2nd Transit Agency Subcommittee (TAS) Meeting Summary
February 9, 2016, 10:00 a.m. to 1:00 p.m.
Cal/EPA Headquarters, Sierra Hearing Room,
1001 I Street, Sacramento, California 95814

Attendees

Last Name	First Name	Company
Barfjani	Shirin	Air Resources Board (ARB)
Brasil	Tony	ARB
Chow	Yachun	ARB
Cooney	Sharon	San Diego Metropolitan Transit System (SD MTS)
Curry	Don	North County Transit District
DeMartino	Donna	San Joaquin Regional Transit
Douwes	Arthur	Santa Clara Valley Transportation Authority
Drayton	John	Los Angeles County Metropolitan Transportation Authority (LA Metro)
Engel	Len	Antelope Valley Transit Authority (AVTA)
Essner	Kristin	Orange County Transportation Authority (OCTA)
Hursh	Mike	Alameda-Contra Costa Transit District (AC Transit)
Jablonski	Paul	SD MTS
Kitowski	Jack	ARB
Lee	Jennifer	ARB
Miller	Steve	Golden Gate Transit
Papson	Andrew	Foothill Transit
Pimentel	Michael	California Transit Association (CTA)
Ramacier	Rick	Central Contra Costa Transit Authority
Turner	Michael	LA Metro
Wiley	Mike	Sacramento Regional Transit District/CTA
Wygant	Michael	North County Transit
Zirges	Ron	Victor Valley Transit
Zuhlke	Sue	OCTA

Conference Call Attendees

Last Name	First Name	Company
Dhaliwal	Balbir	ARB
Easley	Terry	Modesto Area Express
Mellera	Marty	San Francisco Municipal Transportation Agency (SFMTA)
Silver	Fred	CALSTART
Tepke	Glen	Metropolitan Transportation Commission

Discussion Items

The meeting began with an update on the status of action items from the first Transit Agency Subcommittee before moving on to new topics. The following items were discussed:

- Cost data and analysis
- Flexibility options
- Transit survey edits and next steps
- Axle weight issue summary
- Feedback on Technology Symposium
- Case study analysis
- Technology off-ramps

Cost Data and Analysis

At the meeting two documents were presented by the subgroup. The first document itemized costs for diesel, compressed natural gas (CNG), diesel hybrid, battery electric bus (BEB), and fuel cell electric bus (FCEB). This document included cost assumptions for purchase price, maintenance, fuel cost, and other total cost of ownership factors. The subgroup was using aggregated data from the transits as well as from various reports such as National Renewable Energy Laboratory studies. At this document TAS data was compared with ARB's recently updated data.

The other document showed a 22-year cost projection for CNG, BEB slow charge, and BEB fast charge under two scenarios: slow ramp up and speedy ramp up. The 22-year projection included annual expenditure estimates for vehicle purchase, infrastructure, fuel, and maintenance.

As discussed, the subgroup utilized the cost information from transit agencies and numbers presented in a draft report prepared by a consultant company for LA Metro. Due to time constraints the subcommittee did not have time to review the printouts in detail nor to discuss the results.

ARB noted that Low Carbon Fuel Standard (LCFS) Program Credits need to be reflected in any cost analysis. Some transits expressed concern over the stability and usability of LCFS credits as a reason not factor them into fuel cost calculations. Transits are concerned that the credits only have values for five years and could end. Transits were also unsure about how to acquire credits and how the system works as a whole. ARB stated that the LCFS program will not sunset in 2020. If there is no further rule amendment for LCFS, the LCFS requirement will remain the same after 2020. ARB acknowledged the need for more information even after the LCFS presentation at the Advanced Clean Transit Technology Symposium (Symposium) the day before, and will seek to provide more educational opportunities for transit fleets.

