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## On August 16 PMAC Meeting

*Additional submitted attachment is included below.*

NEXTGEN CLIMATE AMERICA

30 August, 2016

California Energy Commission Dockets Office
1516 Ninth Street
Sacramento, CA 95814-5512

Re. NextGen Climate America Comments on the August 16 PMAC Meeting, Docket 15-PMAC-01

To the CEC Staff and PMAC Members,

Thank you for the opportunity to comment on this docket, and the issue of gasoline price volatility. California's climate leadership has clearly demonstrated that economic growth is compatible with reducing GHG emissions. The state has experienced economic growth and job creation above the national trend[1] during the period when its climate policies are beginning to take full effect. State policies have generated over $7 billion in clean energy and sustainability projects[2] in California, and created hundreds of thousands of jobs[3]. While the overall impact of sustainability policies has been overwhelmingly positive, volatility in oil markets has real consequences for businesses and consumers. California's gasoline prices have experienced significant price volatility over the last few years and it is reasonable to ask whether the state's climate policies contribute to this.

Out preliminary investigation into this indicates that there is **limited, if any, evidence to support the assertion California's sustainability policies increase fuel price volatility** and in fact, there is significant evidence to the contrary. The subject, however, deserves a more comprehensive examination than is presented here.

## Diversification of the fuel portfolio reduces risk from volatility

Just as prudent financial planning recommends diversifying an investment portfolio to protect against market volatility, diversifying a fuel portfolio can reduce risks from volatility in fuel markets. A diverse fuel portfolio reduces risk through two primary mechanisms, by giving consumers alternative fuels to satisfy their transportation demand when fuel prices go up, and by reducing the market power of fuel providers by weakening the linkage between a particular fuel and our broader economic success.

In 2015 alternative (non-petroleum) fuels comprised 8.1% California's fuel market[4]; a level which is rapidly increasing, largely due to the effects of California's Low-Carbon Fuel Standard (LCFS). The fuels which are replacing petroleum come from a variety of sources, which helps insulate them from price shocks in any fuel market. With commercially viable options available, consumers can find alternatives

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[1] See: LA Economic Development Corporation 2016-2017 Economic Forecast & Industry Outlook http://laedc.org/wp-content/uploads/2016/02/LAEDC-2016-2017-February-Forecast.pdf and PPIC "California's Future" http://www.ppic.org/content/pubs/report/R_116SBR.pdf

[2] Source: California Climate Investment Map http://www.climateinvestmentmap.ca.gov/

[3] Source: AEE 2016 Advanced Energy Jobs in California Report http://info.aee.net/advanced-energy-jobs-in-california-2016

[4] Source: UC Davis, May 2016 Status Review of California's Low-Carbon Fuel Standard https://itspubs.ucdavis.edu/wp-content/themes/ucdavis/pubs/download_pdf.php?id=2634

to gasoline to avoid price spikes. Gasoline, for example, is being displaced by ethanol; almost all retail pumps dispense a 10% ethanol blend. Further growth in gasoline alternatives is feasible through higher ethanol blends[5], as well as "drop-in" renewable gasoline, such as that being produced through Tesoro's[6] partnership with several biologically-derived crude oil substitute producers[7]. An even greater diversity of options is available for diesel substitutes including biodiesel from a variety of in-state and out-of-state producers, as well as renewable diesel[8], which can be used at any concentration in un-modified diesel engines. An increasing number of plug-in electric vehicles is entering the California fleet, which provides another alternative to petroleum fuels.

In addition to more options, diversifying the fuel pool also reduces market power of any particular fuel or company, thereby insulating the market from price shocks which affect that fuel. As the sixth-largest economy in the world[9], California consumes enough petroleum to exert a significant effect on world oil markets. By reducing net petroleum consumption through fuel diversification, there is less stress on finished fuel supplies as well as petroleum supply chains, so disruption of any chain, through a refinery outage or pipeline failure for example, is less likely to trigger a severe price spike. Fuel distributors have more supply options and so can seek better prices in more competitive markets, rather than being obligated to take whatever supply is available. Recent research sponsored by the Consumers Union and conducted by ICF International estimates that the value of reducing market pressure through fuel diversification along the lines of a continued LCFS would be approximately $1.2 billion cumulatively through 2030[10].

