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January 20, 2009

DOCKET
08-ALT-1
DATE JAN 20 2009
RECD. JAN 20 2009

California Energy Commission
Dockets Office, MS-4
Re: Docket No. 08-ALT-1
1516 Ninth Street
Sacramento, CA 95814-5512

Re: AB 118 Alternative and Renewable Fuel and Vehicle Technology Program.

Dear Commissioners Boyd and Douglas and Energy Commission Staff:

Clean Energy would like to thank you for allowing us to comment on the Draft AB 118 Alternative and Renewable Fuel and Vehicle Technology Investment Plan. We acknowledge the hard work that has gone into this document to date and look forward to further supporting the Energy Commission's staff in the final completion of this document with comments, expertise and data. Clean Energy is very supportive of the State's AB 32 goals and believes that the Natural Gas Vehicle Industry not only provides an immediate low carbon fuel solution today, it can also innovate itself to achieve California's targeted 80% greenhouse gas reductions prior to 2050.

Support of the Investment Plan's Overall Approach.

Clean Energy formally supports the Energy Commission's overall approach to financing research projects that will ultimately transition California's fuels and vehicles toward a significantly lower carbon future as outlined. We believe early and significant investments in the Low Carbon category is wise, particularly for those fuel and vehicle strategies that can demonstrate promise to advance to Ultra Low Carbon and Super Ultra Low Carbon categories. Natural gas is one such fuel as investments in this affordable, clean and domestically abundant alternative to both gasoline and diesel can exponentially improve carbon reductions with more efficient vehicle platforms and renewable fuel blends like biomethane and hydrogen.

It is our belief that if the Energy Commission continues on the proposed course and is able to make strategic investments that are capable of combining natural gas fuel with hybrid (HEV) and plug-in hybrid vehicle (PHEV) platforms or biomethane and renewable hydrogen blends, California will have a number of pathways to achieve its 2050 greenhouse gas goals with an abundant domestic fuel source. For example, the California Air Resources Board (ARB) estimates that biomethane derived from landfills has the potential to reduce greenhouse gas emissions by 88.5% when compared to gasoline or diesel. It is unlikely that California's biomethane sources can produce enough transportation fuel to power what the state will need overall. However, if biomethane is blended with fossil-based natural gas and placed into HEV or PHEV platforms, it is possible that the 2050 goal could be achieved and both fuels could positively impact significantly more vehicles in terms of low carbon performance. Fortunately, the same can also be said about renewable hydrogen blends with natural gas and high efficiency platforms.

Overweight Investment in and Focus on Super Ultra Low Carbon Fuel Category is a Flawed Approach. Investing in Strategies that Demonstrate Early and Long-Term Benefits is a Superior Approach.

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Despite the evident benefits derived from several promising pathways presented by the Natural Gas Vehicle Industry, there are some stakeholders who would like to see the majority of the Investment Plan focus solely on Super Ultra Low Carbon projects. While Clean Energy can certainly understand why some stakeholders may favor this approach, we would caution the Energy Commission's board and staff from following this advice based on the following key reasons. First, if the Energy Commission fails to make significant investments in technologies, like fossil-based natural gas, several key medium- and heavy-duty high volume fuel fleets will be denied the most promising low carbon alternative to diesel and gasoline available and California will forgo significant and immediate carbon reduction benefits as a result. Such a decision would be counter to the ARB's low carbon fuel goals. More specifically, California's Ports and Goods Movement Industry, Waste Industry, and Transit Bus Industry would all benefit from natural gas incentives as both compressed natural gas (CNG) and liquefied natural gas (LNG) trucks, fueled by domestic natural gas, are proven Low Carbon strategies. Further, this pathway could evolve into Ultra Low Carbon or Super Ultra Low Carbon strategy with vehicle platform advancements or renewable fuel advancements or both. Without the Investment Plan's support of fossil-based natural gas vehicles, key medium- and heavy-duty sectors may not achieve any meaningful carbon reductions in the short- to mid-term as battery-electric vehicle applications are immature, unproven, and severely limited for short-haul needs and non-existent for long-haul needs. Surely, hybrid and plug-in hybrid strategies will help, but combining these strategies with low carbon options, like natural gas and biomethane, is a more strategic investment.

