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Ms. Marijke Bekken
California Air Resources Board
1001 I Street
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Submitted Electronically: http://www.arb.ca.gov/lispub/comm2/bcsubform.php?listname=techfuel-reports&comm_period=1

RE: Technology and Fuels Assessment Overview or Sector Reports

UPS is pleased to submit our comments on the California Air Resources Board's Technology and Fuels Assessment Overview and technology sector reports. We have already provided our views to the California Trucking Association (CTA) and the American Trucking Association, of which we are members, so the views that they submitted to you under separate cover generally reflect our positions. However, we want to emphasize certain points and include some that not all their members may share.

UPS compliments you for seeking the views of industry on the underlying technologies and their costs, reliability, range, necessary infrastructure, etc. This should facilitate cooperation as we move into the next phases.

Our attached comments take each technology report and overview separately and we note where we especially agree with CTA and ATA and where UPS takes issue with these reports. We request that you incorporate our views into future updates of your technology reports, and we hope that you regard them as helpful.

Respectfully,

A handwritten signature in black ink, appearing to read "Michael G. Britt, Sr.".

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UPS Comments on CARB Technology and Fuels Assessments Reports

UPS is pleased to comment on the California Air Resources Board's "Technology and Fuels Assessment Reports" These draft reports are the appropriate starting point for evaluating emerging and developing technologies in preparation for any regulatory considerations by the State of California. Our comments will take each technology and fuels assessment individually and we will also draw on the comments of the California Trucking Association (CTA) and the American Trucking Association (ATA). UPS requests that CARB include our views in any future or modified technology and fuels assessments.

UPS is committed to making our network more sustainable and that includes the fuel efficiency and carbon footprint of our truck fleet, which numbers about 100,000 trucks worldwide. At the end of 2015, our alternative fuels and advanced technology fleet for small package delivery, which we call our "rolling laboratory," numbered just shy of 8,000 vehicles.

Our company was pleased to join at the White House 12 other firms, among the largest companies from across the American economy, on July 27, 2015, in launching the American Business Act on Climate Pledge. UPS was the only company from our business sector to do so then.

UPS was recently recognized with the prestigious EPA Truck Carrier 2015 SmartWay Excellence Award. It recognizes exceptional achievement among EPA SmartWay partners. The 2015 award assessments are based on environmental performance, as demonstrated by partner data submissions with the SmartWay freight assessment and carbon tracking tools, and on other leadership criteria.

UPS is a global leader in logistics, offering a broad range of solutions including transporting packages and freight; facilitating international trade, and deploying advanced technology to more efficiently manage the world of business. UPS is committed to operating more sustainably – for customers, the environment and the communities we serve around the world. Headquartered in Atlanta, UPS serves more than 220 countries and territories worldwide.

Draft Heavy Duty Technology and Fuels Assessment Overview

Neither the CTA nor the ATA commented on this technology report, but UPS offers some observations. We note that some of the list prices and incremental costs of the trucks described in this draft overview are less expensive than our recent direct experience. Specifically:

- The electric belt loader portrayed in Figure 6 of page 9 of this overview is described as costing \$57,000, around \$5,000 more than a conventional, internal combustion-powered belt loader, UPS is unable to purchase a belt loader at this price. Instead, the electric loader costs us about \$62,000, or \$10,000 more than a conventional belt loader.
- On page 10 of this overview, the price of an electric baggage tug is reported at \$42,000. UPS's experience is that a suitable electric tug costs \$59,000, which is \$19,000 more than a conventional tug.

- On page 11 of this overview, Figure 11 portrays a UPS battery electric EV1 delivery truck. The text of the overview indicates that the current incremental cost for this truck is \$80,000 – \$90,000 more than its diesel counterpart. In fact, the current list price for this EV1 is \$179,000. For a BYD Electric Vehicle Manufacturing (BYD) 145 KWR truck the list price is \$200,000, while we pay about \$52,000 for a gasoline powered truck, so the incremental cost of the BYD is \$148,000, plus an additional 7% tax on the incremental price for a true incremental cost of \$151,000 per truck.

