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Mr. Daniel Hawelti
Air Resources Engineer
California Air Resources Board
Submitted via online Comment Submittal located at:
http://www.arb.ca.gov/lispub/comm2/bcsubform.php?listname=techfuel-report-ws&comm_period=1

Re: Draft Technology Assessment: Lower Emission Natural Gas and Other Alternative Fuel Heavy-Duty Engines – September 29, 2015

Dear Mr. Hawelti:

The Southern California Gas Company ("SoCalGas") appreciates this opportunity to comment on the September 29, 2015, Draft Technology Assessment: Lower Emission Natural Gas and Other Alternative Fuel Heavy-Duty Engines ("NG Tech Assessment"). We understand this is a first draft and hope the following comments can assist staff in developing a final version. SoCalGas looks forward to participating in a dialogue with the California Air Resources Board ("ARB"), engine original equipment manufacturers ("OEMs"), and trucking, freight movement and other interested stakeholders on this and the other technology assessments which will inform the many State efforts regarding the Sustainable Freight Plan, greenhouse gas emissions ("GHG") and petroleum reductions as well as the State Implementation Plan.

I. Additional Information Is Needed to Make the Draft NG Tech Assessment Truly Comprehensive

Because the various technology assessments being prepared under your Sustainable Fright Strategy are linked, SoCalGas requests ARB provide a cross reference document that would help in understanding how the engine assessments (diesel, natural gas, etc.) relate to the Engine/Powerplant and Drivetrain Optimization and Vehicle Efficiency (June 12, 1915), Heavy-Duty Hybrid Vehicles (November 13, 2015) and yet to be released fuel technology assessments. We also suggest development of a glossary[1] that defines terminology used in the different assessments.

[1] An example of a glossary of transportation terms may be found at: https://www.truckloadrate.com/faq.htm

For example, it is our understanding that ARB uses its own vehicle classification scheme (versus United States Environmental Protection Agency ("EPA")'s), and that heavy-duty trucks and/or vehicles include Class 4 through 8[2] as shown below:

- Class 4 (or T4) - Light-heavy duty trucks, Gross Vehicle Weight Rating (GVWR) 8,501lbs - 10,000 lbs.
- Class 5 (T5) - Light-heavy duty trucks, GVWR 10,001 lbs. - 14,000 lbs.
- Class 6 (T6) - Medium-heavy duty trucks, GVWR 14,001 lbs. - 33,000 lbs.
- Class 7 (T7) - Heavy-heavy duty trucks, GVWR 33,001 lbs. - 60,000 lbs.
- Class 8 (T8) - Heavy-heavy duty trucks (including urban buses), GVWR 60,000 +lbs.

It would be helpful for the NG Tech Assessment to make this clear.

There also appear to be data gaps in the NG Tech Assessment. For example, the Lower NOx Heavy-Duty Diesel Engines assessment (page ES-2) states that there are approximately 10 manufacturers of Class 4 to 8 trucks in the U.S., but the NG Tech Assessment states that "most" on-road heavy-duty natural gas engines in use today are produced by a single manufacturer (page ES-3). Some sections of the NG Tech Assessment have data provided for just one or two of the heavy-duty vehicle classes or specifics of a single vehicle class are discussed. It would be very helpful if data availability, or lack thereof, for each vehicle class is clearly identified. SoCalGas has attached an appendix of documents (listed on page 12) that we hope will assist to fill some of the data gaps.

II. Comments on Executive Summary

The following comments follow the same order of the question-and-answer format of the NG Engine Tech Assessment.

A. Question and answer starting on page ES-2 – What role can heavy-duty natural gas vehicles play in meeting California's air quality goals?

1. *Additional Information on the Newly Certified Low NOx Engine Should Be Included in the NG Tech Assessment*

SoCalGas is pleased to see mention of the new Cummins Westport Innovations, Inc. ("CWI") 8.9 liter compressed natural gas ("CNG")/liquefied natural gas ("LNG") engine that was very recently certified by both ARB[3] and EPA to ARB's optional low-NOx standard of 0.02 grams NOx/bhp-hr, because this engine is of critical importance to meeting California's near term air quality goals.

SoCalGas understands that the draft NG Tech Assessment was released right after certification of the CWI 8.9 liter CNG/LNG engine in the NG Tech Assessment, but believes ARB can highlight more information on this engine in the final report such as that provided below.