The maintenance costs for BEBs presented by TAS were slightly lower than conventional buses and differed significantly from what ARB previously collected. The maintenance costs for conventional buses are also higher than what was previously collected by ARB. We discussed that fewer parts and lack of fluids should result in substantially lower costs and that long term battery bus costs needed to be better understood before making conclusions. What is included in maintenance costs also needs to be described in more detail. It was not clear if any differences in regular bus inspections was factored and should be addressed. The group agreed to continue to develop the analysis and refine its assumptions. Discussion items related to cost included the following:

- There was some discussion about substantial mid-life cost assumptions for buses with 12 year battery warranties. It was unclear what other mid-life costs there would be and how to identify data sources that would provide support for including or excluding certain costs.
- ARB committed to collect information on common maintenance and repairs intervals for conventional buses compared to battery electric buses to shed light on where there are differences in maintenance costs.
- Some individuals noted that Altoona test results on some BEBs have shown high maintenance costs which raise questions about potential repair costs.
- Per the Symposium, drivetrain of electric trolley buses are substantially similar to BEBs, and the group agreed the related information could shed light on long term repair and maintenance concerns.
- Steve Miller and Marty Mellera from San Francisco Municipal Transportation Agency will look into trolley bus maintenance costs for comparison.
- There was some discussion about the cost curve for maintenance that peaks shortly after the warranty expires but falls as less expensive third party parts enters the market.
- Transit agencies note that not all buses go through mid-life overhaul, and some transit agencies only do the mid-life overhaul as necessary.
- Some transits are skeptical that the cost of BEBs will continue to fall precipitously.
- There was some doubt cast on the idea that economy-of-scale should be factored in. This was highlighted with the example that BYD has manufactured over 6,000 buses worldwide and has orders for 7,000 more, but the vehicles are priced similarly to buses from Proterra that have production orders of magnitude smaller than BYD.
- Some transit agencies raised concerns about fuel efficiency of BEBs, which can differ greatly depending on routes, topography and bus operator.
- Some transit agencies indicated that it is possible that the ACT regulation could hurt the ability of transits to sell bonds due to the impending costs. As transit agencies look to bond against local revenues, they must disclose available revenues. This regulation may limit the amount of

revenues that are available to bond against. ARB committed to reviewing this issue to better understand the concern.

Flexibility Options

The discussion on flexibility options was fairly short due to additional time spent on costs assumptions. The topic focused on what a "performance-based" regulatory approach would be and what metrics could be used to determine equivalent actions. The following points were discussed:

- The approach would not mandate specific technologies and would allow any technology that meet GHG and petroleum reduction goals. This would need to be accomplished without double counting the LCFS credits and SB375 goals.
- Some transit agencies mentioned that there should be flexibility (i.e. an exemption from the regulation) for transit agencies that commit to implementing low NOx engines coupled with biogas.
- Some transit agencies mentioned that it may be necessary to also look at implementing large scale demonstrations, in which ARB would fully support a system's transition to 100% zero emission technology. This demonstration would serve as a case study for zero emission technology, and provide real-world, holistic data that could be used to better understand the cost impacts of the statewide transition to zero emission technology. ARB agreed they would be interested in exploring the proposal and what it would entail.
- Various transit agencies suggested rail expansion should be considered as an option. Many transit agencies have the rail system in place already. Some transit agencies believe it could have more impacts on ridership increase if they use the money to expand service instead of putting money into zero emission buses. We discussed that any method for accounting for electric rail should be similar to methods for including bike sharing and other enhanced mobility options.
- Several areas of clarification include transit fleet concerns about double counting emissions reductions with actions to meet regional SB375 goals. ARB still needs to identify what actions would not present double counting concerns with regional actions to meet SB375 goals.
- Flexibility options previously discussed include the ability for transit fleets to work together to meet a combined goal are beneficial for providing potential cost saving and zero emission bus deployment opportunities.

Transit Fleet Survey

ARB received comments from several transit agencies about the survey questions and is incorporating a number of changes in response. The survey should be ready to be mailed fairly soon and ARB will coordinate with Michael Pimentel to send it to CTA members and with Rick Ramacier to send it to CalACT members. The goal is to get feedback from some agencies before April if possible.

