the least certain financial incentive (the SGBPTC), showing a 100% discount of its nominal value to indicate high investor uncertainty with the tax credit's continued existence. Figure 6 illustrates the effect of further discounting on credit values, implementing a discount to 25% of the nominal value of recent LCFS credit values and to 35% of the nominal value of recent RFS RIN prices (Miller et al., 2013). In principle, the nominal cellulosic ethanol value should be sufficient to stimulate new production. Yet, in practice, production increases of ultralow-carbon fuels have grown slowly and haphazardly.

The discounting of financial incentives for ultralow-carbon fuel production holds back the development of the ultralow-carbon fuels industry by making it more difficult to secure financing for new projects. Instead of providing another layer of nominal funding with long-term value uncertainty, we recommend creating greater certainty to ultralow-carbon fuel producers to stimulate investment and new fuel production. The proposed CCIFP policy would, in effect, act as an insurance policy for fuels investments, providing security that sudden, unexpected drops in policy support or in the price of fossil fuels will not affect the viability of potential projects.

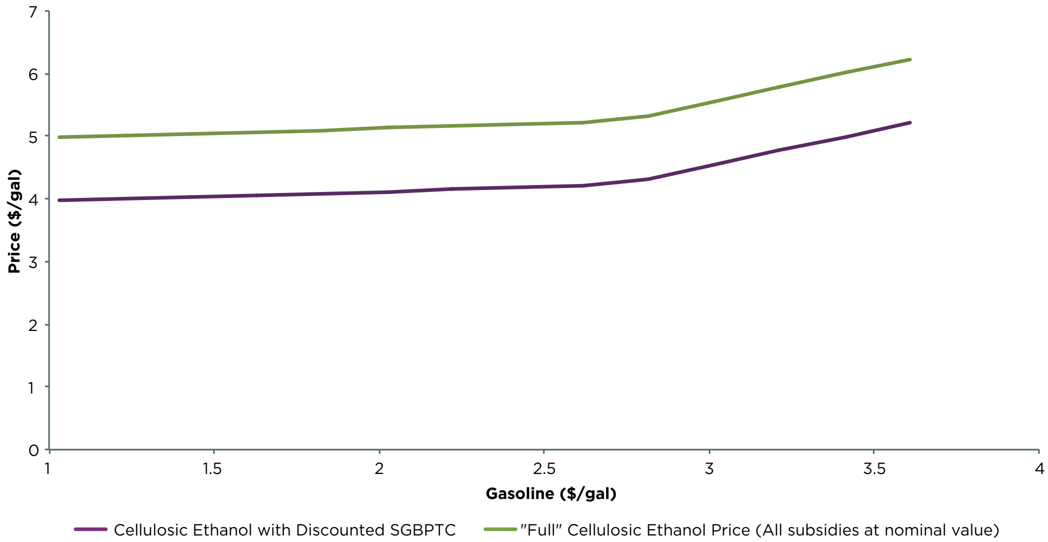

Figure 5. Theoretical value for cellulosic ethanol production and value with discounted Second-Generation Biofuel Producers Tax Credit

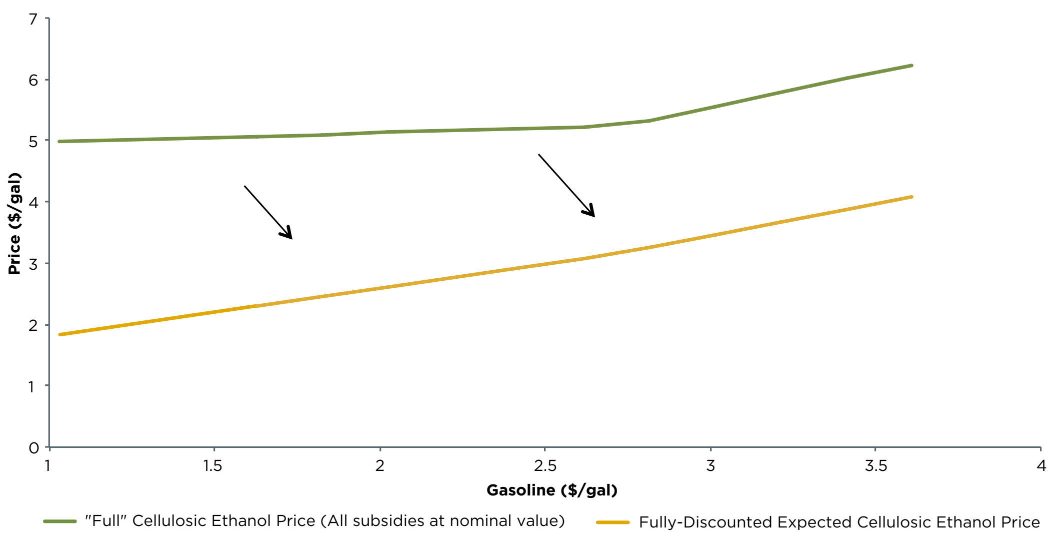

Figure 6. Theoretical value for cellulosic ethanol production and value with fully discounted incentives

3 PROGRAM DESIGN

The CCIFP policy depends on leveraging a set of existing policies in order to support alternative fuel production in California while minimizing new spending. The previous chapter evaluated how existing policies fit together to support advanced biofuels and ways in which they create uncertainty and fall short of their goals. This section builds on the previous chapter's policy assessment by evaluating how CCIFP can fill the gaps within the existing policy framework, foster greater certainty, and mitigate GHG emissions cost-effectively.

This chapter lays out a framework for the proposed CCIFP policy and describes several implementation options. First, we evaluate existing examples of CfD policies and derive several best practices from these case studies. Then, we provide a design for how a similar program to support ultralow-carbon fuel production in California could operate. We then evaluate that proposed design by modeling several policy and economic scenarios to determine (a) the amount of ultralow-carbon fuel production that might be supported through the program, and (b) CCIFP spending and liability by fuel production level and policy mix in the scenarios.

3.1 CASE STUDIES

A reverse auction policy to establish a strike price for greenhouse gas reductions or renewable energy deployment has been implemented in several jurisdictions and achieved success at facilitating new technology deployment while lowering prices. This section will assess two case studies to show how regulators structured their reverse auctions and reference prices, as well as the impact of the policy implementation.

3.1.1 U.K. Department of Energy & Climate Change

As part of its efforts to modernize its electricity infrastructure and diversify the electricity mix within the U.K., the Department of Business, Energy and Industrial Strategy (BEIS) introduced a CfD policy as a component of its 2013 Energy Act. This policy uses a reverse auction mechanism, where different potential renewable energy projects competitively submit bids for strike prices, which are per-unit electricity prices that the project developers would need to recoup costs on a project. Unlike a traditional auction, a reverse auction rewards the lowest bid, which is to say the cheapest strike price. The winning bidder then enters a contract that sets the strike price as a price floor for the project's electricity for the duration of the contract. If the market value drops below the strike price, the program will pay the difference.

The CfD program's reverse auction works in conjunction with an administrative maximum strike price that sets the starting point for the auction. Typically, a CfD contract ensures project support for 15 years, though BEIS has the authority to vary contract details in certain cases (DECC, 2013a). The CfD program budgets out by five years of delivery dates, with funding expanding from 50 million British pounds ($65 million) in 2015/2016 to 300 million British pounds in 2020/2021. This funding includes two pots: a largely stable allocation for established technologies, such as onshore wind, and a growing pot allocated toward less-established technologies that may need additional support. The program may expand to include a third pot of funding dedicated solely to biomass energy in the next several years. The high level of funding for this program indicates that it is designed as a primary support mechanism for renewable energy deployment, rather than as a supplementary mechanism that leans on other incentives.

The U.K. CfD program incorporates different tiers of maximum strike prices for different types of renewable generation technologies. These vary depending on capital cost as well as how well established a given technology is within the market. For example, offshore wind has a higher maximum strike price than onshore wind, and is thus placed in a different tier; therefore, relatively low prices bid by onshore generators do not crowd out investment in offshore wind installations that are less established and have higher up-front capital expenses (DECC, 2015b).

The maximum strike price only sets an initial guideline. The competitive bidding process is designed to ensure that bidders find ways to deliver electricity at lower prices in order to increase their respective share of the funding. The maximum strike price in the CfD program was established via a consultative process that included a wide range of individuals and organizations including generators, suppliers, consumer organizations and environmental groups (DECC, 2013b). BEIS took a variety of factors into their calculations in setting maximum strike prices, including capital costs, maximum build rates, and data on existing investment decisions. Furthermore, if the electricity prices for a given project exceed the strike price, the excess is paid back into the program, as shown in Figure 7.