[2] www.arb.ca.gov/msei/vehicle-categories.xlsx
[3] http://www.arb.ca.gov/msprog/onroad/cert/mdehdehdv/2016/cummins_mhdd_a0210630_8d9_0d20-0d01_ng.pdf

For example, ARB's Executive Order A-021-0630 shows that the CWI 8.9 liter CNG/LNG engine was certified at 0.01 grams NOx/bhp-hr, ***one half*** the level of ARB's lowest optional standard. The new CWI 8.9 liter CNG/LNG engine also features Closed Crankcase Ventilation, reducing engine methane emissions by seventy percent thus meeting the 2017 EPA GHG emission requirement.[4] ARB's 2016 Mobile Source Strategy Discussion Draft[5] acknowledges a low-NOx path for heavy-duty trucks is superior to a zero tailpipe emission vehicle path in the period from 2015 to 2030, and both the South Coast Air Quality Management District (SCAQMD) and the San Joaquin Valley Air Pollution Control Distract (SJVAPCD) are calling for near-zero emission vehicles as shown in the following statements:

- "In Southern California, clean, zero- and near-zero emission vehicle technologies are critical to meeting clean air standards." said Barry Wallerstein executive officer for the South Coast Air Quality Management District. "Cummins Westport's new engine provides an important tool toward reaching that goal." CWI press release (September 2015).[6]
- SJVAPCD adopted an Action Plan[7] promoting The Use of Natural Gas Technology for Good Movement in the San Joaquin Valley, noting "it is virtually impossible for the San Joaquin Valley to attain the new standards for ozone and particulates without the implementation of transformative measures, including significant advancements in zero/near-zero emissions technologies for mobile and stationary sources." And, "Heavy-duty natural gas vehicles provide fewer barriers to adoption than electric/hybrid." (May 2015).

2. *ARB Should Modify Its Unsupported Policy Statement*

SoCalGas is concerned that ARB is stating the following with no discernable back-up documentation: "However, because NOx emissions from heavy-duty natural gas vehicles are expected to be higher than those of advanced technology alternative fuel trucks such as fuel cell and battery electric trucks, a shift to natural gas-powered heavy-duty trucks alone will not be sufficient to meet California's air quality challenges in the long term." (Page ES-2)

The NG Tech Assessment correctly implies that attaining both the federal and California air quality standards is challenging, but the NG Tech Assessment is represented as a report on the current and projected development of heavy-duty low-emission natural gas engines over the next 5 to 10 years, not a policy report on how California may meet its short-term air quality obligations nor its long term GHG goals. The quoted ARB statement above is simply not accurate. While there may be no tailpipe emissions from fuel cell and battery electric trucks, the use of these trucks generates emissions upstream of the tailpipe. In-basin electricity generation and hydrogen production will result in some NOx emissions, and its unclear if such emissions will be equal to or less than emissions from the new low-NOx engines.

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[4] http://www.westport.com/news/2015/cummins-westport-isl-g-near-zero-natural-gas-engine-certified-to-near-zero-emissions

[5] http://www.arb.ca.gov/planning/sip/2016sip/2016mobsrc_dd.pdf

[6] http://www.westport.com/news/2015/cummins-westport-isl-g-near-zero-natural-gas-engine-certified-to-near-zero-emissions

[7] http://www.valleyair.org/Board_meetings/GB/agenda_minutes/Agenda/2015/May/StudySession/final/05.pdf

Further the statement is not supported by ARB or air district data. For example, ARB's handout[8] at the October 16, 2015, Mobile Source Strategy workshop shows the projected emission reductions from current levels needed for the South Coast Air Basin to attain the federal ozone standards is 70% in 2023 and 80% in 2031, not 100% reduction from a single mobile source category as implied in the NG Tech Assessment answer as to the role for heavy-duty NG vehicles. The South Coast Air Quality Management District ("SCAQMD") presents a similar picture in its 2016 Air Quality Management Plan ("AQMP") Fact Sheet,[9] although the percentages are even smaller because the reductions are taken from the 2012 baseline rather than "current levels."

