



GRANT REQUEST FORM (GRF)

A) New Agreement # EPC-20-040

B) Division	Agreement Manager:	MS-	Phone
ERDD	Liet Le		916-776-0785

C) Recipient's Legal Name	Federal ID Number
DOE- Lawrence Berkeley National Laboratory	94-2951741

D) Title of Project
Innovative School Bus Charging for Resilient Communities

E) Term and Amount

Start Date	End Date	Amount
6/1/2021	3/31/2025	\$ 4,000,000

F) Business Meeting Information

ARFVTP agreements \$75K and under delegated to Executive Director

Proposed Business Meeting Date 5/12/2021 Consent Discussion

Business Meeting Presenter Liet Le Time Needed: 5 minutes

Please select one list serve. EPIC (Electric Program Investment Charge)

Agenda Item Subject and Description:

Lawrence Berkeley National Laboratory. Proposed resolution approving Agreement EPC-20-040 with Lawrence Berkeley National Laboratory for a \$4,000,000 grant to design, construct, and study an electric school bus depot charging system, featuring a novel and efficient direct current-coupled topology with an integrated solar canopy and stationary storage, and adopting staff's determination that this action is exempt from CEQA. Such a system caters to the scalability of EV charging depots because it requires no power from the utility and can also power a resilience hub.

G) California Environmental Quality Act (CEQA) Compliance

1. Is Agreement considered a "Project" under CEQA?

Yes (skip to question 2)

No (complete the following (PRC 21065 and 14 CCR 15378)):

Explain why Agreement is not considered a "Project":

2. If Agreement is considered a "Project" under CEQA:

a) Agreement **IS** exempt.

Statutory Exemption. List PRC and/or CCR section number:

Categorical Exemption. List CCR section number: Cal. Code Regs., tit. 14, § 15303 ; Cal. Code Regs., tit. 14, § 15306

Common Sense Exemption. 14 CCR 15061 (b) (3)

Explain reason why Agreement is exempt under the above section: The project is exempt under CCR, title 14, Section 15303 and 15306, because it consist of



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construction and location of limited numbers of new, small facilities or structures and includes laboratory testing of system controls before field deployment.

- b) Agreement **IS NOT** exempt. (consult with the legal office to determine next steps)

Check all that apply

- Initial Study
- Negative Declaration
- Mitigated Negative Declaration
- Environmental Impact Report
- Statement of Overriding Considerations

H) List all subcontractors (major and minor) and equipment vendors: (attach additional sheets as necessary)

Legal Company Name:	Budget
Paired Power, Inc	\$ 1,800,590
eIQ Mobility, Inc.	\$ 478,608
Breathe California of the Bay Area	\$ 90,000
Franklin-McKinley	\$ 0

I) List all key partners: (attach additional sheets as necessary)

Legal Company Name:

J) Budget Information

Funding Source	Funding Year of Appropriation	Budget List Number	Amount
EPIC	20-21	301.001H	\$4,000,000

R&D Program Area: EGRO: Transportation

TOTAL: \$ 4,000,000

Explanation for "Other" selection

Reimbursement Contract #: Federal Agreement #:

K) Recipient's Contact Information

1. Recipient's Administrator/Officer

Name: Joanna Santoro
 Address: 1 Cyclotron Road,
 MS64R0121
 City, State, Zip: Berkeley, CA
 94720
 Phone: (510) 486-6824
 E-Mail: jsantoro@lbl.gov

2. Recipient's Project Manager

Name: Bruce Nordman
 Address: 1 Cyclotron Rd,
 MS 90R400
 City, State, Zip: Berkeley, CA
 94720-8099
 Phone: 510-486-7089
 E-Mail: bnordman@lbl.gov



STATE OF CALIFORNIA

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CEC-270 (Revised 12/2019)

CALIFORNIA ENERGY COMMISSION

L) Selection Process Used

Competitive Solicitation Solicitation #: GFO-20-304

First Come First Served Solicitation Solicitation #:

M) The following items should be attached to this GRF

- | | | |
|-----------------------------------------------------|-----------------------------------------|----------------------------------------------|
| 1. Exhibit A, Scope of Work | <input checked="" type="checkbox"/> | Attached |
| 2. Exhibit B, Budget Detail | <input checked="" type="checkbox"/> | Attached |
| 3. CEC 105, Questionnaire for Identifying Conflicts | <input checked="" type="checkbox"/> | Attached |
| 4. Recipient Resolution | <input checked="" type="checkbox"/> N/A | <input type="checkbox"/> Attached |
| 5. CEQA Documentation | <input type="checkbox"/> N/A | <input checked="" type="checkbox"/> Attached |

Agreement Manager

Date

Office Manager

Date

Deputy Director

Date

EXHIBIT A Scope of Work

I. TASK ACRONYM/TERM LISTS

A. Task List

Task #	CPR ¹	Task Name
1		General Project Tasks
2	X	Develop the Fleet Energy Management Software
3		Develop the Charging System
4	X	Deploy the Full System on Site
5		Measurement and Verification of Deployment
6		Community Engagement
7		Evaluation of Project Benefits
8		Technology/Knowledge Transfer Activities

