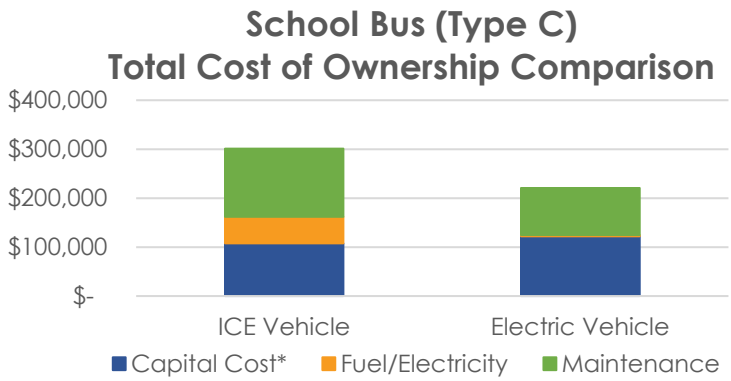
# School Buses

POTENTIAL FLEET ELECTRIFICATION SAVINGS

## Fleet Electrification Opportunities

ICF, on behalf of Consumers Energy provides fleet electrification recommendations and objective guidance from our team of electric vehicle (EV) experts. We are here to help your school district understand the potential impacts and benefits of shifting your Internal Combustion Engine (ICE) fleet vehicles to EVs.

Below is a high-level estimate of the potential total cost of ownership (TCO) savings and emission reductions associated with converting one of your Type C school buses to electric.




**$80,290**
TCO savings over the school bus's lifespan

**171**
Metric Tons Net Green House Gas Emissions Reduced

*EV capital costs include EV charging infrastructure and installation cost estimates, Consumers Energy's PowerMIFleet EVSE and Make-Ready Program incentives, and the Environmental Protection Agency (EPA)Clean School Bus Program incentives. TCO calculations are based on a 12-year vehicle life.

## Why Switch to Electric Buses?

Battery electric vehicles (BEVs) don't release any tailpipe emissions, which means cleaner air for your students, staff, and local community.

Electric buses can help cut down on operations and maintenance costs. That's because they are more efficient, less expensive to fuel, and require less maintenance over time. Pellston Public Schools projects annual fuel savings of $60,000 from electrifying four of their nine buses.

EVs have a lower center of gravity which offers better handling and responsiveness. The electric engine provides smooth acceleration and deceleration, and a quiet ride, which all leads to a safer experience.

EVs are broadly incentivized by Consumers Energy's PowerMI EVSE and Make-Ready Program as well as through state and federal agencies. Our experts can connect you with the type of financial assistance that is right for you.



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Fleet advisory services provided by ICF

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## Types of EV Charging Infrastructure

EVs require access to chargers, also known as EVSE. In a fleet application, the majority of charging is typically done at the fleet facility – overnight or between shifts. Facility-based charging can be supplemented with periodic charging at workplaces, idle locations, and public destinations as needed. There are three types of EV chargers: Level 1, Level 2, and Direct Current (DC) Fast, which are described further below.

| | Level 1 | Level 2 | Direct Current (DC) Fast |
|---|---|---|---|
| **Power Supply (Volts)** | 120 | 240 or 208 | 208/480 three-phase |
| **Range per hour (Miles/hour charging)** | 2 to 5 | 10 to 20 | 150+ |
| **Additional Notes** | Plugs into the vehicle's SAE J1772 charge port.<br>Slowest category of EVSE | Most common charger for home, public and workplace charging. | May require infrastructure upgrades and cost significantly more than Level 2 chargers.<br>Range depends on vehicle type and power supply. |

Our analysis uses a conservative one-to-one vehicle-to-charger ratio, but it may be possible to reduce the number of chargers by:

- Manipulating the duty cycles of the vehicles to allow for successive (non-overlapping) charging;
- Identifying managed charging solutions to optimize charger use;
- Garaging EVs together to allow for shared chargers; and
- Leveraging publicly available EVSE, where appropriate.

## Enviromental Benefits

**Converting a school bus to electric is estimated to produce the following environmental impacts:**

**171**
metric tons (MT) of $CO_2$ eliminated over 12 years

**694**
Pounds (lbs.) of site NOx eliminated over 12 years

**Over 12 years, these estimated emission reductions equate to:**

switching **6,479** incandescent lamps to LEDs, or:

recycling **58** tons of waste instead of landfilling it, or:

planting **2,813** trees.

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## Total Cost of Ownership Assumptions

The following table provides additional context and assumptions around our fleet savings estimates.

| School Bus (Type C) TCO Comparison | Diesel School Bus | BEV School Bus |
|---|---|---|
| Capital Cost | $107,500 | $325,000 |
| Charging Infrastructure Hardware (L2: 8-11 kW)[1] | N/A | $1,500 |
| Charging Infrastructure Installation | N/A | $3,500 |
| EV and EVSE Incentives/Grants[2] | N/A | ($208,000) |
| Annual Fuel/Electricity Costs[3] | $5,749 | $263 |
| Annual Maintenance Costs[4] | $14,100 | $9,750 |
| 12-Year Total Costs[5] | $301,177 | $220,886 |
| **Single EV School Bus TCO Savings** | **$80,290** | |

## Type C School Bus EV Models

There are several BEV model options available for Type C school buses summarized in the table below.

| Manufacturer | Model | Type | EV Range (Miles)* | Battery Size (kWh)* | Seating Capacity* |
|---|---|---|---|---|---|
| Blue Bird | Vision Electric | BEV | 120 | 155 | 77 |
| IC Bus | chargE Type C CE Series | BEV | 120 | 315 | 42 - 66 |
| Lion Electric | LionC | BEV | 100 - 155 | 127 - 211 | 77 |
| Motiv Power Systems | EPIC 6 on Ford F-59 Platform | BEV | 90 | 127 | 48 |
| Starcraft | E-Quest XL (Paratransit) | BEV | 105 | 127 | 48 |
| Thomas Built | Saf-T-Liner eC2 Jouley School Bus | BEV | 138 | 226 | 81 |
| Unique Electric Solutions | International PC105 School Bus | BEV | 180 | 150 | 72 |

*Where ranges of data are provided, the specifications vary based on the vehicle model configuration

[1] This conservatively assumes a one-to-one charger-to-vehicle ratio and does not account for any existing chargers your fleet may have. Depending on the scheduled duty cycles of the vehicles, it may be possible to reduce the number of chargers.
[2] Assumes Consumers Energy's PowerMIFleet EVSE and Make-Ready Program incentives (up to $5,000 for L2 charger port and installation costs, with a limit of 10 ports per site), and the EPA Clean School Bus Program incentives (Class 6/7 buses are eligible for $190,000, or $285,000 if located in a prioritized district. $13,000 is available for infrastructure costs including charger and installation, or $20,000 is available for both if located in a prioritized district). EV capital and infrastructure costs shown in the table do not have incentives applied.
[3] Assumes 15,000 miles driven per year, $2.86/gallon diesel (year 1 cost), $0.12/kWh (year 1 cost). Fuel pricing is escalated annually using projections from U.S. Energy Information Administration's 2021 Annual Energy Outlook.
[4] Uses a dollar per mile maintenance cost assumption ($0.94/mile for diesel buses, $0.87/mile for BEV buses), escalated at 2.2% annually.
[5] NPV assumes a 5% discount rate.