Zero-Emission Buses

What is this measure?

This measure would fund the replacement of a traditional diesel bus with a zero emission bus, the expansion of a bus fleet with zero emission buses, and/or support the infrastructure necessary to recharge battery electric buses or refuel fuel cell electric buses. These projects could be done for either school bus fleets, municipal bus fleets, regional commuter bus fleets, or private bus fleets with appropriate routes and duty cycles.

Why would someone do this as mitigation?

The beneficial impacts from switching to a zero emission bus are equivalent to the difference in well-to-wheels emissions from operating the bus vs. the well-to-wheels emissions from operating a conventional diesel bus. In addition to greenhouse gas benefits, this also reduces local and regional emissions of toxic and criteria pollutants. These reductions provide direct health benefits within the region. Diesel emissions from older buses, especially school buses, can lead to reduced lung function in children, increased hospitalizations, and elevated cancer risk.

Currently, there are battery electric transit buses and battery electric school buses available and in use in California. Several transit agencies in the state are operating fuel cell electric buses in regular service. When the District has discussed zero emission buses with operators in the county, we have heard concerns about installing the necessary infrastructure to recharge the vehicles at fleet yards and about the training necessary for staff to adopt new technologies. Typically, local bus fleets have limited funds available for replacing existing buses and the total cost of purchasing and operating vehicles is an important factor in purchase decisions. So, there are obstacles to local adoption of zero emission buses that could be addressed by this measure.

The CARB Mobile Source Strategy[1] identifies transit buses as a target for deployment of zero emission technologies.

How would you implement this measure?

Implementing Agency

The existing District low emission school bus program could be used as a model for implementing this measure, and the District could be the agency to implement the measure. Under this program the District works with operators to identify buses to be replaced and then enters into agreements to provide funding for a portion of the cost of the new bus.

Enforceability

Generally, agreements to fund buses and supporting infrastructure commit the grantee to maintaining and operating the bus for a specific period of time. They also require the grantee to maintain records and make them available upon request. Old vehicles which are replaced are permanently removed from service. Typically a hole is drilled in the engine block to render it unusable.

[1] www.arb.ca.gov/planning/sip/2016sip/2016mobsrc.pdf

Interaction with Existing Programs

The District's existing low emission school bus program[2] has operated since 2001. During that time the program has provided funding to retrofit 34 school buses with filters that reduce diesel particulate emissions and has provided funding to assist with replacing 26 old school buses with new, lower emission buses. To date, no school districts have purchased zero emission buses under the program but District staff remain in contact with school districts to keep them informed about the latest options.

The District was also successful in partnering with the Lompoc Unified School District during 2017 to obtain $619,975 of Carl Moyer State Reserve Funds to assist in replacing six old buses at the School District. State Reserve Funds may be available each year for specific projects, so they may or may not be available for bus replacements in future years.

The California Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project[3] (HVIP) offers point of sale incentives for clean trucks and buses. Currently, there are battery electric transit buses and battery electric school buses that qualify for vouchers under the HVIP program. The vouchers are not sufficient to cover the cost difference between a new diesel bus and a battery electric bus, so funds from this measure could be used to close the gap.

How would you quantify the benefits?

For this measure, the GHG benefits would be calculated as the difference between operating a zero emission bus and a typical diesel bus. *The Greenhouse Gas Quantification Methodology for Air Resources Board Low Carbon Transportation Program Consumer-Based Heavy-Duty Projects*[4] provides well-to-wheel emission factors each available type of zero emission bus and typical diesel bus. The methodology also provides annual vehicle miles traveled assumptions for each bus type. County-specific average mileage is also available for both school buses and transit buses through the EMFAC database[5].

A battery electric school bus emits approximately 70 metric tons CO2e/year less than an equivalent diesel school bus and a battery electric transit bus emits approximately 133 metric tons CO2e/year less than an equivalent diesel transit bus. The difference between the two is driven primarily by miles traveled. A typical transit bus travels more miles per year than a typical school bus so its annual GHG reductions are greater.

Questions for Discussion

- Are any local transit agencies or school districts willing to commit the time and effort to adopt the new vehicles?
- For battery electric buses, do the service yards have sufficient electrical capacity to support charging?
- Which local transit agencies or school districts have routes that are appropriate for the available buses?
- Should the measure be targeted toward replacements, or toward fleet expansion, or both?

[2] www.ourair.org/itg/school-bus/
[3] https://www.californiahvip.org/
[4] www.arb.ca.gov/cc/capandtrade/auctionproceeds/arb_cbhd_finalqm_16-17.pdf
[5] www.arb.ca.gov/emfac/2014/

Input Received

Comments Made at Workshops

Opportunities:

- For transit buses, if you reduce the incentive amount (to match with HVIP funding), and also use a higher vehicle miles traveled (VMT) amount of 66,000/yr, the cost-per-ton decreases substantially, making the measure much more attractive. Please show this in the summary sheet.
- School buses have low mileage, and the technology is not yet proven; transit buses are more cost-effective, and the technology may also be more advanced.
- A local transit agency (MTD) is already doing electric buses, so this is a good fit. They will soon test their routes using 40-foot buses.
- Buses are available on the market - BYD is one manufacturer with a factory in Lancaster. MTD plans to replace 14 old electric buses with new BYD buses soon, and will also try out 40-ft BYD bus(es).
- Support for also providing infrastructure as part of measure.
- Like public health co-benefits (criteria, diesel PM).
- Consider giving bus replacement projects more money than fleet expansion projects. Generally, buses are used until they're worn out. They are seldom sold/repurposed.
- Like the long-term nature of these reductions.
- Transit will always be needed to serve low income populations.
- Give free passes to new users to reduce VMT from passenger vehicles (but quantifying GHG reductions from this strategy would be a challenge).
- Suggest adding a renewable gas project to the list that would involve providing a local fuel source and also infrastructure investments, to get CNG buses on biofuel.
- For fleet expansion projects, quantify how replacement with an electric bus instead of with a cleaner diesel bus goes over and above in terms of GHG reductions.

Challenges:

- Will transit play a large role in our transportation future? Autonomous vehicles and car-sharing will take away ridership.
- Transportation is evolving. Mitigation needs to avoid having stranded investments; infrastructure needs to be adaptable to change.
- The price of gasoline is definitely a factor in transit ridership. For example, MTD saw increasing ridership when gas prices increased, then ridership dropped when gas prices decreased.
- This type of measure will not yield large amounts of GHG reductions. Projects should go out-of-state and purchase GHG credits where they are less costly/more cost-effective.

Potential Implementers:

- A local transit agency (MTD)
- Are there any north county transit agencies that might consider adopting ZEVs, such as SMAT or a Lompoc transit agency?

Additional District Discussion

- In response to the comment about the cost-per-ton for school buses vs. transit buses, District staff separated the two project types in the spreadsheet to more clearly show the difference in GHG reduction costs.
- Although the cost-per-ton for transit buses is much lower than for school buses due to the fact that transit buses travel more miles per year, school buses target a particularly sensitive population (children riding on the bus) and also tend to drive in areas with sensitive populations (residential areas, and areas near schools). Also, if the school buses are driven less miles per year, it's possible that they will remain in service for longer (based on the CARB quantification methodology, both project types are assumed to last 15 years).