Draft Technology Assessment: Medium and Heavy Duty Battery Electric Trucks and Buses

With respect to this report, UPS generally supports the comments of CTA and the ATA that appear in their letter of comments on this report. We would add:

- With respect to the last paragraph of page ES-5 of the draft report, regarding the cost of a BEV charger, the draft report says a charger can range in cost from \$1,000 to \$350,000. We agree with the CTA/ATA comments that medium and heavy duty BEVs will require more power than is provided by AC Level 1 charging. UPS would add the following additional comment:

The current cost to provide 1772 compliant, electric vehicle service equipment chargers, for medium duty trucks is \$18,000 each. The latest charging system that UPS is using is made for charging light electric buses. These systems take less time to charge our vehicles, so we may be able to use 1 charger for 2 or 3 vehicles. However they cost \$52,500 each to install. UPS will need this size system for a large majority of our trucks and routes. Specifically, we need the 145 kwhr BYD medium bus systems to gain parity with our gasoline fleet in terms of miles of range and duty cycle.

- With respect to the comment on page I-2 of the draft report, “In the medium and heavy duty arena, diesel fueled engines are commonly used,” we agree with CTA/ATA that the conventional option for medium-duty electric trucks is more gasoline, than diesel. UPS notes that since 2009, UPS alone has shifted 25,000 of its class 6 trucks to gasoline instead of diesel. The maintenance requirements of these diesel emission control systems forced truck owners to operate outside their normal duty cycle for no reason other than to meet the needs of the emissions control system. The added cost and maintenance nightmares have led truck owners to shift to gasoline engines and the low gasoline prices today only accentuate this shift.
- The comments of CTA and ATA, taken from their comments on this draft report, on the cost of CFC-funded electric delivery vans, are in fact taken from UPS’s experience.

Draft Technology Assessment: Medium and Heavy Duty Fuel Cell Electric Vehicles (FCEV)

UPS generally agrees with the CTA and ATA comments contained in their letter on this draft report, but we add the following additional comments:

- With respect to the material on page ES-3 regarding fuel cell electric vehicles in the medium duty cycle, UPS is currently involved in a FCEV project with the U.S. Department of Energy. Based on our system modeling, we believe that the fuel cell will become the best option for the delivery vehicle vocation. However, we will need more research and technology demonstration funding to fully deploy this technology. The fueling infrastructure issues need resolution in parallel with the vehicle development.
- On page III-1 on Light-Duty Fueling Infrastructure. UPS is very much interested in deploying hydrogen-powered fuel cell trucks, but we would require on-site hydrogen fueling capability because of the nature of our hub and spoke operations. We would consider offering public access to each of our hydrogen fueling locations. Small reformers to generate hydrogen range in cost from \$1.5 million to \$2.5 million depending on the vehicles' duty cycles. UPS would also like to explore renewable natural gas as the energy source for these hydrogen generation/refueling stations.

Draft Technology Assessment: Heavy Duty Hybrid Vehicles

UPS has considerable experience with what this draft report defines as “heavy-duty hybrid vehicles,” as we have about 380 electric hybrid package delivery vehicles in our fleet (as well as about 40 hydraulic hybrids). We generally concur with the comments of the CTA and the ATA. We certainly agree that government financial incentives were, and continue to be, critical in UPS’s decision to deploy what we have done to date and will do in the future.

UPS disagrees with one assertion in this draft report regarding the state of readiness of hybrid technology for parcel delivery vehicles. On page ES-4, table ES-1 Summary of Hybrid Deployments and Technology Readiness, the chart describes the technology readiness as “Commercially Available.” And the chart notes that the parcel delivery duty cycle is “ideal duty cycle for hybrids.” UPS’s experience is that the average fuel economy savings with the current 380 hybrid electric vehicles we operate is about 30%. Compared to a conventional delivery truck, the upcharge for the hybrid electric system without grants is \$55,000 per vehicle. The fuel economy payback on these existing units at \$3.00 a gallon for fuel is well over 20 years, hardly an economically attractive prospect. Note that the hybrid electric system in these vehicles generally operates to achieve “launch assist.”

In contrast, however, we believe that an electric vehicle with a small fuel-powered generator on-board to recharge the batteries en route, as needed, is the best path for reducing emissions and achieving a product with a 5-year return on investment. Further, we can also “geo-fence” this type of hybrid vehicle to produce zero tailpipe emissions in areas that government designates as especially vulnerable to pollution (“underprivileged”). That is, the vehicle’s software knows its geographical location and can restrict the generator from operating in certain proscribed areas to ensure zero emissions in those sensitive areas. UPS recommends funding for development of the

latter technology instead of the traditional, launch assist technology that is currently deployed.

