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How to Electrify a School Bus Fleet

Learn how to electrify your school bus fleet in six steps. From funding opportunities to the operation of charge points.

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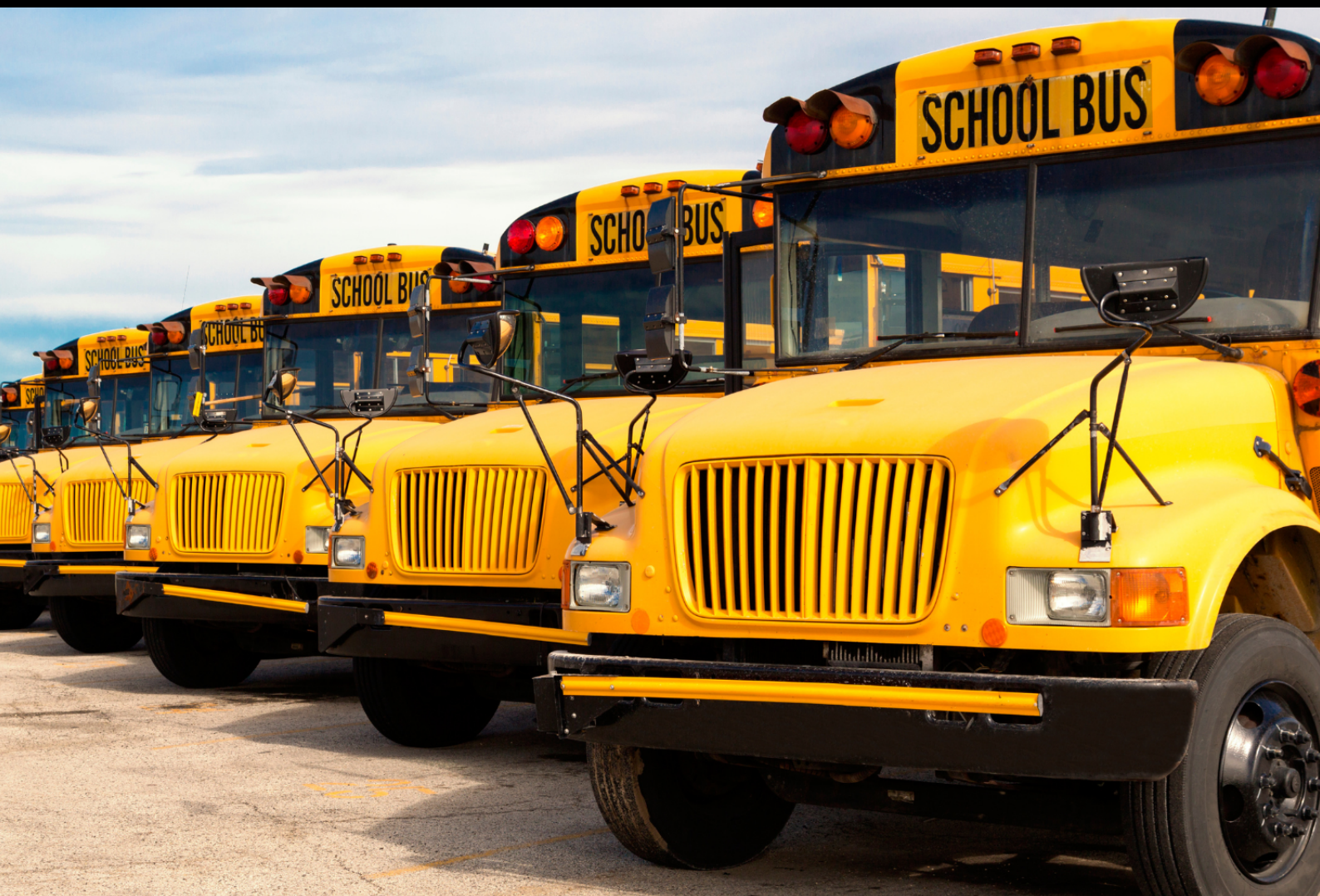

1. Introduction

The transition from internal combustion engine (ICE) buses to electric buses can bring numerous benefits to US schools and local authorities, including improved air quality, lower operating costs, quieter operations, reduced dependence on fossil fuels, and a positive community impact.

In the pursuit of sustainability, global governments and local authorities are taking actions to reduce carbon emissions. The United States, in particular, is leading the way, with school districts eligible for funding to transition from diesel-powered buses to electric ones.