At ARB's April 22, 2015, Symposium on California's Development of its Phase 2 Greenhouse Gas Emission Standards for On-Road Heavy-Duty Vehicles, Dr. Wayne Eckerle, Cummins Vice President for Corporate Research & Technology, stated that lower NOx levels were achievable with minimal carbon dioxide penalty at the level of 0.1 grams NOx/bhp-hr for diesel engines and 0.02 grams NOx/bhp-hr for natural gas engines, but that research and "more work is needed to identify a robust 0.02 grams/bhp-hr diesel solution."[10] Despite an indefinite timeframe for introduction of a 0.02 grams NOx/bhp-hr diesel engine, ARB still projects a continuing role for diesel heavy-duty engines. SoCalGas would like ARB to project a similar role for heavy-duty low-NOx natural gas engines.

CWI is applying its successful technology in its new 8.9 liter CNG/LNG engine to an 11.9 liter engine, appropriate for Class 8 line-haul trucks with targeted completion of EPA and ARB certification in 2016.[11] The natural gas industry is committed to playing a significant role in improving California's air quality, and it is very satisfying to see us reach these goals even sooner than anticipated. The partnership project that helped produced the new 8.9 liter engine with SCAQMD, the California Energy Commission ("CEC"), SoCalGas, and Clean Energy Fuels coming onboard as a new funding partner, was extended with additional funding approved by the SCAQMD Governing Board at their November 6 meeting after receiving approval from their Technology Committee on October 16.[12]

While SoCalGas has been communicating the opportunities and pathways for natural gas with ARB for over two years, a tipping point has been reached where we no longer just talk about how near-zero emission engines will be achieved in the future. The wall has been breached. When SCAQMD, CEC and SoCalGas originally helped to fund the development of a near-zero emission natural gas engine, CWI thought they could bring such an engine to market in 2017 or 2018. CWI exceeded even their own expectations by delivering a certified near-zero NOx emission engine a full year ahead of schedule. SoCalGas encourages ARB to seriously consider long term, natural gas heavy-duty near-zero vehicle pathways, delivering improved air quality and lower GHGs, now that we know natural gas engines will do much more than "deliver near term opportunities to reduce NOx emissions."

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[8] http://www.arb.ca.gov/planning/sip/2016sip/measures_reductions.pdf

[9] http://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/2016-air-quality-management-plan/factsheet-2016-aqmp.pdf?sfvrsn=2

[10] http://www.arb.ca.gov/msprog/onroad/caphase2ghg/presentations/2_7_wayne_e_cummins.pdf

[11] http://www.aqmd.gov/docs/default-source/technology-research/clean-fuels-program/clean-fuels-program-advisory-group---september-3-2015/5-richard_carlson.pdf?sfvrsn=8

[12] http://www.aqmd.gov/docs/default-source/Agendas/Technology/10-16-15_tech-cmte-agenda.pdf?sfvrsn=6

The comments above are also applicable to information provided on pages I-2 (Introduction and Purpose of Assessment), V-4 (Future Technology) and VI-2 (NOx and GHG Emissions).

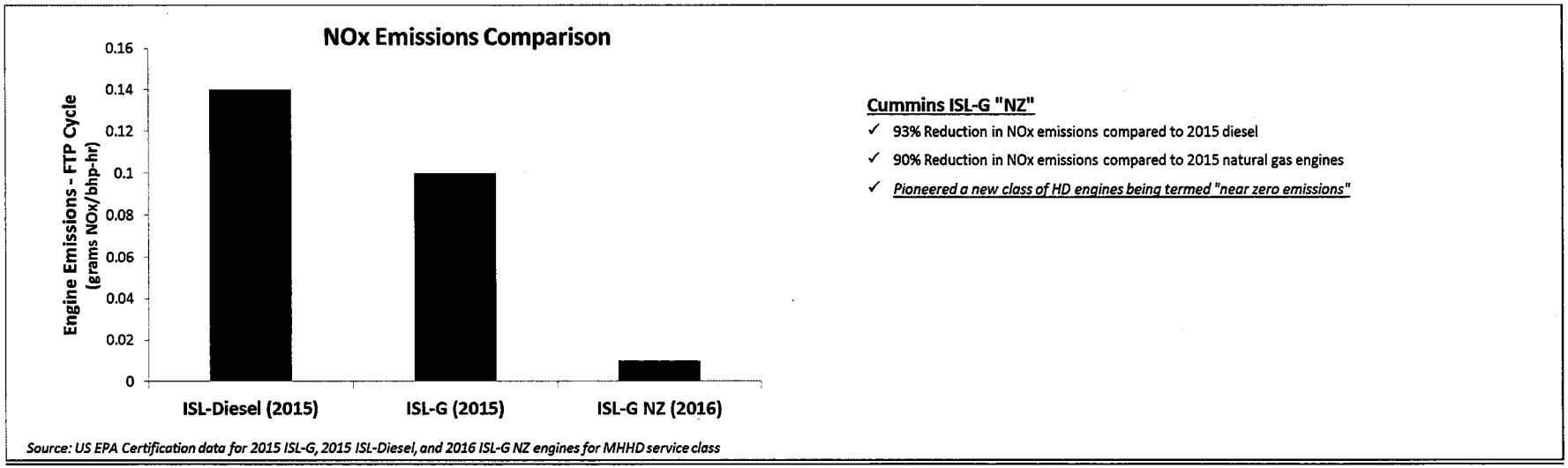
B. Question and answer starting on page ES-3 – What market share do heavy-duty natural gas vehicles have, and who makes them?

