

**To:** Operations and Scheduling Committee

**Date:** 07/23/2019

**From:** Ruby Horta – Director of Planning, Marketing & Innovation

**Reviewed by:** *Ruby*

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**SUBJECT: Battery Electric Bus (BEB) FY 2018-2019 Update**

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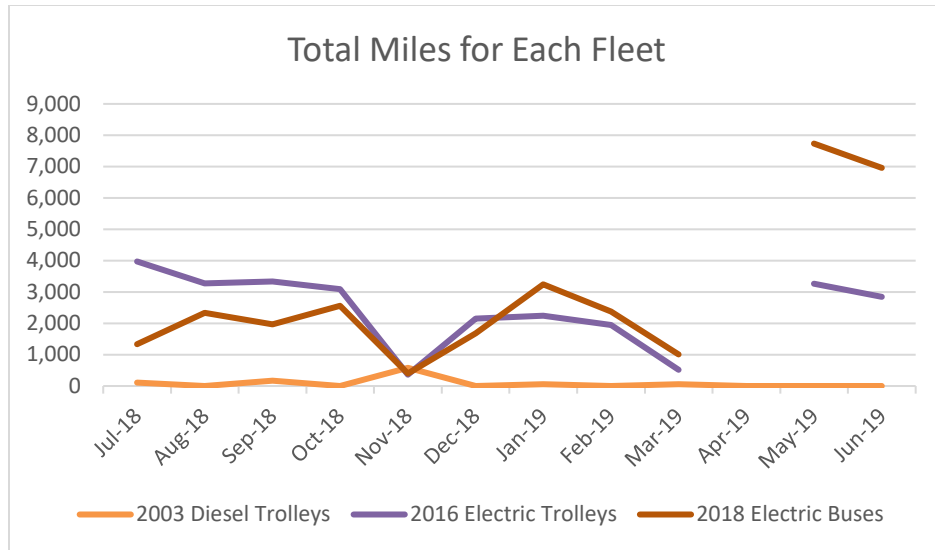
**Background:**

County Connection received two federal grants to purchase electric buses. The 2012 Clean Fuels grant and the 2016 Low/No grant to purchase eight battery electric buses (BEBs) and the necessary charging infrastructure. All eight BEBs operate in Walnut Creek on Routes 4 and 5. Two inductive chargers have been installed at the new Walnut Creek Transit Village to support the continuous operations on these two routes.

**Maintenance and Operations:**

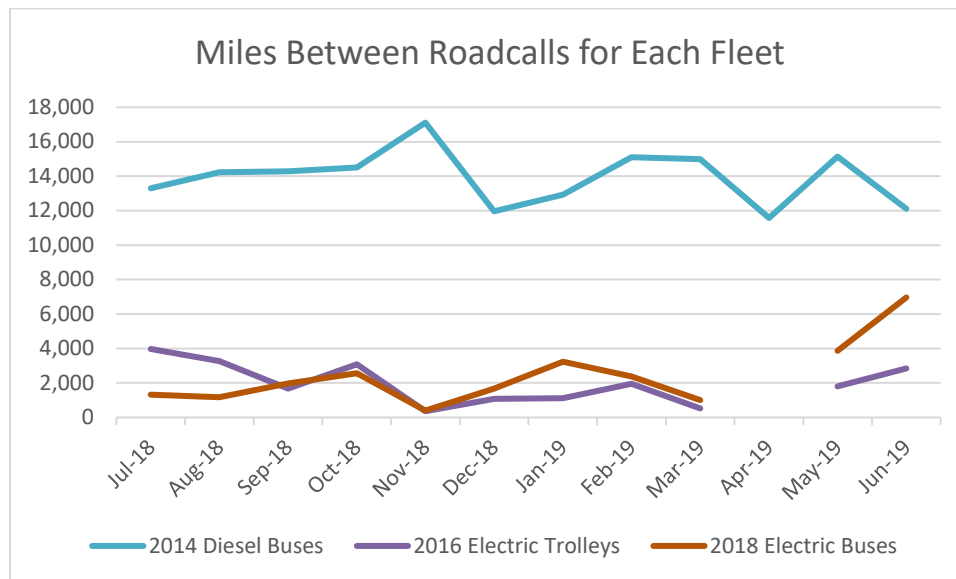
The first four electric buses (trolleys) were introduced to the fleet in December 2016 (1600 series) and the second set in May 2018 (1800 series). The electric trolley project was classified as a prototype, to allow County Connection to keep three (3) of the old diesel trolleys. This arrangement provided the protection needed to ensure service would not be interrupted on Route 4 while the electric trolleys were tested.

In the initial months, the electric trolleys were not as reliable and diesel trolleys were used to cover service. Over time, the need for the reserve diesel trolleys decreased as the electric trolleys became more reliable and the 1800 series increased the electric bus spare ratio. The chart on the following page compares total miles between the 2003 diesel trolleys and the electric buses. The diesel trolleys were removed from the fleet in March 2019. Since the diesel trolleys have been removed from the fleet, moving forward, staff will use the 2014 diesel buses for comparison purposes.



Since July 2018, the electric bus reliability has averaged 63%. Most of the unreliability is due to failures in the battery management system. Staff is working with various partners to resolve these issues.

Another important comparison is the number of the road calls mechanics must attend to for each fleet. In this case, we compared the 2014 diesel buses to the electric buses. The diesel buses tend to travel, on average, about 10,000 miles further than the electric buses before requiring a road call.



