September 5, 2008

TO: Commissioners Boyd and Douglas, California Energy Commission
Deputy Executive Officer, Tom Cackette, California Air Resources Board
AB 118 Docket

FROM: John Boesel, President and CEO

RE: Recommendations for a Robust AB 118 Program

DOCKET
08-ALT-1
DATE SEP 19 2008
RECD. SEP 19 2008

CALSTART appreciates the opportunity to provide input to the California Energy Commission (CEC) and the California Air Resources Board (CARB) on how to take optimal advantage provided by the AB 118 funds to help the state achieve its goals of dramatically cutting greenhouse gases, improving air quality, reducing its dependence on oil, and growing the clean technology industry.

In specific, this memo will focus on the following three areas:

1) General principles for an effective research, development, and deployment (RD&D) program;
2) Criteria for the AB 118 investment portfolio;
3) Recommended investment target areas for FY09 and FY10 based on our gap analysis.

The recommendations contained in this memo are based on CALSTART's 15 years of experience in clean transportation technology research, development, demonstration, and commercialization programs. We have had the fortune over this time of working on successful programs with a variety of federal, state, and local agencies. We seek to share with you our thoughts on the best practices associated with such programs. The recommended investment target areas, this analysis is based on feedback we have received from the clean transportation technology industry, other government funding agencies, investors, and environmental groups.

Best Government RD&D Program Practices and Principles

The best principles and practices can be boiled down to the following: Dynamic not Static, Encouraging Innovation; Strong Business Case; and Results Oriented Contracting.

Dynamic Not Static: The clean transportation technology industry is changing at a rapid rate. The best program will be one that is open to new inputs, flexible, and able to change from year-to-year. Creating mechanisms and processes to receive and filter inputs on the quickly changing market and pace of technology development will be critical.

Encouraging Innovation: The CEC and CARB would benefit the most by as often as possible setting goals and clear objectives and not prescribing specific technologies or designs. It will be in the best interests of the CEC and CARB

to stimulate innovation and the ingenuity of the private sector. Clearly some priorities will have to be established, but the agencies should avoid being too specific in demanding specific technologies. For example, the agencies could call for more programs to encourage hybrid technology without specifying whether it should be hydraulic or hybrid electric. Focusing instead on outcomes and inviting creativity in solutions is the approach likely to produce the best long-term results.

Strong Business Case: The CEC needs to invest in those sectors where a plausible business case can be made. Particularly given the entrenched and ubiquitous positions of the incumbent internal combustion engine fossil based fuels, some clean transportation technology sectors will benefit from government assistance to get "jump-started." In general the government should probably not invest in a technology that won't become self-sufficient within a 5-7 year time horizon.

Results Oriented Contracting: In our history we have seen the effectiveness of a significant share of government RD&D programs reduced by overly detailed and bureaucratic contracting processes. The recipient of government funds clearly needs to be transparent and accountable to the government agency. Yet, the agency should focus on results and milestones instead of being overly concerned about how each penny is spent. The Defense Advanced Research Projects Agency (DARPA), widely known as one of the most effective technology investors among government agencies, will often let contracts that allow for payments to be made solely on performance.

AB 118 Portfolio and Project Selection Criteria

The legislation makes it clear that the number one focus of the bill is to reduce greenhouse gas emissions. The broad elements of the investment portfolio should be developed with this primary criteria in mind. While the focus should be on approaches that ultimately have the potential to help the state achieve the 2050 goal of 80 percent reduction in greenhouse gases compared to 1990 levels, the state should not ignore low risk approaches that can also reduce GHG emissions over the next 10-15 years. Indeed, a portfolio approach of low risk/low pay-off and high risk/high pay-off approaches may well make sense.