The data presented in this answer is only for nationwide sales of Class 8 trucks and buses and the percentages of natural-gas fueled buses purchased in 2013 by California transit agencies. More data is needed for a comprehensive representation of the market share for all Class 4 through 8 CNG and LNG vehicles in California. SoCalGas has attached a number of documents as an appendix (documents listed on page 12) with information on manufacturers and market share of heavy-duty natural gas vehicles. One of these documents, the California Hybrid, Efficient and Advanced Truck Research Center's ("CalHEAT") 2011 California Truck Inventory and Impact Study, provides a beneficial, although dated, characterization of California's truck population including the number of trucks in different size categories, and how they are used. SoCalGas suggests that ARB work with CalHEAT to update this California specific truck inventory for inclusion in the final Tech Assessment.

C. Question and answer starting on page ES-4 – How do NOx emission levels from the latest technology heavy-duty natural gas trucks compare to NOx levels from heavy-duty diesel trucks?

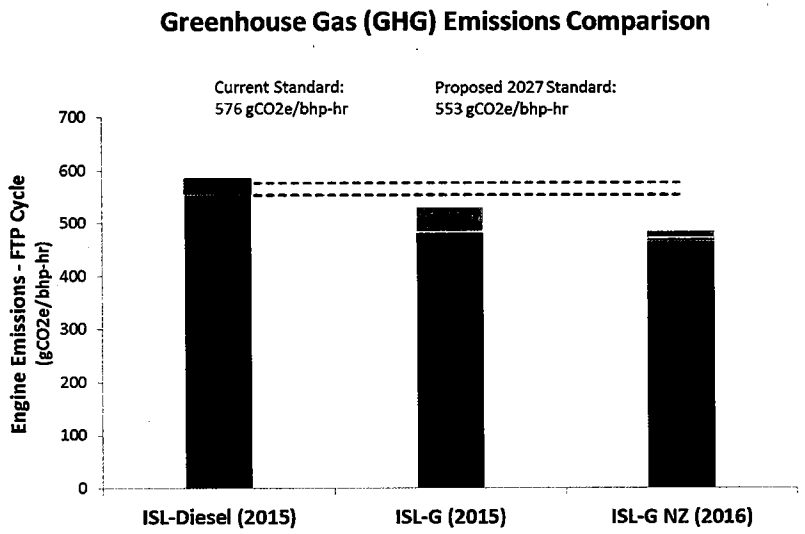
The answer to this question has not been updated to reflect ARB's latest certification data for the 2016 model year (MY) CWI 8.9 liter CNG/LNG engine as discussed above. SoCalGas is not aware of a comparable 2016 certified diesel engine. The comparable MY2015 diesel engine is certified at 0.14 grams NOx/bhp-hr versus 0.01 grams NOx/bhp-hr for the MY2016 CWI 8.9 liter CNG/LNG engine. The new CWI 8.9 liter CNG/LNG engine demonstrates a 95% reduction in NOx emissions compared to the current 0.20 grams NOx standard and a 93% reduction in NOx compared to the latest diesel engine technology as illustrated in Figures 1 and 2 below. This engine is pioneering a new class of heavy-duty engines that achieve near-zero emissions meaning they emit at or below the NOx levels of modern electric power-plants. Aside from NOx emissions, the new CWI 8.9 liter CNG/LNG engine is certified at 16 % below the current Phase I GHG standard for medium-heavy duty engines and 12% below EPA's proposed 2027 Phase II GHG standard. The CWI 8.9 liter CNG/LNG engine is labeled as ISL-G NG in the figures below.

