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June 7, 2010

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Subject: **Clean Energy Comments on CARB Natural Gas Commercial Fuel Specification**

Clean Energy would like to thank the California Air Resources Board (CARB) for allowing us to submit the following comments in regards to the proposal to change the commercial fuel specification for natural gas fuel in California.

Need for a Performance Based Commercial Fuel Specification

California needs a performance based fuel standard for natural gas used as a transportation fuel in natural gas vehicles (NGVs). The existing standard is based on the range of historical variability of gas in California. At the time of adoption of the standard, the NGV industry recommended a broad standard that would accept all the gas represented by the historical variability of gas in California. The NGV industry recommended this position based on the fact that California gas was some of the best natural gas in the U.S. To date, no other state in the U.S. has adopted a fuel specification for NGVs and the gas in some states varies more than the natural gas here in California. Studies and decades of in the field experience shows that CARB's adoption of a very prescriptive

composition specification for California will not impact emission performance, engine durability, or any other performance attribute of NGVs in most cases.

The current standard was adopted prior to the NGV industry developing a recognized performance based methodology for natural gas fuel. In the mid 1990s, the NGV industry, through research conducted at Southwest Research Institute (SwRI) under contract with the Gas Research Institute, developed a performance based criteria – Methane Number (MN), that would take the guesswork out of comparing natural gas of varying composition. MN reflects the anti knock properties of a fuel when used in spark ignited engines (very much like the octane number – a performance specification for gasoline fuels). MN is calculated from the natural gas composition and accommodates variability of gas composition without sacrificing performance. Hence, the NGV industry has been lobbying CARB to adopt a MN specification for natural gas fuel since the late 1990s.

A Methane Number specification for natural gas properly accounts for the subtleties of changes in natural gas composition. For example, natural gas with higher ethane composition than the 6% currently allowed under the existing CARB spec is perfectly acceptable as a fuel as long as propane and C3+ carbon compounds are kept low. Correspondingly, natural gas with higher than 3% C3+ concentrations is also an acceptable fuel as long as ethane composition is sufficiently low. Methane number is the correct approach for CARB to adopt. MN is performance based and correctly describes the attributes of a fuel for spark ignited natural gas engines.

If Methane Number – then What Value to Accept?

Heavy-duty engine manufacturers have supported a MN fuel specification since the concept was developed by SwRI. In the early 90s – before the concept of Methane Number was developed - one major engine manufacturer certified its engine to a minimum gas composition of 94% methane (or about a MN 90 value) – unsure of the consequences of operation with lower methane composition. As this manufacturer gained experience with their engine in other areas of the world where gas composition differs significantly from composition in the U.S., and the MN concept was developed and shown to be the proper criteria for gas composition, this manufacturer changed their acceptable gas composition to MN 65. This demonstrates the appropriateness of MN specification to address a worldwide market.

On the other hand, light duty vehicle manufacturers (GM, Ford, Chrysler, Honda) have testified that because their engines operate at stoichiometry and have

closed loop control and 3-way catalysts, their products can operate on essentially any fuel, no matter what the MN. Changes in composition of fuel are immediately compensated for by the engine control system.

So the issue from a fuel specification standpoint is to adopt a performance based commercial fuel specification (MN) that is appropriate for heavy-duty spark ignited engines. The question is – what number.

Southern California Gas Company has had a MN80 exemption that has been in place for a number of years. The exemption is for an area that includes a large population of NGVs. Since this exemption has been in place for so long and the fact that no issues have been reported concerning operation of vehicles with MN80 fuel – it therefore seems appropriate that MN80 be given high consideration as the new performance based fuel specification for natural gas as a transportation fuel.

In the late 90s, the NGV industry and California utilities lobbied for a MN73 specification for California. While MN73 seems very aggressive, in terms of manufacture warranties for heavy-duty engines – this specification was justified and backed by performance data. As standards have since been tightened, the changes required in heavy-duty engine technology now require that the gas composition be set at MN75 for engine warranties. So it appears that MN75 is now a floor for CARB's consideration – and MN80 seems to be a legitimate conservative specification to adopt. This MN80 approach has been on the table now for 8 years and should finally be adopted by CARB.

Treatment of Inerts in the Fuel Specification

The levels of inert gases acceptable in the current fuel specification are between 1.5 and 4.5%. This is a good example of adopting a fuel specification based on historical values versus performance criteria. Inerts are nothing more than diluents in gas. They are historically there but are really not necessary in a performance specification. In a verbal conversation with Sempra recently, they indicated that in going back and checking the last 10 years of pipeline records, 77% of the time the main gas coming into California had less than 1.5% inerts. In other words, inerts are not needed in natural gas for functionality. An excellent example of this is liquefied natural gas (LNG) used in transportation fuel which has very little inert content.

Currently about 50 million gallons of LNG are sold as vehicle fuel in California. Clean Energy has about 50% of this market. The Clean Energy's LNG has essentially no inerts. Clean Energy's LNG composition out of our plant in Boron,

California is about 99.5% methane, 0.4% ethane, 0.075% propane, and <0.05% nitrogen.