Axle Weight Issue Summary

ARB sent a two page summary about bus axle weights for comment before the meeting. The concerns about bus axle weights were discussed at the prior transit agency meeting and ARB committed to address it in a summary paper. The paper summarized axle weight limits in California and how changes to California law (AB 1250) have changed the axle definitions from using gross axle weight ratings (when fully loaded) to curb weight ratings (without passengers).

ARB reviewed all 21 bus models with Altoona tests performed in the past five years. The buses include three BEBs, seven CNG buses, and 11 diesel buses. The results show that all but one bus failed to meet the former 20,500 lbs. gross axle weight requirement, but all buses met the new 22,000 lbs. curb weight requirement including the three zero emission buses. Of all 21 buses, the New Flyer 40 foot bus had the highest rear axle curb weight and the Proterra battery electric 40 foot bus had the lowest curb weight rating. A draft copy of the paper "Weight Requirements for Transit Buses in California" is available on the meetings page at http://www.arb.ca.gov/msprog/bus/actmeetings.htm. No changes were suggested.

Technology Off-Ramps

Transit agencies generally agreed that off-ramps should be used to avoid situations where rule requirements could adversely impact service or would be impractical to implement. ARB would expect fleets to incorporate zero emission buses where they can meet their existing service needs, but recognizes there is a potential that future compliance could become impossible or impractical for certain fleets. ARB will continue to work closely with transits to identify potential situations and how to address them. Discussion items that require further details include:

- Range of slow charge buses.
- Barriers to installing fast chargers on-route.
- Space constraints on existing facilities.
- Barriers with meeting energy needs at the facility.

Some of the next steps are to identify what kind of delay or exemption would be appropriate and what information would need to be provided to support a claim. We expect that off-ramps are less likely to be needed initially but could become important as a higher percentage of the fleet is transitioned to zero emissions. Also, with expected improvements in technology, any off-ramp extension would need to be temporary and reassessed later.

ARB is seeking assistance in identifying information that transit fleets already have that could be used to document a situation where the off-ramp would apply. The transit survey should provide some insight as to which fleets or divisions could encounter barriers. ARB will work on describing potential off-ramps in

more detail and will seek assistance in defining what information could be used to support a claim.

Feedback on Advanced Clean Transit Technology Symposium

The Symposium was held the day before and was generally viewed as beneficial. At the Symposium, representatives from Southern California Edison and the Los Angeles Department of Water and Power described steps they are taking to reduce barriers for transportation electrification and see zero emission vehicles as beneficial to the electricity grid. Some areas to explore include, electric vehicle rate schedules, the possibility for utilities to own bus charging infrastructure, and clarification on who pays for costs if upgrades were needed on the utility side of the meter. ARB agreed to coordinate a meeting with the electric utilities and transit fleets to discuss barriers and potential solutions. The Transit Subcommittee came to a consensus that the meeting should be in person and that the California Public Utilities Commission (CPUC) should be invited. The initial meeting should focus on the needs of transit fleets. ARB is already in discussion with the CPUC and will invite their representatives to participate.

Action items

- Steve Miller will coordinate with Marty Mellera of SFMTA to exam their existing electric trolley bus operations and maintenance data compared to similar conventional buses and will seek to address questions about long term and mid-life assumptions for electric drive systems. ARB will continue to evaluate available data from existing trolley bus and hybrid bus studies.
- ARB will coordinate a meeting with transit agencies, electric utilities, and invite CPUC.
- ARB will produce more educational materials and will set up a webinar on the LCFS program to help transit operators understand how the program works, its value, and how to take advantage of LCFS credits for different fuel types.
- ARB will work with bus manufacturers and others to collect information on common maintenance intervals and repairs costs on different bus types to shed light on estimated maintenance and repair cost questions.
- ARB will work to develop discussion draft documents with potentially appropriate off-ramps and possible guidelines for their use.
- ARB will identify what actions would not present double counting concerns with regional actions to meet SB375 goals.
- ARB will review the impact of the proposed regulation on bond sales to better understand the concern.