While the CEC and the CARB should keep their focus on the 2050 GHG reduction goal, they should not ignore the need to also make investments that will also produce near-term reductions and may indirectly help produce significant longer-term reductions. For example, outside of the 165 or so public natural gas vehicle stations, the low carbon refueling infrastructure in the state is limited. Supporting the roll-out an E85 network in the next 2-3 years, particularly since the fuel is likely to be derived from corn ethanol, may only result in small, but still significant carbon reductions. However, the development of such a network will facilitate greater consumer awareness and comfort with alternative fuels. It will also help support and make it easier for the next generation of cellulosic ethanol to enter the market.

Though the legislation was developed with a primary focus on the state's greenhouse goals in mind, it also made it clear that other objectives included improving air quality, cutting dependence on oil, and creating new economic opportunities in the state. Fortunately, we see very little conflict among these criteria. Virtually every technology that could reduce greenhouse gases will also result in better air quality and reduced dependence on oil. The opportunity for AB 118 investments to create "win-win-win" solutions is very high.

In fact, instead of being concerned that some of the AB 118 investments could run at cross purposes with other programs and state objectives, based on conversations thus far, we are impressed that the both the CEC and CARB appear to be looking for opportunities to use AB 118 funds to help support other programs and initiatives. One example of how the funds could be invested would be to help truckers serving the state's ports to purchase trucks that not only reduce harmful smog forming emissions but also cut greenhouse gas emissions. With the use of Proposition 1B funds and others, the Ports of Long Beach and Los Angeles are seeking to replace or clean-up more than 15,000 trucks that access their property on a routine basis. Over the next 10 years, not only at the ports but throughout the entire California goods movement sector and particularly in the heavily impacted Central Valley, there is a one-time opportunity to replace the existing old dirty diesel trucks with newer ones that will not only help improve air quality but will also cut greenhouse gas emissions. By using AB 118 funds to complement existing programs, such as the $1 billion from Proposition 1B, California could transform the trucking industry in a way that no other state or country has. In fact, to not use the Proposition 1B and other funds to help generate greenhouse gas emissions could be extremely harmful. The average trucking company is not likely to change its equipment or transform its fleets twice. It would be ideal if the new truck or retrofit was able to secure both criteria and greenhouse gas emission reductions.

While seeking synergies with other state and regional funding programs, the state should also be cognizant of how federal funding is being used to support the development and commercialization of clean transportation technologies. Over the past 3-5 years the limited amount of federal funding dedicated to this sector has been focused on three primary areas (listed in terms of descending level of investment): next generation biofuel processes and pilot plant construction; energy storage, and plug-in hybrid electric vehicles. Outside of the Federal Transit Administration's fuel cell bus program federal investment in hydrogen has effectively stopped. Particularly given the size of the climate and transportation energy security challenges, the federal investment in the recent past has been extremely modest. Thus, even in the areas mentioned above, the state may want to consider providing additional resources.

In contrast, private sector investment in the clean transportation technology has soared over the past 3-5 years. In specific, over this period, venture capital backing of this sector has gone from virtually insignificant, to more than $150 million annually in the past couple of years. It should be noted that transportation still receives only a small fraction (approximately 5%) of the total venture investment made in the larger cleantech industry. Yet, of all of

cleantech sectors, transportation is the single most capital intensive one. Thus, several gaps remain and there are clearly areas where AB 118 funds will be able to help accelerate more climate friendly transportation technologies. These gaps are elaborated upon in the last section of this memo.

Gap Analysis and Recommendations for FY09 and FY10 Investment Areas

In developing recommendations for AB 118 investment for fiscal years 08-09 and 09-10, CALSTART conducted a gap analysis. Based on our knowledge of the state-of-technology, the goals of the program, and existing public and private sector investment, we recommend the CEC and CARB consider the following areas to target AB 118 investments.

1) Advanced Low Carbon Passenger Vehicle Incentives

Both the CEC and CARB should consider using a portion of AB 118 funds to provide incentives for new light-duty vehicles that meet a very low carbon standard such as what the European Union is now considering. Many elected officials recently have been specifically calling for more support for plug-in hybrid electric vehicles (PHEVs). While we see potential in this technology, we'd recommend that a portion of the AB 118 funds be set aside to jump-start the market for any passenger car that meets a performance standard that could be equal to or even better than what is expected from a PHEV on a wells-to-wheels basis.