Figure 1 - NOx Emission Comparison



Source: US EPA Certification data for 2015 ISL-G, 2015 ISL-Diesel, and 2016 ISL-G NZ engines for MHHD service class

Figure 2 - GHG Emissions Comparison



Cummins ISL-G "NZ"

- ✓ **Over 17% lower GHG emissions than 2015 diesel**
- ✓ 70% Reduction in methane emissions compared to 2015 natural gas engines
- ✓ Already 16% below the current GHG standard for MHHD engines
- ✓ ***Already 12% below the proposed 2027 GHG standard for MHHD engines***

Source: US EPA GHG Certification data for 2015 ISL-G, 2015 ISL-Diesel, and 2016 ISL-G NZ engines for MHHD service class

In the answer to this question, ARB states that "NOx certification levels for the latest diesel engines are 10 percent to 60 percent below the standard," (page ES-4). SoCalGas requests that ARB provide specific information documenting these stated NOx certification levels, as we are unaware of a diesel engine certified to 0.08 grams NOx/bhp-hr, which is 60 percent below the 2010 NOx standard.

The reference for Figure ES-1 (ARB 2014c), In-Use Running Exhaust Emissions Diesel, Diesel Hybrid, and Natural Gas Trucks (Page ES-5), is a slide with summary report data. In the interest of completeness, SoCalGas provides in our appendix (list on page 12) the actual reports on which Figure ES-1 is based. These are the University of West Virginia and University of California, Riverside final reports prepared for the SCAQMD.[13] To address questions raised regarding sample size, test cycles, and test vehicles for these studies, SCAQMD with partnership funding (CEC and SoCalGas) is preparing a request for proposal for $3.5 to $4 million to test over 100 heavy-duty vehicles across various vocations and duty-cycles in "real world" on-road conditions (On-Road Heavy-Duty Vehicle In-Use Emissions and Fuel Usage Profile Study). SoCalGas will share with ARB the results of this study when it is completed.

While SoCalGas does not disagree with the conclusion in the second paragraph in the answer, we suggest that it be updated as it states, "[S]taff believes natural gas engines are likely to be certified to today's optional low-NOx emission standards sooner than will diesel engines." (Page ES-4.) As discussed previously, not only has a natural gas engine been certified to one of ARB's optional low-NOx emission standards, it meets the lowest of the three optional standards with emissions certified 90% below the current heavy-duty engine standard of 0.2 grams NOx per brake horsepower hour. In fact, while the standard is set at 0.02 grams NOx/bhp-hr, the new engine was certified at 0.01 grams NOx/bhp-hr, which we understand is the cleanest heavy-duty engine ever certified.

The comments above also apply to the NOx emissions discussion in section VI.A on page VI-1.

D. Question and answer starting on page ES-5 – How do well-to-wheel GHG emissions for natural gas powered trucks compare to those powered in other ways?

It appears that ARB has drawn conclusions from a report that have not been publically released and undergone public review. On Page ES-6, "ARB is developing a separate fuels technology assessment that will evaluate overall well-to-wheel GHG missions from various transportation fuels. Preliminary results from that assessment indicate that natural gas powered trucks using conventional natural gas are expected to have higher well-to-wheel GHG emissions than electric and fuel cell vehicles...." We believe it is essential for ARB to complete, release, and provide opportunities for public comment on technology assessments before using preliminary results in other related assessments. Alternatively, ARB could use previously reviewed and publicly vetted information, such as approved Low-Carbon Fuel Standard ("LCFS") documents, to support its conclusions.

