



## Notice of Funding Opportunity

**Title:** Evaluating Bi-Directional Energy Transfers and Distributed Energy Resource Integration for Medium- and Heavy-Duty Fleet Electrification

**Website:** <https://www.energy.ca.gov/solicitations/2020-09/qfo-20-304-evaluating-bi-directional-energy-transfers-and-distributed-energy>

**Funding:** Total: \$22,000,000. Maximum awards: \$3M-\$4M, depending on group.

**Dates:** Pre-Application Workshop: October 14, 2020  
Deadline for Written Questions: October 21, 2020  
Submission Deadline: December 30, 2020

**Summary:** The purpose of this solicitation is to fund technology demonstration and deployment (TD&D) research projects that enable and evaluate resilience, renewable integration, and cost management use cases for medium- and heavy-duty (MDHD) plug-in electric vehicles (PEVs). Electrification of these large weight-class vehicles is challenging and costly due in part to their high-power charging needs and more demanding duty cycles as compared to light-duty vehicles. Up to \$22M in funding is available for projects that: advance hardware and software tools for managed bi-directional energy transfer from electric school buses (Group 1); or advance hardware and/or software to integrate MDHD PEVs and charging equipment with a behind-the-meter distributed energy resource (DER) package that includes distributed generation, stationary storage, and an energy management system (Groups 2-3). In each group, projects will improve the functionality of key enabling technologies and aim to reduce equipment and integration costs, leading to improved total cost of ownership for MDHD PEV fleets. This solicitation supports the 2018-2020 Electric Program Investment Charge (EPIC) Investment Plan Initiatives: S2.3.1 “Development of Customers’ Business Proposition to Accelerate the Integrated Distributed Storage Market” and S3.2.1 “Grid-friendly Plug-in Electric Vehicle Mobility.”

### Project Topic Areas:

This solicitation funds TD&D projects that will assess, advance, and find potential cost efficiencies of secure behind-the-meter DER packages that meet MDHD fleet mobility needs or optimize vehicle charging and discharging for one of three different use cases. The solicitation is divided into three groups, recognizing that different MDHD fleets will require different charging and site energy management approaches.

#### Group 1: Bi-Directional Energy Transfers from Electric School Buses

Group 1 projects will develop and demonstrate technologies for controlled, bi-directional energy transfer between electric school bus batteries and end-loads, grid-connected facilities, or distribution systems. To date there have been relatively few demonstrations of managed discharging of electric vehicle batteries in California. While these have demonstrated technical feasibility, further evaluation and data collection is necessary to understand implementation strategies, costs, and benefits for specific use cases. These demonstrations will inform other school districts deciding whether to include bi-directional capabilities in school bus procurements as well as electric vehicle charging service providers evaluating business models that include bi-directional capabilities, among other stakeholders. Reflecting decision maker needs for this information, demonstration of bi-directional energy transfers for resilience benefits is a priority consensus recommendation contained in the Joint Agencies Vehicle Grid Integration Working Group Final Report. Group 1 focuses on electric school buses in part because there are multiple commercially available products designed and warranted for bi-directional operation. These buses are currently being purchased by California school districts, including through the Energy Commission’s School Bus Replacement Program.

#### Group 2: Integrated DER packages for Charging MDHD Fleets

Group 2 projects will tailor DER packages to fleets that are beginning to incorporate MDHD PEVs into their operations. Early adopters include transit agencies, ports, airports, railyards, and hub-and-spoke delivery operations. However, for PEVs to penetrate broadly into the MDHD market, fleets need better understanding of specific attributes. Important attributes include the cost and performance of these



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vehicles, the extent to which integrated DER packages can impact metrics such as total cost of ownership, and vehicle availability and downtime. Many of these fleets return to a central location to charge, but some may require en-route fast charging to extend vehicle range and minimize downtime. Group 2 projects may propose DER packages to support any combination of centralized and en-route charging with a focus on ease of integration and replicability at other sites. Specifically, the components and control systems should be interoperable, scalable, and replicable to the extent possible, all of which are important factors in the evaluation of technical merit and approach sections for proposals in this group. Drayage truck fleets including charging infrastructure to support drayage truck operations are not eligible for this solicitation. Please see the Energy Commission’s website for electric drayage truck related funding opportunities.

**Group 3: Integrated DER packages for Electric School Buses**

Group 3 projects will tailor DER packages for electric school bus charging, taking advantage of beneficial inherent attributes including long dwell times that are coincident with peak solar production, and well-defined duty cycles. Public schools often serve as community shelters during emergencies; thus, these projects may have a more targeted focus on increasing site and community resilience and should incorporate this community benefit into the value of lost load (VoLL) calculation. These demonstrations will inform decision makers as to whether to include DER charging for school buses and similar fleets as they become electrified. Note that all school bus projects should apply to either Group 1 if focused only on bi-directional energy transfer, or Group 3 if focused on DER integration. Bi-directional energy transfer is allowed in Group 3, but not required.