While this category alone could easily consume the entire annual AB 118 budget, we recommend that no more than 20 percent of the funds be set aside for this purpose. California alone cannot be expected to provide enough incentive funding to launch a market for the next generation of advanced vehicles. Other states and the federal government will need to participate in this effort.

2) Low Carbon-Ultra Clean Trucks

AB 118 was signed into law by the Governor at a time when options to both reduce criteria and greenhouse gas emissions from the goods movement sector are on the verge of being viable. What is needed now is incentive funding to jump-start the technology. Advanced heavy-duty natural gas engines, hybrid electric, and hybrid hydraulic technology are now proving to be robust and reliable, but the purchase costs of all three technologies remain high. AB 118 funding from CARB and CEC can and should be used to help jump-start this market. Once the volumes increase, based on our confidential discussions with the manufacturers, we believe the prices will come down and the market will be able to thrive without subsidy over a 4-7 year period.

For the advanced natural gas trucks, which Kenworth only started manufacturing this year, a $35,000 per truck subsidy truck would help accelerate the adoption of this technology. The Kenworth LNG trucks, using Westport engine technology, will virtually eliminate the harmful public health impacts created by the diesel trucks serving the ports today and so heavily impacting the surrounding communities. In addition, compared to the most

advanced diesel engine and the currently available spark-ignition natural gas fueled trucks, these trucks would reduce greenhouse gas emissions by approximately 15%. Over time, as the biomethane industry takes off, the potential for even greater reductions will exist. Providing enough funding for 500 trucks to be purchased in each of the first two years of the AB 118 program would not only help jump-start this promising segment, but would have an immediate public health impact.[1] Both the CARB and the CEC could consider giving additional points to the applicant if the trucks were deployed or likely to be used consistently in an impacted Environmental Justice community.

Hybrid technology represents another significant opportunity to improve air quality and cut carbon emissions from the goods movement sector. Through CALSTART's Hybrid Truck User's Forum (HTUF) we are working closely with more than 80 fleets nationwide, every major truck manufacturer, and numerous hybrid drive train suppliers to accelerate the introduction of medium- and heavy-duty hybrids. Both hybrid electric and hydraulic hybrid truck technology should be encouraged through the use of CEC and CARB AB 118 funds. Depending on the application and duty-cycle, hybrid technology can cut oil consumption and greenhouse gas emissions by 20-50 percent. To support the introduction of hybrid trucks, AB 118 funds should provide first year funding equivalent to $30,000/truck for up to 1,000 trucks. In each subsequent year, as volumes grow, the incentive funding per truck should decline by $5,000 so that by year six the subsidy would be zero. To minimize costs to state government, the state may want to consider using the block grant authority provided in AB 118, and allow the funds to be managed by the HTUF program. HTUF has a proven track record of effectively managing funds from the U.S. Army for this purpose and of saving costs by coordinating fleet purchases.

Ultra Low Carbon Biofuel Production

California is currently the third largest oil producing state in the nation. To move ahead and demonstrate that lower carbon fuel future is truly viable, and to go beyond the mere 10 percent reduction in carbon intensity as set forth in the Low Carbon Fuel Standard, California should become a leading producer of next generation, ultra-low carbon fuels[2]. Incentive funding should be provided to build plants in state that will help increase the production of next generation or ultra low carbon biofuels. Several corn ethanol and biodiesel plants have already been built and don't require additional incentives. The bar to receive incentive funding should be much higher. For example, if an existing corn ethanol plant produces a fuel with X amount of carbon emissions on a field to

[1] If the voters approve Proposition 10 on the November 2008 ballot in California, we would not recommend that any of the AB 118 funds be invested in dedicated natural gas trucks. Proposition 10 would provide in excess of $1 billion for this purpose. None of the Proposition 10 funds could be used to support medium- or heavy-duty hybrids which are the other leading candidates to reduce both greenhouse gas and criteria emissions from the goods movement sector.

