



Bidirectional Electric School Buses as Resilience Hubs & Grid-Supporting Assets: California Case Studies

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Nuvve & SDG&E Cajon Valley V2G School Bus Deployment

When: Feb 2023 - Feb 2025 (2 year pilot)

What: 6 new ESBs connected to 60 kW bidirectional DC fast chargers as part of a pilot program in partnership with SDG&E and Nuvve

Where: Cajon Valley Union School District in San Diego, CA

Programs: Emergency Load Reduction Program (emergency demand response) and managed charging (charging during off-peak hours)

Benefits: emissions reductions, revenue from V2G services, lower EV total cost of ownership



Photo: Cajon Valley Union School District

"We are going to be all V2G. That is the goal of this district... to be able to support the grid and send the energy back to the grid on demand with the vehicles that we have right now." - Tysen Brodwolf, Transportation Director for Cajon Valley Union School District.

ZUM Oakland Project: Nation's First All-Electric and Bidirectional School Bus Fleet

When: Sept 2024 - present

What: 74 all electric BYD school buses paired with Tellus Power Green bidirectional chargers

Where: Oakland Unified School District in East Oakland, CA

Programs: PG&E Vehicle-to-Everything (V2X) Pilot, which includes Emergency Load Reduction Program (emergency demand response) and Dynamic Rate Pilot participation ("Hourly Flex Pricing")

Benefits: emissions reductions, air quality improvements, revenue from V2G services, lower EV total cost of ownership, utility bill savings



Photo: Zum

Nuvve RESCHOOL (Resilient Energy Solutions for Schools) Project: Revolutionizing Emergency Power

When: Q1 2024 - Q1 2026 (2 year pilot)

Who: Nuvve; University of California, Riverside;
Energetics

What: CEC grant-funded project to demonstrate
vehicle-grid-integration (VGI) and islanded/microgrid
vehicle-to-building (V2B) capabilities at two project sites

Where: 2 California School Districts - **Porterville Unified
School District** is one of the confirmed sites

Why: Inform the development of a blueprint as a replicable
approach to help other school bus fleets transition to
zero-emission and bidirectional charging infrastructure

How: Installation and commissioning of up to 3 new EVSEs or the
use of up to 3 existing EVSEs, in addition to the interconnection
and operability of two Battery Energy Storage Systems (BESS)



Photo courtesy of Nuvve



Image courtesy of Center for Resilient
Neighborhoods Hawaii

Nuvve & The Climate Center Partner on RESCHOOL To Demonstrate Resilience Hubs

Partnership will demo how V2G ESB projects can serve as Resilience Hubs, starting with RESCHOOL project

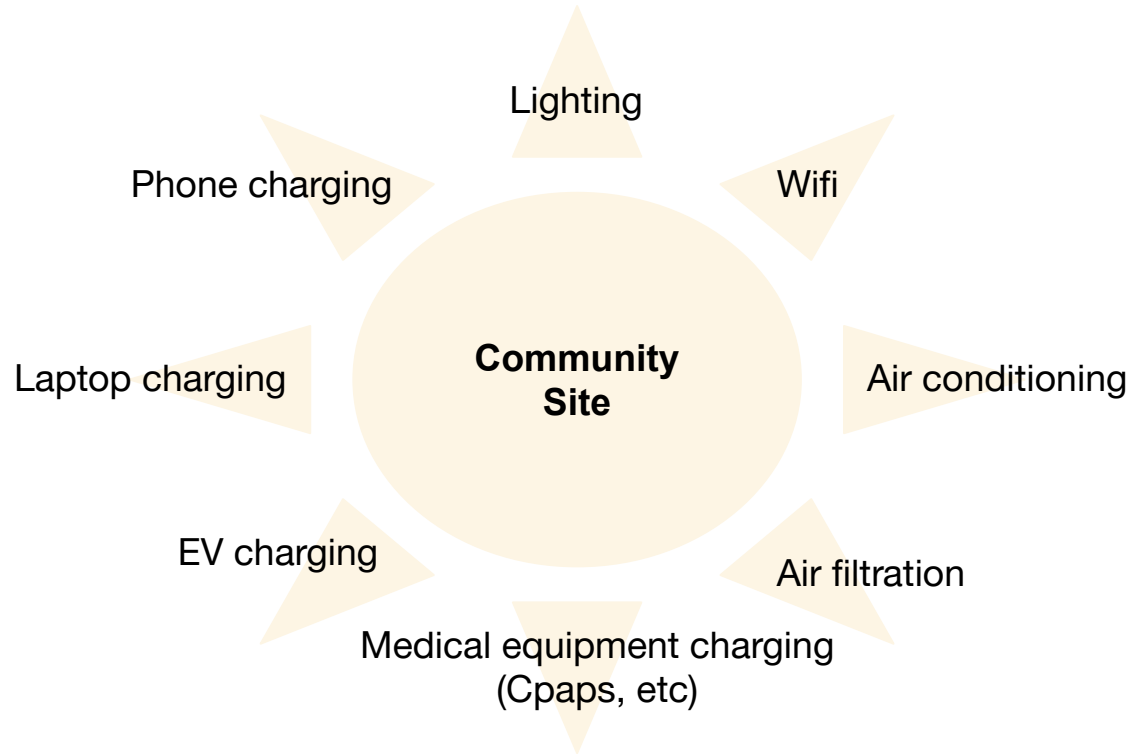
- **Resilience Hubs:** centers that enhance a community's capacity to adapt to climate change (extreme heat waves, wildfires, floods, etc.)
- **RESCHOOL Porterville site:** first confirmed site to serve as a technical proof of concept for a Resilience Hub
- **Resilience-enhancing community benefits** of Porterville project are unique compared to other V2G ESB deployments

