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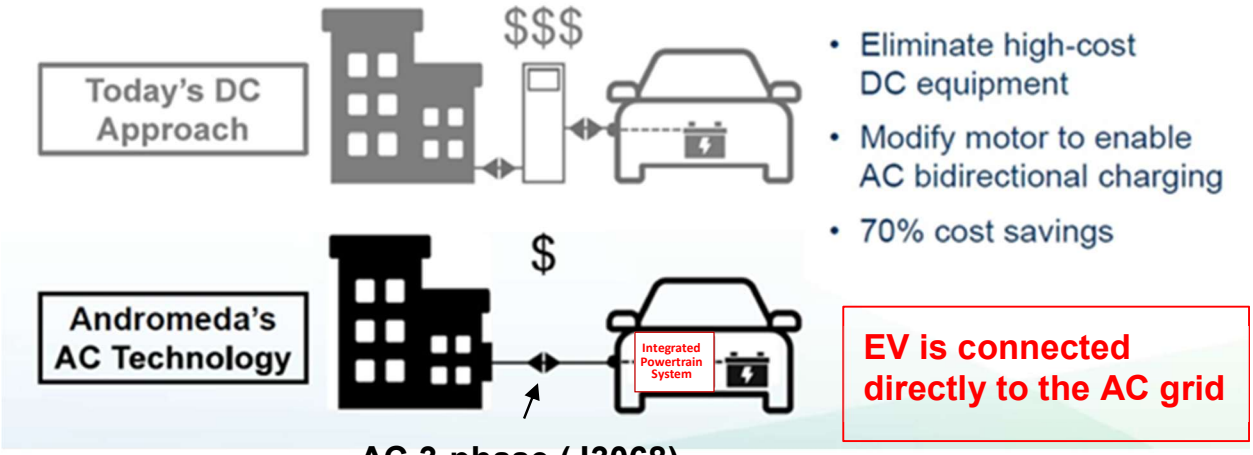
Openâ€¯Modularâ€¯EVâ€¯Powertrainâ€¯Standard (OMEPS)

Additional submitted attachment is included below.

Long Beach, CA, August 5, 2025.

Subject: "Open Modular EV Powertrain Standard (OMEPS)" research concept for the Electric Program Investment Charge 2026–2030 (EPIC 5) Investment Plan

To the California Energy Commission



AC 3-phase (J3068)

1. **Contact information** – *Hillel Pitlik*, hillel@andromedapower.com, (949)257-5405.

2. **Organization** – *Andromeda Power, LLC* and *Verdek, LLC.*

3. **Brief description of the proposed OMEPS concept and purpose**

   Open Modular EV Powertrain Standard (OMEPS) defines an ecosystem of **interoperable, plug-and-play modules** — Motors, MotorTransformers**,** Inverters, Unidirectional and Bidirectional AC/DC Converters, Battery Packs, three-phase AC interface (SAE J3068) — with standardized mechanical, electrical and communication interfaces to assemble EV powertrains easily and quickly.

The MotorTransformer, developed through CEC project **EPC-22-007**, integrates traction motor and isolation transformer capabilities in the same device, enabling the vehicle to travel and charge from, or discharge to, the grid via **three-phase AC**. This concept does not add cost, weight, and volume to the EV.

When paired with a **J3068** coupler, this integration **eliminates the need for off-board bulky and expensive DC fast-charging equipment**, reducing the cost and size of both onboard and off board infrastructure.

OMEPS will publish open specifications, reference designs and certification guidelines so that small enterprises can enter the market, assembling EV powertrains quickly and affordably, into new EV models.

By removing proprietary architectures (current EV business models) and using **low-cost, high-power AC charging hardware** (J3068 EVSE costs **95 % less per kW** than DC fast chargers), OMEPS addresses the **high costs of charger interconnection and grid upgrades** and the **high costs of EV charging infrastructure**. Standardized three-phase AC interfaces mean charging equipment can connect to existing 277/480-V services without expensive service upgrades. Plug-and-play modules also allow light-, medium- and heavy-duty EVs to use common devices, reducing per-vehicle costs and enabling more **affordable and ubiquitous public charging infrastructure**.