[2] The Low Carbon Fuels Standard does not place an over-all cap on carbon emissions from the fuel sector it simply calls for a decrease in the carbon intensity of the fuel sold. Increased demand for gasoline and diesel could easily offset the decrease in carbon intensity and result in a net increase in over-all greenhouse gases from the transportation fuel sector.

tank basis, then the incentive funding should only be for plants that produce 50% less than X.

Again, a performance standard should be established instead of stating that the funding can only be used for cellulosic ethanol plants. With the backing of venture capitalists a number of the state's chemists and synthetic biologists are being tapped to produce a variety of different bio-based fuels. We cannot say with certainty whether the best next generation fuel will be an alcohol, a form of bio-based diesel, biomethane, or an organically derived gasoline. To provide a boost for in-state next generation fuel production, we recommend providing at least $20 million over the first the first two years of the AB 118 program to stimulate in-state production of very low-carbon fuels.

Landfill Gas

While the methane gas from some landfills is starting to be used to generate electricity, most landfills are still flaring their gas. Few are using the gas to power the hundreds of vehicles coming and going from the site each day. The technology exists now to use all landfill gas for either electricity generation, or if the cost of connecting to an electricity transmission line is too high, to produce fuel for refuse trucks. Incentive funding for the first two-years of the AB 118 program should be sufficient to turn a significant number of the state's landfills into fuel production facilities. Once this process has been shown to be truly viable the state could move ahead with regulations to ban the flaring of all landfill gas.

Ultra Low Carbon Transit Buses

Transit districts need to be part of the climate solution but as a result of budget cuts they are going to have a hard time financing the purchase of ultra low (on a WTW basis) carbon buses. Battery technology has improved, but a pure electric 40' bus would still cost at least three times the amount of a diesel bus. Fuel cell buses are 2-2.5 times as expensive as battery buses. Transit districts using natural gas could start to phase in biomethane, a widely used fuel in Sweden that has extremely emissions on a wells-to-wheels basis, but more than likely a capital intensive refueling and distribution system would have to be created.

There would be multiple benefits resulting from providing assistance to transit properties seeking to lower their carbon footprint. The most direct impact would be from the decreased emissions from the buses themselves. Second, transit buses can serve as mobile classrooms and help educate the public about the viability of lower carbon options. Third, by testing, evaluating, and demonstrating them in the transit environment, the technologies will mature and improve and then become more viable for the much larger truck market. Lastly, any of the bus technologies that would dramatically reduce carbon emissions compared to a diesel bus would also generate far fewer criteria emissions. An ultra low carbon school bus program would help improve urban public health by accelerating the turnover of fossil fuel buses.

CALSTART recommends providing $15 million each year to help transit districts procure ultra low carbon transit buses and their related infrastructure.

Both the CARB and CEC should also consider allowing the funds to be used to install renewable power generation if it's used to power the buses. For example, parking lots of transit districts could be turned into solar carports that could generate electricity for battery electric buses. Incentives should be provided only for projects and transit buses that produce no fewer than 50 percent of the emissions of a diesel bus using B20 on a wells-to-wheels basis.

Ultra Low Carbon School Buses

For most of the same reasons stated above, the state should be doing it all can to accelerate the phase-out of old dirty school buses. At least one manufacturer is now producing plug-in hybrid electric school buses. The cost of such buses is beyond the budget of most school districts, particularly in this era of budget cuts and layoffs. The public health benefit, given the impact of diesel emissions on children, would be even greater for this category.

Unfortunately, given the state of education financing in California, unless the AB 118 funds could be combined with Moyer or other regional air district funding, the state is likely to have pay the full price of a $125,000 hybrid electric school bus. Financing the purchase of 500 such buses would cost $62,500,000 or roughly one eighth of the combined CEC and CARB funding in the first two-years of the AB 118 program.