Nuvve's RESCHOOL Porterville site will provide a technical solution and testbed for the Resilience Hub concept, an initiative led by The Climate Center



Porterville High School Gym

Imagining the Community Resilience Hub



Conclusions

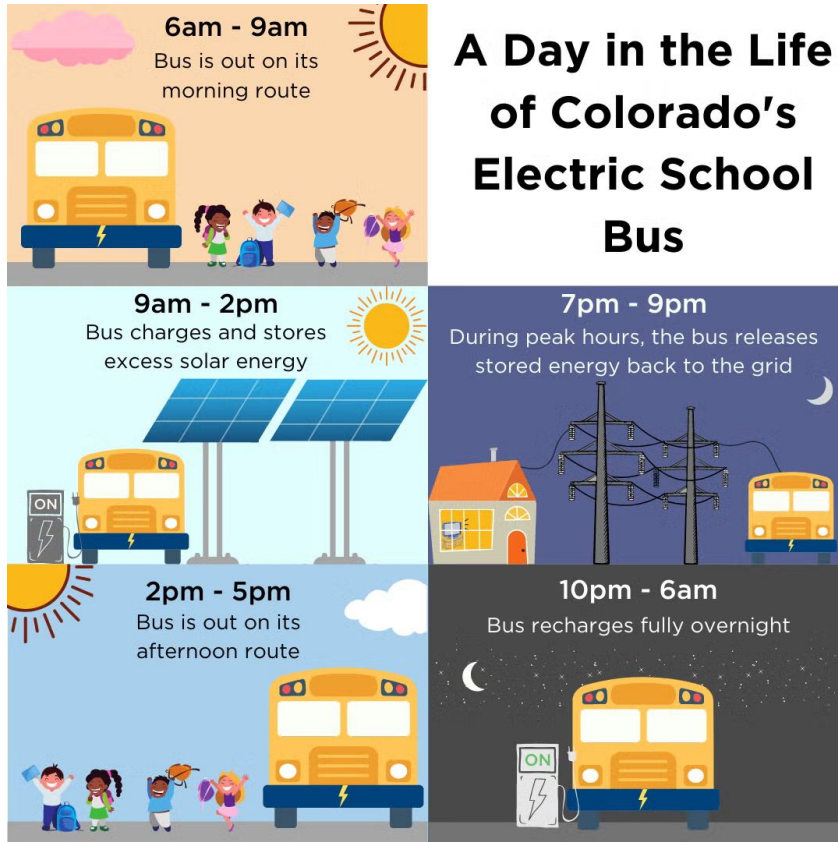


Image courtesy of La Plata Electric Association

V2G School Bus Projects:

- Here today and earning thousands in revenue for school districts across CA
- Ideal use case for V2G
- Addressing energy equity challenges, resilience challenges, and the climate crisis
- **Can serve as community Resilience Hubs with right infrastructure in place**
- Will inform development of VGI blueprints to support transition to V2G ESB's across CA

Conclusions

Benefits of V2G ESB's are Numerous:

- **For utilities:**
 - Help meet statewide clean transportation and decarbonization goals
 - Distribution deferral upgrade and grid utilization benefits
 - Can mitigate local (distribution) and system-wide grid peaks
- **For communities, school districts, and students:**
 - Resilience Hubs - grid resilience and backup power
 - Revenue from grid services and utility bill savings
 - Air quality improvements

Challenges to Scalability

- Accessing export compensation beyond seasonal demand response
- V2G interconnection + energization timelines + distribution grid constraints
- Availability of infrastructure funding + stackability of upfront incentives

Thank you.

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