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Ms K. Sideco
Low Carbon Fuel Standards Program
California Air Resources Board
ksideco@arb.ca.gov

October 13, 2014

Re: **Prospects for in-state biofuel production from crops and crop residues.**

Dear Ms Sideco:

This letter responds to the Air Resources Board's request for input from its recent meeting (September 23, 2014) on the status of the Low Carbon Fuel Standard and changes in that regulation. In particular, I would like to contribute information about potential in-state biofuel refineries that have reasonable prospects for producing fuels. This information is included in a larger report currently in review by the California Energy Commission that we will make available at a later date once review is complete.

The abstract of that report states:

In-state bioenergy production from crop sources at best will contribute to, but not be sufficient for the state's needs for alternative fuels and power. Based on the use of readily grown crops and simpler conversion technologies suitable for high quality feedstocks, it is reasonable to anticipate that current in-state liquid biofuel production could increase from all feedstock sources investigated by approximately 140 M gge/y of ethanol and biodiesel fuel, plus small additional amounts of power (see table attached). The crops considered include winter annual oilseeds useful for biodiesel energy (sugar) beets, sweet and grain sorghum, and sugar and energy cane for ethanol. There are unique opportunities for a small number of crop-based bioenergy based businesses in California supported by the exceptional, place-specific agroecological and policy conditions that prevail here. These new biofuel facilities will create approximately 350 permanent jobs, many more construction and support jobs, and much larger beneficial secondary and tertiary economic consequences in largely disadvantaged, rural areas of the state. Many of these benefits would be concentrated in rural, disadvantaged communities. There are no significant adverse environmental effects anticipated from the small modifications to existing cropping systems in the state required for these new bioenergy businesses. Feedstock production will be sustainable based on current, broadly accepted understandings of that term. There is little risk of adverse climate consequences. Opportunities for crop-based biofuel businesses in California are overlooked in aggregated analyses and macro-scale models and require the locally adapted methods used here for assessment. An assumption upon which those developments depend is that water available to agriculture for irrigation in the future will return to levels approximately similar to those in the past after the current drought. To develop green jobs in rural areas of California from businesses like these, to share the anticipated benefits resulting

from California's LCFS with rural residents, an investment of water for biomass production is necessary.

We believe to be conservative these estimates and conclusions and are based on reported self-interest by businesses applying the California Energy Commission's AB 118 program, contacts by businesses with the California Biomass Collaborative and through the University of Californian's Division of Agriculture and Natural Resources, and the professional judgment of the authors of the report based on long-term experience with agricultural systems in California, and the use of several special modeling tools, including the Biomass Crop Adoption Model, IMPLAN software, and erosion modeling using the Universal Soil Loss equation applied to several representative feedstock systems, and other modeling and qualitative methods of assessment.

In summary, there are several potential businesses developing in California with the potential to develop in the near term, based on now well-developed technology, that result from the high yields and exceptional resource use efficiency of crop production in California in general. The LCFS provides incentives for modest levels of in-state fuel production from agricultural crops and residues and could lead to a number of new businesses of benefit, especially to rural Californians. Current policies will not result in significant competition with food and most feed production activities in the state. Only in regions where bioenergy crops provide special advantages within current farming systems will such enterprises develop.

Sincerely,

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Crop	Commodity	Current Price (2013-14)	BCAM entry price (2007)	Location with most likely adoption	Estimated acres (thousands)	Fuel type	Yield (as harvested)	Feedstock cost			In-state potential	Assumptions#		
	$/t	$/t	$/t				gal/t	$/gge	gge/ac	gge/ton	Mgge/y	lb/ac	t/ac	Quality
Canola	seed	475	385	SAC, SJV	100	biodiesel	129.15	2.85	169	135.22	16.90	2500	1.25	43% oil
	meal													
Camelina	seed	340*	525	SAC, SJV	0	biodiesel	96.11	5.22		100.63	0.00	1600	0.8	32% oil
	meal													
Sorghum	grain		134-139	SAC, SJV	100	ethanol	110.95	1.81-1.88	296	73.97	29.59	8000	4	
Sorghum	sugar*		23.75	SJV, IV	15	ethanol	21.54	1.65		14.36	8.62		40	13% brix
	livestock feed													
	biogas					CNG								
Beets	sugar**	65	40	NSJV, SAC	60	ethanol	25.20	2.38	672	16.80	40.32		40	16% sucrose
	livestock feed													
	biogas					CNG								
Sugarcane	sugar***		45	IV	60	ethanol	21.54	3.13	646	14.36	38.78		45	13% brix
	bagasse					electricity								
	biogas					CNG								
Energy cane##	bagasse		45	IV	40	ethanol	63-79.2	0.85-1.07	622-781	42-52.8	31.9-40.1		45###	
	biogas					electricity								

Sum does not include ethanol estimated from in-state grain sorghum production since that displaces use of imported corn grain but does not increase in-state production volumes.

Footnotes:

** Current average in the Imperial Valley;
*** Estimated
Camelina price estimated from previous BCAP program price in 2010-11. ($0.16/lb + $85/ac subsidy)
Based on Kaffka et al., 2014, and other sources
Conversion factor assumptions are in http://www.energyalmanac.ca.gov/transportation/gge.html & http://www.nrel.gov/docs/fy14osti/60663.pdf.
Cellulosic ethanol yield at commercial scale is unknown, but a median estimate is 75 gallons/dry ton, more conservative estimation 63-72 gallons/ton is applied for energy cane (from Hsu, 2008)
Energy cane productivity: 20.0 ± 3.5 dry short tons per acre with the moisture 20%, resulting in 14.8 dry tons per acre (suggested fresh 45 t/ac with 33% DM). (Monge et al., 2013.)