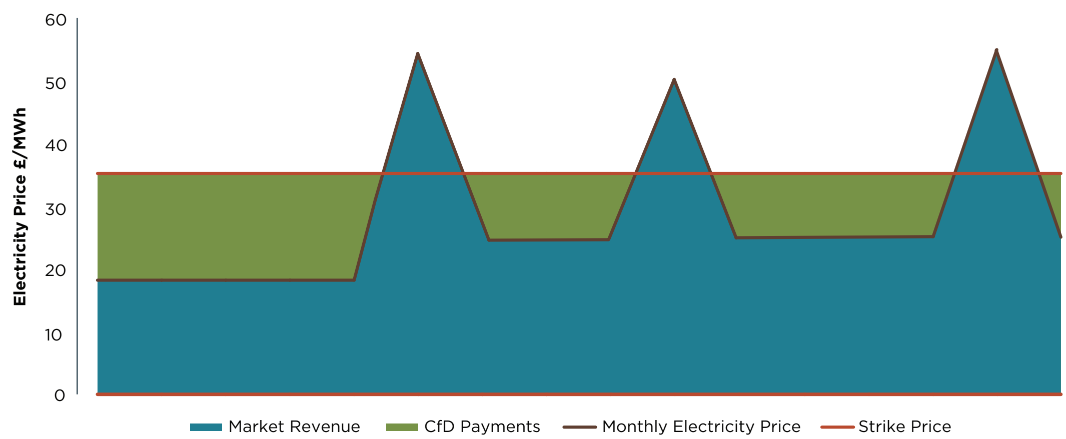

Figure 7. Relationship between electricity price and auction strike price under CfD program

Source: Adapted from DECC, 2011

Note: This figure is intended to be illustrative of the CfD mechanism and does not reflect actual electricity prices and payments during the implementation of the CfD program in the U.K.

In cases where the amount of capacity from interested projects exceeds the CfD budget, a reverse auction is held to determine how to allocate funding between different, competing project bids. The CfD program has only held one reverse auction so far, but plans to hold several additional auctions by 2020 (Weston, 2015). The funding is allocated from lowest bid to highest bid until the fixed amount of capacity is met, with the highest accepted bid (i.e., the final bid that hit the capacity limit) setting the clearing price for the entire auction. In a theoretical auction for 20 megawatt-hours (MWh) of capacity with three bids for facilities each providing 10 MWh of electricity at 3, 4, and 5 British pounds ($3.90, $5.20, and $6.50) per MWh, the two cheapest facilities would win funding in the auction at a strike price of 4 British pounds per MWh. If all of the bids match the maximum price, then the funding is allocated on a first-come, first-served basis at the maximum price until the budget for CfD is met.

In order to qualify for the reverse auction, applicants must meet a variety of criteria. These include planning permits and grid connection offers, as well as the project size, target commissioning date, and operational timeline. CfD support is only available to renewable electricity projects that fall within a set of broad technology categories, such as wind power. Furthermore, there are technology-specific application requirements as well as a requirement to demonstrate a supply chain plan, for example, to demonstrate feedstock availability for biomass projects.

One year after policy implementation, the first year of auctions yielded 27 projects and 2.1 gigawatts of electricity capacity procurement at the cost of 315 million pounds. The bulk of the capacity increase – more than 75% – came from onshore and offshore wind farms, with the rest coming from small-scale solar, combined heat-and-power, and advanced conversion technologies (DECC, 2015a). Based on the estimated budget published by BEIS, the program ramps up its spending significantly from 2019 to 2021 as the majority of the projects come online.

A potential issue with the BEIS CfD policy could be the disparity between different electricity generation technologies under the program. For example, in the first round of auctions, onshore and offshore wind investments made up the majority of the applications for the program and effectively crowded out investment in solar energy. This may lead to the elimination of onshore wind as a category within the CfD program, prompting uncertainty among some producers about changes to eligibility requirements in future allocations (Wilkins, 2016). Greater differentiation of funding pots and strike price tiers would likely have resulted in a more diverse funding mix for the program, although increased differentiation would likely result in higher strike prices and program expenditures for certain categories. Furthermore, fossil fuel price declines in recent years have reduced wholesale electricity prices and thus increased the program's payments to renewable projects, increasing spending and reducing the amount of available funding for the next round of allocations (Porter, 2015).

3.1.2 World Bank Pilot Auction Facility

The World Bank is heavily involved in climate finance and has begun testing novel methods of encouraging investment in carbon reductions in developing countries. Through this effort, the World Bank introduced the Pilot Auction Facility (PAF) mechanism to mitigate methane emissions in a cost-effective way. The program was introduced in 2015 and has already concluded its first round of auctions for projects that were verified via the Clean Development Mechanism (CDM), Verified Carbon Standard (VCS), or Climate Action Reserve (CAR) and generate credits for carbon trading. This program consists of a reverse auction for put options for methane emissions reduction credits, which are individual price guarantees for a unit of methane reduction. Put options are common contract instruments in the financial sector, typically used on stocks, that give the holder the right but not the obligation to sell that option at a previously agreed-upon price. Instead of a contract that pays a producer for a fixed amount of time, the PAF establishes a price floor for a fixed amount of emission reductions, for example, 8.7 million metric tons of CO_2-equivalents in the first auction.

Auction winners receive funding by first purchasing zero-interest bonds issued by the World Bank for this program at an issue price. Each bond issued via a put option corresponds to one Certified Emission Reduction (CER). Once the emission reductions have been verified, the bondholders receive a redemption price equal to the auction's price floor. The purpose of the issue price, that is the premium, which was set at $0.30 per CER during the initial auction, is to help ensure that the bidders have a genuine commitment to the project. Each bond issued for a put option has a maturity and target date. In order to redeem a bond for compensation, the emissions reduction project must be completed within the time frame specified by the bond. Put options are tradable, encouraging put option holders whose projects may be underperforming or behind schedule to sell their option to another who is generating greater carbon reductions.

The PAF incorporates a competitive, multiple-round online auction system to determine the minimum price necessary to support private investment in emission reductions and identify the lowest-cost projects. Each bidder enters the auction already knowing the issue price per emission reduction and thus bids down the strike price. The net payment for each put option is therefore the difference between the issue price and the strike price. The auction works backwards from the total supply of put options and the maximum strike price, so that with each price increment bidders announce how many put options they will purchase at that price. The auction continues until the number of put options available at the current price meets or exceeds the bidders' demand.

Compliance and enforcement is facilitated via the existing carbon auditing standards in order to ensure that the program is only supporting real emission reductions. In order to qualify, CERs must be verified using CDM, VCS or CAR methodologies, all of which are made available on the PAF website ahead of the auction. Furthermore, the World Bank also conducted background research on applicants in conjunction with a due diligence questionnaire and risk assessment.

The first auction, in 2015, generated emission reductions on the order of 8.7 million metric tons of CO_2-equivalents split out among 12 separate bidders (World Bank Group, 2015). The strike price was $2.40 — nearly $6 lower than the starting price for the auction. The second auction, using a slightly different auction mechanism, generated emissions reductions 5.7 million metric tons of CO_2-equivalents priced at $2.09 per ton among 21 different bidders. By putting a floor on the value of qualifying carbon credits, this program incentivizes methane reduction projects that otherwise would not have occurred, increasing the potential for climate mitigation through the avoidance of a potent climate forcer.

Future auctions will use the lessons learned from the first auction in order to provide additional time and flexibility in terms of conducting due diligence on applicants, conducting more outreach to inform potential applicants about the program, as well as simplifying and speeding up the auction process.

3.2 PROPOSED DESIGN

The proposed CCIFP policy takes inspiration from the U.K.'s CfD program and takes several steps to tailor it to the fuel market. This section provides an overview of how the CCIFP framework could operate and discusses several design considerations necessary for supporting alternative fuels via a contract-for-difference approach.

The main design elements we will be considering in this section include the following:

» Application requirements: These requirements specify the information that potential applicants to the program would need to provide in order to be eligible to participate in the program.

- Eligibility: Eligibility requirements specify the environmental and economic criteria that fuel producers must meet in order for their fuels to qualify to participate in the program.
- Contract structure: The contract structure contains several design considerations for the relationship between California and alternative fuel producers under a CCIFP contract, including the contract duration and production level.
- Maximum administrative strike price: This design element determines how CCIFP would calculate the maximum price floor for the reverse auction, which would be the starting point for subsequent bids.
- Market value: This design element establishes how the CCIFP would establish the market value received by alternative fuel producers for the purpose of estimating the difference between market price and strike price for CfD payments. The market value is the de facto price of the fuel that includes its sale value plus incentives received by fuel producers when selling their fuel in the California marketplace.
- Support for disadvantaged communities: Per the requirements of AB32, a portion of funding from the GGRF must be directed toward aid for California's disadvantaged communities. This design element considers approaches toward providing projects located within these communities with preferential consideration under the CCIFP.
- Auction format: This design element includes the basic structural guidelines for the auctions held under the CCIFP, including frequency, bid unit, bid format and funding allocation.

