ELECTRIC SCHOOL BUS | VEHICLE TO GRID

A rural co-op in Colorado examines the benefits of an electric school bus and a vehicle-to-grid technology

In 2021, the Colorado Energy Office awarded School District 9-R $328,803 for the purchase of an electric school bus through the Regional Air Quality Council's ALT Fuels Colorado program. The funds supported the purchase of a Bluebird all-electric bus with a 155 kWh battery. La Plata Electric Association (LPEA) augmented the state grant, investing $120,000 in a bi-directional fast-charging system.

Deploying the battery in an electric bus as a distribution grid asset provided multiple benefits, with cost savings repaying the investment in just a few years.

Technology: The utility uses Nuvve's (Nuvve Holding Corp.) V2G platform to charge the bus's battery during inexpensive off-peak hours and, when demand for electricity is high, pull electricity from the vehicle battery to the grid. This bi-directional charging technology transforms the bus into an energy storage asset that provides flexibility and will help reduce costs for LPEA's members. The battery can also supply power during outages.

Economics: Smaller, not-for-profit electric utilities such as co-ops and municipal utilities can derive additional economic benefit from these heavy-duty electric vehicles by pulling power from the bus instead of the grid in order to avoid exceeding the peak demand triggering high-cost power. Avoiding peaks enables the utility to save, conservatively estimated, about $1200/month. The experience of LPEA indicates the savings on power costs enabled by the bi-directional charging system will cover the investment in charging infrastructure within a few years.

Consumer benefits: Not-for-profit utilities can reduce the utility's power costs by reducing peak load, a cost savings that can be passed on to the consumers.

Grid benefits: Reducing peak load can prevent outages in extreme situations and reduce overall stress on the grid. In some cases, these batteries can supply power to buildings in the event of an outage.

Environmental benefits: In general, power suppliers meet high demand using peaker plants powered by natural gas or other fossil fuels. Reducing peak demand reduces the need to run those plants. In the future, the flexibility enabled by advanced energy storage will reduce the need to build those plants.

Quality of life benefits: The V2G capability can improve the school district's return on investment for the purchase of an electric bus, making this safer, cleaner technology more accessible to all school districts, even those strapped for resources.

The bottom line. In addition to purchasing a 60-kW bi-directional charger, LPEA invested in a transformer sized to accommodate four school buses with the expectation that the school's fleet will grow.

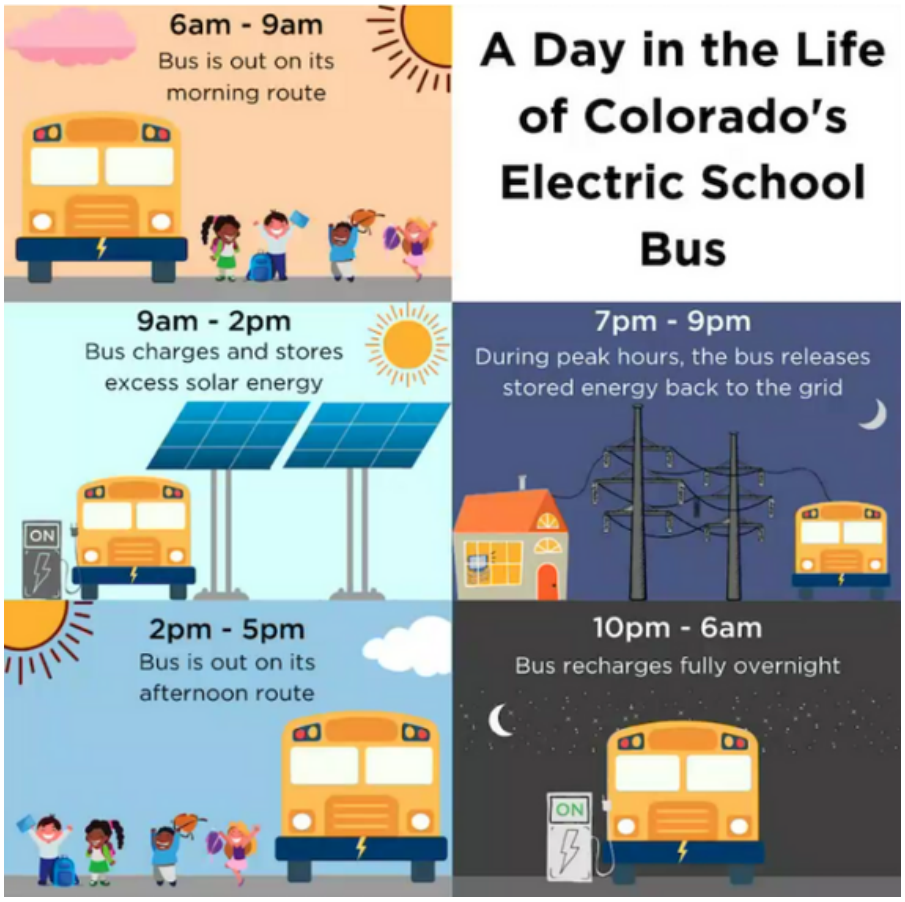
The utility manages the charging. LPEA has revenue grade metering; the bus has its own meter. This arrangement allows more control and better data for analysis.

The cost of a Level 2 charger was around $12-$20K when LPEA was making the purchase. The 60kW Level 3 fast charger cost about $75K (the cost has gone up). Many charging system vendors sell the system and a revenue sharing leasing agreement.

LPEA paid a premium to purchase the system without the leasing agreement. The utility had to customize the software in order to make the AMI and Nuvve systems fully interoperable. Utilities will need access to the system's interface.

LPEA faces a $20/kW coincident peak demand charge every month from Tri-State G&T Cooperative. The co-op's ability to reduce demand during peaks provides meaningful cost savings. The utility expects to recover its costs over a period of 10-12 years.

LPEA accesses the battery for peak shaving multiple times a month, enabling the co-op to meet its peaks and save around $1200 per month. The co-op could potentially save $12,000 inside a year, meaning the investment would pay for itself in just a few years.



Fast Facts on the bus, the battery, and charging

- LPEA's bus travels roughly 50 miles on a standard route (twice per day) and has enough charge to travel 100 miles if needed.
- Empty, the bus takes three to four hours to charge its 155-kWh battery fully.
- A bus can feed 60 kW into the grid in 15-minute intervals.
- When fully charged, the bus stores enough electricity to power 30 average single-family homes, or 100 energy-efficient homes, for a few hours.
- Any claims of revenue-grade metering should be verified.

School buses as a community asset. The business model for many EV charging vendors relies on energy arbitrage; they lease the infrastructure and manage the charging. That model may not work for smaller school districts. LPEA's Dominic May believes buses are better viewed as a community asset that can provide value to the school and the utility.

Under this model, the utility controls and manages the battery charging. In LPEA's case, the utility applied for the state grant, invested in the infrastructure, and gave the bus to the school with the condition that the utility had indefinite control of the battery. It is vital for the school district's transportation leader to support the program and advocate for the new technology.

LPEA will be creating a program designed for the school system, rather than a new rate. LPEA is planning programs for consumers, including EV-charging programs, that allow consumers to stack the benefits for meaningful savings.

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