## Fuel diversification can produce results on a similar timeframe to the considered alternatives

The committee is primarily considering three alternatives for reducing gasoline price volatility and the spread between CA gasoline prices and national ones, a policy to allow imports of non-CARBOB gasoline in times of high prices, a state refined products reserve and forward purchasing of gasoline supplies by the state, which could be diverted to moderate price spikes if necessary. All of these options would likely take years to implement and would likely require legislative action to grant appropriate authority. Allowing Federal RFG into the state, even as a temporary measure to reduce price volatility, would likely require a CEQA process through multiple regulatory agencies. A refined products reserve would require local CEQA and zoning approvals for what would likely be an unpopular expansion of petroleum infrastructure. Forward purchasing of petroleum would almost certainly require legislative authorization and appropriation of sufficient resources. This means that the effects of any of these actions would almost certainly not begin until 2018 or 2019 at the earliest.

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[5] The EPA has certified 15% ethanol blends in post-2001 model year vehicles, for example.

[6] Mention of a trademarked name or product does not constitute endorsement by the author, NextGen Climate or any affiliated entity.

[7] See: http://tsocorp.com/refining/renewable-biocrude/

[8] e.g. Neste Oil's NextBTL product. See: https://www.neste.com/na/en/customers/products/renewable-products/nexbtl-renewable-diesel

[9] Based on U.S. Department of Commerce and World Bank data.

[10] Source: ICF International 2016, Consumer Impacts of California's Low-Carbon Transportation Policies. http://consumersunion.org/wp-content/uploads/2016/03/Consumer-Impacts-of-Low-Carbon-Transportation-Policies-Report.pdf

Fuel diversification is already occurring, thanks largely to the LCFS, as well as other state alternative fuel programs. By 2020, the LCFS requires a 10% reduction in GHG intensity within the transportation fuel sector, which requires a significantly greater than 10% reduction in petroleum's share of state transportation fuels[11]. This reduction substantially reduces supply pressure on petroleum fuels within CA, ensuring that transient loss of supply or petroleum market volatility does not reflect itself in prices to consumers. Importantly, because LCFS has a significant head start on the alternatives under consideration, it works on a similar timeframe to the alternative policies under consideration and unlike the alternative policies, its effect can grow as it incentivizes additional reductions in petroleum consumption.

## Alternative fuel markets are likely to be less volatile than the petroleum ones they replace.

In addition to the inherent value of diversification, there is evidence to believe that the markets which would supply California's alternative fuel will be moving in to will be less volatile than current petroleum markets. While markets for biofuels are, at present, limited in scope, liquidity and transparency, we can draw several informative conclusions from examination of markets for key feedstocks.

At present, the dominant substitute for gasoline is ethanol derived from corn[12]. Corn ethanol prices are determined by a wide variety of production costs and market factors, however the price of corn is generally the single greatest contributor to both wholesale ethanol prices and ethanol price volatility[13]. Diesel substitutes, including both biodiesel and renewable diesel, are generally made from oil feedstocks; in some cases this is waste or recycled oil from food processing industries, in others it is purpose-grown oil from oilseed crops such as soybean or canola. While there are few transparent, liquid markets for waste oils, the soybean oil market serves as a useful proxy, since it represents the marginal oil that would replace oils shifted from alternative uses into biofuel production[14]. Finally, California retail gasoline prices are discerned by examining wholesale markets for CARB Oxygenate Blend (CARBOB), the petroleum fraction of retail gasoline dispensed in California. CARBOB price changes reflect the effects of international oil markets as well as in-state refining capacity, since the majority of California's motor gasoline supply is refined in-state. In addition, we will also examine West Texas Intermediate Crude, as a proxy for broader crude oil market prices, in order to assess the impacts of international crude oil prices absent any effects specific to California, e.g. refinery outages or costs imposed from environmental policy; since most corn and soybeans are grown outside of California this may also better reflect input prices to agricultural markets.

