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UCSD Comments Regarding  
The Draft Committee Report for the  
Investment Plan for Alternative and  
Renewable Fuel and Vehicle  
Technology Program

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08-ALT-1: AB 118 Regulations

Byron Washom  
Director, Strategic Energy Initiative  
Office of the Vice Chancellor – Business Affairs  
9500 Gillman Dr #0007  
University of California San Diego  
La Jolla, CA 92093-0007

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California Energy Commission  
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1516 Ninth Street  
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**08-ALT-1: AB 118 Regulations - UCSD Comments on the Draft Committee Report for the Investment Plan for Alternative and Renewable Fuel and Vehicle Technology Program**

**Introductory Remarks**

The University of California, San Diego (UCSD) appreciates the difficult task assigned to the California Energy Commission (CEC) with regards to reducing green house gas emissions. UCSD applauds the efforts of the CEC for looking at the long term 2050 State goals (reducing GHG emissions to 80% of the 1990 level) seriously while also establishing short term goals that will enable long term success. UCSD shares this commitment to sustainability with the CEC and desires to offer their campus as a “living laboratory” to help achieve these GHG emissions reductions.

UCSD has embarked on an aggressive campaign to be a leader in achieving and exceeding state, regional, and UC sustainability goals. Having already invested heavily in numerous sustainability programs and projects, UC San Diego is continuing to work towards its goal of becoming “one of the greenest universities in the country”. The following exemplifies the many types of projects and associated results that the campus has achieved:

- Implemented a comprehensive Alternative Transportation Program that has shifted 51% of campus commuters from single-occupant vehicles (SOV) to alternative forms of transportation. Specifically, the campus has realized the following results:
  - 165% increase in transit bus use
  - 52% increase in bicycling to campus
  - 11% increase in campus shuttle riders
  - 5% decrease in SOVs on campus
- Converted diesel fleet to Ultra-Low Sulfur (ULSD) B20 Biodiesel. To date, over 500 thousand gallons has been used by the campus.
- Installed three electric vehicle fast chargers on campus, significantly increasing vehicle availability...90% less charging time and reduced energy use.
- Partnered with Caterpillar in bringing the new “Greenline” bus to campus. This new B100 biodiesel capable bus will provide service from the main campus to Hillcrest Medical Center near downtown San Diego. While running the route, the bus will also provide operational test and evaluation data for campus and Caterpillar researchers.
- Completed over \$60 million in energy efficiency retrofits reducing energy use by 20% or over 50 million kilowatt-hours per year.
- Shifted over 80% of the campus load from the grid to an onsite, efficient, clean natural gas burning 30 megawatt cogeneration plant.
- Installed a campus-wide energy management system capable of a 4 MW demand response during critical power demand events, demonstrating a 41% load reduction during the last CAISO Stage 1 Alert.
- Built nearly 1 megawatt photovoltaic system that will produce over 1.7 gigawatt-hours of renewable energy annually.
- Procured and added to the campus fleet 45 Hybrid-electric and 230 zero emission vehicles (includes 196 Neighborhood Electric Vehicles).

The University sees the availability of funding and goals provided by AB 118 as a means to continue the cutting edge work as the State’s premier sustainability campus. UCSD plans to achieve several new projects that acting as a testing ground and demonstration project to the rest of the community to help determine which alternative fuels are viable solutions for real world applications. To achieve this diversified portfolio of alternative fuel vehicles, UCSD will form strategic partnerships with a variety of groups such as: local utilities, technology development corporations, and local outreach channels. The following is a

short list of projects that UCSD believes to fit within the goals of AB 118 and intends to pursue with the assistance of AB 118 funding:

- 300 kilowatt molten carbonate fuel cell utilizing renewable methane to co-produce with Hydrogen for CNG-Hydrogen and H2 transportation applications, in addition to installing advanced energy storage under the SGIP program for DC to DC vehicle charging station
- Fueling station – to provide H2 and HCNG blended fuel
- Infrastructure to pipe H2 produced from the planned 300 kW Fuel Cell site to the proposed fueling station at the East Campus Energy Park
- 800 Fleet vehicle conversion to Hydrogen, CNG, CNG-Hybrid, Electric, and Plug-In Hybrid Vehicles

