Innovative Clean Transit Standard Frequently Asked Questions

This document answers frequently asked questions that have arisen throughout the process of developing the Innovative Clean Transit standard.

Background

What would this standard do?
The goal of this standard is to achieve 100 percent conversion of transit buses to zero-emission technologies (battery or fuel cell) by 2040. It achieves this through a purchase requirement and ***does not*** require transit agencies to replace buses before the agency would normally do so.

What is the timing of this standard?
The proposal begins with a modest purchase requirement with many years of lead time. The purchase standard gradually increases from 25 percent of bus purchases in 2023 to 100 percent in 2029. If transit agencies across the state collectively deploy a set number of buses (850 in 2020 and 1,250 in 2021), the compliance start date would be deferred until 2025. The standard also provides more time (2026) for smaller transit agencies to start purchasing zero-emission buses.

What types of buses does the standard apply to?
The standard applies to buses operated by public transit agencies (standard, articulated, cutaway, coach, and double decker buses) excluding school buses. Privately operated buses, such as employee shuttle buses or tour buses are not covered under this standard but could be covered in zero-emission vehicle standards concurrently being developed by CARB for fleets.

What kind of flexibilities are built into the rule?
CARB staff have spent more than three years incorporating feedback about this standard from many stakeholders, including transit agencies. This feedback has resulted in small agencies being exempt from the standard until 2026. Purchase standards for articulated, cutaway (small shuttle buses), double decker, and coach buses operated by transit agencies are also delayed until 2026. The standard also allows agencies to request exemptions from the purchase standard under several circumstances, including: delays in the installation of charging or hydrogen fueling infrastructure; routes with mileage or hills that exceed vehicle performance; financial hardship; or unavailability of buses. The rule also provides bonus credits to agencies that were early adopters of zero-emission buses and allows transit agencies in the same region to coordinate purchases for compliance purposes.

Why do we need a rule if so many electric buses are being deployed already?
Solely using voluntary approaches to advance zero-emission buses does not send a strong signal to transit agencies to create economies of scale to drive down the up-front costs of zero-emission buses. Furthermore, the CARB Board unanimously approved the Mobile Source Strategy in 2017. In that plan, the Board said it would adopt the Innovative Clean Transit Rule by 2017, putting the current standard a year behind the Board's commitment. Voluntary approaches will also not push market development that enables technology transfer from buses to other heavy-duty vehicles.

Environmental & Health Benefits of Zero-Emission Buses

How do emissions of electric buses compare to diesel and natural gas?
In addition to zero tailpipe emissions, battery electric buses have 75 percent lower global warming emissions than diesel and natural gas buses on today's grid in California. And fuel cell electric buses, powered by hydrogen generated from at least 33 percent renewable energy (per California law) have 50 percent lower global warming emissions than diesel and natural gas buses.

How do the emissions of buses fueled with biomethane compare to electricity?
Biomethane produced from sources of waste such as landfills, waste water, or dairy manure lowers the climate impacts of these sources of fugitive methane emissions. While reducing the amount of fugitive methane emissions is an important part of combating climate change, there is a limited amount of biomethane potentially available, let alone produced today.

Combusting biomethane still generates carbon dioxide and other tailpipe emissions. Landfills represent the most common and least expensive source of biomethane. Using biomethane from landfills in CNG buses produces more global warming emissions than electric buses on today's grid. Due to an absence of policies for dairies to capture and at least flare fugitive methane (as required for landfills), biomethane from dairy manure represents a greater reduction in methane and is considered to have "negative" emissions, although it is a more expensive and less developed source of biomethane.

State of the Technology

Do electric buses have the range to meet transit agencies' needs?
Yes. Several manufacturers offer battery electric buses with nominal ranges over 250 miles per charge and one offers a range of over 350 miles. The exact range of a bus (electric or combustion) depends on factors such as average speed, hills, demand for heat or air conditioning, and passenger load. In California, an electric bus with 150 miles of range would meet more than 50 percent of buses' daily mileage now. Bus ranges have more than doubled just in the last three years. As battery technology continues to improve, the range of electric buses will continue to increase. A zero-emission bus with a 200-mile range would cover 85 percent of buses in California. Fuel cell buses also have ranges of over 200 miles per tank of hydrogen.

