May 21, 2018

Mr. Peter Christensen
California Air Resources Board
1001 I Street
Sacramento, CA 95814

RE: Western Propane Gas Association Comments Regarding CARB's Proposed VW Settlement Incentive Program

Dear Mr. Christensen:

Please accept these comments on behalf of the Western Propane Gas Association (WPGA) and its members who provide propane fuel, products, and services supporting low-emission vehicle and transportation initiatives across California. Propane provides a lower emission vehicle option[1] for California school buses, airport shuttles, and public transit buses, particularly in rural areas without access to alternative-fuel low-emission options or with vehicle duty cycles and environmental conditions exceeding the practical and technical limits of current and anticipated next-generation fully-electric heavy-duty (≥14,000 lb. GVWR) vehicles (HDV).

As a matter of fairness to rural citizens and school children whose air quality interests are not adequately represented in CARB's latest VW Settlement incentive program guidance, and as a strategy with the use of ultra-low emitting or near-zero alternatively-fueled HDVs in communities where electric vehicles simply cannot perform reliably or cost-effectively, we again request inclusion of a provision within the VW Settlement Funding program to provide incentive support for non-electric, CARB-certified ultra-low emitting heavy-duty propane vehicles.

As you are likely aware 85% of California's land mass is rural with communities and school students often having little or no access to low-emission alternative fuels and vehicle options routinely available in urban areas. While electric heavy-duty vehicles may[2] make cost-effective sense for urban applications, they are simply not yet capable of reliably handling bus duty cycles involving longer rural route distances, steeper road grades, and temperature extremes (cold winters and/or hot summers) typical of rural, mountainous, and desert locales. Providing a viable lower-emitting heavy-duty vehicle option in the VW Settlement incentive program for residents and students in the 85% rural proportion of the State will act not solely to reduce bus-related emissions that will otherwise occur but will embrace CARB's

[1] The CARB-certified Roush-Ford commercial propane truck and bus option is currently CARB-certified at .05 g/bhp-hr NOx, fully 75% below the current onroad HDV standard, and Roush expects CARB certification of their "near-zero" propane engine within a few months. Near-zero HDVs operate with lifecycle emissions approaching or achieving equivalency with EV lifecycle emissions.

[2] See LA Times article of May 20, 2018 titled "Bumpy Ride for Region's Electric-Bus Campaign", identifying numerous electric transit bus operational flaws, budget overruns, and the potential for related political graft, in the Los Angeles region's commitment to EV transit buses.

commitment to ensuring incentive program operational parity and fairness across all of the State's many, varied regions and populations.

I. WPGA Concerns for VW Settlement Incentive Program Project Cost-Effectiveness Criteria

Based on readily available new HDV vehicle cost information and emission rates, new propane school buses possess approximately 65% greater NOx cost-effectiveness when compared to electric school buses set for funding with your Program's incentives. What this means is that for every dollar invested by CARB in EV school buses—which are likely to perform relatively poorly in rural settings with temperature and weather extremes, routinely longer route distances, and steeper roads--three times more NOx would be reduced had the same dollar been invested in new, CARB-certified ultra-low emitting propane school buses.[3]

While it is clear that CARB is pursuing a behavioral change involving HDV choice by limiting VW Settlement incentives to electric-only buses, your current program's guidance effectively precludes any opportunity for the far more cost-effective emissions reductions of ultra-low emitting HDVs (with IC engine power). Also it ignores a critical perception that current-generation EV HDVs make little sense in rural environments that daily will force operation on steep grades, on longer-distance routes (that will prevent or greatly limit opportunity charging), and during winter and summer temperature extremes.

If some significant percentage of EV HDVs, designed and operating almost entirely in largely urban, coastal, densely-populated settings, have been both expensive and poor performers (as exemplified numerous times in California over the last 25 years), it makes little sense to incentivize EV HDVs for use in much more rigorous rural settings until substantial technical and cost improvements in the "state of the art", latest generation electric vehicles have been accomplished. We believe it is highly probable that the great majority of new, current-generation HDV EV buses incentivized through the VW Settlement program will not perform capably and reliably over time in rural areas with tougher duty-cycle requirements. While we recognize the technology-forcing benefits sought by CARB's funding limited to electric-only buses, CARB must provide a portion of VW Settlement funds for non-electric, ultra-low emitting vehicles to accomplish its emission reductions objectives affecting California's rural residents and school children.