The MotorTransformer's bidirectional capabilities enable EVs to serve as **mobile micro grids** in rural or disaster-prone areas, contributing to resilience while obviating the need for costly DC hardware. Because the OMEPS is open source, low cost OMEPS devices will benefit disadvantaged/vulnerable communities (DVC) enterprises and local transit agencies can source and assemble EV powertrains without large capital outlays, creating DVC opportunities to participate in EV production and electrify public transit.

4. **How the OMEPS concept will lead to technological advancement and overcome barriers (SB 96)**

OMEPS will accelerate technological advancement by opening the EV powertrain supply chain. Modular, standardized building blocks enable numerous manufacturers to innovate on specific components rather than developing entire proprietary platforms.

High infrastructure costs — a major barrier — are overcome by the integrated MotorTransformer and J3068 AC charging, which eliminate the need for separate DC chargers and cut EVSE costs by up to **90 %**. Standardized modules can also be mass-produced and deployed in high-density areas without major grid upgrades, addressing the **high costs of charger interconnection**.

Bidirectional Converters and Smart Controls will synchronize EV charging, and discharging, with renewable energy production, helping to overcome the **misalignment between EV loads and intermittent renewables** by enabling time-shifting and bidirectional energy flow.

OMEPS will incorporate **uniform data-exchange and cyber security protocols** to address the **lack of robust and uniform data sharing** in transportation electrification. Each module's communication interface will support secure data collection and open APIs, enabling researchers to study **consumer decision-making behavior** (e.g., charging patterns, range anxiety) and identify adoption barriers.

By lowering costs and simplifying infrastructure, OMEPS creates new business models for community-owned chargers and micro-transit fleets, giving **DVCs** direct economic benefits from EV adoption.

The same low-cost AC infrastructure and OMEPS modules can electrify public buses and transit in non-attainment areas, mitigating pollution at a fraction of current cost.

Finally, by enabling vehicles to operate as micro grids, the concept improves **resilience during natural disasters and power outages**, ensuring communities have access to electricity when central infrastructure fails.

5. **Anticipated outcomes and potential benefits**

Success of OMEPS will yield the following outcomes:

- **Cost reductions**: Standardized modules and AC charging hardware reduce EV powertrain and EVSE costs; eliminating DC fast-charging equipment decreases weight and materials; the J3068 cost advantage (90 % lower per kW) lowers installation expenses for public and private chargers.
- **Widespread affordable charging**: Low-cost AC EVSE and plug-and-play modules allow deployment of public chargers in apartment complexes, curbside locations and rural communities, addressing the **lack of affordable public charging infrastructure**.
- **Enhanced grid integration**: Bidirectional OMEPS modules let EVs absorb excess renewable energy and discharge during peaks, improving alignment with intermittent renewables and providing demand-response services.
- **New business opportunities in DVCs**: Local manufacturing of OMEPS modules and the need for installers will create jobs; low-cost transit electrification will improve air quality in DVCs.
- **Resilient emergency power**: EVs equipped with OMEPS modules can supply electricity during outages; modular micro grids enhance community resilience.
- **Data-driven insights**: Standardized OMEPS modules and data protocols support research on consumer preferences and charging behavior, leading to better outreach and incentive programs.
- **Ratepayer benefits**: Lower EVSE and grid-upgrade costs translate to lower rates; improved safety, reliability, affordability, environmental sustainability and equity are delivered through robust module testing, high efficiency and inclusive deployment.

6. **Metrics to evaluate impacts**

OMEPS success will be measured through:

- **Cost metrics**: Reduction in powertrain development cost; installation cost per kW of AC EVSE (target ≥80 % reduction).
- **Adoption metrics**: Number of new EV OEM using OMEPS-compliant modules and suppliers producing OMEPS-compliant modules; number of pilot EVs and heavy-duty transit vehicles assembled; number of public chargers installed in DVCs; number of DVC-owned micro grids or transit fleets adopting OMEPS.
- **Infrastructure metrics**: Reduction in required grid-upgrade expenditures for high-density charging areas; deployment of AC micro grids vs. DC fast chargers because OMEPS devices.
- **Renewables alignment metrics**: Percentage of EV charging matched to renewable generation; kWh of bidirectional energy exchanged with the grid through OMEPS devices.
- **Consumer metrics**: Data on charging behavior and survey responses to understand adoption barriers; increase in EV adoption rates in disadvantaged communities deploying OMEPS devices.
- **Resilience metrics**: Number of emergency events supported by OMEPS-compliant EVs; total hours of backup power delivered.
- **Cyber security/data metrics**: Compliance rate with OMEPS data-sharing protocols; number of reported cyber security incidents (target zero).