UCSD desires to be a practical application tester of the above mentioned technologies, offering the unique fleet operations setting to provide both on-road testing and real-time evaluation through a verifiable feedback process. Utilizing several fuel types on a university campus will provide an excellent testing ground for the performance, life cycle cost analysis, and vehicle maintenance issues that may be associated with these fuels. We envision providing wide dissemination of the results with the public through various outreach channels such as local news, campus academic/research interest groups, the San Diego Regional Clean Cities Coalition as well as partnerships with other regional public and non-profit agencies, and resources available through the San Diego Energy Resource Center (a partnership of SDG&E and the California Center for Sustainable Energy). Additionally, UCSD will again site host the Montreux Energy's California's Clean Fuels Roundtable in April 2009.

### **UCSD Comments on the Draft Committee Report for the Investment Plan for Alternative and Renewable Fuel and Vehicle Technology Program**

The Draft Committee Report is a bold document that will serve California in its investment for Alternative and Renewable Fuels, and it will support the California public and private institutions as they attempt to leverage AB 118 funding with forthcoming competitive procurements from federal ARRA funding.

### **UCSD Supports Many Facets of the Draft Report**

**UCSD strongly supports the Draft Report's position on fuel feedstock:**

The transition away from fossil fuels will require new sources of energy and fuel feedstocks. California's waste streams represent a large and growing feedstock opportunity, and environmental challenge for the state. Traditional solutions are overtaxed and ineffectual. The waste from agriculture, food processing, landfills, forests, and municipal or water treatment plants holds

substantial resource potential for conversion to alternative and renewable fuels, and this program seeks to encourage this development in a responsible and sustainable manner. Also, purpose-grown, energy crops offer new commercial opportunities for the agricultural community in California. But, this endeavor must be carefully considered and pursued according to the best sustainability practices, principles, and goals for California natural resources. Lastly, the state has established aggressive goals for the development of renewable electricity. An alternative and renewable fuels and vehicle market can be developed with attention paid to the use renewable process energy, providing added stimulus for the expansion of businesses in California that manufacture clean, renewable energy systems.

UCSD co-subscribes to the Draft Report's position regarding Hydrogen Fuel Potential:

Because of the high cost to manufacture FCVs and build fueling infrastructure, government incentives will be needed to support the development of this option for several years. Multipurpose fueling infrastructure, which lowers costs by demand for increasing fuel consumption, may be a pathway to accelerate hydrogen availability and cost reductions. In addition to FCVs, other "bridging" technologies will ready the market for hydrogen. For example, blending 30 percent hydrogen with natural gas (hythane) and hydrogen-compressed natural gas (H/CNG) fuels have produced positive results in trucks, buses, and vans. Hydrogen-fueled internal combustion engines offer reduced greenhouse gas emissions and a near-term bridge with existing conventional vehicle technology. Expansion of a hydrogen economy will not only depend on advances in vehicle technology, but also fuel cell advances in stationary applications, such as on-site power systems, warehouse fueling for forklifts, and industrial applications.

However, the CEC might delete the term "hythane" since it is actually a copyrighted term from one particular private entity.

UCSD's strongest endorsement of the Draft Investment Plan is reserved for the biomethane section starting on page 29.

Landfill gas and wastewater treatment generate 106 billion cubic feet (bcf) of feasibly recoverable biogas per year. Dairy waste produces another 15 bcf for a total of 121 bcf, and an additional 250 bcf of renewable biogas is feasibly recoverable from thermochemical gasification processes. These biogas sources, if used to produce biomethane transportation fuel, could displace virtually all diesel used for transportation purposes and reduce GHG emissions by more than 24 MMTCO<sub>2</sub>e/year.