The Clean School Bus Program, an initiative established by the Environmental Protection Agency under the Bipartisan Infrastructure Law of 2021, provides $5 billion worth of funding over a 5-year period to support the shift towards low/zero emission school transport fleets. The funding offers fleet operators the resources necessary to make the transition and establish reliable charging operations.

This report outlines a comprehensive approach to acquiring funding for electric school buses (ESBs), determining the total cost of ownership (TCO), and ensuring successful charging operations. Furthermore, we will delve into the various electric vehicle (EV) charger options available for school buses, and provide guidance on monitoring charging operations.

2. Research & Obtain Funding

There are extensive funding options for school bus operators seeking to transition to electric school bus fleets. One of the most comprehensive sites to start searching for funding is the EPA website, which provides details on the Clean School Bus Program. Refer to the EPA site on when the window for applications is open and how to apply.

Benefits of Electric School Buses

At this stage, it is important to research the benefits of electric school bus fleets. These are key points in winning stakeholder approval. A few benefits include:

- Reduced operating costs, leading to a lower total cost of ownership (TCO). Studies have shown that electric buses can lead to a lower total cost of ownership when compared with traditional diesel buses due to higher fuel efficiency and reduced maintenance costs. A recent academic study showed that an electric bus yields a total cost of ownership that is 15% less than a diesel bus.

- Less air pollution, improving community and student health and safety. Research shows that electric buses result in a greater reduction of air pollution and CO2 emissions than other electric vehicles.

- Less maintenance required over the lifetime of an electric passenger vehicle, as revealed in a recent World Bank report.

- Easier refueling (as long as efficient charging systems are in place).

Calculating TCO

To fully appreciate the real savings made possible by electrifying your school bus fleet, you must first understand what your TCO is. Calculating TCO involves:

- Deciding on the type and brand of electric school bus to buy.
- Calculating the daily/monthly mileage of the buses.
- Understanding how the funding incentives work – funding of vehicle purchase, utility program, carbon-emission credits, etc.

LEARN MORE

Detailed reports on TCO for electric vehicles in various regions can be found on The Nickel Institute Website: www.nickelinstitute.org

In general, the main benefits that lead to a reduced TCO for EVs over ICE vehicles are as follows:

- **Initial Cost:** An ICE vehicle is usually cheaper to purchase, while an electric vehicle may have a higher initial cost. However, the TCO of an EV is often lower due to lower operating costs, such as cheaper fuel and reduced maintenance costs.
- **Fueling Cost:** The cost of refueling an ICE vehicle is typically higher than charging an electric vehicle, as electricity is cheaper than gasoline. This can result in significant savings over time.
- **Maintenance Cost:** The fewer moving parts in an electric car result in lower maintenance costs, which can also contribute to a lower TCO.
- **Driving Range and Charging Infrastructure:** The limited driving range of an electric vehicle means that owners may need to plan their trips more carefully and recharge more frequently. The availability and accessibility of charging infrastructure also play a role in the TCO of an EV.
- **Tax Incentives and Government Subsidies:** In some states, there may be government incentives or subsidies available for purchasing EVs and EV fleets (such as the Clean School Bus Program), which can considerably lower the TCO. It's important to consider these factors when comparing the TCO of ICE and EVs.

The shift to electric school buses requires careful preparation for increased energy needs. School bus operations managers must understand their site's power capacity and any necessary upgrades.

3. Prepare Utilities & Your Site

To make the transition as smooth as possible, it's important to work with utility providers and ask the following questions:

- What is the current level of power available at the site?
- Does the available energy meet the needs for charging the planned number of electric buses?
- Are there any **Vehicle-to-Grid (V2G)** programs available?
- Would using charging optimization software be helpful?

DID YOU KNOW?

V2G is a connection between an electric vehicle and the power grid that enables a two-way flow, either charging the vehicle from the grid or discharging the vehicle to feed power back into the grid.

To fully understand the benefits and requirements of the transition, it's a good idea to use a reliable simulation tool. The **Ampcontrol Simulation Tool** uses AI to assess the site's capabilities and charging behavior.

Inputting relevant information enables the AI engine to generate a report that includes charging profiles, smart charging suggestions, and an assessment of charging efficiency. This information is crucial for making informed decisions and ensuring a successful transition to electric buses.

After reviewing your site, you should have a solid understanding of the charging infrastructure needed for your electric bus fleet. It's time to pick the electric buses that best suit your needs and order the necessary charging stations. Plan the installation based on the lead times for the equipment.

LEARN MORE

Get accurate charging site plans with charging optimization in just a few seconds. Our simulation tool will show you how you can reduce energy demand costs, safely oversubscribe your grid connection, and optimize your charging operations.

