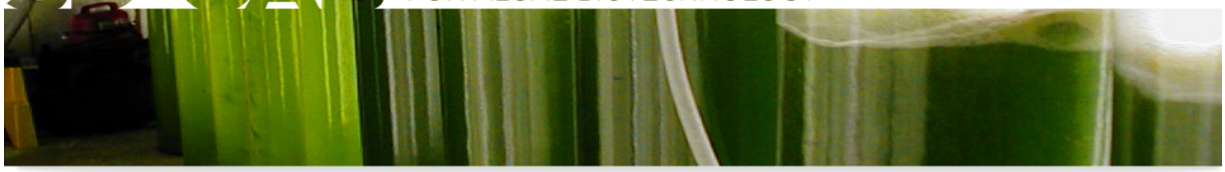
SD-CAB SAN DIEGO CENTER FOR ALGAE BIOTECHNOLOGY



Advancing Research and Development of Sustainable Energy from Algae

January 31, 2013

Energy Commission Staff:

I wanted to take this opportunity to provide some observations on what I found to be a very informative Biofuels Pre-solicitation Workshop, which the Commission hosted on January 11, 2013. In that same context, I will provide an update on some related developments on the algae R&D front, stemming from the CEC-funded California Initiative for Large-Molecule Sustainable Fuels (CILMSF), and the CILMSF road-mapping meeting, which we hosted at UC San Diego back in October 2012.

First and foremost, thank you again for your earlier vision and support of the CILMSF; we at SD-CAB were honored to be able to "stand up" and host this Initiative, and I am pleased to report that the output from the CILMSF has exceeded my expectations of what I thought might be possible. In the short time that CILMSF has been operational, our researchers and students have generated over 20 published articles or papers, and many more currently under review or awaiting publication. The topics of these papers range from metabolic engineering of algae for altered fatty acid (fuel) accumulation to crop protection and co-product production, to help biofuels become economically viable. These publications demonstrate the rapid progress we are making toward economically viable sustainable drop in fuels produced from algae, and represent accomplishments of which we can all be proud. The spin-off technologies from these discoveries will also help create high paying jobs in California in a sustainable and environmentally friendly manner, showing how public funds can be leveraged to support this important work. Further, this productivity demonstrates both the promise and potential of algae as a viable commercial-scale alternative fuel feedstock, as well as highlighting the need for sustained efforts to help bring it from the R&D phase into the commercial phase.

It will perhaps surprise no one that I believe in algal biotechnology and the potential of algae to provide low carbon fuels for California, but this should not be characterized as just another parochial viewpoint - these are peer-reviewed scientific achievements, enabled by the research you have helped to generate. It may well be that there will be third or fourth-generation feedstocks that emerge with even greater promise to create the volumes of drop-in, low-carbon fuel that will be required for California to meet its mandated targets. Until such time as research should identified these more robust organisms, I would continue to argue that it is critical for the state, and the Commission, to look at how it intends to allocate its precious resources to achieving the green house gas emissions that this world needs, and this State has promised to deliver.

To this end, I am increasingly concerned by what appears to be a current pattern of CEC resource allocation for non-scalable alternative fuels – i.e. the funding of multiple small awards for technologies that may produce low carbon fuels, but which lack any scalable

Stephen Mayfield, Director, San Diego Center for Algae Biotechnology and
John Dove Isaacs Chair of Natural Philosophy, University of California, San Diego
Division of Biological Sciences, 2150C Bonner Hall, MC: 0368
9500 Gilman Dr., La Jolla, CA 92093, Phone 858 822-7743 email: smayfield@UCSD.edu

potential. This is not to be critical of these awards or technologies; my colleagues and I at SD-CAB have long championed the concept of "silver buckshot", meaning many small solutions that ultimately add up to a significant contribution. However, we are at a point where it is critical to consider allocation of future R&D resources in a more focused manner, and at project that have the potential to reach a scale that can have a meaningful impact on our promised GHG reductions. In the absence of such a focused effort, California risks fostering multiple "one-off" type projects in which there may promise but not viable commercial-scale potential, whether because of insurmountable technological or capital limitations, and which as a result will require continued public support in order to operate, and which even then will never achieve the scale that addresses our stated goals.

