Appendix B-2

DOF Comments to the ICT SRIA and CARB Responses

Addressing Department of Finance Comments

1. **Battery disposal will increasingly be an issue once this proposed regulation is fully implemented. Either transit agencies will face disposal costs, or there will be environmental costs. The SRIA must include one or the other to fully cover regulatory impacts.**

All batteries have a finite life time. Proper disposal at the end of battery life is important for environmental protection. However, the batteries used by zero-emission buses (ZEBs) are expected to outlast the transit buses and the cost of recycling may not be incurred by the transit agencies.

Batteries used by zero-emission technologies are rechargeable and have a longer life span compared to conventional batteries. Though the energy capacity of the batteries used in ZEBs will degrade over time, when used properly, the battery life can often outlast the bus life. According to a study conducted by the National Renewable Energy Laboratory (NREL), it is anticipated that the batteries will retain approximately 70 percent of their initial capacity, and potentially operate for 10 years after bus retirement when treated properly.[1, 2] Some ZEB manufacturer(s) even provide a 12-year battery warranty. A transit agency can choose to recondition a battery to extend its useful life. The average bus life in California is about 14 years. Upon the retirement of a transit bus, if the battery still has remaining useful life, the battery can be reconditioned and resold or repurposed for other uses, such as energy storage, which does not have as severe demand on the battery.

NREL suggested that used batteries could replace grid-connected combustion turbine peaker plants, and provide peak-shaving services.[2] The NREL study concluded that the battery's second use can "eliminate end-of-service costs for automotive battery owner and provide low- to zero-emission peaking services to electric utilities, reducing cost, use of fossil fuels, and greenhouse gas emissions … the overall benefit to society can be quite large."[2]

If a battery continues to be used after bus retirement, it will not incur a disposal cost to the transit agencies. On the contrary, it could become a new revenue source for the transit agencies when these batteries are repurposed for different uses. However, the cost of battery disposal has to be paid at the certain point of its lifetime. This new revenue source from battery repurposing could be used to pay for the disposal cost. Staff does not have enough data regarding the residual value of the batteries after they are retired from buses because battery electric buses have not yet reached the end of life stage. However, some lithium-ion battery manufacturers do provide an attractive

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[1] National Renewable Energy Laboratory (NREL). Battery Second Use for Plug-In Electric Vehicles Analysis. Available: https://www.nrel.gov/transportation/battery-second-use-analysis.html. Accessed July 6, 2018.

[2] National Renewable Energy Laboratory (NREL) (2015). Identifying and Overcoming Critical Barriers to Widespread Second Use of PEV Batteries. February 2015. Available: https://www.nrel.gov/docs/fy15osti/63332.pdf.

residual value to customers upon the retirement of a battery.[3] Therefore, staff believes that the residual value can offset the recycling cost and does not include a residual battery value in the economic analysis for the transit agencies.

[3] EnerDel applies a 25% of residual value to retired batteries. Available: http://enerdel.com/services/guaranteed-residual-value/. Accessed July 6, 2018.

2. **The SRIA must have growth in the number of buses over time that is at least proportional to population growth, rather than assuming that the total remains at 2016 levels.**

   The 2029 population is projected to be more than 10 percent larger than the 2016 population. Economic trends suggest that growth is more urban, and with limited road capacity, the demand for public transportation will likely rise. The SRIA notes that the relative costs per bus will remain the same no matter the total, but a higher total will increase electricity demand and demand for low-carbon fuels. A key assumption is that renewable fuel prices decrease, with hydrogen prices falling to around 30 percent of current levels, and greater demand could either stimulate production or stress supplies and raise prices. There is a great deal of inherent uncertainty about how markets will develop, but the current static assumption will likely understate the scale of changes. Not keeping up with population growth also understates the health benefits of reducing emissions in urban areas.

In the SRIA, a static population based on the National Transit Database (NTD) 2016 was used for cost analysis.[4] The total number of buses may increase over time as human population and/or passenger mile grows. The cost analysis in the ISOR has been updated to incorporate growth of bus population, which represents Metropolitan Planning Organizations' (MPOs) forecasts and human population increase. As shown in the CARB's mobile source emissions inventory, EMFAC 2017, the statewide growth rates of urban buses, ranging from 0.7 percent to 1.4 percent per year between 2020 and 2050. This forecast is based on MPOs' vehicle miles traveled (VMT) targets and human population growth. For areas governed by a MPO that forecasts transit growth in target years of the Regional Transportation Plan/Sustainable Communities Strategy, the growth rate is generated by linear interpolation of the growth between the base year and target years; for areas that are not covered by a MPO, or where a local MPO does not provide transit growth, the county-level human population growth rate published by the Department of Finance were used as surrogate for transit growth.[5]

This growth will increase the number of ZEBs in the proposed ICT regulation as well as the number of conventional internal combustion buses in current conditions. The vehicle number growth will then have an effect on the associated cost for both the proposed ICT regulation and current conditions. The growth impact on cost is modeled and included for ZEB infrastructure with the proposed ICT regulation because all infrastructure will be new. However, it is difficult to model for the infrastructure for buses with internal combustion engines due to limited or no information. For instance, it is uncertain which transit agencies will need to have major infrastructure expansion, like

[4] National Transit Database (2016). 2016 Annual Database Revenue Vehicle Inventory. Available: https://www.transit.dot.gov/sites/fta.dot.gov/files/Revenue%20Vehicle%20Inventory_0.xlsx.
[5] California Air Resources Board (CARB) (2018). EMFAC2017 Volume III – Technical Documentation. March 1, 2018. Available: https://www.arb.ca.gov/msei/downloads/emfac2017-volume-iii-technical-documentation.pdf.

adding a new facility, or whether existing fueling infrastructure and space will need to be upgraded or expanded to accommodate such growth. For example, a depot yard that is servicing 100 buses may have a capacity of 110 buses. Therefore, the increase of fueling infrastructure for buses with internal combustion engines is not included in the current conditions, which will result in a lower total cost. If total costs in the current conditions is a lower estimate, the incremental costs in the proposed ICT regulation relative to current conditions will be a higher estimate. This assumption results in a conservative assumption for total costs in the proposed ICT regulation.