3.2.1 Application requirements

In order to demonstrate project viability and ensure that fuel production under the CCIFP can begin with minimal delay, projects must supply information before qualifying as bidders in the reverse auction. This required information could include:

1. Secured site location and necessary construction permits
2. Engineering plans, including facility specifications and expected production volumes
3. Letter of intent from funders indicating project financing contingent on meeting certain conditions
4. Construction timeline and start date
5. Offtake or marketing agreement for the sale of finished fuel
6. Financial plan to demonstrate expected capital and production costs
7. CI estimation and fuel production pathway details

The above criteria are not intended to be exhaustive, but rather illustrative of the basic program details necessary to indicate the credibility of a project and the likelihood that it would be operational within the timeline of the program.

3.2.2 Eligibility

The proposed CCIFP policy is designed to incentivize the production of ultralow-carbon fuels that would otherwise find difficulty securing funding and investment. To meet this goal, the policy necessitates eligibility requirements in order for fuel producers to qualify as auction participants. Otherwise, projects using established, already-commercialized technologies would be able to enter into the auction and crowd out investment in emerging technologies. For example, fuel pathways such as biodiesel from inedible corn oil and used cooking oil that have already been widely commercialized may offer significant CI benefits relative to existing fuels, but do not require additional policy support. However, expansions and upgrades to existing facilities that utilize novel conversion technologies to generate ultralow-carbon fuels merit inclusion within the program.

In order to ensure that the funding from CCIFP supports the use of underutilized, sustainably abundant feedstocks and supports the commercialization of novel fuel technologies that would struggle to find investors without a guarantee of support, we propose the following eligibility criteria:

1. The CI of the produced fuel must be less than 30 gCO_2e/MJ. The CI of the fuel must be verified through an LCFS Method 2 application or through a preliminary calculation of the fuel's CI submitted as part of the application package. The preliminary calculation should meet similar standards as an LCFS Method 2A or 2B application, depending on the fuel produced from the project in question.

   One method of incentivizing fuels with CIs under 30 gCO_2e/MJ may be that the calculated market value, which is to say the present value for unit of fuel in relationship to the strike price, for the CCIFP program would be designed with a 30 gCO_2e/MJ baseline for the purpose of estimating the LCFS credit value. In effect, fuels with lower CIs could benefit from greater LCFS credit support from greater GHG reductions under the LCFS program that would occur in addition to the funding from the CCIFP. This would allow producers with the lowest CI-fuels to provide lower bids during the auction and would give them a competitive advantage.
2. The fuel should be produced in-state because a key goal of the CCIFP is to contribute to California's GHG reduction goals by producing low-carbon fuels locally rather than importing them. Improving California's alternative fuels capacity also could provide economic benefits to disadvantaged local communities by making use of locally-produced feedstocks. Therefore, the CCIFP will require that conversion facilities for all supported projects are located within the state, although there will be more flexibility provided to feedstock source but with preference given to in-state feedstock sources.
3. The production of the fuel must use next-generation conversion technology (i.e., second-generation) that has not been widely commercialized. These technologies include, but are not limited to: cellulose hydrolysis; pyrolysis; Fischer-Tropsch synthesis; gasification; hydrothermal liquefaction; bacterial fermentation; algal biomass harvesting; and power-to-liquids technologies.

   One option for more strictly defining next-generation technologies would be to limit eligibility to fuel production pathways that produce less than 100 million gallons of fuel nationally per year for ethanol replacements at the time of application. Likewise, production of drop-in gasoline or diesel substitutes must be below 100 million gallons of fuel to qualify. For natural gas substitutes or gas-to-liquid technology, existing production levels must be under 400 million standard cubic feet of gas per day.

4. Any biomass feedstock used for the production process must be a non-food material, meaning it is not a material that is generally fed to either humans or livestock unless to ruminants as forage. Other feedstocks, such as industrial byproducts, agricultural residues, and waste materials, are eligible as long as the finished fuel meets the CI requirement below. This criterion is meant to exclude biomass feedstocks that are used in fuels that already have been commercialized or that may have large indirect, market-mediated effects such as indirect land use change emissions.
5. Eligibility requirements may also incorporate non-GHG impacts of feedstock production, including sustainability requirements. For example, preferential consideration, could be granted to projects using feedstocks that are collected from wastes or from activities that restore ecosystems, more specifically conservation biomass, for use as a tiebreaker for otherwise equal bids in the auction.

3.2.3 Contract structure

The structure of the contract between California and alternative fuel producers must incentivize producers to complete their projects quickly while also ensuring stability of prices once their facilities become operational.

Discussions with biofuel producers and previous studies have indicated that long-term funding commitments are key to mitigating investor uncertainty (Peters et al., 2015). The U.K.'s CfD program generally provides 15 years of cost certainty to investors. Therefore, we recommend a minimum of 10 years of funding support. In the CCIFP, funding support would be available starting two years after the contract is established, to allow for construction time, and would continue for 10 years thereafter. If the project is delayed beyond the 2 years granted for construction, that project's effective opportunity window for receiving support from the fund would be shortened, thus incentivizing either faster turnaround or self-selection among bidders for more viable projects. The amount of funding available to the CCIFP would dictate the extent of the support available to a given project.

To guide the program toward supporting larger facilities over time, the reverse auctions could incorporate larger bid units over time (see 3.2.7 below). For example, a contract from an auction held during year three of the program would support 8 million GGE of production and one held during year five would support 12 million GGE.

The amount of fuel production supported need not necessarily correspond to the full production of a facility, thus reducing the total amount of program liability for a given facility, as well as providing support to facilities that are struggling to reach their nameplate capacity. This could be an important option to mitigate the downside risk of starting a large project, but could also work in the program's favor in terms of supporting larger, commercial-scale facilities at its outset. In the event of unforeseen difficulties for a larger facility, a price floor guarantee for only a part of its production, for example, the first 4 million GGE, could end up supporting a larger fraction of its overall production if it has challenges scaling up production. This would reduce the risk of a double-downside, where both production volumes and market values for a finished fuel are lower than anticipated.

The size of a contract could thus be determined by whichever is smaller, a set percentage of a given project's nameplate capacity (e.g., 40%) or a fixed number of gallons. For example, a project with a capacity of 10 million gallons per year could apply for 4 million gallons of support per year or 40% of its nameplate capacity. Furthermore, there could be an option for that facility to compete in subsequent auctions as its operational capacity increases. For context, DuPont and Poet DSM's cellulosic ethanol facilities have 30 and 24 million gallons of nameplate capacity, respectively, and Quad County Corn Processor's bolt-on corn kernel fiber facility has 2 million gallons of capacity (EPA, 2016b). While a 4-million-gallon guarantee would cover only a fraction of the production of a commercial-scale cellulosic facility, it could be a viable incentive to supplement a first-generation facility with a bolt-on addition to process cellulosic residues.

As part of the contract, it may be beneficial to require that a project deposit some portion of its capital into an escrow fund. While this may be prohibitive to some projects already in need of financial support, this step could be very important for separating out more serious, better-financed projects with a higher likelihood of success from the rest of the applicants. When the project reaches key construction benchmarks, the money from the escrow would be released, thus ensuring that the project is actually being constructed while also making capital available during the startup phase of the project.

3.2.4 Calculating the maximum administrative strike price

Similar to the design of the U.K. BEIS's CfD program, the initial strike price for the auction must be established by setting an administrative maximum price. This price effectively sets an upper bound for what California would pay out to producers and provides a guideline for the initial bidding. In contrast to the U.K. CfD program, however, the maximum strike price for low-carbon fuels would largely be informed via the per-unit, monetary credits already available to generators, rather than a consultative process involving stakeholders. Unlike the U.K.'s program, which is designed as a primary funding mechanism for renewable electricity deployment, the CfD program in California would be used to leverage existing financial incentives and act as a form of insurance against policy uncertainty. In principle, the reverse auction should start from the maximum administrative strike price and lead downward as bidders submit competitive strike prices.

Depending on the type of fuel produced and the type of fuel displaced (e.g., renewable diesel displacing petroleum diesel), the proposed administrative maximum would be calculated based on the subsidies and credits available to each fuel on top of the average market value for the displaced fossil fuel. To reduce volatility within the program, the maximum administrative strike price could be pegged to the average price or value of a given wholesale fuel or RIN. The sum of the market price and the financial incentives for two example fuels, cellulosic ethanol and renewable diesel, are shown in Table 2 and Table 3.