II. VW Settlement Program Misses the Mark for NOx and GHG Reductions; **Non-electric heavy duty vehicles using conventional and/or renewable propane cost-effectively reduce NOx and GHG emissions, yet have been excluded for incentive funding.**

As noted in discussions with CARB staff and in written communications, WPGA anticipates inclusion of renewable propane ("RP") in the LCFS in the months ahead. Once this has occurred, RP credits will be available to refiners for production, and the fuel (RP typically results as a refinery by-product of renewable diesel production) will then be marketed for use in California propane vehicle fleets.

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[3] Assumes $95,000 for new LPG bus vs. $300,000 for new EV bus; NOx cost-effectiveness for propane bus calculated at $177/lb vs. $506/lb for EV bus. CARB's Rural School Bus Pilot Project provided $400,000 per EV bus, and CARB's Proposed Beneficiary Mitigation Plan (VW) at pg. 19 specifies an incentive of $400,000 per battery EV bus or fuel cell electric bus; at $400,000 per EV bus, the propane bus option reflects about four times the cost-effective per pound of NOx reduced. LPG bus CARB-certified ultra-low NOx rate of .05 g/bph—hr currently available, with mfr. scheduled to obtain "near-zero" certification in Q3-2018.

Under an HDV scenario using RP, a near-zero propane school bus would reflect a carbon intensity value in the high 30's, with the vehicle's total lifecycle emissions reduced to levels very near that of the far more costly electric school bus. Even with use of conventional propane[4], the near-zero bus option will readily and cost-effectively satisfy the VW Settlement's primary objective of reducing heavy-duty vehicle NOx emission, along with reducing carbon emissions by around 20% over the industry's mainstay gasoline school bus.[5]

III. CARB EV HDV School Bus Case Study Is Not Representative of Rural California Operating Conditions

In CARB's School Bus Fleet Seminar presented on April 20th of this year, limited case-study information was provided regarding the use of electric school buses funded with CARB incentives in two Sacramento-regional school districts. The Rescue Union School District is the more rural of the two, operating in the eastern suburban foothills of the Sacramento region and within El Dorado County. No information was provided in the Seminar's Case Study acknowledging or detailing bus routes on steep, winding roads that predominate in middle- and upper-Sierran communities. Seasonal temperature ranges were similarly left unaddressed, other than to indicate "smooth, comfortable, quiet AC" in the EV bus.

According to the Seminar, the Rescue EV bus routes were "Rural; Hills; 45 – 55 mph", with routes averaging 30 – 40 miles and involving one run in the morning and one again in the afternoon. The time necessary to complete each average 35-mile route was short enough to allow for full charging of the bus in between morning and afternoon runs.

Importantly, neither of the two case studies presented in the Seminar were consistent with conditions routinely affecting rural school bus routes in CA's low population-density, rural counties. Rural school bus routes often exceed the average 35-mile per-trip distance cited in the Rescue example, precluding the option to charge the vehicle between morning and afternoon routes. Further, road conditions—primarily steeper road grades and weather conditions (e.g. winter snow)--will reduce average speeds to substantially less than the 50 mph average cited in the Rescue example.

Seasonal temperature swings (particularly in winter months) beyond those applicable to the Rescue example are also a routine part of a school bus fleet's challenges in California's rural and mountainous areas. While the Rescue example notes that their EV bus is equipped with air conditioning, its functionality in warmer months of the school year results in substantial battery power drain virtually certain to force full system charging between morning and afternoon routes. Unfortunately, in an important portion of California's non-urban school districts, bus route distances are routinely longer, on steeper roads, and in weather conditions that range in Summer-Fall months from over 100 degrees Farenheit, to winter temperatures that fall below 0 degrees Farenheit. In sum, truly rural school bus routes are not represented in the two case studies cited in the Seminar documents and are very unlikely to be adequately served by electric buses using currently available battery storage and charging technology. Moreover, increased electric power demands caused by rural bus route topography, route distances, and

[4] California propane is a mixture of petroleum refinery and natural gas liquids-derived products, with the majority share coming from natural gas liquids.