Second, failure to invest in natural gas vehicle strategies today may harm both the production and platform advancement of natural gas vehicles and the production of biomethane and renewable hydrogen fuels for transportation use. It is extremely important for the State of California to demonstrate its support for vehicles that can achieve ARB's low carbon fuel goals for 2020 and beyond. Without clear support from California's key agencies, critical natural gas vehicle advancements could be placed at risk. Further, the production of key renewable resource options that can enable the State to achieve its 2050 transportation fuel goals may be lost or applied elsewhere because the very vehicles that operate on the fuel were unsupported.

Third, Clean Energy believes that it will take a portfolio of fuel and vehicle strategies to achieve California's AB 32 goals under transportation. In many ways, Clean Energy views investments made to advance the Natural Gas Vehicle Industry as a portfolio strategy investment since natural gas vehicles can further benefit from higher efficiency vehicle platforms and renewable fuel streams that can work in combination with one another. Many opponents to natural gas as a transportation fuel view the technology with dated lenses and raise domestic supply concerns that are false. With the unconventional extraction of natural gas shale, the country's domestic supply of natural gas has increased from 82 to 118 proved years at 2007 consumption levels. Further, natural gas vehicles are manufactured throughout the world and total 8.6 million units demonstrating the technology's maturity and readiness for immediate implementation. Incorporating efficient vehicle platforms and renewable fuels that can blend or replace natural gas altogether demonstrate a strategy that AB 118 needs to succeed. Energy Commission staff should note that other strategies, although not as evident because few discuss the issue, are also subject to resource limitations. Fuels that are dependent upon fossil-based petroleum blending are certainly limited as many experts in the

field believe oil has peaked in terms of world production. Further, resources for lithium-ion and other battery strategies are also in limited supply. In fact, we believe this is why it is critical to pair HEV and PHEV strategies with low carbon fuels like natural gas over high carbon fuels that have already peaked in production or fuels that are limited by other resource constraints.



In conclusion, we think it would be bad public policy to invest the majority or the entirety of AB 118 funds in the Super Ultra Low Carbon category as they are largely unproven strategies and that it will take a portfolio of options to assure a low carbon fuel success story for California. We also recommend that the Energy Commission view the Natural Gas Vehicle Industry as a diversified investment in and of itself as it has the potential to achieve Low Carbon, Ultra Low Carbon, and Super Ultra Low Carbon outcomes. However, it should be noted that to ultimately achieve the Super Ultra Low Carbon outcomes with natural gas vehicles, the Low Carbon and Ultra Low Carbon investments within the Natural Gas Industry must also, if not initially, take hold.

Low Carbon, Ultra Low Carbon and Super Ultra Low Carbon Classifications.

The Draft Investment Plan designates natural gas as a "Low Carbon" transportation fuel strategy. While we don't disagree that fossil-based natural gas on its own should be listed under the Low Carbon classification, there are several pathways or strategies that can significantly enhance the performance of a fossil-based natural gas transportation fuel strategy. We would recommend that the Energy Commission consider the following classifications for natural gas-based strategies to properly reflect the innovations in our Industry:

Low Carbon:

- Fossil-based natural gas.

Ultra Low Carbon:

- Fossil-based natural gas with low mileage hybrid platform (30 mpg+);
- Fossil-based natural gas blended with renewable hydrogen;
- Fossil-based natural gas blended with biomethane.

Super Ultra Low Carbon:

- Fossil-based natural gas combined with high mileage hybrid platform (50 mpg+);
- Fossil-based natural gas combined with plug-in hybrid platform;
- Fossil-based natural gas + biomethane blend with high-efficiency vehicle platform;
- Fossil-based natural gas + renewable hydrogen blend with high-efficiency vehicle platform;
- Biomethane;
- Biomethane combined with high-efficiency vehicle platform.

As you can see, natural gas as a transportation fuel uniquely has a number of pathways that can achieve California's 2050 greenhouse reduction goals outlined under AB 32. In fact, base natural gas vehicles that are identified as a Low Carbon strategy under the Draft Investment Plan are critical to the long-term health of the SULC strategies. In other words, to harness the benefits of biomethane and renewable hydrogen blends, natural gas vehicles are required.

Without base natural gas vehicles, biomethane and renewable hydrogen blends cannot participate in the State's low carbon fuel goals. Clearly this would be a misstep for California.

Technical Comments on the Draft Investment Plan:

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Set "Low Carbon" Classification to the Low Carbon Fuel Standard's 2020 Goal.