By incorporating existing financial incentives into the maximum administrative price, the proposed CCIFP policy leverages existing support while minimizing California's obligated spending. In the near term, CCIFP funding would stabilize the price received by facilities by decoupling low-carbon fuel prices from the petroleum market while reducing uncertainty from fluctuations in the LCFS and RIN markets. Over the longer term, if the RFS or SGBPTC end, the amount paid by California would increase. Conversely, were the market for low-carbon fuels to improve, their sale price could exceed the strike price and result in payouts back into the CCIFP, allowing the program to support more projects in subsequent auctions.

The maximum strike price likely will be significantly different for cellulosic ethanol relative to other fuels, such as drop-in diesel or advanced aviation fuel. Therefore, it is likely necessary that subsequent auctions develop administrative maximum strike prices for a given pool of fuels, such as diesel replacements or aviation fuels. This would facilitate support for the lowest-carbon fuels in new sectors, such as jet fuel made from municipal solid waste, which may be significantly more expensive to produce than other eligible types of fuel.

A key point of uncertainty within the administrative maximum is the SGBPTC. As discussed above, this financial incentive may distort the administrative maximum price due to its high value and relatively high uncertainty. Furthermore, as the production tax credit is only applied after a facility has begun to generate a profit and pay income taxes, its implementation and value to producers may be delayed by several years.

Table 2. Example maximum CCIFP administrative strike price for California cellulosic ethanol, in gasoline gallon-equivalents (GGE)

COMPONENT	AMOUNT ($/GGE)	DESCRIPTION
Ethanol, Market Price, Minus D6 RIN	0.99	Average Chicago Board of Trade ethanol price in 2015, minus the average D6 RIN price over that time period
LCFS Credit Value	0.83	LCFS credit value for cellulosic ethanol (assuming 30 g CO_2e/MJ carbon intensity, and $100/ton LCFS credit value)
D3 RIN	2.82	RFS credit for cellulosic ethanol production, factoring in CWC value
Second Generation Biofuel Producers Tax Credit	1.01	Tax credit for cellulosic biofuel production
Total Price	**5.65**	

Table 3. Example maximum CCIFP administrative strike price for California renewable diesel, in gasoline gallon-equivalents (GGE)

COMPONENT	AMOUNT ($/GGE)	DESCRIPTION
Petroleum Diesel, Market Price	2.07	Average U.S. diesel price in California, 2015 (EIA data), minus taxes
LCFS Credit Value	0.83	LCFS Credit Value for Renewable Diesel (assuming 30 g CO_2e/MJ carbon intensity, and $100/ton LCFS credit value)
D7 RIN	2.82	RFS credit for cellulosic diesel production
Second Generation Biofuel Producers Tax Credit	1.01	Tax credit for cellulosic biofuel production
Total Price	**6.73**	

3.2.5 Market value proxy used in CCIFP

The market value in the program largely refers to the sale price for the fuel plus the amount of other policy support received by alternative fuel producers used to determine the payouts from the CCIFP. Whenever this so-called market value (shown in Figure 8) is lower than the strike price, CCIFP would pay the difference to project awardees, which is to say the auction-winning producers. CCIFP would track this price via reports from producers in conjunction with the offtake agreements. To prevent manipulation of the program from excessively low reported sales prices, wholesale fuel prices in the program would not be reported by the producer. Instead, they would be derived from monthly averages of either the CBOT ethanol price or reported statewide gasoline and diesel sales prices.

Market Value =

Wholesale Sale Price (e.g.,wholesale ethanol price minus D6 RIN value)
+RIN value+LCFS Credit Price+SGBPTC+Other Policy Support

Figure 8. Market value for cellulosic ethanol

As mentioned above, the calculated market value could assume a baseline CI of 30 g CO_2e per MJ of fuel. This would provide additional incentive to produce lower-CI fuels by providing an additional financial benefit to the project operator from higher LCFS credit values relative to the calculated CCIFP price. For example, assuming an LCFS credit value of $100 per ton of carbon, the CCIFP calculated market value would assume an LCFS credit value of $0.83 per GGE of cellulosic ethanol, whereas the value from the program for a 15 g CO_2e/MJ fuel would be $1.00, a difference of $0.17 per GGE.

In cases where the calculated market value exceeds the strike price, the CCIFP would not pay anything to the producer. Instead, as in the U.K.'s CfD program, one design option for the program would have the producer pay the difference back into the CCIFP. This policy option could be desirable for California, as it would facilitate the accrual of additional funding to support the program, mitigate liability and generate revenue to hold additional auctions. However, it also would reduce the potential benefit of projects for investors and could drive strike prices upward to compensate for the lost potential. A mechanism to pay back market value above the strike price was included in the U.K.'s CfD program due to the relative predictability of the electricity sector, which has long-term supply agreements. This mechanism may be more limiting for fuel producers than electricity producers, as reducing the upside of windfall profits for first-movers in the fuels sector in cases of high product value could limit interest in the program.

One option to mitigate the effect of reducing upside through a payback mechanism would be to provide a buffer between the amount paid back into the program and the amount a producer receives from sales and incentives above the strike price. For example, if the market value exceeds the strike price, only 50% of the difference would need to be paid back; or alternately, 100% of the amount above $0.25 above the strike price, or some combination of these two mechanisms.

As a cost control mechanism, this report recommends capping the maximum CfD payments available to a fuel producer. This is recommended in order for the policy to cap maximum potential liability for a project and therefore able to support greater production levels. The spending cap used in the scenarios below is $1.00 per GGE. Therefore, if the market value is more than $1.00 below the strike price that the producer has bid, the producer would only receive $1.00 of compensation from the CCIFP. This level of guarantee would still be substantial relative to the size of the various incentives but would provide the program with greater flexibility and certainty for supporting more projects. For projects with additional demonstrated socioeconomic benefits in disadvantaged areas, this cap could be increased in order to better support those projects.

It is important to note that the actual market value of the finished fuel may differ from the amount actually recouped by the producer. In the case of the SGBPTC, as discussed previously, the tax credit is provided when the project in question generates income and has a positive tax liability, which may be unlikely in the early stages of a project. It is also important to remember that some ultralow-carbon fuels, such as non-biological low-carbon fuels, are not eligible for all incentives and so would recoup a lower value compared to cellulosic ethanol, for example.

3.2.6 Support for disadvantaged communities

The support of public health concerns, improving quality of life and creating economic opportunity in California's disadvantaged communities are key elements in the allocation of cap-and-trade auction proceeds. Under the requirements of Senate Bill 535, a quarter of the proceeds from the GGRF must go toward projects that provide aid to disadvantaged communities, with 10% of the funds dedicated to projects physically located within those communities, according to the California Environmental Protection Agency (CAL EPA, 2014). The agency identifies applicable communities using a set of indicators to score environmental, public health and socioeconomic data. The qualifying 25% of California census tracts scored by the indicators are then released publicly.

Under the proposed CCIFP policy, projects either aiding or physically located within disadvantaged communities could qualify for a one-time benefit to their application during the reverse auction or an ongoing benefit to a contract in the form of a financial incentive. As part of an application package prior to the reverse auction, projects could demonstrate through land permits that they would be located within a designated disadvantaged census tract.

Providing additional benefits to project bids that demonstrate socioeconomic benefits during the auction process could be done in one of two ways: (1) a tiebreaker between two bids with equal strike prices, or (2) a bonus credit for the purposes of a bid. For the tiebreaker option, it would likely be necessary to set minimum bidding increments, for example $0.10 or $0.25, in order to avoid a situation where a project not benefiting a disadvantaged community outbids one that does by a non-meaningful amount. An example of how the bonus credit would work would be if a bid of $3.25 from a project situated in a disadvantaged community could qualify for a bonus credit of $0.10 and thus be counted as $3.15 for the purposes of the reverse auction.

Alternately, some rounds of auctions for a specified pot of funding could only be available to projects benefitting disadvantaged communities, thus ensuring that the winning project would be one that provides the required type of socioeconomic benefit. The CCIFP could also make a commitment toward the California Air Resources

Board's (ARB) socioeconomic goals by providing additional financial incentives for the duration of a contract. This could include an increase on the per-unit CCIFP spending cap provided to a given project. For example, a project under contract located within a designated census tract could be offered up to $1.25 per GGE under the program's spending cap instead of the proposed $1.00.

3.2.7 Auction format

The proposed CCIFP policy will hold regularly occurring reverse auctions in order to determine strike prices and distribute new contracts. The program is designed to grow over time, while never creating a maximum potential liability greater than it can support using its confirmed funding. Therefore, auctions would be triggered when the confirmed funding exceeds the maximum liability of the remaining years on existing contracts, plus the total liability of one additional auction's worth of contracts. The program will use a per-GGE spending cap on its contract guarantee in order to forecast the maximum liability of each contract.

