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Todd R. Campbell, MEM, MPP
Director of Public Policy



October 6, 2008

Mr. Dean C. Simeroth
Criteria Pollutants Branch, Chief
California Air Resources Board
Stationary Source Division
1001 I Street
P.O. Box 2815
Sacramento, CA 95812

Re: Meeting on CARB's Comparison Document of Natural Gas vs. Diesel
(August 10, 2008)

Dear Mr. Simeroth:

Clean Energy would like to thank you and your staff for your collective time spent with us to discuss the draft Comparison Document, dated August 10, 2008, estimating the lifecycle greenhouse gas emissions of natural gas and diesel as a transportation fuel. During this meeting, Clean Energy staff and our consultants gained a better understanding of CARB's approach in drafting this preliminary document and we have collectively identified areas within the analysis where we can help CARB staff refine its analysis to better reflect our industry's current and future operations.

You have asked us to identify pathways that would best reflect the operations of both compressed natural gas (CNG) and liquefied natural gas (LNG) vehicle fueling for the natural gas vehicle industry. Based on our knowledge and experience in the industry, we recommend that CARB incorporate the following CNG pathways for the final document:

- (1) CNG (using Canada as a source);
- (2) CNG (using the Rocky Mountains as a source)
- (3) CNG (using the Permian Basin/San Juan as a source)
- (4) CNG (using California landfill gas)
- (5) CNG (using out-of-state landfill gas)
- (6) CNG (using remote LNG shipped to Baja, re-gasified, pipelined to CA, then compressed).

Mr. Simeroth

Page 2

We also recommend that CARB incorporate six LNG pathways to be analyzed for the final document:

- (1) LNG (using Canada as a source);
- (2) LNG (using the Rocky Mountains as a source);
- (3) LNG (using the Permian Basin/San Juan as a source);
- (4) LNG (using California landfill gas)
- (5) LNG (using out-of-state landfill gas); and,
- (6) LNG (using remote LNG shipped to Baja as a source and trucked to the station).



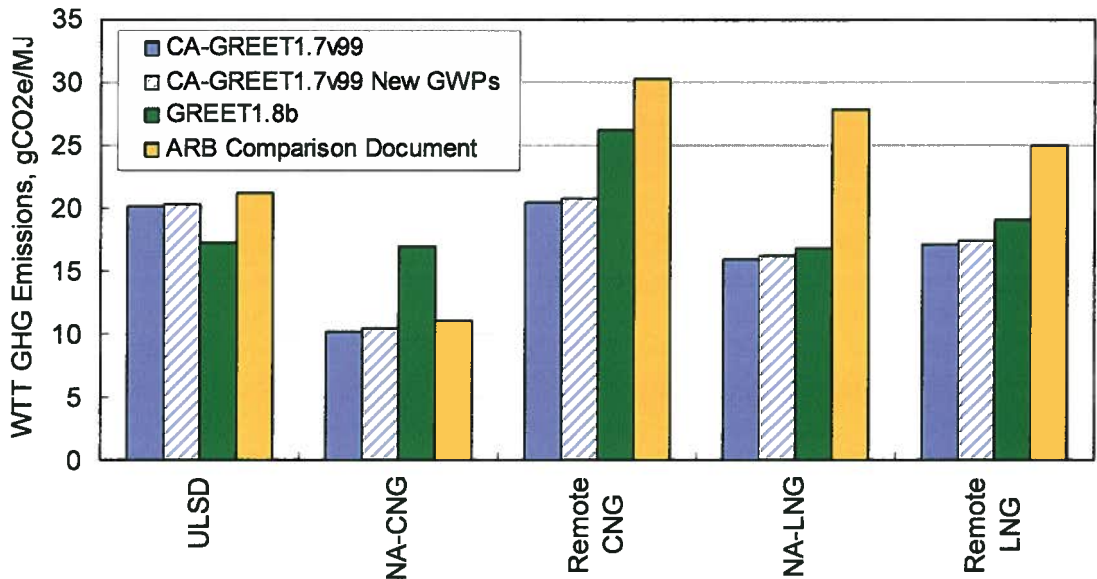
Clean Energy believes that the first five CNG and LNG pathways recommended above are the most reflective of the natural gas vehicle industry today and will continue to be well into the future. We continue to submit that Option 6 (Baja) for LNG is an unlikely LNG pathway for vehicle refueling as the country is flush with natural gas (new natural gas shale discoveries in North America are projected to extend proven natural gas reserves from 83 to 120 years, increased renewable portfolios should displace natural gas use in power generation, and the rise of biomethane use provides additional resources) and existing LNG production facilities for vehicles are not physically connected to the Baja terminal's pipelines. That said, we have included it based on CARB staff's desire to be thorough in its analysis and to cover the unexpected. We strongly recommend that CARB alter the mechanics of Option 6 in that we believe any LNG fuel purchased by Clean Energy from the Baja import terminal would be trucked directly to fueling stations, not gasified into existing pipelines and then re-liquefied at a California-based LNG production facility. Such an operational practice would be pre-empted by economics and presumably an increasingly tightened low carbon fuel standard by CARB over time.