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[11] See ICCT http://www.theicct.org/potential-low-carbon-fuel-supply-pacific-coast-region-north-america and ICF International http://www.ucsusa.org/clean-vehicles/california-and-western-states/west-coast-oil for scenario analysis of likely alt-fuel scenarios which meet 2020 LCFS targets.

[12] The amount of corn ethanol consumed by California is expected to decrease over time as declining LCFS targets reduce its value as a low-carbon substitute fuel.

[13] http://www.agmrc.org/renewable-energy/ethanol/the-changing-economics-of-corn-ethanol/

[14] For a longer explanation of this see Jeremy Martin, Union of Concerned Scientists 2016 http://blog.ucsusa.org/jeremy-martin/all-about-biodiesel

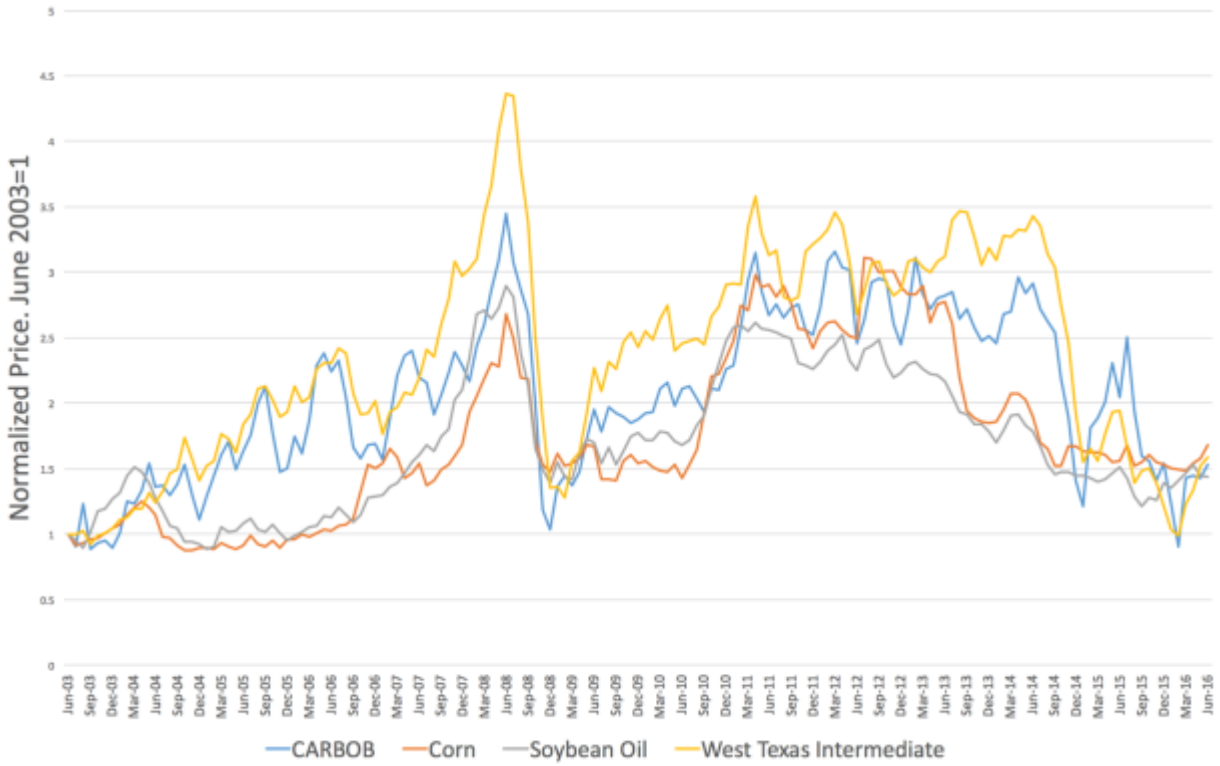


*Figure 1 - Normalized prices of CARBOB, Corn, Soybean Oil and West Texas Intermediate Crude oil[15].*

Visual inspection of the graph shows apparent correlation between the four commodity prices, though corn and soybean oil, as a rule, appear less volatile and lower priced over the indicated time range than either petroleum product. Hypothesis testing for relationships between these values is difficult because of obvious dependencies between each and exogenous confounding factors from broader market behavior. Levene's test for equal variance indicates that the variances of West Texas Intermediate is not related to either corn or soybean oil prices, while CARBOB variances are unrelated to soybean oil but cannot be statistically separated from corn over this time period[16].