The maximum liability is defined as the spending cap multiplied by the total number of GGE supported for the remaining years on all contracts. In the scenario analysis in Section 3.3 below, this report assumes a spending cap of $1 per GGE and a timeline of 10 years, so that the total liability for a new project is $1 million per million GGE of contracted annual production. As the auctions would be held regularly, projects would be able to prepare documentation ahead of time in order to comply with participation criteria. If program funding is insufficient to support an auction that year, a notice would be posted three to six months before the usual auction date. This notification would typically occur after the summer, when the available GGRF funding for the next year is announced.

Auctions begin at the maximum administrative strike price calculated by the program operators for the pool of fuel being supported. For example, a cellulosic ethanol auction would likely begin with a lower strike price than a drop-in diesel or jet fuel auction. Winning an auction entitles the lowest bidder to a contract for one bid unit of supported production, modeled in the scenario analysis as 4 million GGE per year. If the budget can support multiple bid units, the auctions are held sequentially in multiple rounds. Projects that require winning multiple bid units in order to be viable must share that information in their application materials. Each bidder will submit a bid in $0.05 increments in one round of bidding, with the lowest price winning that round of bidding. If no project bids lower than the maximum administrative strike price or if there is a tie, then tiebreakers are used. These can include CI, feedstock sustainability, benefits to disadvantaged communities, and whether that bidder already has a contract under the program, as specified in the final program design.

One option to expand the CCIFP's support for alternative fuel projects would be to increase the minimum bid unit over the lifetime of the program. Depending on the levels of funding for the CCIFP, the program may only be able to support a few million GGE of production in the first year, which may only be sufficient to support a smaller, demonstration-scale or bolt-on project, just a fraction of the potential production from a larger, commercial-scale facility. By increasing the minimum bid unit by 2 million GGE annually, the smallest supported project would grow from 4 million GGE to 24 million GGE by the end of the program. A project may also bid to have a fraction of its total production supported by the project, such as a 20 million GGE-per-year project bidding for 4 million GGE of support. This may help bridge the program's transition to supporting larger facilities ahead of the expanding minimum bid size. Increasing the minimum bid size over time would help to guide the program toward supporting larger projects over time, as the available capacity for bolt-ons in California decreases and the commercial viability of larger facilities grows.

3.3 FUNDING AND PROGRAM SIZE

The proposed CCIFP policy leverages existing financial incentives in order to provide a guarantee to low-carbon fuel producers and maximize the effectiveness of California's own spending. Due to uncertainty about market values of fuels, and about the value of the other policy incentives available, the amount of spending that will be required for each successful project bid will be uncertain, and this uncertainty about potential liabilities will affect the number of projects that can be supported. In order to better understand the relationship between the CCIFP and other variables in the fuel marketplace, this section develops a variety of policy and market scenarios to evaluate spending and production support.

The scenario analysis in this section focuses on cellulosic ethanol, largely because it is the most abundantly produced alternative fuel that meets the GHG threshold requirements of the proposed CfD program, while also being the closest to full commercialization, with several U.S. facilities with nameplate capacities above 10 million gallons nearing completion or in their startup phase. Consequently, support for cellulosic ethanol likely would entail lower maximum administrative strike prices and financial support than other technologies, although its uptake may be limited by the ethanol blend wall. Despite this, the proposed CfD program should not solely support cellulosic ethanol production and the scenario analysis presented below is intended to be illustrative. The implementation of the program should be tailored to the fuel pools that CARB identifies as the most desirable for achieving the state's climate and fuel production goals.

California's funding commitment for the CCIFP is the largest factor determining the amount of production support granted by the policy, as it is the one constant in determining the amount of support available to contracted producers. With that in mind, the scenarios presented in this section fall into two families: those in which the only guaranteed funding is a single $40 million payment at the outset, and those in which $40 million is paid into the fund every year, but the payment is not guaranteed ahead of time.

Each scenario considers the reverse auction of at least 4 million GGE's of cellulosic ethanol production for a contract of 10 years, modeling the program budget, annual spending, production volumes, and incentive values to 2030. This production volume is designed to be strictly illustrative, and is derived from both the spending cap of $1 per gallon and the total amount of funding allocated to the program for the recommended 10-year timeline as explained above: either $40 million once, or $40 million per year.

For each facility modeled in this analysis, we assume a startup time wherein the facility's production grows from zero to its nameplate capacity. For modeling purposes, this section assumed that a project less than 10 million GGE would be a small bolt-on facility with a shorter startup time, whereas anything above 10 million GGE would be a stand-alone commercial facility. The startup time for a bolt-on facility is assumed to be 2 years, whereas the start-up time for a larger facility is estimated to be 5 years. We assume that the production levels in a facility incrementally ramps up to half of nameplate capacity in the year prior to full capacity operation, which is year three for bolt-on facilities and year six for commercial-scale facilities, such that the weighted average share of the nameplate value produced during the startup period is estimated to be 32% of nameplate capacity for a bolt-on facility and 16% for a larger facility.

The scenario modeling estimates the amount of fuel production supported with either a one-time $40 million funding allocation or a recurring $40 million allocation. Each funding level is then assessed across three different policy mixes, described in Table 4. Depending on the policy mix, the initial value of an existing incentive can shift, or alternately assumed to end during the course of the program or end prior to the CCIFP implementation.

Table 4. CCIFP scenario parameters

PARAMETER	BASELINE POLICY MIX	OPTIMISTIC POLICY MIX	PESSIMISTIC POLICY MIX
Chicago Board of Trade ethanol price (CBOT, $/gallon)	Baseline ethanol price, for ethanol fuels; the starting price in the baseline scenario is the 2015 average price	Baseline price x 1.25	Baseline price x 0.75
Gasoline or diesel price	Baseline fossil fuel price; the starting price in the baseline scenario is the 2015 average price	Baseline price x 1.25	Baseline price x 0.75
Inflation rate	2% per year		
Strike price	Winning bid price from reserve auction (default: $5.00/GGE). Indexed to inflation.	$4.00/GGE	$5.00/GGE
Program pay-In	Producers pay all value above strike price back into program		
Spending cap	$1.00 per GGE		
LCFS credits	Assuming LCFS credit price is set to $100 per ton (indexed to inflation) and delivered fuel CI is 15 g CO_2e/MJ	$150/ton CO_2e	$50/ton CO_2e
Cellulosic Waiver Credit	This is the waiver credit price paid when cellulosic ethanol production falls below mandated volumes, equal to $3.00 (indexed to inflation) minus the gasoline price		
D3 RIN price	The RIN price for cellulosic ethanol. The starting price is set to the 2016 price and accounts for the value of the CWC.		Program is repealed after 2022
D6 RIN price	The standard RIN price for renewable fuel; the starting price is set to the 2016 average price		Program is repealed after 2022
D7 RIN price	The RIN price for cellulosic diesel, which is 1.7x the D3 price		Program is repealed after 2022
SGBPTC	This incentive is fixed at $1.01 per gallon and expires in 2017	Expires after 2030 and is indexed to inflation	Expires after 2016
Timeline	2017 to 2030		
Startup time	Bolt-on: 2 Years Commercial-scale: 5 years		
Bid unit	4 million gallons per year		
Escalating bid unit[a]	2 million gallons per year		
Contract duration	10 years		

[a] *One-time funding and scenarios do not include an escalating bid unit*

Each category includes three scenarios to reflect a mix of policy and market assumptions:

- **Baseline Policy Scenario:** This business-as-usual scenario reflects a future policy mix that makes middle-of-the-road assumptions about the value provided by financial incentives to 2030. The SGBPTC will extend through 2022. The RFS and LCFS will extend through 2030, with the incentive values increasing in line with a 2% inflation rate. Baseline fuel prices for gasoline or ethanol will increase from 2016 by the same inflation rate.
- **Optimistic Policy Mix:** This scenario is designed to reflect a policy mix with high value signals and very low regulatory uncertainty. This policy differs from the Baseline Policy Scenario by assuming that the SGBPTC will extend through 2030. The RFS and LCFS will extend through 2030, with the incentive values indexed to inflation. Baseline fuel prices for gasoline or ethanol will be 25% higher than in the baseline policy scenario, sending a higher value signal.
- **Pessimistic Policy Mix:** This scenario is designed to reflect a policy mix with lower value signals and high regulatory uncertainty. The pessimistic policy mix differs from the Baseline Policy Scenario by assuming that the SGBPTC will not be extended beyond 2016. Furthermore, the scenario assumes that the RFS will be repealed after 2022 and RIN values drop to 0. The LCFS will extend through 2030, with the incentive value indexed to inflation. Baseline fuel prices for gasoline or ethanol will be 25% lower than in the baseline policy scenario, sending a lower value signal.