Clean Energy would like to reiterate the critical importance of displaying the recommended pathways in the final document over the pathways drafted in the current CARB document. For example, the current document contains pathways that are not reflective of how the LNG industry currently operates or plans to produce vehicle fuel. While we appreciate CARB's efforts to provide a model that will allow each fuel provider to calculate the carbon intensity of its product using its own special circumstances, maintaining three LNG pathways that will never be implemented in a finalized CARB document could harm the LNG refueling industry irreparably and mislead potential customers, adversely impacting the state's low carbon fuel goals.

During our meeting, we also questioned the comparison of a low carbon diesel fuel that achieved a ten percent reduction in carbon. We have confirmed with CARB staff that this was a hypothetical analysis and that no such fuel existed in the market place to date. When asked why this comparison was performed for natural gas and not for any other fuel under consideration, CARB staff explained that it was done for internal purposes only but would likely not be in the final version of the Comparison Document. We, therefore, would ask that hypothetical fuels not be included in the final version of the analysis as such a comparison could harm or unfairly stunt the growth opportunities of a vital and existing low carbon fuel, such as domestic or renewable LNG.



Clean Energy is also concerned that the values presented in the ARB Comparison document are significantly different than the values resulting from the AB1007 analysis and from the ULSD and CNG pathway documents posted on the LCFS website. We understand that the first CA-GREET model posted on the LCFS website is based on GREET1.7 while the soon to be released ARB version of the CA-GREET model is based on GREET1.8b. However, the only change for natural gas fuels in the new version of the GREET model is the global warming potential (GWP) factors for CH₄ and N₂O. Figure 1 below compares the WTT values produced by CA-GREET1.7 v99 with the old and new GWP values. The updated GWP factors minimally impact the results for NG fuels.



Also shown in the figure are the values generated by GREET1.8b with all Argonne National Lab default values, including the U.S. average electricity mix. The ULSD values are markedly lower because of the increased refining efficiency values. The CNG values are higher than the CA-GREET values, mainly because of the higher pipeline leak rate assumption. The LNG values are higher than the CA-GREET values largely due to poorer boil-off recovery efficiencies.

Finally, the values presented in the ARB Comparison document are shown. The ULSD and NA-NG CNG values are higher than those in the pathway documents posted on the LCFS website. The remote CNG values and the LNG values are substantially higher than the CA-GREET and GREET1.8b values. To better understand the underlying assumptions in the ARB analysis, Clean Energy requests that ARB provide the version of GREET utilized to generate the results presented in the Comparison document. If this level of transparency is not feasible, at a minimum we request the following:



- Electricity Mix for each case
- ULSD Case
 - Crude recovery efficiency
 - Crude transport modes and miles for each mode
 - ULSD refining efficiency
 - Refining non-combustion emissions
 - ULSD transport modes and miles for each mode
- For all NG Fuels:
 - NG Recovery efficiency
 - Vented methane in recovery %
 - Processing efficiency
 - Vented methane in processing %
 - Non-combustion emission in processing step
- CNG from California NG
 - Pipeline transport distance
 - Pipeline leak rate %/mile
- CNG Remote Baja Case
 - Pipeline transport distance to liquefaction
 - Pipeline leak rate %/mile
 - Liquefaction efficiency
 - Storage losses
 - Storage days
 - Boil-off recovery efficiency
 - LNG transport modes and distances
 - Boil-off assumptions during transport
 - Boil-off assumptions during terminal storage
 - Regasification efficiency
 - Pipeline transport distance and leakrate
 - Compression efficiency
- LNG Canada NG Case
 - Pipeline transport distance
 - Pipeline leak rate %
 - Liquefaction efficiency
 - Boil-off assumptions at the liquefaction plant
 - Heavy duty truck transport distance and boil-off assumptions
 - Station storage boil-off assumptions (days, loss rate, recovery)
- LNG Remote LA Case
 - Pipeline transport distance to liquefaction
 - Pipeline leak rate %
 - Liquefaction efficiency
 - Boil-off assumptions at liquefaction plant
 - LNG transport modes and distances
 - Boil-off assumptions during transport
 - Boil-off assumptions during storage at terminal
 - Distribution distances and boil-off assumptions

Finally, you mentioned during the meeting that CARB is currently engaged in internal discussions regarding which entities that are involved in the LNG and CNG vehicle fuel production cycle should be the “regulated entity” responsible for compliance with the LCFS. You indicated that CARB was currently contemplating regulation of the

Mr. Simeroth

Page 5



entity that holds title to the natural gas at the border of the State of California. We strongly believe this is the wrong approach, and that in order to effectively regulate and incentivize participants in the LNG and CNG vehicle fuel market the regulated entity for purposes of LCFS compliance must be the CNG or LNG fuel provider. Gas marketing firms and utilities that purchase gas at the California border are commodities businesses (not fuel businesses) that sell that gas downstream to a multitude of customers for a wide variety of end uses. Vehicle fuel providers like Clean Energy currently constitute a tiny fraction of the utility and/or gas marketing firms' natural gas customers, and the commodity supplier has no visibility or control over the fuel creation and sales process. In order for natural gas to be used as a low-carbon fuel alternative, it must be either compressed or liquefied and trucked to the end customer. It is the fuel providers that compress, liquefy *and sell natural gas as a vehicle fuel* that should be regulated under the LCFS.¹ It is the fuel providers, like Clean Energy, that make the decisions regarding gas sourcing and CNG and LNG production methods that are critical to determining the carbon intensity of the fuel production process. The fuel providers, like Clean Energy, enter into long-term natural gas vehicle fuel supply agreements with fuel consumers and make the capital investments necessary to build natural gas fueling infrastructure. Ultimately, it is the fuel providers that must be the regulated entity under the LCFS. Attempting to regulate the commodity provider that holds title to the gas at the border would presumably require highly inefficient and complicated supervision by the commodity provider of a certain portion of their downstream customers that compress or liquefy natural gas for use as a vehicle fuel. This presents numerous significant practical and logistical problems that may prove highly detrimental to the natural gas fueling industry as a whole and result in an ineffective regulation. We would welcome the opportunity to speak in greater detail with CARB regarding the "regulated entity" decision. We believe that it is a critical decision that must be made correctly if the LCFS is going to effectively regulate and incentivize the low carbon natural gas fueling industry.

Again, Clean Energy would like to thank you and your staff for your time and consideration of our comments, input and analysis. We hope that you will continue to view us as a resource and ally in developing and implementing the state's Low Carbon Fuel standard.

Most sincerely,

A handwritten signature in black ink, appearing to read "Todd R. Campbell", written over a horizontal line.

Todd R. Campbell
Director of Public Policy

Cc: Floyd V. Vergara, Esq., P.E.
Linda Lee, P.E.

¹ Properly defining the "fuel provider" under the LCFS will be of critical importance. For CNG, we would propose that the fuel provider be defined as the owner of the compression infrastructure utilized to compress the gas for use as a vehicle fuel. For LNG, we would propose the fuel provider be defined as the entity supplying the LNG to the end-user for use as a vehicle fuel.