Learn more at: **www.ampcontrol.io/simulation-tool**

4. Schedule the Installation of Charging Infrastructure

When choosing electric buses, it's important to consider the most popular types, assess their charging efficiency, and determine which ones fit your requirements. A A detailed list of vehicle manufacturers is included at the end of this report. Below is a brief overview of the main types.

Battery Electric Buses (BEBs): These buses rely solely on battery power and produce zero emissions. They have a high energy efficiency but may take longer to charge than other types of electric buses. BEBs offer the advantage of longer travel distances on a single charge.

Hybrid Electric Buses (HEBs): These buses use both a battery and an internal combustion engine to power the vehicle. The engine recharges the battery during operation, increasing charging efficiency. HEBs are a good option for operations with varying demand levels, as they can run on electric power or use the engine as needed.

Plug-in Hybrid Electric Buses (PHEBs): These buses also use a battery and an internal combustion engine, but they can also be plugged in to recharge the battery, which improves charging efficiency. PHEBs are a good choice for operations that mix electric and diesel power.

LEARN MORE

AC and DC charging stations have a variety of differences, which can lend better to different types of fleets. Discover which type of charger might be a better fit for your electric school bus fleet and the differences between AC and DC charging sttions.

Learn more at: **www.ampcontrol.io**

When selecting a charger for your electric bus fleet, it is important to understand the difference between AC and DC charging options. For smaller to medium-sized fleets, AC or slow DC charging may suffice. Larger fleets may benefit from fast DC charging.

If you plan to implement Vehicle-to-Grid (V2G) technology, make sure to thoroughly review the charging point specifications. Only a limited number of chargers have this feature.

DID YOU KNOW?

V2G technology may not be suitable for every use case. Usually, it is advised to prepare EV fleets without V2G, as V2G is more complex, has varying availbility depending on geography, and requires higher investments.

5. Manage your Charging Station

The next stage is to plan how your charging operations will work in practice. You need to decide the following:

- Who will plug the buses into the charging stations? Drivers, site staff, maintenance staff, etc.
- How will you monitor and maintain the charging hardware?
- What procedures will be in place to address charging problems, such as faulty charging stations, power outages, etc.?
- How can you make your charging operations as efficient as possible? e.g., take advantage of cheaper energy at night.

DID YOU KNOW?

Smart charging systems apply an intelligent decision-making process that automatically adjust the power output from charging stations. The smart systems can, at any appropriate time, increase power, reduce power, or delay the charging process.

The most effective way to monitor your charging operations and make sure they are as efficient as possible is to implement **smart charging software**.

A smart charging solution such as Ampcontrol helps you to optimize charging by capturing data, analyzing it thoroughly, and automating elements of the charging system to get the best results. It will help you to achieve maximum cost-efficiency while running a reliable EV charging site.

LEARN MORE

Discover how Ampcontrol's smart charging solution can help you optimize, analyze and automate elements of your electric school bus charging operations

Learn more at: **www.ampcontrol.io/school-buses**

6. Monitoring your Electric School Bus & EV Chargers

The penultimate step is to make sure that you keep a close eye on your ESB fleet performance. Monitoring your vehicles and chargers not only reduces the chance of problems arising, but also allows you to adjust your operations to be more efficient and potentially save money.

There are two main ways to track and monitor your ESB fleet performance:

- **Vehicle Monitoring:** Fitting ESBs with telematics technology.
- **Charging Monitoring:** Use performance indicators and track operation and maintenance of chargers. Ampcontrol is the ideal software system to track and monitor your charging infrastructure.

7. Optimize your Charging

Finally, using the tracking data gained in the previous step, you can begin to optimize the charging of your ESB fleet.

In many cases, adjusting the charging using your energy tariff is an excellent way to reduce charging costs. Your dynamic load management helps you to shift charging to cheaper energy rates and reduce the total power demand of your site.

In addition, demand response programs and Vehicle to Grid schemes are good additional options to collaborate with utilities by providing energy back to the grid. etc. As ESBs run on a regular schedule, they are ideal as a backup source of energy when electricity demand is high, according to energy providers.

A good starting point is to implement dynamic load sharing which uses the OCPP protocol to distribute the available power more effectively amongst the plugged in vehicles.

Another way to increase the efficiency of charging your electric school bus fleet

LEARN MORE

Discover how Ampcontrol's EV smart charging management software uses real-time data to monitor charger performance, ensure vehicles' on-time departures, and lower total energy costs.