3.3.1 One-time funding policy scenarios

This section evaluates the possible production supported through the CCIFP if the funding is limited to a one-time, $40 million allocation. The purpose of this is to establish a lower-bound showing what is possible without recurring funding and contrast it to the spending proposal by ARB for direct production subsidies. For reference, the Very Low Carbon Fuel Incentives Program proposed by CARB is designed to directly subsidize the production of approximately 40 million gallons of fuels by spending a maximum of $40 million (CARB, 2016c). While this incentive would only be guaranteed for one year, ARB is planning to explore options for supporting multiyear commitments to the funding in order to maximize the potential for longer-term investments.

Each scenario chart assesses two variables: the annual spending on contract for difference payments and the cumulative funding available in the budget, which includes both the guaranteed CCIFP funding plus any banked funding from when fuel prices exceed the strike price. The spending cap is $1.00 per gallon of fuel. For all scenarios, the initial auction secures 4 million GGE of production for 10 years, to reflect the maximum liability of the spending cap multiplied by the total fuel production.

Follow-up auctions only occur in the scenarios if the total liability of adding another facility plus the existing contract (i.e., the per-gallon spending cap multiplied by the new total production) is less than the total amount of guaranteed incoming CCIFP funding plus remaining unspent funding. In all scenarios, the production begins on a two-year delay from 2016 with $40 million of funding coming in once in 2017.

In the baseline policy mix, shown in Figure 9, the initial auction supports a small facility with a nameplate capacity of 4 million GGE per year beginning in 2018. The market value of the finished fuel is slightly below the strike price, such that the annual spending and drawdown on the initial $40 million is minimal. The remaining funding is sufficient to sustain a follow-up auction for a second 4 million GGE project in 2026, triggered as the potential future liability to support the initial project falls over time. For the duration of the time series the program supports 38 million total GGE of cellulosic ethanol at the cost of $4 million while leaving $36 million in the fund in 2030.

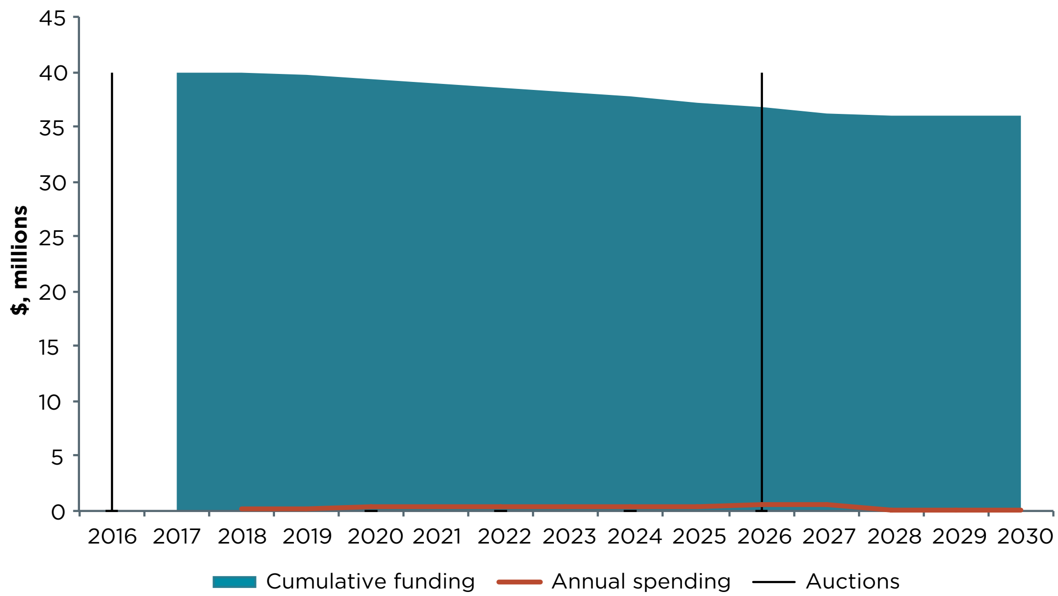

Figure 9. Baseline policy mix, one-time funding

The optimistic policy mix scenario, illustrated in Figure 10, differs substantially from the baseline primarily because high market values result in annual pay-ins into the program, driven by the additional value from the SGBPTC extension beyond 2016, high fossil fuel prices, and a lower strike price. This significantly drives up the accrued funding and generates several follow-up auctions. The annual production supported through the program (accounting for startup periods at partial capacity) increases from 1 million GGE to a peak of more than 9 million GGE by 2028. From 2018 to 2030, 73 million GGE of cellulosic ethanol would be supported through the CfD without any payments from the state. Furthermore, the absolute amount of supported production is actually higher than 73 million GGE, but much of the additional production from the extra auction rounds would occur post-2030. Due to the significant amount of funding paid into the program in this scenario, the parties involved should explore raising the minimum bid size in order to support larger facilities.

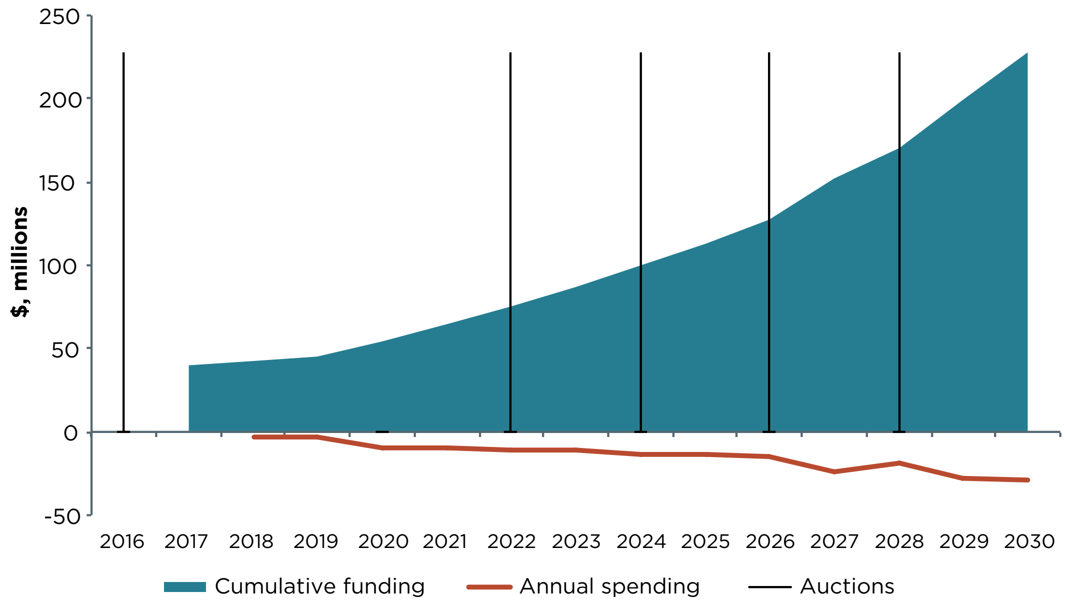

Figure 10. Optimistic policy mix, one-time funding

The pessimistic policy mix presented in Figure 11 resembles the baseline policy mix, but with higher CfD payments that cause a more substantial drawdown of the initial fund. This scenario sustains zero follow-up auctions and hits the per-gallon spending cap of $1 dollar of support after the RFS is repealed in 2022. Approximately $7 million of funding would remain in 2028 once the initial project support from the first auction has concluded. The total amount of fuel supported through 2030 in this scenario is 35 million GGE.

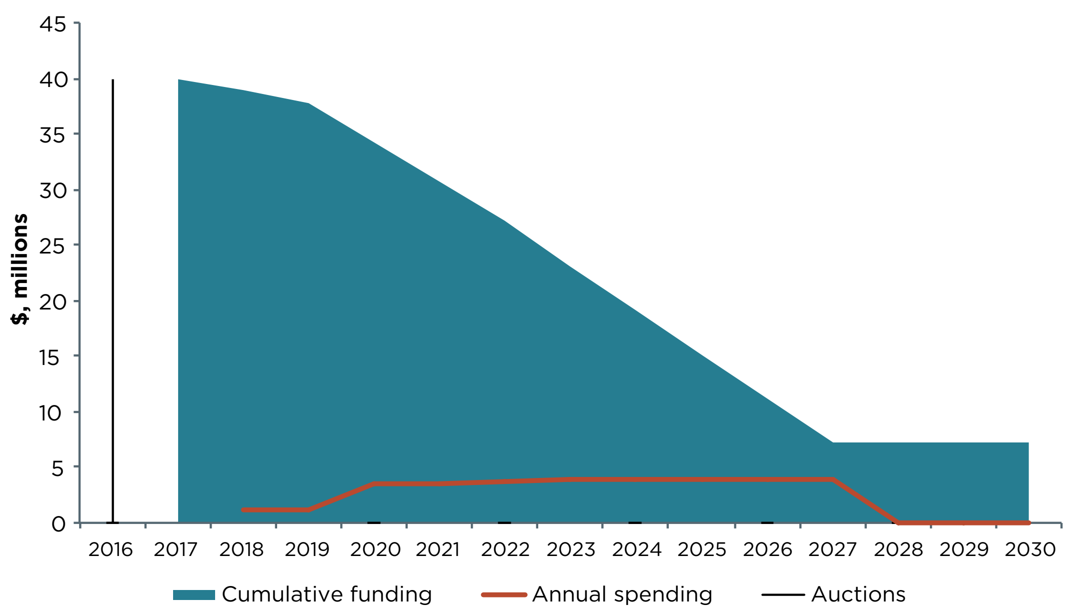

Figure 11. Pessimistic policy mix, one-time funding

The results from all three scenarios show that a one-time, $40 million funding commitment from California would be able to support up to 73 million GGE of cellulosic ethanol production cumulatively from 2017 through 2030. A $40 million funding commitment from CCIFP would establish a relationship with one to five smaller-scale producers over a 10-year period. It is likely that in terms of production volumes and GHG mitigation, the impact of the program would be limited, although still cost-effective, unless greater funding levels could be allocated for subsequent auctions and additional projects.