7. **References supporting the concept**

The concept builds on:

- **CEC Integrated Powertrain System – MotorTransformer project (EPC-22-007):** Demonstrates that a modified traction motor can act as an isolation transformer without disassembling motor coils, enabling vehicles to charge/discharge via three-phase AC and eliminating external DC EVSE. High-voltage tests confirm reliable operation at 50 kW.[1]

- **Andromeda/Verdek comments on SAE J3068:** Show that J3068 EVSE costs 75–90 % less per kW than DC fast chargers and requires no cooling; **SAE J3068/2** (2024) supports bidirectional power flow, making it suitable for fleets and adaptable to grid conditions. These reference substantiates the cost and technical advantages of combining MotorTransformer modules with J3068/2 EVSE.[2]

- **SAE J3068 EVSE cost analysis:** Notes that J3068 hardware costs significantly less than DC fast chargers and requires no cooling.[3]

- **Patent application US20250088070A1 (US18/536,156):** Describes an Integrated Powertrain System with MotorTransformer acting as a motor or an isolation transformer, which uses a Matrix Converter to convert 50/60 Hz grid power into high-frequency power so the MotorTransformer can operate in both driving and vehicle-to-grid modes. The MotorTransformer's primary and secondary windings form a poly-phase isolation transformer and traction motor, enabling bidirectional charging/discharging and regenerative braking.[4]

[1] https://www.energizeinnovation.fund/projects/integrated-powertrain-system-motortransformer
[2] https://efiling.energy.ca.gov/GetDocument.aspx?tn=261929
[3] https://chargedevs.com/newswire/sae-releases-new-j3068-specification-for-charging-of-medium-and-heavy-duty-evs/
[4] https://patents.google.com/patent/US20250088070A1

8. **Support for EPIC 5 Strategic Goals**

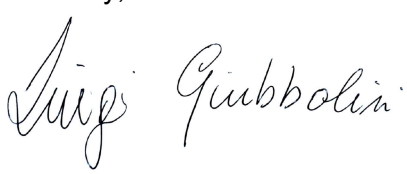
   OMEPS strongly supports multiple strategic goals:

   - **Transportation Electrification:** By lowering EV powertrain and charging costs and enabling small manufacturers to enter the market, OMEPS accelerates adoption across vehicle classes and reduces barriers in DVCs.
   - **Distributed Energy Resource Integration:** Bidirectional AC interfaces allow EVs to act as mobile storage and supply resources, enhancing grid flexibility and renewable integration.
   - **Building Decarbonization:** OMEPS module-equipped EVs can supply buildings with clean electricity, reducing reliance on fossil-fuel backup generators.
   - **Achieving 100 % Net-Zero Carbon Emissions and Coordinated Role of Gas:** By enabling cost-effective electrification of light-, medium- and heavy-duty vehicles and public transit, and by providing demand-response services, OMEPS reduces the need for gas-fired peakers and speeds progress toward net-zero goals.
   - **Climate Adaptation:** Modular micro grids and OMEPS-enabled EVs provide resilient power during natural disasters and outages, supporting communities when the centralized grid is compromised.

By integrating plug-and-play modules, low-cost AC charging and bidirectional MotorTransformer technology, **OMEPS** offers a comprehensive strategy to address high costs, infrastructure gaps, renewable alignment, DVC participation, transit electrification, resilience and data/cybersecurity concerns—while meeting EPIC 5's goals for equitable, sustainable transportation electrification.

Thank you for your consideration. We look forward to supporting **California's clean transportation goals**.

Sincerely,



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About Andromeda Power, LLC and Verdek, LLC

Andromeda Power, LLC and Verdek, LLC are leaders in EV charging, power electronics, and grid-integrated infrastructure. Andromeda Power develops high-power AC and DC charging solutions, while Verdek provides turnkey EVSE deployment for fleets and commercial applications. Our CEC-funded Integrated Powertrain System enables EVs to fast charge directly from three-phase AC and supply three-phase AC power, supporting energy resilience and vehicle-grid integration (VGI).