B. Acronym/Term List

Acronym/Term	Meaning
AC	Alternating Current
ABAG	Association of Bay Area Governments
BAAQMD	Bay Area Air Quality Management District
CAM	Commission Agreement Manager
CAO	Commission Agreement Officer
CARE	BAAQMD Community Air Risk Evaluation
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CPR	Critical Project Review
DC	Direct Current
eIQ	eIQ Mobility
EV	Electric Vehicle
FMSD	Franklin-McKinley School District
LBNL	Lawrence Berkeley National Laboratory
M&V	Measurement and Verification
NRTL	Nationally Recognized Testing Laboratory
PG&E	Pacific Gas & Electric
TAC	Technical Advisory Committee

II. PURPOSE OF AGREEMENT, PROBLEM/SOLUTION STATEMENT, AND GOALS AND OBJECTIVES

A. Purpose of Agreement

The purpose of this Agreement is to fund the design, construction, and study of an electric school bus depot charging system, featuring a novel and efficient direct current (DC)-coupled topology

¹ Please see subtask 1.3 in Part III of the Scope of Work (General Project Tasks) for a description of Critical Project Review (CPR) Meetings.

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with an integrated solar canopy and stationary storage. Such a system caters to the scalability of electric vehicle (EV) charging depots because it requires no power from the utility and can also power a resilience hub.

B. Problem/ Solution Statement

Problem

Today's grid infrastructure cannot handle the impending influx of grid-tied EV chargers, and electric service upgrades for EV charging will eventually become a barrier to scalable adoption. In addition, the recent increase in public safety power shut-offs has greatly increased the need for both resilient charging systems and resilience hubs.

Solution

The Recipient proposes a new type of charging station, featuring a DC-coupled connection between a solar canopy, stationary battery storage, vehicle chargers, and a resilience hub. DC-coupled solutions have been shown to be more energy-efficient and less expensive than the conventional alternating current (AC)-coupled solutions, and are the best candidate for mass scalability. The solution is optimized for a direct coupling between the solar canopy and EV battery, which is ideal for school buses that are parked at times of peak solar generation. It usually operates without grid power, and can often power the school as well, greatly reducing demand charges during school hours. The charging system will be connected to the school's critical loads, allowing the school cafeteria to function as a resilience hub during an outage or disaster.

C. Goals and Objectives of the Agreement

Agreement Goals

The goals of this Agreement are to:

- Design and build a scalable DC-coupled EV charging system that is capable of powering five school buses during normal operation, and a resilience hub during an outage.
- Verify and demonstrate reduced CO₂ emissions, 10-20 year life-cycle cost savings, and improved reliability compared to the standard diesel bus or grid-tied charging solutions, and evaluate the benefits and tradeoffs of these targets and how they affect one another.
- Better understand the opportunities and barriers to wider deployment of charging depots with solar and storage, and study how the system can ultimately relax the strain of EV charging on the existing utility infrastructure.
- Build community awareness on the importance of reducing emissions and the existence of the resilience hub.

Ratepayer Benefits:² This Agreement will result in the ratepayer benefits of lower costs, greater electric reliability, and safety. Those benefits are achieved in the following ways:

² California Public Resources Code, Section 25711.5(a) requires projects funded by the Electric Program Investment Charge (EPIC) to result in ratepayer benefits. The California Public Utilities Commission, which established the EPIC in 2011, defines ratepayer benefits as greater reliability, lower costs, and increased safety (See CPUC "Phase 2" Decision 12-05-037 at page 19, May 24, 2012, http://docs.cpuc.ca.gov/PublishedDocs/WORD_PDF/FINAL_DECISION/167664.PDF).

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Lower Costs: The proposed solution promises to greatly reduce the life-cycle cost of an electric school bus charging depot. While its upfront cost is slightly higher than standard alternatives, this solution greatly reduces operating costs by eliminating the need to purchase electricity or fuel for the vehicle. At scale, this type of solution will help tremendously in mitigating the need for extensive upgrades to the electric utility infrastructure and reducing demand charges as EVs become more and more prevalent. The proposed DC-coupled topology is also more efficient than alternating current (AC)-coupled alternatives, and is the best topology for minimizing operating costs and carbon emissions.

Greater Reliability: This project will improve the electrical reliability of the charging depot and school. During an outage, the depot's generation and storage will connect to the school's critical loads to function as a resilience hub for disaster relief. The system can also charge the buses during an outage for emergency transportation.

Increased Safety: The proposed system promises to improve air quality via reduced emissions compared to standard practices today. The resilience hub also provides an additional layer of safety, allowing for disaster relief or emergency transportation during an outage.

Technological Advancement and Breakthroughs: This Agreement will lead to technological advancement and breakthroughs to overcome barriers to the achievement of the State of California's statutory energy goals by lowering the barriers to adoption of electric vehicles while simultaneously boosting network resilience throughout the state. The transition to EVs will require the electric utility to undergo major infrastructure upgrades, and it is essential for a scalable charging solution with solar and storage to be developed. The proposed solution is capable of functioning off-grid, and is a prime candidate for mitigating the strain of EV charging on the grid and reducing demand charges. The charging system features an innovative DC-coupled topology that connects solar and storage with a much higher efficiency than standard AC-coupled alternatives. At scale, the use of simple and efficient DC-DC converters potentially allows for a huge cost reduction in components and equipment. This solution will seamlessly integrate data-driven fleet energy management software to ensure optimal operation and provide a scalable cost-saving solution to schools statewide. At scale, this solution will also enable schools to become resilience hubs, providing emergency transportation and relief from outages and disasters.