Can electric buses handle hills?
Yes. San Francisco boasts the steepest hills traversed by buses in the state with grades up to 23 percent. Several manufacturers are testing battery electric buses on these streets and representatives at SF Muni are optimistic electric buses will be able to meet their needs. For fuel cells, AC Transit regularly operates its buses in the hills of Berkeley and also took a fuel cell bus up and over Donner Pass from Oakland to Reno en route to a bus conference.

How can electric buses help in natural disasters?
With ranges over 200 miles, electric buses can provide emergency transportation services similar to combustion vehicles. In anticipation of wildfires, when electricity can go out, buses could be designed to provide back up power to support emergency services and temporary shelters. It should be noted that natural gas and diesel fueling stations are also limited during electrical outages (e.g., electricity is required to compress natural gas). Finally, the recent amendments to the Low Carbon Fuel Standard will help incentivize integration of renewable energy into bus charging, which if done onsite with battery storage, could provide a reliable source of electricity in the event of a natural disaster.

Can the same equipment be used to charge buses made by different manufacturers?
Yes, charging standards and interoperability are here today. For depot charging, all the leading electric bus makers except for BYD are using the "J1772 CCS Type I" standard. BYD has announced it will offer this as an option to customers in 2019. For overhead charging, all the bus makers are now following an international standard ("OPPCharge") which has been used for overhead charging of heavy-duty vehicles in Europe for several years.

Cost Considerations

How does the cost of electricity compare to diesel or natural gas?
All three large, investor owned utilities in California are developing, have proposed, or had new electricity rate structures approved to aid transit agencies in accelerating electric buses. For example, Southern California Edison addressed demand charges in a new rate that waives these charges for the next five years and reintroduces them over five years thereafter. The final rate offers savings compared to today's rate. Importantly, the savings in utilities' new rates do not come at the expense of other ratepayers, but instead from shifting electricity demand to periods with high renewable electricity generation and low demand. Finally, the Low Carbon Fuel Standard provides significant financial credits that will pay for a majority of a fleet's electricity costs. With the LCFS and new electricity rates, transit agencies could even generate revenue by operating electric buses.

How does the total cost of ownership of electric buses compare to diesel or natural gas?
In addition to fuel savings, electric buses offer lower costs in maintenance. In an electric bus, there is no transmission, belts, or exhaust systems to replace or maintain. With savings from fuel and maintenance, electric buses have comparable, and in many cases, lower total costs of ownership than diesel and natural gas buses, despite having higher purchase costs and expenses related to charging infrastructure, according to analysis by CARB and others.

Funding

Is there funding to help transit agencies make the switch?
While the total cost of ownership for transitioning to electric buses is positive, in the early years of this transition, there are additional up-front capital needs to pay for the currently, but continually declining, higher cost of electric buses and charging infrastructure. California has adopted a suite of programs to facilitate the transition to zero-emission buses. One key program is the Hybrid and Zero Emission Truck and Bus Voucher Program (HVIP), which provides large up-front financial incentives to help pay for the higher cost of electric buses.

Moreover, the recent VW Appendix D investment plan includes tens of millions of dollars for zero-emission buses and charging infrastructure. Voters also rejected Proposition 6, which means there continues to be funding for zero-emission bus projects through revenue from gasoline and diesel sales. Recently announced awards from this revenue will help pay for 285 zero-emission buses for 11 transit agencies.

To pay for infrastructure costs, investor owned utilities have developed programs that will pay for all the electrical infrastructure upgrade costs for heavy-duty electric vehicles, and specifically for buses, 50 percent of the charger costs. Other programs such as HVIP can help cover the balance of charger costs.

There are few other types of vehicles in California that have this level of support for the conversion to zero-emission vehicles. While there is not a 100 percent guarantee that incentives will exist forever, the California Air Resources Board, the California Public Utilities Commission and several other agencies have provided clear direction that they intend to support the transition to zero-emission buses in California.