Draft Technology Assessment: Engine/Powerplant and Drivetrain Optimization and Vehicle Efficiency

- **Warranty and maintenance issues with new truck technologies and the shift away from diesel with attendant loss in engine efficiency**

UPS emphatically agrees with the CTA/ATA comments about the problems with warranties and maintenance of new technologies introduced into trucks, especially with respect to diesel emissions controls. The prime example from the past of such premature deployment is the emissions control after-treatment technology present on diesel trucks today, both medium and heavy. Its cost, difficulty in service and in maintenance, and lack of customization all have discouraged the use of diesel engines and shifted trucking toward the spark-ignited, Otto cycle engine. The latter, is substantially less thermodynamically efficient than the compression-ignition engine. The dual-fuel diesel/LNG class 8 tractor that UPS has run in service since 2002, has disappeared from the market, replaced with a spark-ignited LNG engine that is significantly less efficient than its predecessor. This translates directly into enhanced carbon emissions, as compared to a compression engine. We believe a large part of this shift to the spark ignition engine was due to the unavailability of diesel emission after-treatment systems that are tailored to that dual-fuel application. We see the consequences in our fleet's fuel consumption and carbon emissions.

The situation with medium delivery trucks is even worse. One need only look at the number of such trucks that have shifted away from diesel, to gasoline. Since 2009, UPS alone has shifted 25,000 of its class 6 trucks to gasoline instead of diesel. The maintenance requirements of these emission control systems forced truck owners to operate outside their normal duty cycle for no reason other than to meet the needs of the emissions control system. The added cost and maintenance nightmares have led truck owners to shift to gasoline engines and the low gasoline prices today only accelerate this shift. We believe that the attendant loss in engine efficiency and increase in carbon emissions is largely unaddressed in proposed federal efficiency and emissions regulations.

This phenomenon is completely unaddressed by the CARB technology assessment reports, and indeed what any consequent regulations that California might impose to address carbon emissions would only add to the environmental benefits of a shift back to efficient diesel engines. UPS has raised this issue to the U.S. Department of Energy and our suppliers. In short, we need a better mousetrap to clean diesel emissions more cheaply and conveniently. Our fear is that the engineering talent needed for such an improvement in emissions after-treatment will instead chase the next premature technology, very likely, we believe under federal regulation, the exhaust heat recovery system that is not commercially available today.

- **Aerodynamics:** On page III-8, Table III-6, the draft report addresses Engine Technologies and Vehicle Efficiency Technologies and projects that aerodynamics can provide a 4-6% improvement in FCR benefit from a 2010 baseline. UPS would emphasize here that delivery vehicles in our experience average only 24 miles per hour during the full duty cycle of the day. Consequently, we believe that aerodynamics will have virtually no FCR benefits and will simply add cost to the vehicle and necessitate extra maintenance.
- **Low-Rolling Resistance Tires (Page A-35)**

UPS fully agrees with the CTA/ATA comments on low-rolling resistance tires and would note that our particular concern focuses on Class 6 tires. We approve taking weight out of the tread, but not from the tire casing. For emphasis, here below is what CTA/ATA said in their comments, which we repeat, as it reflects our experience:

“Tire rolling resistance must be tailored to each vehicle subcategory. This especially holds true with respect to Class 4-6 vocational vehicles. SmartWay tire verification focuses on in-use highway applications – not vocational operations. Class 6 tires currently have a heavy-rub band on the sidewall to prevent sidewall damage largely caused by excessive scrubbing against curbs during urbanized hauls. Thicker sidewalls help maintain casing integrity and affords fleets the ability to get close to four subsequent retreads. LLRTs typically do-away with thicker side bands to lower tire weight (in the range of 30%) and get better fuel economy test track results. Unfortunately, fleets do not deliver goods on test tracks and even the best drivers have contact with curbs throughout their delivery schedules.

“Further reducing tire rolling resistance can result in the trade-off of shorter useful lives and fewer retread opportunities. It takes 23 gallons of oil to manufacture a new tire and only 8 gallons to retread – a statistic that cannot be ignored in undertaking both carbon and fuel use analyses. If better tire rolling resistance levels can in fact be achieved while maintaining heavy-rub bands needed for greater casing integrity and durability, both CTA and ATA would be in a better position to support vocational tire requirements.

“Finally, many vocational applications need to go off-road at construction sites, mining operations, landfills, and similar locales. LLRTs do not satisfy customer needs for adequate traction in these environments. CTA and ATA request that CARB ensure the independent study of new LLRT’s in advance of their entry into the marketplace to assess safety, traction, and availability.”