The Draft Investment Plan classifies "Low Carbon Fuel" as "renewable diesel, liquefied petroleum gas, compressed natural gas and liquefied natural gas" but also states that this category will provide "at least a 40 percent reduction in GHG emissions." It is not clear how the Energy Commission is defining the 40 percent reduction in GHG emissions for this category (if it is "well-to-wheel" number or other calculation), but it is clear that the fuels referenced under this category, on their own, do not achieve a 40 percent reduction if a "well-to-wheel" analysis. Natural gas – compressed or liquefied – provides the greatest benefits for this category as the reductions range from an 11 to 30 percent "well-to-wheel" reductions according to the Energy Commission's own analysis with TIAX under AB 1007 (see "CEC: Full Fuel Cycle Assessment Well To Wheels Energy Inputs, Emissions, and Water Impacts, June 2007, CEC-600-2007-003). While more recent analysis on natural gas vehicles demonstrates a reduction of 21% GHG emissions for medium- and heavy-duty vehicles and upwards of a 30% reduction for light-duty vehicles, we recommend that the "Low Carbon" transportation fuel category be amended to achieve the California Air Resources Board's 2020 low carbon fuel goal set at a "10 percent reduction in GHG emissions." Failure to amend this definition to a "minimum 10 percent" may mean no immediate funding will move to low carbon fuel applications that are available in the marketplace today or the foreseeable future. Such a situation could threaten the viability and success of the Low Carbon Fuel Standard's 2020 goals.

Re-Classify Biomethane as a Super Ultra Low Carbon Strategy.

Biomethane, as a transportation fuel strategy, is currently listed as a "Ultra Low Carbon" transportation fuel strategy. However, the definition of a "Ultra Low Carbon" transportation fuel achieves "at least a 60 percent reduction in GHG emissions." While biomethane certainly can achieve a 60 percent reduction in GHG emissions, a draft study by the California Air Resources Board released in October of 2008 on landfill gas finds biomethane to provide an 88.5% GHG emission reduction on a well-to-wheels basis. Since the Draft Investment Plan defines "Super Ultra Low Carbon" transportation fuel strategies as those fuels that achieve "at least an 82% percent reduction of GHG emissions", we believe biomethane should be re-classified as a "Super Ultra Low Carbon" transportation fuel strategy when the document is finalized.

Biomethane is a Fuel Strategy for Heavy- and Medium-Duty Vehicle Applications.

The Draft Investment Plan correctly identifies compressed natural gas, liquefied natural gas, and hybrid platforms as emerging fuels and vehicle technologies for heavy- and medium-duty vehicle applications. However, the document fails to mention biomethane or biomethane blends, a fuel strategy that supports the Energy Commission's current biofuel goals and one that will be used significantly by medium- and heavy-duty vehicles due to natural direct access points (i.e., landfill re-fueling opportunities for refuse trucks). To encourage private investment in the biomethane production market, it will be critical for the Energy Commission to highlight this pathway for medium- and heavy-duty vehicles in the final document as investors do look for direction from public policy. The failure to reference biomethane

application in these key sectors may result in unintended consequences counter to the Energy Commission's and the State's biofuels and low carbon fuel goals.

Natural Gas should be separated out from Propane.



Clean Energy would urge the Energy Commission to disassociate natural gas as a transportation fuel with propane as natural gas is a unique and distinct fuel strategy that differs from propane and is closer associated with renewable forms of fuels as demonstrated with hydrogen and biomethane. In fact, we would argue that the Natural Gas Vehicle Industry continues to evolve and progress in an effort to remain a viable strategy well into 2050. We would therefore appreciate that the final document reflect natural gas as its own fuel strategy with a number of key pathways, both fuel and technology advancements, that can deliver substantial greenhouse gas reductions for decades to come.

Medium- and Heavy-Duty Engine and Chassis Manufacturers.

The Draft Investment Plan notes that both Cummins Westport and Kenworth are two engine manufacturers that produce natural gas engines for medium and heavy-duty engines. We would like to point out that Kenworth is a chassis manufacturer, not an engine manufacturer. However, we would like to note that both engine manufacturers and chassis manufacturers that provide natural gas engine options are growing in number as fleet operators and owner-operators are seeking out economic alternatives to diesel that meet both criteria air pollutant and GHG emissions reduction goals. The engine manufactures of record today are Cummins Westport, Westport Innovations, Emissions Solutions, Inc. and Baytech. There are also engine manufacturers in other countries outside of the US, such as Clean Air Power, that could be enticed to bring their products to the US market if public policies are favorable. The chassis manufacturers for medium- and heavy-duty natural gas vehicle options to date are Kenworth, Peterbilt, Freightliner, Autocar, and Capacity.