[5] Life Cycle Associates; "Life Cycle Analysis of LPG Transportation Fuel Under the Californian LCFS"; pg 68. CA petroleum-derived LPG calculated to contain 83.63 g CO2e/MJ. For natural gas-derived LPG, the value calculated was 81.09 g CO2e/MJ. CA non-renewable propane derives largely from natural gas liquids, and thus the final carbon intensity resides nearer the lower (natural gas-derived) value. In comparison, CA reformulated gasoline (CARBOB) exceeds 101 g CO2e/MJ---nearly 20% greater than traditional CA propane.

seasonal temperature extremes mean that the poor average emission-related cost-effectiveness of the electric school bus will become even worse. Obviously this outcome is not consistent with CARB's essential objective of protecting California citizens' public health and air quality resources.

IV. CARB's Rural School Bus Pilot Program – HDV EV Bus Success or...

Anecdotal information of one school district's experiences with an electric bus funded under the Rural School Bus Pilot Project is likely more indicative (than the Rescue School District case study) of the everyday challenges affecting school districts that daily run EV buses in rural areas or that run exurban-into-rural area routes. Earlier this year, the rural Fall River Unified School District, at 3200' elevation in northeastern Shasta County, received a full-sized electric school bus through CARB's Rural School Bus Pilot Project. The District operates several buses with a travel distance of 162 miles/day.

In addition to range and terrain challenges, such school districts face heating challenges. Districts are heating their buses by non-conventional means before sending buses out each day. Once on the route, the school children are relegated to be the primary (and only) interior-bus conditioned air heat source.

While the electric bus' interior bus heating limitation will hopefully be resolved with a practical, low-emission solution, its range and use limitations—primarily from longer routes, steep mountain roads, and colder winter temperatures---are unlikely to be. In combination, those real-world, everyday influences will significantly reduce absolute reductions of GHGs and criteria pollutants and project cost-effectiveness, yet it appears unlikely that CARB's Rural School Bus Pilot Program has or will account for them[6].

Rural school districts are being incentivezed to purchase electric vehicles that will not fit their needs. To avoid wasteful funding of electric bus placements in marginalized settings, we respectfully ask that CARB identify rural and rural-exurban interface school bus districts whose routes will not practically or cost-effectively accommodate EV performance due to longer travel distances, steep roads, and/or seasonal temperature extremes. In those rural communities located far from California's temperate coastal urban population centers, you will find the proposed electric-only incentives cannot practicably be utilized.

If no option is made available within the Program for those rural districts, many of which are routinely beset with serious financial limitations, it may appear that rural school district children's health is considered less important than their urban counterparts' health. Without offering a non-electric, practicable, low-emission bus option for rural districts which cannot use the electric-only bus option, it may appear to the public that CARB's VW Settlement Incentive Program is biased in favor of urban school districts and students.

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[6] CARB's rural school bus pilot program appears biased to promote EV bus placements, despite 1) increased travel distances, steeper terrain, and more extreme average temperatures often affecting non-urban, non-coastal, more "rural" areas; and 2) substantially poorer cost-effectiveness values for EV vehicles when compared to ultra-low and near-zero emitting buses equipped with an internal combustion engine. In the "Third Selection" of CARB's Pilot Program's February 2018 approved project list of 14 total buses, 11 EV HDV buses (79%) were approved for rural districts while only 3 Hybrid/IC Engine Buses using a renewable fuel (21%) were. See: http://www.ncuaqmd.org/files/RSBPP%20Third%20Selection%202-15-18%20%20for%20web.pdf. Fall River Unified was one of the Districts approved for an EV bus, despite real-world conditions limiting EV HDV vehicle range, performance, and the VW Settlement Incentive Program's emission cost-effectiveness.