The bus population growth was accounted for in the emission reduction modeling and the infrastructure for ZEBs. Therefore, there is no change on emission reductions and health benefit. This growth will also not change the fuel prices for conventional fossil fuels and electricity. The prices of compressed natural gas, gasoline and diesel are based on the energy prices for the transportation sector in the Energy Information Administration (EIA)'s Annual Energy Outlook 2018 (Reference case and Pacific region). Compared with other vehicles in the transportation sector, transit buses consume a small amount of the total energy. A population increase of 0.7 to 1.4 percent is not expected to impact fuel prices. Electricity price is determined by rate schedules and is also not anticipated be impacted by minor changes in the bus population.

Hydrogen price, however, is more dependent on station throughput. The higher the throughput is, the lower the hydrogen price. It is possible that an increase in the population of buses that use hydrogen could result in a decrease in the price of hydrogen. Given the lack of hydrogen market history, the price impact of this change in bus population is difficult to predict and was not estimated as part of the economic analysis. The current assumption without incorporating bus growth for hydrogen price is conservative, and the costs may be lower than presented.

3. **Public transit is no longer the only option to personal vehicles for individuals, and some private companies are now providing bus service, for their employees, as an alternative to public buses. If transit agencies raise prices to cover higher initial costs of this proposed regulation, such alternatives may be even more attractive, and undercut the estimated benefits. The SRIA could usefully add a discussion of these dynamics.**

There will be upfront capital costs associated with ZEBs and their infrastructure due to the proposed ICT regulation. This might raise concerns that transit agencies may pass on the incremental costs to individuals through changes in service or fares. The State is aware of these concerns and is committed to providing incentives to help ease the transition to zero-emission technologies. In fact, the proposed ICT regulation is structured to provide opportunities for transit agencies to take advantage of substantial incentive funding that is being prioritized to ensure a successful transition to zero-emission technologies. These funding opportunities should substantially offset the upfront capital costs.

There are several major funding programs established to reduce the incremental costs associated with zero-emission technologies, such as Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP). For fiscal year (FY) 2017-2018, the budget allocated up to $180 million for the HVIP program with a minimum of $35 million set aside to fund ZEBs exclusively. An additional $125 million has been allocated to the HVIP program per Senate Bill 856 for the FY 2018-2019. Transit agencies can use state and federal grant funding to reduce or eliminate most of the initial incremental capital costs of the proposed regulation. In addition, staff estimated that, in the long-term, the cost savings outweigh the capital costs of adding ZEBs. Therefore, the likelihood of transit agencies raising fares to cover the higher initial cost is low. If a transit agency considers a fare increase, any increase has to be approved by the board of a transit agency.

Transit systems are evolving, and there could be many innovative alternatives to public transit in the near future. Some alternatives, such as private shuttle and ride-hailing services, have become popular in recent years. This would be the case with or without the proposed ICT regulation. Alternatives that might arise to supplant public transit cannot be easily predicted. In addition, the emissions impacts of those replacements could be minimal because other transportation modes are transitioning to low- and zero-emission pathways. The proposed ICT regulation itself is not anticipated to significantly alter the dynamic between public transit and other personal/private alternatives. Staff views any significant change in fares by transit agencies to cover initial capital costs as unlikely, given that the proposed regulation is structured to provide ample funding for transit agencies to offset those costs. In addition, the proposed ICT regulation contains a Zero-Emission Mobility program option that can synergistically work with these alternatives to increase accessibility to the entire transit system.

Reference List B-2

The following documents are the technical, theoretical, or empirical studies, reports, or similar documents relied upon in proposing these regulatory amendments, identified as required by Government Code, section 11346.2, subdivision (b)(3). Additionally, each appendix references the documents upon which it relies, as required by Government Code, section 11346.2, subdivision (b)(3).

Note: Each "Explanatory Footnote" is a footnote containing explanatory discussion rather than referencing specific documents relied upon.

1. National Renewable Energy Laboratory (NREL). Battery Second Use for Plug-In Electric Vehicles Analysis. Available: https://www.nrel.gov/transportation/battery-second-use-analysis.html. Accessed July 6, 2018.

2. National Renewable Energy Laboratory (NREL) (2015). Identifying and Overcoming Critical Barriers to Widespread Second Use of PEV Batteries. February 2015. Available: https://www.nrel.gov/docs/fy15osti/63332.pdf.

3. EnerDel applies a 25% of residual value to retired batteries. Available: https://enerdel.com/services/guaranteed-residual-value/. Accessed July 6, 2018.

4. National Transit Database (2016). 2016 Annual Database Revenue Vehicle Inventory. Available: https://www.transit.dot.gov/sites/fta.dot.gov/files/Revenue%20Vehicle%20Inventory_0.xlsx.

5. California Air Resources Board (CARB) (2018). EMFAC2017 Volume III – Technical Documentation. March 1, 2018. Available: https://www.arb.ca.gov/msei/downloads/emfac2017-volume-iii-technical-documentation.pdf.