Light-Duty Manufacturers of Natural Gas Engines.

Although it is true that Honda is the only OEM that produces a factory floor dedicated natural gas vehicle – the Honda Civic GX – in the US Market, it should be noted that Toyota introduced a Camry hybrid natural gas vehicle at the LA Auto Show in November of 2008 with a range of 250 miles per fill. Clean Energy has also engaged other auto manufacturers within the past year and has found significant interest in bringing more natural gas vehicle options to the US and California market as natural gas, as a transportation fuel, provides an economic, clean and low carbon fuel alternative to both diesel and gasoline. We strongly encourage the Energy Commission to provide incentive funding to attract these types of vehicles to the California marketplace and those that combine natural gas fueling systems with HEV or PHEV platforms.

Worldwide Growth of Natural Gas Vehicles over the past Five Years Significant and Should Further Encourage California Investment.

It should be noted that natural gas vehicles have enjoyed significant growth over the past five years, from 2.5 million vehicles to a historic 8.6 million vehicles. Clearly, supportive policies for natural gas vehicles and the current environment (over-dependence upon petroleum and the need for low carbon fuels that are clean to combat global warming) is a game changer. This is exactly why Clean Energy and the Natural Gas Vehicle Industry seek investment to advance both our future fuel compositions and vehicle platforms as we believe natural gas vehicle penetration will be both significant and important in supporting California's

immediate and long-term goals. Unlike the 1990s, we believe the current economic and environmental climate will support NGV development and biomethane production will move away from power generation toward the transportation sector as the greenhouse gas emissions reductions are greater (as further explained below).

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Biomethane's Best Application is Transportation, Not Power Generation.

If the goal is to reduce both air pollution and climate change, biomethane's best and optimal application is in the transportation sector. Displacing diesel or gasoline is far superior to replacing fossil-based natural gas as the carbon intensity for diesel and gasoline is substantially higher. For example, the carbon intensity for diesel is roughly 95 gCO2e/MJ and gasoline is approximately 96 gCO2e/MJ whereas natural gas is about 68 gCO2e/MJ. The Air Resources Board determined in October of 2008 that biomethane produced from landfills possesses a carbon intensity of 11 gCO2e/MJ. Thus, displacing diesel or gasoline with biomethane provides roughly an 88.5% GHG emissions reduction benefit whereas displacing fossil-based natural gas (an already low carbon fuel) provides a smaller percentage reduction. Therefore it is critical that funding programs, like AB 118, help develop the natural gas vehicle market to leverage and harness biomethane as a transportation fuel.

Natural Gas Interest Areas for Research, Development and Deployment that the Energy Commission Should Support.

(1) Funding for Hybrid and Plug-In Hybrid Vehicle Platforms paired with Natural Gas Systems

(a) Light-duty vehicle GHG emissions can benefit significantly by pairing low carbon fuels with higher efficiency platforms. Obviously, the higher the efficiency, the better outcome in GHG emission performance. We see hybrid-natural gas and plug-in hybrid natural gas vehicles for light-duty achieving ultra low and super ultra low carbon standards, providing California and the nation with a pathway to a lower carbon future with an abundantly domestic fuel source. We therefore strongly urge the Energy Commission to encourage OEMs to produce vehicles like the Toyota Camry hybrid natural gas model by providing funding for this research area.

(b) Medium- and heavy-duty vehicle applications that combine low carbon fuels and high efficiency platforms will also be critical in advancing GHG performance for these vehicle classes. We believe that natural gas-hybrid and plug-in hybrid combinations for heavy- and medium-duty vehicles could provide ultra low carbon reduction targets while allowing continued use of a clean, low carbon domestic fuel: natural gas.

(2) Seed Funding to Develop Regional Liquefied Natural Gas Fueling Infrastructure for Medium and Heavy-Duty Fleets in the Goods Movement Sector

We view this potential source of infrastructure funding as critical to developing an alternative to fossil-based diesel since it will provide a real alternative to independent owner operators and trucking fleets of all sizes. Further, by focusing CNG and LNG infrastructure development in and around California's ports, the Energy Commission stands to significantly maximize its investment as the potential to place a significant number of low carbon fuel LNG trucks on the road is very promising. Certainly, policies, such as the San Pedro Bay Clean Truck Program, further support the Energy Commissions consideration for this type of investment.