Low Carbon Retail Refueling Network

Given the immensely dominant position of the incumbent fuels, gasoline and diesel, the development of a truly viable low carbon fuel retail network will be a significant undertaking. Among the challenges facing the low carbon fuel retailer are lack of consumer awareness, pipelines and distribution channels, as well as cost. To support the growth of such a network, CARB and CEC should focus their resources on the cost challenge. Incentive funding can help persuade an independent station operator to dedicate a portion of his valuable real estate for new fuels.

Though the program got off to a slow start, state funds originally made available in the 2006-2007 budget are now being used to build an effective E85 network in Sacramento. By the Spring of 2009 there should be more than 20 stations in the greater Sacramento metropolitan region selling E85. In addition, through a DOE grant, CALSTART has helped facilitate the opening of 10 E85 stations in other parts of the state.

Some critics may argue that E85 stations should not be supported because ethanol only comes from corn in the United States. While the ethanol produced in the U.S. today is largely derived from corn, having an established network of E85 stations will make it much easier to encourage investment and support the development of a cellulosic ethanol industry. Several California firms, as well as others in the United States, are working quickly to bring down the cost of converting cellulosic material, not food crops, into ethanol and bring the next generation ethanol to the market. If a distribution and retail network can be built for today's ethanol, it will encourage the market introduction of cellulosic ethanol.

The race to reduce carbon emissions is one of time. We do not have the luxury of acting in series and waiting for cellulosic ethanol production techniques to be perfected before we begin addressing the distribution and retail challenges. As the brave independent station operators who have opened E85 and biodiesel stations in California will tell testify, securing permits, doing the construction, and meeting all of the complex rules necessary to install a new type of fuel takes a considerable amount of time. Educating the consumers and getting them to buy the products can take even longer. Most people have no idea whether they own a flex-fuel vehicle or not.

While the discussion of this topic has focused on E85, it's only meant to be illustrative. We recommend that incentive funding to deploy infrastructure be made available for all lower carbon fuel choices. For example, state funds would also be very valuable in developing the next generation of charging for plug-in as well as hydrogen vehicles. For the first two years, at least $20 million should be allocated to support the development of a variety of low carbon refueling networks.

Research and Development of Low Carbon Vehicle and Fuel Technologies

When being debated by members of the legislature there was a large emphasis on the funds being used to get low carbon solutions "on the road." While we agree with this emphasis, and believe it's consistent with the legislation as finally passed, California would be missing a golden opportunity if it did not provide at least $10 million/year for the research, development, and demonstration (RD&D) of advanced technologies that could provide even greater opportunities to reduce emissions. It may be best for the CEC not to target any areas for RD&D funding, but instead encourage the submittal of innovative ideas, concepts, and plans. But, were it to focus some resources, the CEC might do well to provide funding for the development or certification of any retrofit technologies that could significantly reduce greenhouse gases from the "in-use" fleet. In the race against time, other than waiting 15 years for the current fleet of vehicles in California to turnover, a technology or product that could be adapted to today's fleet could be one of the most valuable weapons in the war against global warming.

Developing the California Clean Transportation Technology Industry

The Economic and Technology Advancement Advisory Committee (ETAAC) to the California Air Resources Board published a report calling for California to take advantage of its policies to reduce greenhouse gases by pro-actively working to build a cleantech industry in the state. In its report, the ETAAC called for a state funding program, not dissimilar to AB 118, to support the development of low carbon solutions and companies in California. In its report the ETTAAC often called for the creation of a new entity that could play a "valuable 'connective' tissue role in helping to coordinate state incentive programs toward the GHG reduction goal."[3] Having an organization evaluate low carbon technologies, facilitate networking, create international partnerships, link technology developers with suppliers, and serve as that

[3] ETTAC Draft Report dated November 15, 2007, p. 2-12.

"connective tissue" would indeed be valuable. However, we recommend that the CEC consider not creating a new organization but looking for opportunities to build off or support existing ones. A $2 million/year investment in this area would yield significant economic and environmental benefits for the state.

We appreciate your consideration of our recommendations. If you have questions or would like further information on the ideas expressed in this paper please contact CALSTART at (626) 744-5600 or send an email to jboesel@calstrart.org.