**Funding:**

There is up to \$22,000,000 available for grants awarded under this solicitation. Applications will be scored and ranked within each specific group; scores will not be compared across groups. For all groups, a maximum of 70% of the EPIC funding may be used for equipment purchases, including charging equipment, stationary storage, distributed renewable generation, smart-inverters, and associated software. This funding limit does not apply to balance-of-system costs. EPIC funds cannot be used to purchase vehicles for the proposed project, although applicants may use match funds to purchase vehicles. Match funding is required in the amount of at least 20% of the requested project funds in Groups 1 and 3; and at least 50% of the requested project funds in Group 2. Applications that include additional match funding will receive additional points during the scoring phase.

Project Group	Available funding	Minimum award	Maximum award	Minimum match funding
Group 1: Bi-Directional Energy Transfer from Electric School Buses	\$6,000,000	\$1,000,000	\$3,000,000	20%
Group 2: Integrated DER packages for Charging MDHD Fleets	\$12,000,000	\$1,500,000	\$4,000,000	50%
Group 3: Integrated DER packages for Charging Electric School Buses	\$4,000,000	\$2,000,000	\$4,000,000	20%

**Project Requirements:**

**Requirements for all groups**

Projects must fall within the TD&D stage, which involves the installation and operation of pre-commercial technologies or strategies at a scale sufficiently large and in conditions sufficiently reflective of anticipated actual operating environments to enable appraisal of operational and performance characteristics, and of financial risks. Benefit electricity ratepayers; and Lead to technological advancement and breakthroughs to overcome the barriers that prevent the achievement of the state’s statutory energy goals. To maximize the impact of EPIC projects and to promote the further development and deployment of EPIC-funded technologies, a minimum of five percent of CEC funds requested should go towards technology transfer activities. The Project Narrative (Attachment 3) must include a Measurement and Verification Plan that



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describes how actual project benefits will be measured and quantified. This plan should provide sufficient detail to document the project team's ability to measure, store, and report data on costs and operating parameters from vehicles, installed components, and the integrated system. These data provide a foundation for documenting and calculating project benefits. Sufficient budget should be provided for these tasks, as well as responding to three benefits questionnaires provided by CEC staff over the course of the project. A plan and schedule for regularly reporting data to the CEC for a minimum of 12 months should be included. The activities proposed in the Measurement and Verification Plan must be included in the "Technical Tasks" section of the Scope of Work Template (Attachment 5). All proposed projects must allocate appropriate funding for Community Based Organizations (CBO) engagement for relevant tasks under the scope of work.

#### Group-Specific Requirements

##### *Group 1: Bi-directional Energy Transfer from Electric School Buses*

Projects funded under Group 1 will develop and demonstrate hardware (e.g., bi-directional PEV chargers, inverters or power converters for mobile power) and software technologies to conduct managed bi-directional energy transfers from electric school buses that allow export of energy from vehicle batteries to building(s) and/or other end loads. Using these technologies, projects will implement strategies to evaluate at least one of the three use cases described above (cost-management, resilience, and renewable integration), and to evaluate any impacts on vehicle battery degradation. Successful projects in this Group will demonstrate controllable discharge of electric school bus batteries to facility circuits or end loads at a comparable cost (\$/kW, \$/kWh not including the vehicle cost) and performance on metrics such as lifetime, response time, and round trip efficiency to an equivalently-sized stationary storage system.

##### *Group 2: Integrated DER packages for Charging MDHD Fleets, and Group 3: Integrated DER packages for Charging Electric School Buses*

Projects funded under Groups 2 and 3 will develop and demonstrate a DER package, with minimum-defined components, to serve the duty cycles and charging infrastructure requirements of a fleet of MDHD PEVs. Successful applicants and projects will design a modular solution that can: scale to achieve significant market participation by 2035; accommodate multiple vehicle types, duty cycles, and use cases; and achieve a less expensive system as compared to a grid-connected unmanaged charging system over the expected useful life of all equipment. The less expensive system needs to be estimated for at least one electric IOU, and plan to achieve parity for all three electric IOUs by 2035. Value of lost load (VoLL) is allowable in this calculation, though the value must be clear in the proposal. Proposals should discuss which components are likely to achieve reduced costs as a result of the proposed project (e.g. hardware, software, balance of system and soft costs, financing, etc.). The EMS should be able to accommodate various applications of MDHD PEVs, and the system design should allow for various storage (e.g. battery chemistries) and distributed generation technologies (e.g. manufacturers, models, and renewable resources).

#### **Eligible Applicants:**

This solicitation is open to all public and private entities with the exception of local publicly owned electric utilities. In accordance with CPUC Decision 12-05-037, funds administered by the CEC may not be used for any purposes associated with local publicly owned electric utility activities.