## **Recommendations for Modification to the DRAFT Report**

### Support for Co-Funding with American Recovery and Reinvestment Act (ARRA)

UCSD would encourage the CEC to broaden some of the definitions and specifics as to not foreclose co-funding opportunities anticipated in forthcoming ARRA solicitations. For example, one might anticipate an ARRA limitation of “early commercial” vehicles whereas the Draft Investment Plan uses the term demonstration projects. There is a very thin, often semantic line between these two terms. For example, UCSD has signed an MOU for five (5) CNG-Hybrid buses for its shuttle fleet that will represent the first demonstration of these units in California and the first university demonstration worldwide. It would be unfortunate if co-funding of this effort was restricted due to a narrow semantic difference. The Energy Commission will focus on providing financial support for pre-production research, development, demonstration, and early commercial units that represent initial deployment and testing of vehicles as projects that will lead to improved performance and reduced cost for the next generation of medium- and heavy-duty hybrid systems. Promising applications include a switch to alternative and renewable fuels, plug-in hybrid and battery electric trucks, and the retrofit of existing vehicles. These demonstrations reduce greenhouse gas emissions.

### Avoid the Exclusion of Buses

UCSD requests that the CEC carefully review the use of the term of “medium and heavy duty hybrid systems” to not exclude buses, and would, therefore, include hybrid buses for funding eligibility:

AB 118 Air Quality Improvement Program (AQIP) Proposed Funding Plan for Fiscal Year 2009-2010, reductions and will cost up to \$2 million per demonstration. The level of needed support depends on the specific technology, including the stage of development, perceived financial risk, interest of co-sponsors, and market potential. The Energy Commission’s allocation for hybrid truck *and bus* applications, based on a 50 percent match share.

### Recommendation for Increased Funding in the SULC Category

UCSD appreciates that the CEC has identified the Super-Ultra-Low-Carbon category to host the funding for electric drive vehicles and hydrogen powered vehicles where the hydrogen is achieved through renewable resources. While UCSD applauds the effort to develop these technologies, they are likely to be the most expensive projects, and the proposed budget does not reflect this fact. UCSD is in agreement with the California Air Resources Board (CARB) who indicated through the January 8, 2009 webinar that an increase in the budget for this category is necessary.

UCSD has a fleet of more than 800 vehicles for University business, including 36 buses that provide both on-campus shuttle service as well as service to selected off-campus commuter destinations. The campus has made great strides in converting its fleet to more sustainable fueling options with almost 40 % of its current mix of vehicles using alternative fuels: Electric, Hybrid-Electric, Ultra-low Sulfur Biodiesel (B20), CNG and E-85. To continue improving the sustainability of its fleet, the campus will be converting its shuttle, heavy

equipment/truck and passenger inventories to CNG and other alternative fuels as quickly as possible. Starting with the installation of a CNG fueling station and procurement of both CNG and CNG-Hybrid vehicles in late 2009, the campus will make a substantial commitment to meeting both statewide near and long-term GHG emission reduction goals.

Future campus plans call for:

- Developing a renewable Hydrogen source from the co-production of electricity that will be demonstrated at the Orange County Sanitation District in 2009 with a molten carbonate fuel cell.
- Installation of DC-DC direct vehicle charging supplied by campus renewable energy sources coupled with Advanced Energy Storage systems.
- Procurement of both plug-in hybrid vehicles and full speed all electric vehicles as these technologies become available.

#### Recommend Inclusion of Bio Algae

The only disappointment in the Draft Investment Plan was the light treatment of bio algae as a distinctive and exceptional resource potential of renewable fuels. UCSD is poised to become the pre-eminent research facility in the field of deriving effective transportation fuels from algae. The campus boasts internationally renowned faculty in this field, and has formed strategic collaborations with similar experts at nearby institutions - including the Scripps Research Institute (TSRI), the Scripps Institution of Oceanography (SIO), the Salk Institute, and San Diego State University (SDSU) – to take advantage of the region’s intellectual and economic assets and develop a top-flight academic center dedicated to the production of renewable and sustainable fuels from algae.

These scientists recently established the San Diego Center for Algae-based Biotechnology, (SD-CAB) in an effort to make sustainable algae-based fuel production and carbon dioxide abatement a reality within the next 5 to 10 years. The primary goal of the center is to create a national facility capable of developing and implementing innovative research solutions for the commercialization of fuel production from algae. With close collaboration with several established industry partners, this research consortium is already garnering recognition at the state and national levels as an emerging “hub” for driving discovery and innovation in this field.