The limited support could dampen interest and participation by larger projects. Cellulosic ethanol facilities in the Midwest have approached 25 million gallons per year of nameplate production capacity, greatly exceeding the 4 million gallon guarantee here. Therefore, it is likely that with the limited support available, this scenario would only be able to support a bolt-on or demonstration facility, or alternately, a portion of the production of a larger project.

3.3.2 Recurring funding policy scenarios

The second family of scenarios evaluated in this report considers a case wherein the CCIFP receives multiple years of funding, but that funding is not guaranteed. These three scenarios assume that $40 million is allocated in 2017 and production begins in 2018, with an additional $40 million allocated every subsequent year through 2030.

This scenario builds on the conservative assumptions from the initial family of scenarios, as the auctions are only triggered if the total amount of funding accrued by the program is greater than the total amount of existing liability plus the additional maximum liability incurred by a new contract. The liability is estimated as the spending cap multiplied by the total amount of guaranteed fuel production. If the follow-up auction triggers a new contract, the model calculates the existing liability and the liability from the new auction to determine the new total liability. If the total liability still is less than the remaining guaranteed funding, then the model assumes that that auction includes multiple auctions for new projects, each with a minimum capacity of 4 million GGE, to use up the remaining funding.

In order to expand fuel production and project size while still assessing liability conservatively, this family of scenarios includes an escalating bid unit that increases the minimum project size by 2 million gallons per year, effectively increasing it by 4 million gallons for every two-year auction period. This provision will slowly guide the program's reverse auctions to yield larger projects. This would transition the program over time from supporting smaller, demonstration and bolt-on facilities toward commercial-scale projects. As an illustrative example, Figure 12 shows how the program increases its overall volume of support in the baseline policy mix. The steep increase in supported production volumes illustrates the transition from small projects toward commercial scale projects over the course of the program's lifetime.

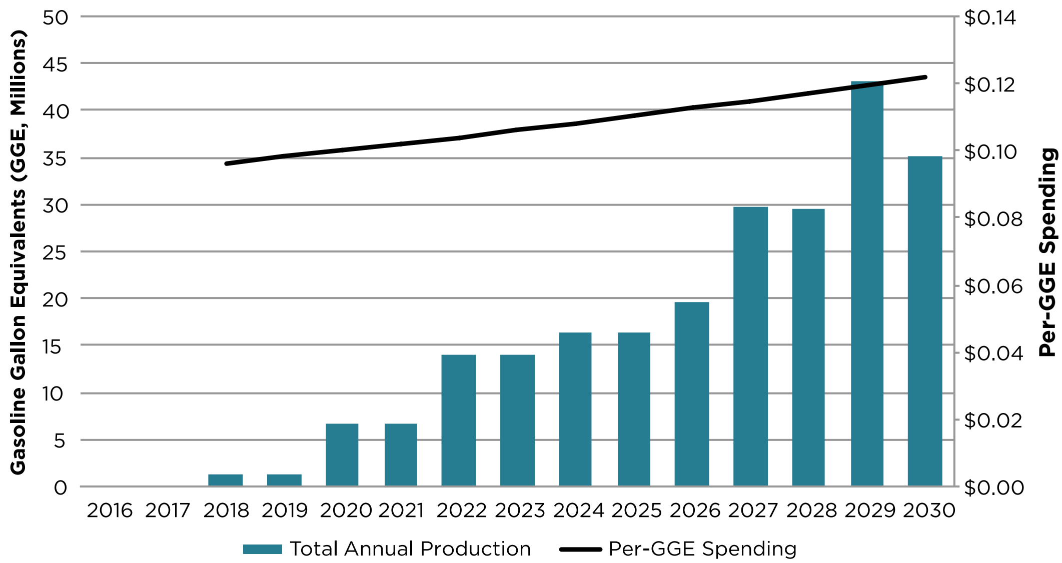

Figure 12. Annual supported cellulosic ethanol production and per-GGE spending with escalating minimum bid unit, baseline policy mix

In the baseline policy mix, shown in Figure 13, the program receives funding of $40 million from 2017 through 2030. The program accrues funding throughout the time series, as the annual spending is below the program funding. The per-gallon spending remains around $0.10 per GGE, thus allowing the program to accrue sufficient funding for five subsequent auctions, with supported production peaking at more than 40 million GGE annually in 2029. The total amount of production through the time series is 309 million GGE.

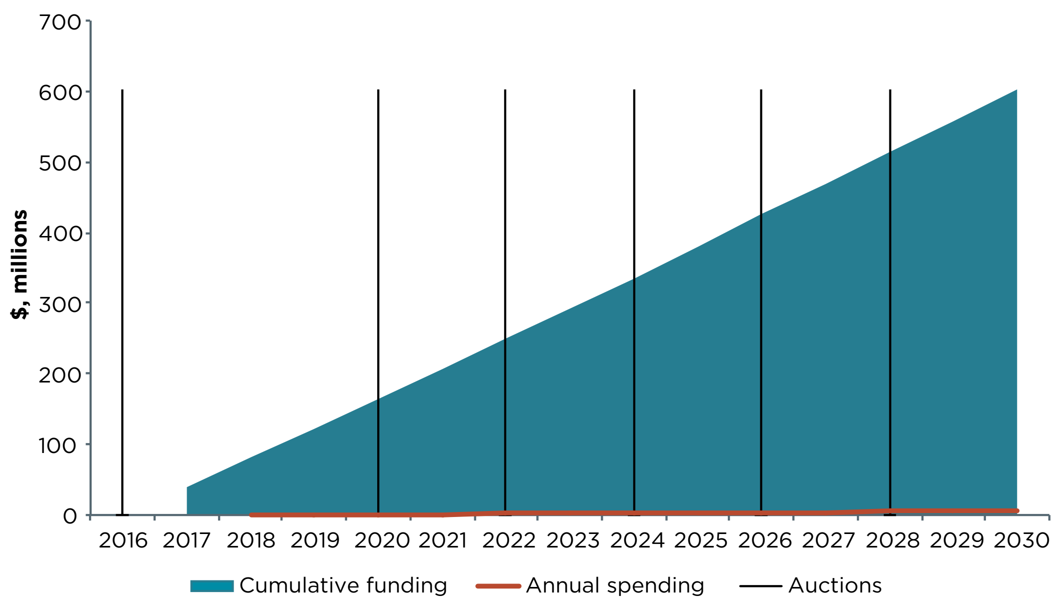

Figure 13. Baseline policy mix, recurring funding

The optimistic policy mix scenario illustrated in Figure 14 differs from the baseline by accruing funding every year from program pay-ins, driven by a combination of high market value from the SGBPTC, high fossil fuel prices, and a lower strike price. The high amount of banked funding triggers an auction every two years. The total production throughout this time series is 405 million gallons, although the duration of the third and later contracts would extend beyond 2030. From 2018 through 2030, the CfD would support 30% more fuel production than in the baseline policy mix. Furthermore, there would be additional contracted production beyond 2030 from several of the later auctions in the time series. The high amount of banked funding relative to the baseline scenario indicates that a mechanism is needed to take advantage of the higher returns to support higher production or a more diverse mix of supported fuels. Furthermore, as shown by the chart, the volume of banked funding could likely support additional auctions either in odd-years or at higher volumes. The high levels of accrued funding in this scenario may necessitate a policy design option to halt funding when the fund reaches a certain level. Another possibility is that the strong policy support for ultralow-carbon fuels in this scenario would lead to either lower bid prices or reduced auction interest over time, causing the funding growth to taper off.