A potential concern, which Figure 1 does not dispel, is that oil price volatility is reflected in agricultural commodity prices, which makes intuitive sense because petroleum is an input to agricultural commodity production. Determining the nature of this relationship – correlation vs. causation – is difficult because oil and agricultural commodity markets are complicated and subject to a wide variety of forcing factors. Several authors, e.g. Saghaian (2010) and Nazlioglu (2011)[17], have found limited evidence for a causal

[15] CARBOB, Corn No 2 Yellow, FOB Gulf of Mexico), Soybean Oil, First Contract Forward price, Chicago Exchange, all retrieved from www.indexmundi.com 12 August, 2016.

[16] To a p-value < 0.05, as described by http://www.real-statistics.com/one-way-analysis-of-variance-anova/homogeneity-variances/levenes-test/

[17] Saghaian, S. H. (2010). The Impact of the Oil Sector on Commodity Prices: Correlation or Causation? *Journal of Agricultural and Applied Economics*, *42*(03), 477–485. http://doi.org/10.1017/S1074070800003667

Nazlioglu, S. (2011). World oil and agricultural commodity prices: Evidence from nonlinear causality. *Energy Policy*, *39*(5), 2935–2943. http://doi.org/10.1016/j.enpol.2011.03.001

link from oil prices to agricultural commodity prices, though the scope and framing of these studies does not perfectly match the question in the context of California's alternative fuel markets.

Ultimately, this evidence offers no reason to conclude that a transition to a more diverse fuel mix will increase state exposure to price volatility as. **If there is no causal link between fuel prices and biofuel feedstock commodity prices, then the value of fuel portfolio diversification should be felt full-force. If there is a causal link between fuel and biofuel feedstocks, then the state is exchanging one volatility risk for the other and likely improving its position in the process, since agricultural commodity volatility appears to be significantly less than that of petroleum products**.

Corn ethanol and bio-based diesel alternatives are currently the majority, but not the entirety, of alternative fuels in California. Biogas, cellulosic ethanol and electricity are poised to become significantly larger elements of the fuel mix in coming years and all would be expected to reduce fuel price volatility on net. Biogas and cellulosic fuels are generally made from waste products, which typically insulates them from market-based price fluctuations which could affect commodity markets. Electricity prices do fluctuate, but under the control of a regulator and generally within smaller price ranges than petroleum. Electric vehicles may also help stabilize the grid and integrate more low-cost variable renewable energy sources, so their presence as a fuel demand may, in fact, reduce both prices and volatility in electricity markets[18].

All of this analysis examines only one factor in the total value proposition surrounding California fuel markets. In addition to reducing risk from petroleum market volatility, a transition to alternative fuels brings additional advantages from improved air quality, lower fuel costs, electricity grid support (in the case of plug-in vehicles) and incentives for technological innovation.

## The path forward

Fuel price volatility is caused by a complex set of forcing factors. The analysis presented here cannot definitively answer the questions about what effect fuel substitution will have and we strongly support a deeper look at the subject. What evidence there is, however, does not support the proposition that California's fuel policies, notably the LCFS, are increasing fuel price volatility. In fact, the evidence presented here suggests that the opposite is true, that diversifying the fuel portfolio is likely to reduce overall fuel price volatility through the basic effects of diversification as well as conditions specific to the California fuel and biofuel markets. In absence of contrary evidence, it seems prudent to continue the path towards fuel portfolio diversification in order to continue reducing fuel price volatility risk to California consumers and businesses.

We look forward to continuing to participate in this process and are happy to follow up with additional information if requested.

Sincerely,

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[18] Source: CalETC California Transportation Electrification Assessment Phase 3-Part A: Commercial and Non-Road Grid Impacts http://www.caletc.com/wp-content/uploads/2016/01/California-Transportation-Electrification-Assessment-Phase-3-Part-A.pdf

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