



ZERO EMISSION BUS OVERVIEW

Vehicles, above all else, have historically represented America's problem with dirty oil. About 44% of U.S. carbon dioxide emissions, which are hastening climate disruption, are from oil consumption.¹ There are more than 1,100 transit agencies operating buses throughout the U.S.² These buses traveled 2.2 billion vehicle miles and used more than 13 million barrels of oil.³ As these fleets age, their buses become increasingly less efficient. A switch to zero emission buses, which require no gasoline or diesel and emit no tailpipe pollution, presents a critical opportunity to slash pollution harmful to our health, reduce oil dependence, reduce greenhouse gases to mitigate climate change, and make our cities safer.

WHAT ARE THEY?

A zero emission bus uses electricity to charge an on-board battery pack, which powers its motor. This means no gasoline or diesel, no dirty oil changes, no internal combustion engine, no dirty exhaust. They can charge up as quickly as just a few minutes and go between 55 and 350+ miles between charges, depending on the model. Battery electric buses are now in operation in dozens of U.S. cities, including Los Angeles, New York, Seattle, San Antonio, and Albuquerque. Some transit agencies, such as those that operate in Los Angeles, have committed to an all electric bus fleet by 2030.

A few cities are also investing in hydrogen fuel cell buses. Currently fuel cell buses can be found on roads in Oakland, CA. Fuel cell buses, like electric buses, reduce air pollution and our dependence on oil (though they are cleaner when the hydrogen is derived from solar rather than natural gas).

CLEANER

The push for cleaner transportation is as much about cleaning our urban air as it is mitigating climate change. Because buses operate in cities, each time a dirty diesel bus is replaced by a zero emission bus, it has an entirely positive effect on urban air quality. Diesel, compressed natural gas (CNG), and hybrid electric buses are significant sources of pollutants—diesel exhaust contains more than 40 toxic air contaminants that in some cases can cause and/or worsen diseases such as asthma and cancer.⁴ Communities of color and low-income neighborhoods face higher health risks due to poor air quality, specifically related to particulate matter emissions.

CHEAPER TO FUEL AND MAINTAIN

Each electric bus can cost hundreds of thousands of dollars less in fuel over its lifetime compared to a diesel or CNG bus.⁵ Over the lifetime of an electric bus, a transit company can expect to save between \$149,000 to

\$190,000 in fuel costs as compared to a diesel or CNG bus.⁶ In addition to lower fueling costs, electric buses can be four times more fuel efficient than a comparable CNG buses.⁷ With many fewer moving parts, electric buses are also both cheaper and easier to maintain. Transit agencies can ultimately save around \$200,000 over the lifetime of the bus on operations and maintenance costs.⁸ The U.S. Department of Transportation states that “electric buses have been observed to log 133,000 miles between maintenance compared to a CNG bus that averaged 45,000 miles between maintenance.”⁹ While upfront costs are higher, when coupled with external funding, the total costs of owning and operating a battery electric bus can be 17%-23% lower than a comparable diesel bus.¹⁰

ENVIRONMENTALLY FRIENDLY

Even factoring in the emissions from the electricity sources used to power them, electric buses are significantly lower in emissions than diesel or CNG buses. Each zero emission bus, over a 12 year period, can eliminate 1,690 tons of carbon dioxide, 10 tons of nitrogen oxides, and 350 pounds of diesel particulate matter, compared to conventional buses.¹¹ And as we continue shifting to cleaner sources of electricity, battery electric and fuel cell buses (especially when the hydrogen is derived from solar power) become even cleaner.

INCREASED OIL INDEPENDENCE & JOBS

Zero emission buses rely on electricity from domestic sources of energy and keep the energy-related profits and jobs rooted here in the U.S. This includes jobs for electrical and utility workers. Additionally, there are a number of companies manufacturing zero emission buses in the United States, providing manufacturing jobs as well.

FINANCING AND FUNDING OPTIONS

There are multiple opportunities for transit organizations to secure funding and financing to assist in offsetting the upfront costs of fully electric buses. Funding opportunities include the [Volkswagen Settlement](#)¹² which set aside \$2.7 billion for projects such as improving green port vehicle programs, installing electric vehicle infrastructure, and funding zero-emission school and transit buses. Other federal programs include the [Congestion Mitigation and Air Quality Improvement Program \(CMAQ\)](#),¹³ the [State Energy Program \(SEP\)](#)¹⁴ and the [Low or No Emission Vehicle Program](#).¹⁵

There are multiple private companies that offer operating or battery leases. Operating leases allow the customers to pay for the cost of the bus over time, with the option to permanently transition the bus into the fleet at the end of the lease term. Battery leasing options enable customers to purchase a fully electric bus at approximately the same cost as a diesel bus, putting the operating savings toward the battery lease.

ENDNOTES

- 1 EIA state carbon dioxide emissions data, 2015.
- 2 <https://www.apta.com/resources/statistics/Documents/FactBook/2015-APTA-Fact-Book.pdf>
- 3 <https://www.sciencedirect.com/science/article/pii/S136192091630476X#f0025>.
- 4 <https://www.osha.gov/SLTC/dieselexhaust/>.
- 5 Based on Sierra Club analysis using 2017 AFLEET Modeling. Default values used, with updates to purchase price, maintenance, and fuel economy based on transit agency reported numbers.
- 6 Sierra Club analysis using the 2017 AFLEET model shows that electric bus fueling costs are approximately \$149,000 less than diesel and \$198,000 less than CNG compared to our analysis.
- 7 <https://www.transportation.gov/r2ze/benefits-zero-emission-buses>.
- 8 AFLEET analysis shows that electric bus O&M costs are approximately \$362,000 less than diesel and \$219,000 less than CNG according to our analysis.
- 9 <https://www.transportation.gov/r2ze/benefits-zero-emission-buses>.
- 10 <https://www.sciencedirect.com/science/article/pii/S136192091630476X#f0025>. <https://www.transportation.gov/r2ze/benefits-zero-emission-buses>.
- 11 <https://www.epa.gov/enforcement/volkswagen-clean-air-act-civil-settlement>.
- 12 https://www.fhwa.dot.gov/environment/air_quality/cmaq/.
- 13 <http://energy.gov/eere/wipo/state-energy-program-competitive-financial-assistance-program>.
- 14 <https://www.transit.dot.gov/funding/grants/lowno>.

Sierra Club National
2101 Webster Street, Suite 1300
Oakland, CA 94612
(415) 977-5500

Sierra Club Legislative
50 F Street, NW, Eighth Floor
Washington, DC 20001
(202) 547-1141

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