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October 1, 2014

Todd Sax, D.Env.
Assistant Chief
Mobile Source Control Division
California Air Resources Board
1001 I Street, P.O. Box 2815
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RE: Comments on Technology and Fuels Assessments

Dear Mr. Sax and ARB Mobile Sources Team,

At XL Hybrids we are very appreciative of the efforts of the ARB team in developing a technology and fuels assessment and agree with the basic principles and structures that have been proposed.

As laid out in your presentation, the technology assessment is in 4 areas with details pertinent to informing planning and regulatory efforts for 3 programs: Sustainable Freight Strategy development, State Implementation Plan (SIP) development, and ARB's mobile source control program. These programs are targeting long range reductions of both criteria and GHG emissions.

I attended the September 2nd workshop on trucks and busses and my comments follow.

1. Introduction and Truck Sector Overview Slides

The introduction slides regarding the catalogue of emissions sources within the state of California should be taken one layer further. While it shows both passenger and commercial sectors are significant contributors to mobile emissions; the next layer if presented would show how those emissions are distributed thus providing some guidance as to how much capability we have to control and reduce. I suggest additional slides showing the distribution in terms of number of vehicles, broken down by sector, and VMT per average vehicle with associated emissions. The commercial sector breakdown was covered in the Truck Sector Overview but not in contrast to the passenger sector. The general trend of course is that the commercial sector emissions are much more concentrated in classes of vehicles with smaller populations that drive much higher VMT per vehicle and emit at higher rates. This should indicate that there is a greater opportunity for reducing the emissions in the commercial sector because there are fewer vehicles that need to be improved and there are greater natural business incentives for the fleets that use those vehicles with higher fuel bills. The data in the Sector Overview clearly shows most of the focus should be on Class 2B/3 delivery and service and Class 7/8 OTR, and that the vocational Class 3 to 8 trucks are a much smaller contributor as a group. The one exception to this may be the special case of worksite localized emissions and associated health impacts. I

would like to see this distribution of the emissions by sector, concentration with a population, and ability to cost effectively impact be studied and presented so it can be used to cost effectively plan and implement programs. For example, I'm not sure that the HVIP funds distribution has proportionally gone to the sectors with the greatest emissions. In particular, zero HVIP funds to date have gone to Class 2B and very little to Class 3 which your data shows is a significant contributor.

On Slide 34 you list 16 major powertrain providers; however, XL Hybrids is not on that list and we have delivered more units that are in service now than 6 of the companies on your list combined. In fact, in the last year we have delivered more hybrid commercial vehicles across the U.S. (except for California) than the entire HVIP did in the same period in California.

The other major comment I would make on the Truck Sector Overview is that it does not specifically address the commercial upfit industry. Over the last decade or more 10's of thousands of alternative fueled commercial trucks have been put on the road by the 3rd party upfitter industry using systems developed by less than 10 CNG and LPG providers. Commercial fleets have widely adopted this model that retains the OEM vehicle warranty and provides warranties for the alternative fuel upfit. XL Hybrids entered this market structure in 2013 to offer a hybrid electric upfit following the same model and installed by major upfitters nationwide. This has resulted in fast adoption by commercial fleets because they can buy the OEM vehicles they always have, service them the same, and operate them the same. To take advantage of California's regulatory structure several of the alternative fuel technology providers have obtained both aftermarket EO's and new vehicle certifications, and XL Hybrids expects to do the same. But much of the overview and assessment is more narrowly focused on OEM products, but we strongly suggest widening the assessment to include the upfit, or aftermarket, industry and technology offerings because this is a significant element of the commercial sector.

2. Hybrid Truck Slides

On slide 2, XL Hybrids is absent from the list of powertrain manufacturers, but it is true that up until recently all of our business was in other states. But there are several powertrain providers on the list that are no longer in business or in this sector.

On slides 7 to 12, start/stop is not necessarily a function of a full hybrid. I recommend you account for architectures that provide propulsion assist and regenerative braking without start/stop. This is specifically what you would most commonly see in a post transmission parallel hybrid architecture. And in the large sector of Class 2B/3 delivery and service fleets many of them do not idle large percentages of their fuel usage and derive much greater benefit from propulsion assist. The smaller emissions sector of vocational trucks does typically have higher percentage idling, and travels much fewer miles so start/stop perhaps without propulsion assist may be more cost effective.

While the parallel hybrid is well suited to the rural/intracity vocational trucks it is also well suited to the Class 2B/3 commercial use vans and trucks. But I am not sure this is a broad distinction that can really be drawn because those sectors may also benefit from other

architectures. That bullet point is really more applicable to the propulsion assist and regenerative braking function and not the architecture.