Inerts should not be part of a performance specification for natural gas. The concept that if pipeline natural gas doesn't contain inerts – station owners must somehow add inerts at the station is not even rational. Adding inerts to a perfectly good hydrocarbon is like adding water to gasoline. You can do it – but why?

LNG must be addressed in new Performance Standard

Natural gas used as a transportation fuel covers both CNG and LNG. Whether the vehicle uses CNG or LNG, the fuel to the engine is natural gas. It is an important consideration for any modification of the commercial fuel specification that CARB recognizes they have jurisdiction over both fuels and both fuels need to come under the umbrella of a revised standard.

If MN80 is determined to be a viable standard for the commercial fuel specification, any fuel such as LNG (~MN106 based on above specifications) should automatically be acceptable without any other needs to further define an LNG specification.

Exemption Process

CARB developed the exemption process to address greenfield NGV development in “hot gas” areas. A potential station developer or fleet that wanted to build a CNG station would first request service from the local gas utility. If the pipeline gas quality did not meet the CARB specifications, the utility would inform the customer that they had to request an exemption from CARB before the utility could supply gas to the station. The terms of the exemption were that the customer could develop the station but access would have to be confined to the resident fleet and that no public access to the station could be provided. The exemption also was good for a limited time of 3 years, had to be renewed, and reports had to be submitted to CARB regarding any issues with vehicle performance/durability. This is an acceptable process for a new installation in an already determined “hot gas” region. It is not a viable process for an already developed market where the gas utility wants to change the composition of gas.

The exemption process is a “make work” process. Some station owners have applied 3-4 times to continue to extend their exemptions. To my knowledge there have been no reports of vehicle issues associated with operating at gas composition of MN73. Further, it would be next to impossible for a station owner

to know what the MN quality is at his or her station without operating a gas chromatograph system at the facility – a financial burden that would turn the station's business fundamentals upside down.

Clean Energy therefore urges CARB to reevaluate retaining the exemption process for scenarios whereas a utility decides to import natural gas that is off spec. For initial development of a station, the process may still be of some value. But for all other situations, it should be the utility that has to file the exemption. Customers have absolutely no idea what is happening to the composition of pipeline natural gas over time. Utilities do. Any/all responsibility for exemptions should fall on the responsible natural gas utility or utilities.

Impact of CARB Commercial Fuel Specification on Stationary Sources

First of all, CARB has an obligation to define a workable performance fuel specification for natural gas used as a transportation fuel. While there certainly could be issues that eventually impact stationary source emissions, we encourage CARB to define a transportation fuel specification that is appropriate for the NGV market.

Engines and vehicles are highly sophisticated technologies where emissions performance is critical. Therefore, it shouldn't be a surprise to CARB that NGVs can accommodate a range of fuel composition variability without producing wide variations in tailpipe emissions. Emission controls are built into the engine design.

For stationary sources, the picture is different. Most stationary sources e.g. residential water heaters, furnaces, cooktops, etc. etc. have combustion systems designed for low emissions – but there is rarely any closed loop or feedback control that allows the various appliances to correct emissions for changes in gas composition. Therefore, given an appliance that is designed for low emissions, any change in gas composition will probably mean that there will be some corresponding change in appliance emissions.

The fact is that gas composition is changing all the time in the U.S. as new production is brought online and old wells go out of production. The change is generally slow. But in the case of California and access to off-shore LNG – the picture can change rapidly. If the composition changes are large and the potential impacts on stationary source emissions too large – then CARB needs to address this issue with the CPUC. Utilities in this argument say that they are responsible for taking gas into their system as long as it meets CPUC specifications. These specifications are defined in Rule 30 for Sempra and Rule 21 for PG&E. While these are CPUC adopted standards – one must realize that

these standards are developed by the utility and adopted (not developed) by the CPUC. The goal of the CPUC is to make sure ratepayers in California have access to cost effective sources of natural gas. If there is a conflict between energy supply and emissions on the stationary source side – then CARB must establish its role in the process to correct any and all deficiencies.

Conclusions

Clean Energy encourages CARB to adopt a MN80 specification for the state. Doing so at this time is essential given the projections for the NGV market to grow significantly in the near-term.

Clean Energy also requests that CARB reevaluate the exemption procedures currently in force and consider modification to account for the fact that natural gas utilities can/will make operation changes that change system gas composition. If gas composition changes are utility driven, then station owners/operators should not be liable for regulation compliance.

Clean Energy encourages CARB to establish a more effective dialog with the CPUC regarding the quality of natural gas in California and the resulting impacts that changes in gas composition can have on statewide emissions. To date, individual local APCDs have had no impact intervening in CPUC proceedings on gas quality. If gas composition variability does have a major impact on stationary source emissions, CARB can't remain silent on this issue.

Thank you for your time and consideration of our comments.
Sincerely,

A handwritten signature in black ink, appearing to read "Michael L. Eaves". The signature is fluid and cursive, with the first name being the most prominent.

Michael L. Eaves
VP Technology Advancement
Clean Energy

cc: Floyd Vergara
Stephen d'Esterhazy
Cody Livingston