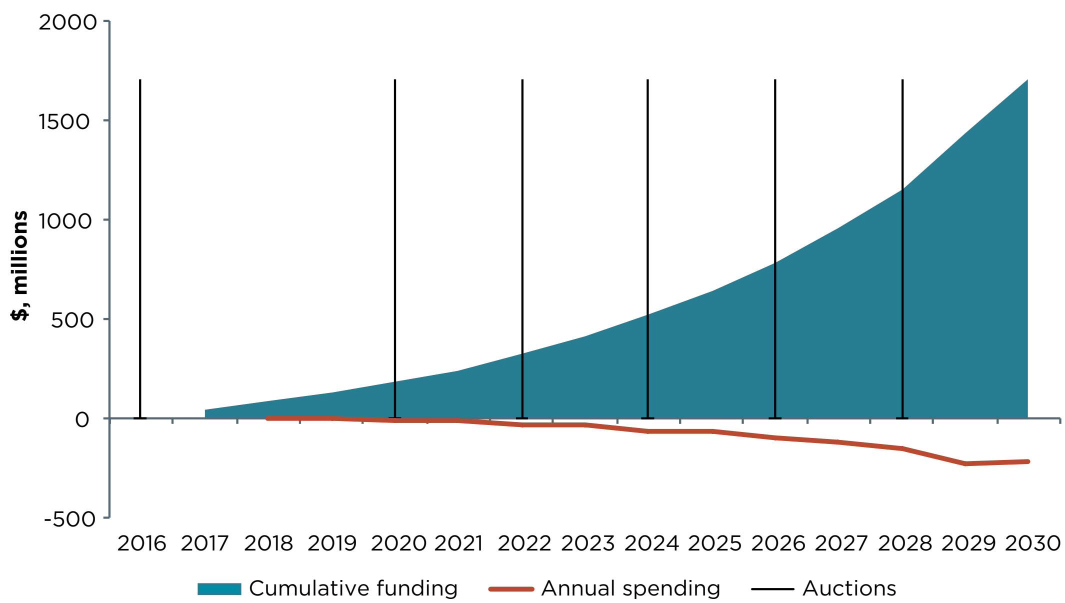

Figure 14. Optimistic policy mix, recurring funding

The pessimistic policy mix scenario differs from the one-time funding pessimistic policy mix scenario in that it accrues sufficient funding to generate several follow-up auctions. The program is able to accrue funding by spending at a rate lower than the annual funding levels. The policy is able to trigger four follow-up auctions. The per-gallon spending cap is reached in 2023 after the RFS program is repealed. The total volume of fuel supported through 2030 is 222 million GGE.

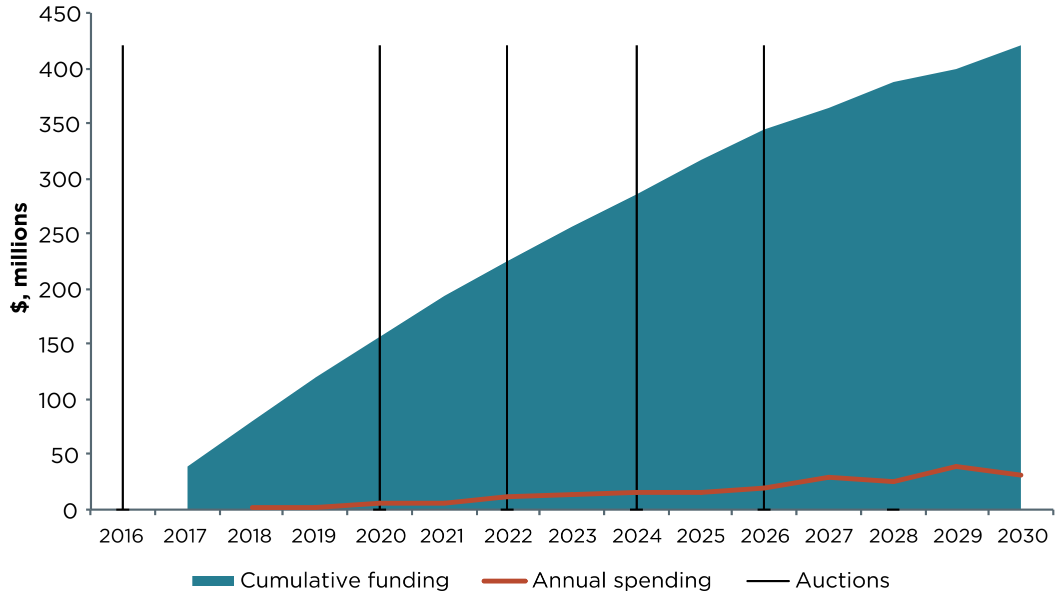

Figure 15. Pessimistic policy mix, recurring funding

The results from all three scenarios show that including an escalating minimum bid in conjunction with recurring funding grows the program significantly over time. In all three scenarios, the program transitions from supporting smaller projects at its outset to larger, commercial-scale projects by 2030. In all three scenarios, the total production from 2018 through 2030 greatly exceeds the one-time funding scenarios by an order of magnitude while also growing to support larger projects over time. All three scenarios still had significant amounts of funding available in 2030, indicating that they had underspent relative to the hypothetical budget allocation from GGRF, leaving open the option for additional auctions and policy support as well as guaranteeing against sudden market or policy changes.

Table 5 summarizes the total amount of cellulosic ethanol production that would be supported by the CCIFP under all scenarios discussed here. For purposes of comparison, a 2015 report from the International Council on Clean Transportation estimates that in order to meet carbon intensity reduction compliance schedules in California, Oregon and British Columbia in 2030, 1.5 billion gallons of cellulosic ethanol would be needed in a medium-demand scenario. While the cellulosic ethanol production supported through the CCIFP would not approach that level of production, it would provide a modest fraction of the fuel in-state and cost-effectively.

Table 5. Total cellulosic ethanol supported in all scenarios from 2017-2030, in million GGE

	ONE-TIME FUNDING ($40 MILLION IN 2017)	RECURRING FUNDING ($40 MILLION/YR 2017-2030)
Pessimistic policy mix	35	222
Baseline policy mix	38	309
Optimistic policy mix	73	405

4 CONCLUSIONS

This report proposes a new policy mechanism for supporting the production of ultralow-carbon fuels in California that uses CfDs to provide a 10-year price floor for ultralow-carbon fuel producers. The proposed CCIFP would use funding from California's cap and trade funds to mitigate policy and market uncertainty for producers. The proposed policy instrument would require approximately 8% of the proposed $500 million dollars appropriated for CARB to make low-carbon transportation and fuels investments in FY 2016-2017, and approximately 3% of the total cap-and-trade funding for the previous fiscal year. This approach minimizes program spending by leveraging existing financial incentives for low-carbon fuel production, only paying out and allowing payment into the program in response to policy and market shifts. By addressing the primary barriers to technology commercialization head-on, the CCIFP would help to bridge the commercialization gap for new technologies, thereby bringing new projects into operation.

The proposed policy would do more to stimulate additional ultralow-carbon fuel production by leveraging existing policies and mitigating their downsides. The cost-effectiveness of the CCIFP derives from the fact that it leans on existing programs and acts as an insurance against policy uncertainty. In cases where the policy framework components, such as RFS, stay in place, CCIFP would likely underspend its annual funding, making it a cost-effective form of support. The primary spending in support of ultralow-carbon fuel production would still primarily flow from other incentives, although the CfD's existence reduces its risk. Instead of an additional, per-gallon incentive, the CCIFP would make new projects viable and likely generate substantial additional capacity expansion by providing certainty for developing new fuel projects, rather than funding existing production.

This report starts out with a few constants, such as a 10-year guarantee for a price floor, and synthesizes them into a scenario analysis that estimates the level of fuel production supported from the program across a variety of policy scenarios. The results show that in the baseline and optimistic policy scenario cases, the program effectively leverages outside financial incentives and tends to underspend on supporting fuel production relative to the allocated budget, while supporting substantial amounts of new production at low cost. In several scenarios, the total amount of supported fuel production would help to make substantial contributions to meeting California's LCFS goals. In some scenarios, the market value exceeds the price floor and thus the program is able to bank funding and support additional auctions in subsequent years, further improving its cost-effectiveness. Due to the conservative approach to calculating liability before triggering subsequent auctions, the pessimistic policy mixes still manage to support fuel production without exceeding the project budget, though fewer auctions are triggered.

Overall, the scenario analysis indicates that a one-time funding allocation would likely support only a small amount of production and would be unlikely to attract interest from larger-scale projects. Due to budget constraints, only 4 million gallons per year could be supported, thus limiting the program to either smaller-scale demonstration facilities or bolt-on components of larger projects. Recurring funding that is not guaranteed would support small projects in the first years but could eventually support commercial-scale projects later in the program. Larger projects could only be supported in early years of the program if additional initial funding in the first year or an annual funding commitment is secured.

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