Given these developments, UCSD applauds CEC for the thoughtful benchmarks developed in this draft implementation document for project funding, sustainability goals, and evaluation criteria. With regard to each of CEC’s sustainability criteria -

\* Substantial reduction of greenhouse gas emissions associated with California’s transportation system;

\* Protection of the environment from the effects of alternative and renewable fuel development; and

\* Promoting market acceptance of sustainably produced alternative fuels by creating incentives to produce such fuels in accordance with certified sustainable production practices and standards.

- UCSD and the SD-CAB is already poised to lead. Production of alternative transportation fuels from algae will help reduce the amount of CO<sub>2</sub> in the environment, because growing algae consume more CO<sub>2</sub> than is ultimately released into the atmosphere when that fuel is burned, resulting in a carbon neutral fuel. The amount of carbon removed will depend on the number of algae farms built and the efficiency with which algae can be modified to convert CO<sub>2</sub> to fuel products. Future algae farms will likely be co-located adjacent to CO<sub>2</sub> producing facilities, like power plants, resulting in potentially significant CO<sub>2</sub> sequestration benefits to the State of California.

With regard to impact on the environment, large-scale production of traditional row-crop feedstocks for biofuel purposes is extremely resource-intensive. Such plants require a substantial amount of fertile and arable land, fresh water, and petroleum-based fertilizer to grow, and the fuel derived from them is ethanol, a lower-energy fuel which is incompatible with the existing infrastructure used to transport, refine and deliver liquid fuels like gasoline and diesel. Conversely, algae can produce hydrocarbons capable of being converted directly into actual gasoline or diesel fuel, which in turn can be transported to market via existing refinery infrastructure.

Market acceptance of these truly sustainable fuels will be critical, as will development of standard practices by which to produce them. Here again, the SD-CAB can and will drive development of appropriate “best management practices” for the production and marketing of these alternative fuels, in parallel with the world-class research that will result in said fuels.

On this topic, UCSD notes the recommendation that its sister campus, UC Davis, be sought out by potential collaborators wishing to pursue AB 118 resources for “projects associated with purpose-grown energy crops as feedstocks”. The agricultural expertise of UC Davis is truly world-class, and creating an incentive for submitters to partner with UC Davis will doubtlessly improve the quality of such proposals. In the same vein, UCSD would respectfully suggest that a similar recommendation be considered for projects associated with production of alternative transportation fuels from “non-traditional” or row-crop feedstocks. The in-residence expertise and rapidly expanding industrial partnerships of the SD-CAB stand as a viable and accessible resource to the CEC, and incentivizing potential submitters to collaborate with the SD-CAB can only enhance the strength of the proposals CEC will ultimately review as part of implementing AB 118.

#### GREET Certification Update

The AB 118 funding will bring demonstration projects forward for transportation systems that are not currently evaluated with GREET. UCSD understands GREET to be the essential evaluation tool for understanding the environmental impact of alternative fuel sources. Clearly, there are several new technologies or hybrid combinations of technologies such as

hydrogen (liquid H<sub>2</sub>) and HCNG applications that may receive funding through the AB 118 program. UCSD recommends that funding should be set aside within this program to keep GREET up to date with the technologies that the State is reviewing. According to the investment plan, the Non-CHG budget category seems to be the appropriate mechanism for such as task.

### **Concluding Remarks**

UCSD is grateful to the CEC for the opportunity to provide testimony to the matter of AB 118. The University, as a leader in sustainability and environmental stewardship, is very enthusiastic about the potential that this Bill provides UC San Diego and others in helping the state reach its GHG emission reduction goals, and fully intends to be an active partner in the “Alternative and Renewable Fuel and Vehicle Technology Program.” The potential that the proposed funding opportunity provides is very exciting, hopefully enabling the campus to pursue projects that will result in a diversified portfolio of alternatively fueled vehicles, as well as provide public education and outreach. UCSD hopes that the CEC will consider the funding increase to the most important Investment Plan Category, Super-Ultra-Low Carbon Technologies, and the request to continue updating GREET to maintain an accurate environmental footprint calculation tool. Finally, the University of California, San Diego looks forward to joining the CEC in the pursuit of cost effective alternative fuels so we as a State can lead the way in meeting the needs of the present without compromising the resources for future generations.