The other key point missing from Slides 7 to 12 is the fault and propulsion power tolerance differences of the two architectures. The parallel architecture can always share load with the gas engine, thus the electric powertrain is not required to have 100% power available 100% of the time. This can have an impact on the design constraints and cost of the system in order to insure the vehicle does not impact fleet operations if using a series architecture. It also has higher stress requirements on the battery system. On the positive side the series hybrid has potential for greater fuel savings in the right drive cycle. I would not say the series hybrid has greater potential for zero emissions; both series and parallel hybrids by their nature of being hybrid will have a gaseous prime mover. The potential for zero emissions is really more driven by deliverable energy from the electric battery.

Another key point in terms of comparing these architectures goes back to the topic of the upfit industry. These architectures require successively more modification to major OEM chassis' and powertrains with the hybrid requiring the least, and the series/parallel hybrid requiring the most. The general trend would be that the parallel hybrid most lends itself to implementation in the upfit industry whereas the others lend themselves more to new OEM solutions using chassis gliders.

In Slides 18-20 covering plug-in hybrids I recommend you make some assessments of the additional value in terms of cost, fuel and emissions savings for PHEV vs. HEV. You can imagine an identical vehicle architecture; one with a larger battery capable of operating in charge depleting mode and recharged via a plug. In the simplest analysis you can take the average electric range in summer and winter and compare the cost of driving those miles paying for the electricity vs. paying for gas running as a charge sustaining hybrid to assess the extra value. There may be additional values for worksite power and multiple recharges per day.

On slide 27 I strongly suggest conducting performance analysis in terms of fuel usage (gallons per mile) and not fuel economy (miles per gallon). What a fleet pays for and what is emitted is driven by the gallons per mile. The public can get very confused by figures of merit expressed in mpg percentages since the dollars and tons saved depend on the baseline mpg, and percentages seem bigger when expressed as mpg (i.e. 100% fuel economy improvement is 50% fuel savings). I would also separate out idle savings (i.e. start/stop) from driving savings (energy recovery and battery propulsion) on this chart.

On slide 28 the last statement about integration seems to indicate a preference for vertically integrated vehicle technology suppliers. There are many beneficial solutions that are not from vertically integrated companies so we hope this does not become constraining in terms of the scope of investigation and planning/regulatory development at ARB. It is well known at this point that the study results showing increased NOx for diesel hybrids were 1) particular to diesels and should not be construed as an issue with gasoline hybrids, and 2) really indicated an issue with how diesel engines are certified. Diesel engines are designed to meet certification standards that are nothing like real world drive cycles and so that is the larger technology assessment issue that should be addressed.

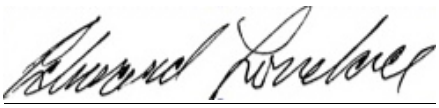
On slides 35-38 this information needs to be updated and studied in much greater detail. XL Hybrids offers a Class 2B hybrid for $10,000 or less before any government incentives. So what NAS projects for 2020 is available right now. Payback is not really tied to years but is tied to miles. Data should be expressed in terms of miles to payback. But another sometimes more important metric to some fleets is lifetime savings or return on asset, so the technology assessment should consider how long different classes of vehicles are kept. Also the NAS payback years seems off by a wide margin. For a $9000 Class 2B with a baseline 12.5 mpg our calculator is 4.7 years payback.

Finally the HVIP is noted on slides 41 to 42. I would just point to the chart I presented at the Board hearing in June 2014 that ARB's incentives programs should be technology agnostic and provide a portfolio response yet for 9 Classes of vehicles and 3 electrification types there is one and one combination that is not supported by ARB programs and that is Class 2B HEVs. This is unfortunate both because it is XL Hybrids current business area but also because Class 2B is a significant emissions source and Class 2B HEVs are not supported by the major OEMs.

	Class 1	Class 2a	Class 2b	Class 3	Class 4	Class 5	Class 6	Class 7	Class 8
HEV	Major OEM	Major OEMs	None	HVIP	HVIP	HVIP	HVIP	HVIP	HVIP
PHEV	CVRP	CVRP /HVIP	HVIP	HVIP	HVIP	HVIP	HVIP	HVIP	HVIP
ZEV	CVRP	CVRP /HVIP	HVIP	HVIP	HVIP	HVIP	HVIP	HVIP	HVIP

We appreciate all the diligence and collaboration that the ARB staff provides and look forward to continuing to work with staff to improve programs and results.

Sincerely,



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