(3) Funding to buy down the incremental costs for low carbon heavy- and medium-duty trucks

One of the biggest stumbling blocks for alterative fuel truck deployment in and around California's goods movement sector has been a bias to fund clean diesel trucks that are not as clean but, because of economies of scale, are more cost effective. The Energy Commission can play an invaluable role by providing critical funding to help buy down the incremental costs associated with CNG and LNG heavy- and medium-duty trucks. A successful program could potentially result in the narrowing of such incremental costs as production volumes of CNG and LNG heavy- and medium-duty trucks rise and the creation of a trucking fleet in and around California's ports that is both low in carbon and meet tough emission standards.

(4) Seed Funding for Co-Location of NG and H2 Stations for Transit Agencies and Regional Clusters where vehicle populations exist.

Our vision for California's hydrogen future is one that harnesses the existing CNG infrastructure throughout the state. Clean Energy has already successfully demonstrated co-location of natural gas and hydrogen blends (HCNG) and natural gas and hydrogen dispensers. We concur with Honda that the best approach to create public access hydrogen infrastructure that is sustainable is through a cluster approach and we believe the most cost-effective way to achieve this network is through co-location of hydrogen and natural gas fueling. Further, because natural gas is the most cost-effective way to produce hydrogen and for the fact that natural gas can blend with hydrogen, we believe natural gas serves as a critical bridge to a hydrogen future. We therefore would encourage the Energy Commission to allocate funding for such projects within its program for HCNG or H2 co-location with existing or new natural gas stations.

(5) Funding of cost-effective small-scale biomethane production units (to harness municipal sewage treatment plants, dairy farms, and landfills).

While the production of biomethane has come along way since the Energy Commission's initial investments in such projects, this critical source of super ultra low carbon fuel still requires further investment. Many projects are being passed over as projects are too small to justify the investment of biomethane production units. This inability to harness this key transportation fuel resource to meet California's AB 32 goals is disadvantageous and a missed opportunity for all involved. We therefore strongly encourage the Energy Commission to invest in further research, development and deployment of advanced biomethane production strategies so that most, if not all, biomethane projects can be utilized.

(6) Funding biomethane production quality improvements critical.

The quality of biomethane can be a potential barrier for the fuel entering the market and if advancements are not made, this source of super ultra low carbon fuel can be lost to wide scale flaring if it cannot achieve pipeline quality. As air quality management districts tighten stationary source emissions to achieve air quality standards set by the Clean Air Act, biomethane electricity generation will be phased out. Therefore, advancing the quality of biomethane to pipeline quality will be critical so that it can reach the transportation sector. Further, the use of biomethane in the transportation sector is a stronger strategy to reduce carbon intensity as the displacement benefits of gasoline or diesel by biomethane are greater than the displacement of natural gas.

(7) Funding gaseous technology components to expand applications.

Technology improvements can be made through research and development that can expand the application of natural gas fueled vehicles. R&D can advance the on-vehicle gas storage technologies including storage tank improvements and adsorption storage systems. Improving fuel storage will allow greater flexibility in configuring vehicles and potentially increase vehicle range which is one limitation of current generation technology. Thermal management technology can be advanced to extend the life of liquid natural gas fuel onboard the vehicle and at fueling stations. Auxiliary power units and refrigeration units, which today only run on diesel, can be shifted to natural gas fuel. Many other technology innovations will spring from CEC funding programs.

Concluding Remarks.

Clean Energy would like to thank the Energy Commission's staff for the hard work that was put into the Draft Investment Plan. We strongly encourage the Energy Commission's Board and Advisory Committee to support the investment approach proposed by the Energy Commission's staff. We also hope that the Energy Commission will view the Natural Gas Vehicle Industry as one that is progressive and can achieve all GHG emissions targets, from low carbon to super ultra low carbon, via strategic investments in high-efficiency vehicle platforms paired with low carbon natural gas and fuel advancements in biomethane and renewable hydrogen. In fact, we believe for the medium- and heavy-duty sector, natural gas provides the most meaningful solution to achieve low carbon emissions. Finally, we strongly encourage the Energy Commission staff to allocate funding for HEV and PHEV development for NGVs, medium- and heavy-duty low carbon fuel vehicle deployment of NGVs at California's ports, and the advancement of biomethane, HCNG and renewable hydrogen fuels and fueling infrastructure.

Sincerely,

Todd R. Campbell
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