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EPIC-5 Research Concept AC-V2G Ecosystem for School Bus & MD-EV Fleets

Additional submitted attachment is included below.

EPIC-5 Research Concept: AC-V2G Ecosystem for School Bus & MD-EV Fleets

Submitted by: Andromeda Power / Verdek
Focus Areas: Transportation Electrification / DER Integration

1. Executive Summary

The widespread adoption of Vehicle-to-Grid (V2G) technology is currently stalled by the prohibitive capital expenditure (CAPEX) associated with proprietary DC-based charging infrastructure. Andromeda Power and Verdek propose an **AC-V2G Ecosystem** built on the **SAE J3068/2** protocol. By leveraging existing on-board vehicle powertrain electronics—transforming traction components into bidirectional grid interfaces—we eliminate the need for expensive off-board DC conversion equipment. This project targets the School Bus and Medium-Duty (MD) EV sectors as a "beachhead market" to resolve the industry's "DC-infrastructure gridlock," delivering a **90% reduction in total infrastructure deployment costs** and accelerating the state's decarbonization and grid resilience goals.

2. Strategic Objectives & Key Gaps

Category	Strategic Objective	Key Gap Addressed
Transportation Electrification	Achieve market-transformative cost leadership by shifting from high-CAPEX DC to standard AC-V2G infrastructure.	**The "DC Gridlock"**: Mainstream OEMs lack incentives to implement AC-V2G because current market infrastructure forces expensive, proprietary DC-based solutions.
DER Integration	Enable bidirectional energy flow for resilience, using parked MD-EV/School Bus fleets as grid-flexible assets.	**High DER Barriers**: Existing DER deployment is hindered by excessive installation costs; we offer a low-cost, high-scale alternative.
Technology Scaling	Transition from TRL 6 demonstrators to commercial-ready, multi-OEM compatible AC-V2G infrastructure.	**The "Deployment Gap"**: Current V2G efforts are stuck at the R&D demonstrator stage; we provide a bridge to full commercial-scale fleet operation.

3. Unique Roles & Cross-Cutting Principles

- **Unique Role**: Serving as the "System Integrator" and "Beachhead Catalyst," Andromeda Power and Verdek bring the technical expertise to retrofit existing MD-EV and school bus powertrains for bidirectional AC-V2G. We provide the "low-resistance" path for municipal fleet adoption by avoiding custom, verticalized OEM proprietary systems.
- **Equity & Affordability**: By reducing infrastructure costs by up to 90%, we democratize V2G, making advanced grid resilience services affordable for school districts and disadvantaged communities (DVCs) that cannot sustain the high costs of DC-infrastructure.
- **Interoperability**: TImplementing **SAE J3068/2** ensures vendor-neutral compatibility, preventing the "walled garden" effect and allowing for a future-proof, interoperable fleet ecosystem.

4. TCO Comparison: Conventional DC-V2G vs. Proposed AC-V2G

Our proposal provides a transformative shift in the Total Cost of Ownership (TCO) for fleet operators, moving from "gold-plated" R&D solutions to market-ready deployments.

Cost Component	Conventional DC-V2G	Proposed AC-V2G (J3068/2)
EVSE Procurement (133 kW)	$100k – $150k / port	$3k – $6k / port
Grid/Site Upgrades	Extremely High	Minimal (Leverages existing AC)
Vehicle Integration	Proprietary/Additional	Zero/Integrated into existing parts
Installation	Complex/High Fees	Standard/Low-cost Electrical
TOTAL TCO	**Baseline**	**Up to 90% Savings**

5. Technology Readiness Level (TRL) Progression

Building on the foundational success of EPC-22-007, which validated the MotorTransformer concept on a light-duty platform at TRL 6, this project focuses on Technology Transfer and Commercialization. We will translate this validated methodology to the MD-EV and School Bus sector, advancing the core technology from TRL 6 (relevant environment) to TRL 8/9 (full-scale operational demonstration and commercial qualification). This progression is essential to unlock private investment and prove the commercial viability of an AC-V2G future.

6. Conclusion

Andromeda Power and Verdek provide a clear, market-ready pathway to transform California's school bus and MD-EV fleets into a massive, low-cost, bidirectional grid asset. By resolving the fundamental economic bottleneck of current V2G technology, this project will move California from isolated demonstrator projects to a replicable, high-impact model for transportation electrification and DER integration. We are ready to move beyond the lab and deploy the infrastructure necessary to secure California's energy future.

Luigi Giubbolini
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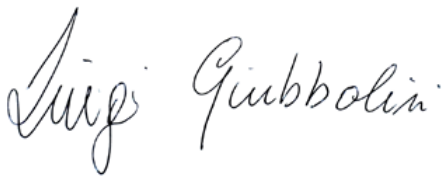

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