Automatic Tire Inflation Systems

UPS fully supports the CTA and ATA position, repeated below from their comments, because they reflect our experience. UPS prefers tire pressure monitoring systems (TPMS) over

automatic systems because we are alerted that there is a problem that we can fix. UPS makes heavy use of telematics and the TPMS is compatible with telematics.

“P. A-37: The assessment only discusses the use of automatic tire inflation systems (“ATIS”). Tire pressure monitoring systems (“TPMS”) provide similar benefits but at a lower cost. A recent study on truck and tire inflation systems indicates that both ATIS and TPMS are being utilized in fleet operations. As of 2012, approximately 33% and 10% of surveyed fleets utilize ATIS and TPMS respectively on their trailers.¹ Roughly 1% of tractors used ATIS. Operators are well aware of the increased fuel consumption, maintenance costs, downtime, and safety concerns associated with operating heavy-duty vehicle with under-inflated tires. These concerns over time have been significant given the historic volatility of diesel prices, the competitive nature of the industry, shipper pressures to reduce costs, and the rising costs of liability.

“TPMS tends to be overlooked since they require user interaction to inflate tires to appropriate pressures. A misguided assumption is that drivers “may” continue to operate a vehicle with underinflated tires. However, in light of continual pressures on fleets to reduce total costs of operation in order to remain competitive and profitable, TPMS is a viable technology option. In fact, the Federal Motor Carrier Safety Administration published the results of a field test of TPMS and ATIS on two fleets that were considered to have good tire maintenance.² The test revealed that both TPMS and ATIS delivered a 1.4% improvement in fuel economy.

“Today, TPMS is much more advanced than the first generation of TPMS that was tested by FMCSA which just delivers alerts to the driver in the cab through an in-cab display. Second generation TPMS (TPMS 2.0 systems) are integrated with telematics and GPS so that the tire data and alerts are sent from vehicles and delivered to a fleet’s operations and maintenance department. By providing the fleet with the location and visibility of its tire problems, dispatch can provide instructions to the driver to handle developing tire problems immediately and maintenance is aware of the exact nature of these issues when the vehicle arrives at the fleet’s location. With the reports these systems provide the fleet, problem tires are attended to before the vehicle sets out on its next trip, thereby dramatically reducing in-route breakdowns and optimizing the percentage of time tires are run properly inflated. In essence, a fleet is able to build its entire tire maintenance program around this technology and drastically improve its ongoing tire inflation maintenance. Therefore this technology has an even greater effect on fuel consumption and greenhouse gas emissions than the TPMS 1.0 systems which were proven to deliver 1.4% improvement in fuel economy by the FMCSA. As a result, the assessment should include TPMS as a technology option.”

¹ North American Council for Freight Efficiency, *Tire Pressure Systems Confidence Report* (August 2013).

² Brady, Stephen; Van Order, Deborah; Sharp, Asa, *Advanced Sensors and Applications: Commercial Motor Vehicle Tire Pressure Monitoring and Maintenance*, U.S. Department of Transportation, Federal Motor Carrier Safety Administration (February 2014).

Draft Technology Assessment: Low-Emission Natural Gas and Other Alternative Fuel Heavy-Duty Engines

UPS agrees with the CTA/ATA comments, in their letter on this report, on the need for financial incentives to buy down the higher incremental costs of natural gas engines. We also agree on the need to incentivize the purchase of trucks that use renewable natural gas.

With respect to the assumed carbon reduction from using natural gas as a truck fuel in very low NOx engines, it is important to note that all these engines appear to be spark-ignited, not compression engines, and so any shift to these engines from diesel as a baseline will likely result in significant increases in carbon emissions because of the reduced thermodynamic efficiency of spark-ignited engines compared to compression engines.

A Cautionary Note, Looking Forward:

Although this is not a comment on current technology, UPS would simply note the importance of California not creating a tilted playing field among competitors. This is especially true if the State seeks to accelerate, faster than would otherwise occur, deployment of expensive new technology to improve efficiency and reduce emissions in medium and heavy duty trucking. If there are major competitors of UPS who operate large fleets of vehicles within the State, but lie outside the regulatory reach of the State, e.g., federal entities such as the Postal Service, then this puts private competitors such as UPS in a very difficult position, as the margins in our business are razor thin anyway. This would also make financial incentives all the more important.