Under the LCFS, California is required to produce about 4 billion gallons of low carbon fuel, with at least 50% GHG reduction, by 2020; that is only 7 years away, and will require production of **11 million gallons of low carbon fuels per day.** California leads the world as a direct result of innovation and invention, and biofuel deployment at the scale required under the LCFS will only be achieved after these innovations and inventions have reduced the price of low-carbon fuels to a level that competes with current fossil fuel costs.

Continuing to subsidize currently non-competitive low-carbon fuels will neither promote the required innovation to make low carbon fuels cost competitive, nor will they provide even a fraction of a percent of the low carbon fuels which California is mandated to deliver in just 7 years. If cost-competitive low-carbon fuels can be realized, the commercial sector will rapidly invest the tens of billions of dollars required to generate production of the 10 million gallons per day we need. Without such cost-competitive fuels, few if any significant commercial investments will be made, and California will be forced to either repeal the LCFS or will be required to invest billions of dollars in public funds to make low-carbon fuels that are not economically competitive, and will therefore require addition subsidies in order to be sold. This is neither a sustainable or economically viable approach. Supporting job growth and reducing greenhouse gas emissions by making low-carbon fuels economically viable is the ONLY sensible route to meeting California's low carbon fuel standards. Any investment from the CEC that does not focus on this hard reality will neither meet the state's mandated targets, nor provide a sound return on the taxpayers' investment. Perhaps more importantly, it will squander the very small amount of time that remains to achieve the significant production quantities that have been promised the voters of California.

I would further suggest that the same principles should be applied to refinement of the current staff draft of the AB 118 investment plan, with regard to how resources might be allocated in any upcoming PON. For example, the draft outlines in some detail the status of ethanol based biofuel for which there is already an active commercial industry, noting that the producers of that fuel "have identified the necessary steps and are beginning to produce lower-carbon biofuels through more efficient production processes, new conversion technologies, and/or inclusion of alternative feedstocks". It can be fairly argued that such activities can be amply supported by the industry and market already operating, and that using the limited funds available for low carbon fuels to subsidize an existing industry to achieve marginal improvements in efficiencies, is not a "leveraged" investment.

Stephen Mayfield, Director, San Diego Center for Algae Biotechnology and
John Dove Isaacs Chair of Natural Philosophy, University of California, San Diego
Division of Biological Sciences, 2150C Bonner Hall, MC: 0368
9500 Gilman Dr., La Jolla, CA 92093, Phone 858 822-7743 email: smayfield@UCSD.edu

Conversely, elsewhere in the staff draft there is a cogent description of renewable "drop-in liquid fuels that are compatible with gasoline and diesel vehicles and infrastructure", and further underscores the "significant volume potential" of these fuels for use in the aviation and marine sectors. However, the draft goes on to correctly state that "these fuels are still in early phases of commercialization and are not yet broadly available". I would respectfully argue that as the Commission considers how to move forward in structuring future PONs for alternative transportation fuels, it should place heavy emphasis on addressing this latter point, i.e. helping to accelerate the demonstration of commercial viability for these drop-in, low-carbon fuels, which could be produced at high volume in the state, for the state. Established commercial-scale technologies that do not meet the "drop-in fuel" definition should be a lower priority in this calculation.

Last, albeit on a separate topic, I would urge that the Commission carefully examine how it might effectively engage the resources that are to be generated from the recently passed Proposition 39, and well as from the state's nascent cap and trade program. Understanding the myriad complexities and challenges that are doubtless involved in the management and stewardship of these funds, it seems patently logical, given the mandated targets discussed previously, that the Commission have a meaningful role in determining the use of these resources to supplement and augment its ongoing programs aimed at producing significant quantities of low carbon alternative transportation fuels.

Thank you again for the opportunity to offer these comments, and I look forward to continued successful collaborations with the Energy Commission.

Sincerely,

Stephen Mayfield

Stephen Mayfield, Director, San Diego Center for Algae Biotechnology and
John Dove Isaacs Chair of Natural Philosophy, University of California, San Diego
Division of Biological Sciences, 2150C Bonner Hall, MC: 0368
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