V. The VW Settlement Incentive Program Fails to Account for Rural California School District Numbers

No single definition of "rural" exists, yet according to research compiled by the California Legislature's Assembly Committee on Jobs, Economic Develop, and the Economy using 2009-2010 data[7], counties with >80% rural land mass are generally considered rural, and about 5 million, or 13% of CA's population, live in rural counties. Entirely rural counties include Alpine, Mariposa, Sierra, and Trinity. Predominantly rural counties include Plumas, Calaveras, Modoc, Siskiyou, Amador, Lassen, and Mono.

Importantly, an undetermined number of California school districts considered "urban" are in small towns or at the rural-urban interface with school buses operating on winding "country" roads, in steeper topography, and with daily and seasonal temperatures that are hotter and colder than found in coastal, urban regions that contain the majority of California's population—and where EV vehicles make greater sense. Unfortunately, no clear information appears to have been provided by CARB on the number of California school districts or school buses operating in non-coastal, non-urban settings where EV buses will involve duty cycles and environmental conditions far more challenging.

According to the National Center for Education Statistics[8], of California's 944 school districts operating in the 2013-2014 school year, 486 operate in "Towns" and "Rural" settings, with the balance in "City" and "Suburban" settings. Within the "Rural" classification alone are 329 school districts, or roughly one-third of all California school districts. While urban-suburban student numbers substantially overshadow numbers of students in California towns and rural settings, it is nonetheless possible (or probable) that those students have been proportionally under-represented by the manner in which CARB's school bus incentive funds (e.g. the Rural School Bus Pilot Program, VW Settlement Program) have been specifically designed to fund partial-electric or fully-electric buses only while disregarding the far more cost-effective emission reductions obtainable with CARB-certified ultra-low emitting and near-zero IC-engine powered buses.

VI. Conclusion

WPGA provided a presentation to CARB staff, identifying an important number of emission attributes of new, CARB-certified propane buses, including superior cost-effective emission benefits when compared to other types of school buses (including EV), and the 75% NOx reduction (below the current HDV onroad standard) provided with the propane Roush-Bluebird .05 g/bhp-hr bus at no additional bus cost. Our industry now has an ultra-low NOx .02g/bhp-hr on the market, expanding on these NOx reductiton benefits. While we have elected to focus on school buses, it should be noted that these benefits apply to airport shuttle buses, delivery trucks and other propane vehicles. Our industry outlined the case where with renewable propane, the carbon intensity value for propane vehicle is lower than that for electric vehicles.

Honing our focus, providing a practical, cost-effective low-NOx bus option within the VW Settlement incentive program for rural school districts would provide important and equitable protection of their

[7] "Fast Facts on California Rural Communities"; see http://ajed.assembly.ca.gov/sites/ajed.assembly.ca.gov/files/publications/Fast%20Facts%20on%20California%20Rural%20Communities2.pdf

[8] See: https://nces.ed.gov/surveys/ruraled/tables/a.1.a.-1.asp

school children's health consistent with the extensive incentives supporting electric vehicles in urban and suburban areas of the State.

In that meeting you took particular note of the high level of NOx cost-effectiveness provide by the propane Roush-Bluebird ultra-low emitting school bus, particularly as a means to counterbalance antcipated expenditures for more expensive, less cost-effective EV buses (at $300,000 - $400,000 per EV bus, vs. $95,000 - $160,00 per ultra low-emitting propane bus).

CARB's VW Settlement Incentive Program funding must provide for non-electric, ultra-low carbon, emissions-reducing, alternatively-fueled (and renewably fueled) bus projects that will operate regularly and reliably in California's rural regions. Allowing access to program funding for ultra-low carbon, near-zero emitting engines will result in highly cost-effective emission reductions that will otherwise be foregone due to the noted practical limitations of heavy duty electric vehicles in the aggressive duty-cycle rural environments.

Please feel free to contact me to discuss details of this letter and our request to revise your funding program's guidance and requirements.

Sincerely,

Joy Alafia