To date, maintenance costs associated with parts have been largely covered by warranties and the collaborative relationships with the various vendors. Three years later, both operations and maintenance continue to learn about the technology and how best to maximize efficiencies. An area of concern is the expertise required to maintain the electric vehicles beyond the warranty

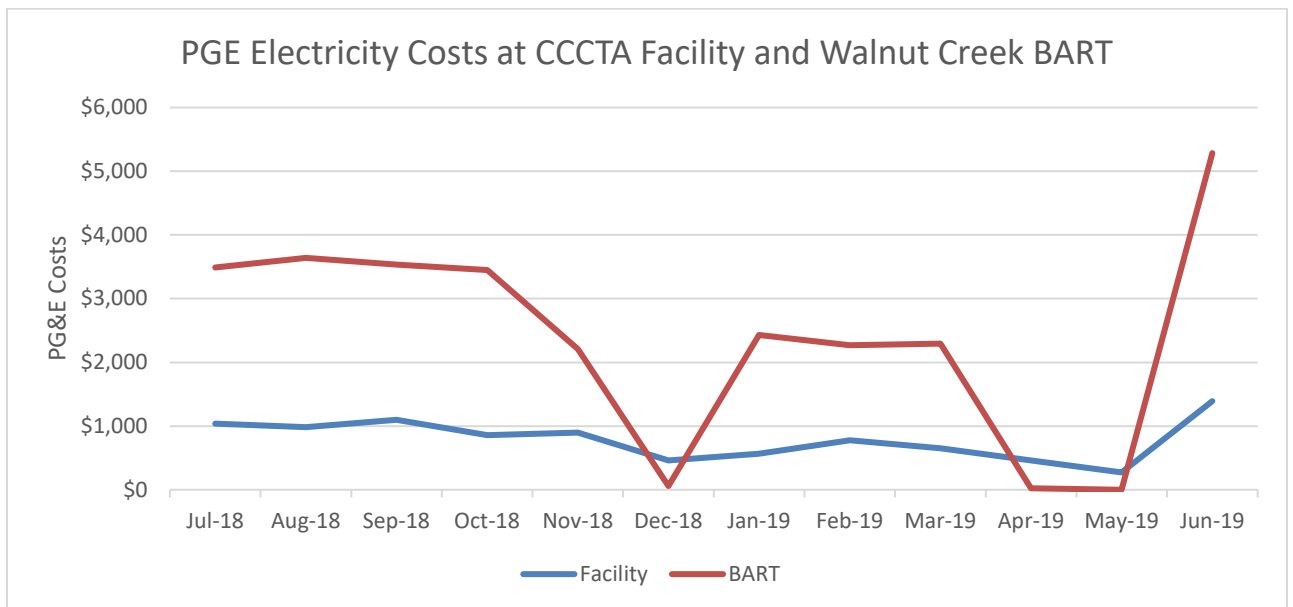
period. The manufacturer currently provides electrical engineering support and it may be necessary to invest further in additional staff and/or training to ensure those needs are met.

Staff recognizes this is still an emerging technology that will continue to develop and improve with time. The 1800 series has a different battery system, which has been significantly more reliable and is currently compensating for the deficiencies of the 1600 series. Staff is constantly evaluating zero emission vehicle research, including electric and fuel cell solutions. Given some of the limitations of electric vehicles at a large scale, it may be appropriate to pursue a blended fleet (electric and fuel cell) to ensure service reliability.

**Cost to Operate:**

The electricity rates have been the major concern since implementation. Since the electric vehicles were put in service, electricity costs remained constant at both the County Connection Facility and Walnut Creek BART station, at about \$0.25/kWh in the summer and \$0.20/kWh the rest of the year. However, starting in May 2019, PG&E adjusted the rate at the Walnut Creek BART station, changing the energy charges from a fixed rate to “Peak” (\$0.58/kWh), “Part Peak” (\$0.28/kWh) and “Off Peak” (\$0.21/kWh). Though this did not significantly affect FY 19 totals, it will likely increase electricity cost per mile in the coming fiscal year.

Between July 2018 and October 2018 total electricity costs were about \$4,500. Staff experienced some issues with the electric fleet and the charger at BART in December 2018 and after the new transit center opened earlier this year. The new energy charge at the BART station and the increased use of the 1800 series vehicles combined, led to a total electricity payment of approximately \$6,600 in June 2019.



The average fuel cost per mile for diesel and electric buses has not changed significantly. The electric bus fuel cost per mile is about \$0.65 compared to \$0.46 for diesel. As mentioned earlier, in addition to County Connection’s staff time, the electric buses also required specialty support

from the various vendors. Those costs are not included in this calculation as they are currently under warranty. However, once that support stops, County Connection will be required to pay for those services or invest significantly in existing staff to ensure proper maintenance.

**Conclusions:**

Electricity costs and bus reliability continue to be the two most important factors when it comes to implementation at a larger scale. As mentioned earlier, the recent rate increase at the Walnut Creek BART station will have cost implications in the coming fiscal year. Staff will continue to provide feedback to the California Public Utilities Commission (CPUC) as rate structures are developed. As California moves to an all-electric future, staff will continue to report to the Board on the progress of the electric and fuel cell buses. Although staff recognizes the importance of reducing greenhouse gases, there are a number considerations that should be further analyzed to ensure system wide reliability, which affects overall ridership. Staff will continue to evaluate zero emission buses and determine an appropriate path for County Connection.

**Financial Implications:**

Ongoing maintenance.

**Recommendation:**

Staff recommend that the O&S Committee forward this item to the Board for review.

**Action Requested:**

None, for information only.