

# Electric school bus

## Cleaner, reliable, ready

The school bus, a class 6-7 vehicle, is a heavy-duty vehicle that's responsible for getting students to and from school, or school-related activities. Approximately 485,000 school buses transport 26 million students in the country daily, which means a lot of mileage and a lot of emissions.

There are numerous operational advantages associated with electric school buses, such as reduced maintenance and lower fuel costs that can help offset their upfront sticker price. Robust incentives, like point of sale rebates and infrastructure rebate programs, can lower the Total Cost of Ownership (TCO), making electric school buses more cost competitive and a more viable option. And because they eliminate tailpipe emissions, they have become an increasingly attractive choice among fleets and policymakers looking to address local air quality concerns, while also reducing noise and carbon pollution.

There are several reasons electric school buses are a better choice compared to their diesel equivalent.

**More fuel efficient:** Diesel school buses can drive at 8.20 miles per gallon, whereas an

electric school bus drives at 20.87 miles per diesel gallon equivalent — making them almost 60% more energy efficient.

**Less maintenance:** Electric school buses have fewer rotating and moving parts, requiring less maintenance, adding to their competitive cost advantage.

**Higher annual savings:** School buses are a prime candidate for electrification because of the reliability of the route. However, with a driving average of 260 days per year (five days of operation per week) at an average of 60 miles of daily range, the vehicle miles traveled (VMT) for buses is relatively lower compared to other vehicle types, it may take longer to make the economics of the higher upfront cost associated with electric buses pencil out, making interventions to bring down the purchase price critical.

Environmental Defense Fund analyzed\* the life cycle costs of a diesel versus battery electric school bus and found that the TCO of one electric school bus is 10% higher over its 12-year lifetime.

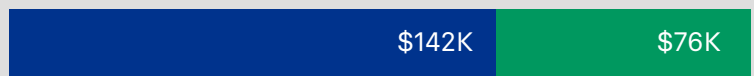
This TCO is projected to fall further with growing technological advancements, but needs financial mechanisms in the near-term like grants, Pay as You Save, and loans to help bring down the upfront cost of a zero-emission bus. With that assistance, the annual savings of reduced operations and maintenance will help recover the initial vehicle cost within a short time.

\*The VMT per vehicle for a school bus is 15000 miles/vehicle-year; Battery electric vehicles are charged with 100% clean electricity.

### Costs of diesel vs. electric school bus

Based on 2018 prices

#### Diesel



#### Battery



Operations and maintenance

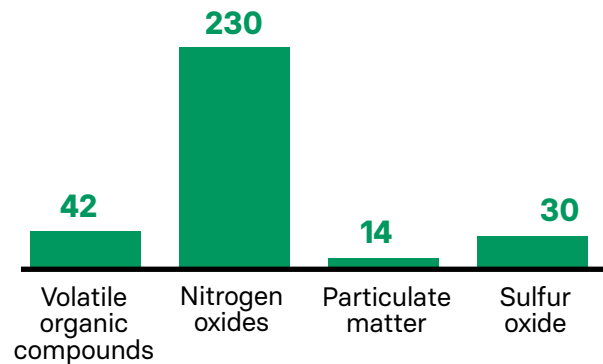
Fueling and charging

# Public health benefits of electric school buses



Each electric school bus prevents **291 metric tons** of climate pollution

Toxic emissions avoided per electric school bus (kgs)



Pollution from diesel-fueled school buses causes serious harm to human health. Diesel exhaust is a particularly nefarious poison for children as it can adversely affect those who already have underlying respiratory illnesses, such as asthma or bronchitis. Asthma is the leading cause of school absenteeism - which, in conjunction with evidence that pollution impacts learning, causes academic performance issues.

Switching to electric school buses would not only address the tailpipe emissions that lead to poor air quality in communities, it would also dramatically decrease the life cycle greenhouse gas emissions of school buses, depending on the electricity generation mix.

EDF analyzed the life cycle emissions of replacing a single diesel school bus with battery electric and found that the life cycle emission reductions are significant. Moreover, if the electric vehicle is charged with electricity generated completely by renewable energy, then the life cycle pollutants and greenhouse gases are almost negligible. This is significant, as these pollutants contribute to poor air quality that can potentially cause serious health effects.

## U.S. electric school bus programs grow

Electric school bus pilot projects are currently in operation in Massachusetts, New York, Vermont, California, Michigan, and Minnesota. Twin Rivers School District near Sacramento was the recipient of a \$7.5 million California Climate Investment Grant and purchased zero-emission buses. To date, they have 40 electric buses and 37 compressed natural gas vehicles – but plan to scrap those CNG vehicles and expand their zero-emission fleet. This is in large part because they have seen 80% savings in fuel costs and 60% lower maintenance costs.

In Virginia Dominion Energy has partnered with local school districts to add 200 electric school buses to the fleet every year for five years, with an aim to reach 100% electric school buses by 2030. Dominion lists numerous benefits leading to this change, including a 60% reduction in operation and maintenance costs, a much higher fuel efficiency, thousands of pounds of reduced carbon dioxide, and millions of pounds of reduced emissions – the equivalent of taking 78,000 cars off the road.