SoCalGas requests that ARB include a discussion of how the new CWI CNG/LNG engine with its Closed Crankcase Ventilation using renewable natural gas ("RNG") can deliver deep GHG

[13] http://www.aqmd.gov/docs/default-source/technology-research/clean-fuels-program/clean-fuels-program-advisory-group---january-29-2015/truck-in-use-emission-testing-results---adewale-oshinuga.pdf?sfvrsn=7

emissions reductions. RNG is proven under ARB's LCFS program to actually have the capability of being carbon negative.[14] This means that taking into account all the energy used and carbon emissions from gas recovery, processing, transportation and distribution and fuel compression at the fueling station, the net is ***removal*** of carbon from the atmosphere. There is no other transportation fuel, including electricity, currently listed with a physical pathway on ARB's LCFS website that has the same negative net carbon-benefit.

In fact, heavy-duty NG vehicles running on RNG will produce fewer GHG emissions than either heavy-duty electric or fuel cell vehicles, when accounting for emissions associated with generating electricity or producing hydrogen. The increased use of RNG produced from sources such as landfills, dairies, and wastewater treatment plants will allow natural gas vehicles to provide significant well-to-wheel GHG emission benefits. The transportation sector can be an important catalyst for building an RNG market. As previously noted, the LCFS identifies RNG from existing organic sources as the lowest carbon-intensity standard pathway available, even lower than hydrogen. Today, due largely to this AB 32 program, RNG is being used to great effect in California in the transportation sector. For example, Waste Management uses RNG produced at its Altamont Landfill and Resource Recovery Facility to fuel its regional waste hauling fleet. Clean Energy Fuels offers RNG at their CNG and LNG fueling stations throughout California. A review of the LCFS reporting tool[15] shows that RNG, as a percentage of total natural gas used in the transportation sector, has increased dramatically in the past year.

Support for low-emission heavy-duty natural gas vehicles is key to both reducing criteria pollutants and furthering the development of an RNG market. ARB should consider the strategy of reducing emissions by investing in natural-gas transportation technologies and fueling infrastructure with the co-benefit of substantial NOx emission reductions. The recently released Draft Short-Lived Climate Pollutant Reduction Strategy depends on the capture of methane and its delivery as an energy resource, which creates market pull for the development of RNG to displace traditional natural gas.

The comments above also apply to the GHG emissions discussion in section VI.B on page VI-2.

E. <u>Question and answer starting on page ES-6 – What advanced natural gas engine technologies were assessed?</u>

SoCalGas suggests ARB include an evaluation of the following additional technologies: variable valve timing, different engine cycles (Miller and Atkinson), high-frequency ignition systems, pre-chamber spark ignition, homogenous-charge compression ignition, waste heat recovery, and emissions treatments such as lean NOx trap and steam/water injection. SoCalGas has research and development personnel who can share and discuss more information on these technologies.

[14] http://www.arb.ca.gov/fuels/lcfs/reportingtool/registeredfacilityinfo.htm
[15] http://www.arb.ca.gov/fuels/lcfs/reportingtool/registeredfacilityinfo.htm

F. Second Question and answer starting on page ES-7 – What is the current state of natural gas fueling infrastructure in the United States?

SoCalGas appreciates the information provided on CEC and SCAQMD funding for natural-gas fueling infrastructure, but it is not a complete list for the whole state. For example, in December 2013, the SJVAPCD awarded $5 million for natural gas fueling infrastructure under their Public Benefit Grant Program.[16] In addition, the federal Congestion Mitigation and Air Quality ("CMAQ") program[17] funds alternative fuel infrastructure. In 2014, SoCalGas reviewed projects under California's 2011-2012 CMAQ funding allocations and found 19 new or expanded CNG/LNG infrastructure projects. To be truly comprehensive, SoCalGas suggests that ARB include all California air district and other local federal, state and funding opportunities.

G. Question and answer starting on page ES9- – How do current heavy-duty natural gas truck purchase and operational costs compare to those for diesel trucks?

SoCalGas believes the range of cost difference between diesel and natural gas vehicles in the NG-Alt Fuel HD Engine Tech Assessment is too high. In ARB's May 2015 Advanced Clean Transit Discussion Document, the incremental cost of a natural gas transit bus over a diesel bus is stated as $40,000 (Transit Bus Natural Gas: $525,000 and Transit Bus Diesel: $485,000). CWI, in their Natural Gas 201: Delivering Options, Westport 2014[18], states that the incremental cost of a natural gas truck over a diesel truck is $50,000. SoCalGas requests ARB provide references for the top of the cost range ($80,000) in the NG-Alt fuel HD Engine Tech Assessment.