Learn more at: **www.ampcontrol.io/smart-charging-software**

8. Summary

Electric school bus fleets are going to become more and more common over the next decade. It provides an effective way for local districts to meet sustainability targets and boost their green credentials.

The six steps set out above will help you to get started on transitioning from a fleet of diesel engine buses to electric buses. Ampcontrol is a smart charging management solution that helps you to monitor the performance and optimize your ESB fleet charging. Contact us today to find out more.

CONTACT US

Contact us to learn how Ampcontrol's EV Charging Management Software can ensure fully charged vehicles and a sufficient range, reduce the power demand for your charging locations, ensure individual departure times, achieve your sustainability goals, and improve students' lifestyles.

Email: **contact@ampcontrol.io**
Learn more at: **www.ampcontrol.io/forms/contact**

Additional Resources

SCHOOL BUSES & COMPATIBLE CHARGERS

There are 4 classifications of school buses, which relate to the size and shape of the bus body – types A, B, C, and D.

Type A school buses, also known as mini-buses, are usually the smallest buses. These are used for long-distance transportation and can have a capacity ranging from 10-16 passengers, though sometimes more.

Type B school buses are similar to Type A buses and are often used for shorter trips or to transport smaller groups of students. They are typically built on a stripped chassis. Type B school buses are classified by the engine location, which is typically beneath or behind the windshield and next to the seat of the driver. The typical capacity for Type B school buses is 10-30 passengers.

Type C school buses carry the traditional school bus design and size. Type C school bus engines are usually located behind the front of the windshield. These buses can hold up to 80 passengers at a time.

Type D school buses are the largest of the four types of buses. Type D buses may have varying designs with the engine possibly located with a front-, mid- or rear-mount. These buses are even longer than Type C buses, and they have a more pronounced, rectangular body. They are used for longer trips and can accommodate up to 90 passengers.

COMPANY	WEBSITE	PRODUCT	CHARGER REQUIREMENTS	COMPATIBLE CHARGERS
TYPE A SCHOOL BUSES				
Blue Bird	https://www.blue-bird.com/	MicroBird – Girardin	J1772 65A/240V	2x 6.6 kW Level 2
Lion Electric	https://thelionelec-tric.com/en/prod-ucts/electric	Lion	208/240 V single phase power 19.2 kW - requires 80 amps	Clipper Creek (and other brands using J1772)
TransTech	http://www.tran-stechbus.com/	TransTech	J1772 208/240V Sin-gle Phase 15 kW	Any brand using J1772
Collins	https://www.collins-bus.com/	Collins	J1772 208/240V Sin-gle Phase 15 kW	Any brand using J1772
TYPE C SCHOOL BUSES				
Thomas Built Buses	https://thomas-builtbuses.com/	Saf-T-Liner C2	Input: 480VAC 3 Phase	Most SAE Com-bo (CCS) DC
Starcraft	https://www.starcraftbussales.com/learn-more-about--school-buses	Starcraft eQuest XL	Output: 60kW - 270-875VDC	Fast Chargers and
Lion Electric	https://thelionelec-tric.com/en/prod-ucts/electric	Lion	Or: 25kW Level 2 Charger	Level 2 J1172 brands
Blue Bird	https://www.blue-bird.com/	Blue Bird Vision	J1772 208/240V	Any brand using J1772
IC Bus	https://www.icbus.com/	IC Bus	Single Phase 15 kW	Clipper Creek (and other
TYPE D SCHOOL BUSES				
Lion Electric	https://thelionelec-tric.com/en/prod-ucts/electric	Lion	208/240 V single phase 19.2 kW - re-quires 80 A	Clipper Creek (and other brands using J1772)
Blue Bird	https://www.blue-bird.com/	Blue Bird All American	Input: 208-240 VAC,100 amps, single-phase, 60 hz; Output: 208-240 VAC, 80 amps	Clipper Creek

About Ampcontrol

Optimize Your Electric Vehicle Operations

Ampcontrol offers cloud-based, charging and management software that connects to any EV charger using OCPP. School bus fleet operators use Ampcontrol for charging sites to ensure on-time departures, a low peak power demand, and energy cost reductions. Since 2019, Ampcontrol has deployed its software with charge points in America, Europe, and Africa.

		Other CMS
Real-Time Charger Monitoring	✓	✓
OCPP Charger Communication	✓	✓
Fleet Management	✓	
Dynamic Load Management	✓	
V2G & Demand Response Events	✓	
Solar & Building Energy Integration	✓	
Alerts & Notification System	✓	
Analytics & Insights Reports	✓	
99.999% Software Uptime	✓	

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