

# Literature and Industry Scan of Electric School Buses

## BRIEFING PAPER

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The Texas Department of Transportation (TxDOT) tasked the Texas A&M Transportation Institute (TTI) with conducting a literature review and industry scan of electric school buses to proactively assist school districts in their efforts toward researching and making decisions on electric school bus use. The project was funded through State Planning and Research funds managed by the U.S. Department of Transportation's Federal Highway Administration. Staff from TTI and TxDOT's Research Technology and Implementation Program and Environmental Affairs Division collaborated to produce this briefing paper.

According to the American School Bus Council, approximately 480,000 school buses transport nearly 25 million students in the United States each day. In Texas, 30,541 school buses were in operation during the 2018–2019 school year. School districts have many options when purchasing school buses. Electric buses are one of the newer alternative-fuel school bus types and have been actively

deployed across the United States since 2017. Electric buses operate from batteries that are charged via an electricity source. The generation of the electricity itself does produce emissions, but the electric buses themselves do not emit any emissions.

Electric buses have a high fuel economy, but their range is much lower compared to buses with other fuel types. The fuel economy of electric buses is impacted by speed, road type, weight, and weather conditions.

Electric buses are more expensive to purchase than buses using diesel, compressed natural gas, or propane. However, industry and agencies believe that the up-front costs can be recovered through lower long-term maintenance and fuel costs. Electric bus manufacturers claim maintenance costs will be lower with electric buses since fewer moving parts exist in the vehicle.

The most significant anticipated maintenance cost for electric school buses involves battery replacements. As technology has improved in recent years, battery prices

### Electric school bus FUEL TYPES



DIESEL



PROPANE



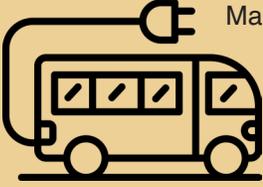
CNG



ELECTRIC

have dropped, and some experts have proposed that electric bus costs could be similar to other alternative-fuel buses in the future. However, school district and transit agency experience has yet to show lower maintenance costs. Issues have arisen with motor inverters and charging infrastructure at both schools and transit agencies, impacting actual maintenance costs.

Electric school buses provide many benefits. One of the most valuable benefits is that they reduce emissions, which can provide a safer, cleaner environment for children. The buses are designed to be quieter, and because there are fewer parts, they have the potential for lower maintenance costs. There are several financing opportunities available for school districts, such as the Volkswagen Settlement and TCSB grant opportunities. School districts can also work with utility providers to take advantage of vehicle-to-grid (V2G) and vehicle-to-building (V2B), further reducing school expenditures.



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# 61 ELECTRIC school buses

deployed across the United States

Electric school buses also have potential cost disadvantages when considering acquisition. The purchase costs for electric school buses are still greater than traditional-fuel school buses, though prices are expected to decrease as market penetration increases. School districts with electric buses have experienced maintenance issues with both the buses and their charging infrastructure.

## Electric school bus BENEFITS



reduce vehicle emissions



quieter



lower maintenance costs

Electric school bus deployment is new, and a technology learning curve for both drivers and technicians must be overcome before certain benefits can be realized. Such issues have the potential to affect the costs a school district may face. School districts would do well to get current price quotes on buses, charging infrastructure, and energy costs. It is also important for school districts to review current research and industry literature for more peer experiences and updates since the electric vehicle industry is rapidly changing.

Currently, no electric school buses are operating in Texas. Everman ISD, located south of Fort Worth, Texas, is in the process of purchasing three Blue Bird electric school buses, with a planned delivery date of fall 2020. As of March 2020, there were 61 electric school buses deployed across the United States. In most cases, schools have purchased only a single bus. One notable exception is the Twin Rivers Unified School District in California, which has continued to purchase additional electric school buses since initial deployment. Its fleet currently consists of 30 electric school buses.

The districts that have deployed electric school buses have all decided to continue using the buses, and many districts have purchased additional electric school buses after their initial experiences.

The following are suggested considerations intended to help school districts throughout the process:

- Utilize funding opportunities for alternative-fuel school buses.
- Build a strong relationship with the school bus manufacturer.
- Inquire about current price quotes for both buses and chargers.
- Be proactive in route planning and deployment, due to range limitations with electric school buses.
- Work with utility companies to negotiate stable utility rates, if possible.
- Ensure that chargers are in proper locations that will not block access points.
- Investigate V2G and V2B technologies for potential implementation benefits.
- Utilize the AFLEET Tool to estimate total cost of ownership and emission differences compared to diesel buses.

## For More Information

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