SoCalGas agrees with ARB's statement, "[N]atural gas vehicles tend to have overall operational cost that are lower than for diesel vehicles" (page ES-9), although we believe that the overall operational cost does not just tend to be lower, they are lower. Validating documentation for this can be found in "The Future of Natural Gas Engines in Heavy Duty Trucks: The Diesel of Tomorrow?"[19], ACT Research, 2013, that states, "Under reasonable assumptions, a natural gas vehicle can have fuel savings of about $20,000 per year driving 100,000 miles over a five year trade cycle with a 6 mpg diesel fuel economy, assuming $1.00 fuel savings for 20,000 DGE per year with a vehicle up-charge of $20-$50K." Thus, even with a vehicle cost differential of $50,000, operators start saving right away.

H. Second question and answer starting on page ES-11 – What research and development work is underway to develop a lower NOx engine with no GHG disbenefit?

SoCalGas appreciates the discussion of our partnership project with the CEC and SCAQMD, and we have provided additional information on the extension of that project above. As discussed above, the new CWI 8.9 liter CNG/LNG near-zero Emission engine has been equipped with Closed Crankcase Ventilation that minimize methane exhaust to atmosphere reducing GHG by 15 percent. In addition, The Gas Technology Institute project is significant, because it aims to keep exhaust ammonia ("NH_3") emissions as low as achievable while targeting average NH_3

[16] See personal communication in letter appendix.
[17] http://www.dot.ca.gov/hq/transprog/federal/cmaq/cmaq-summary.pdf
[18] [1] http://www.westport.com/file_library/files/webinar/2014-07-10_NaturalGas201Webinar.pdf
[19] [2] http://www.actresearch.net/wp-content/uploads/2013/04/ACT_NGP.pdf

emissions at 10 parts per million or lower. The projected engine certification and field demonstration is early 2017.

SoCalGas notes that SCAQMD has other research and development projects that target GHG emission reductions especially using RNG. An example of these is a contract to co-sponsor a study on "Opportunities and Benefits of Deploying Next Generation Heavy-Duty Natural Gas Vehicles Operating on Renewable Natural Gas."[20] Additionally, other state agencies beside ARB are administering GHG Reduction Funds ("GGRF") such as the California Department of Food and Agriculture that recently announced awards of approximately $11 million for RNG production from diary digesters[21]. While not all of this new RNG may be used as transportation fuel, ARB should consider evaluation of other state agency GGRF to evaluate if there is applicability to heavy-duty gaseous fueled vehicles.

III. Conclusion

SoCalGas is looking forward to continue working with ARB and other stakeholders on further development of this NG Tech Assessment and the others ARB is working to develop. Thank you for your time and attention and please contact me with any questions or concerns with these comments.

Sincerely,

Jerilyn López Mendoza
Program Manager
Environmental Affairs

[20] http://www.aqmd.gov/docs/default-source/Agendas/Technology/10-16-15_tech-cmte-agenda.pdf?sfvrsn=6
[21] https://www.cdfa.ca.gov/egov/Press_Releases/Press_Release.asp?PRnum=15-032

List of documents included in electronic attachments:

1. Center for Alternative Fuels, Engines, & Emissions Final Report July 2, 2014: In-Use Emissions Testing and Demonstration of Retrofit Technology for Control of On-Road Heavy-Duty Engines
2. University of California, Riverside, and Bourns College of Engineering-Center for Environmental Research and Technology (CE-CERT) Report July 29, 2014: In-Use Emissions Testing and Demonstration of Retrofit Technology for Control of On-Road Heavy-Duty Engines
3. 2011 California Truck Inventory and Impact Study
4. NGVAmerica Facts about NGVs plus OEMs and conversion companies (accessed 10-26-15)
5. Personal communication with A-1 Alternative Fuel Systems (10-27-15)
6. CNG Conversion Companies from alternativefuels.about.com (accessed 10-26-15)
7. NGVAmerica Certified Approved Conversions HD-Engines, dated 1-1-2015
8. ARB Certified Engine and Emission Control System Manufacturers for 2011 and later CNG/LNG heavy-duty engines (compiled on 10-23-15 from ARB online certification database)
9. July 2014 CalHeat NGV Roadmap