Agreement Objectives

The objectives of this agreement are to:

- Design and develop a DC-coupled school bus charging depot with solar, storage, and a connection to critical loads in a resilience hub.
- Demonstrate a major improvement over baseline solutions on cost, carbon, and resilience metrics as described in the Project Performance Metrics (Attachment 11).
- Use the experience from this demonstration to develop a design template that provides a cost-effective, modular, and scalable solution for EV charging depots, for any vehicle type. At scale, this solution must ease the burden of EV charging on the grid infrastructure.
- Build awareness of this solution with the local community, other school districts, and other EV fleet depots. Market this solution as the most attractive means of fleet charging.

III. TASK 1: GENERAL PROJECT TASKS

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PRODUCTS

Subtask 1.1 Products

The goal of this subtask is to establish the requirements for submitting project products (e.g., reports, summaries, plans, and presentation materials). Unless otherwise specified by the Commission Agreement Manager (CAM), the Recipient must deliver products as required below by the dates listed in the **Project Schedule (Part V)**. All products submitted which will be viewed by the public, must comply with the accessibility requirements of Section 508 of the federal Rehabilitation Act of 1973, as amended (29 U.S.C. Sec. 794d), and regulations implementing that act as set forth in Part 1194 of Title 36 of the Federal Code of Regulations. All technical tasks should include product(s). Products that require a draft version are indicated by marking “**(draft and final)**” after the product name in the “Products” section of the task/subtask. If “(draft and final)” does not appear after the product name, only a final version of the product is required. With respect to due dates within this Scope of Work, “**days**” means working days.

The Recipient shall:

For products that require a draft version, including the Final Report Outline and Final Report

- Submit all draft products to the CAM for review and comment in accordance with the Project Schedule (Part V). The CAM will provide written comments to the Recipient on the draft product within 15 days of receipt, unless otherwise specified in the task/subtask for which the product is required.
- Consider incorporating all CAM comments into the final product. If the Recipient disagrees with any comment, provide a written response explaining why the comment was not incorporated into the final product.
- Submit the revised product and responses to comments within 10 days of notice by the CAM, unless the CAM specifies a longer time period, or approves a request for additional time.

For products that require a final version only

- Submit the product to the CAM for acceptance. The CAM may request minor revisions or explanations prior to acceptance.

For all products

- Submit all data and documents required as products in accordance with the following:

Instructions for Submitting Electronic Files and Developing Software

- **Electronic File Format**

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- Submit all data and documents required as products under this Agreement in an electronic file format that is fully editable and compatible with the California Energy Commission's (CEC) software and Microsoft (MS)-operating computing platforms, or with any other format approved by the CAM. Deliver an electronic copy of the full text of any Agreement data and documents in a format specified by the CAM, such as a memory stick.

The following describes the accepted formats for electronic data and documents provided to the CEC as products under this Agreement, and establishes the software versions that will be required to review and approve all software products:

- Data sets will be in MS Access or MS Excel file format (version 2007 or later), or any other format approved by the CAM.
 - Text documents will be in MS Word file format, version 2007 or later.
 - Project management documents will be in Microsoft Project file format, version 2007 or later.
- **Software Application Development**

Use the following standard Application Architecture components in compatible versions for any software application development required by this Agreement (e.g., databases, models, modeling tools), unless the CAM approves other software applications such as open source programs:

 - Microsoft ASP.NET framework (version 3.5 and up). Recommend 4.0.
 - Microsoft Internet Information Services (IIS), (version 6 and up) Recommend 7.5.
 - Visual Studio.NET (version 2008 and up). Recommend 2010.
 - C# Programming Language with Presentation (UI), Business Object and Data Layers.
 - SQL (Structured Query Language).
 - Microsoft SQL Server 2008, Stored Procedures. Recommend 2008 R2.
 - Microsoft SQL Reporting Services. Recommend 2008 R2.
 - XML (external interfaces).

Any exceptions to the Electronic File Format requirements above must be approved in writing by the CAM. The CAM will consult with the CEC's Information Technology Services Branch to determine whether the exceptions are allowable.

MEETINGS

Subtask 1.2 Kick-off Meeting

The goal of this subtask is to establish the lines of communication and procedures for implementing this Agreement.

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The Recipient shall:

- Attend a “Kick-off” meeting with the CAM, the Commission Agreement Officer (CAO), and any other CEC staff relevant to the Agreement. The Recipient will bring its Project Manager and any other individuals designated by the CAM to this meeting. The administrative and technical aspects of the Agreement will be discussed at the meeting. Prior to the meeting, the CAM will provide an agenda to all potential meeting participants. The meeting may take place in person or by electronic conferencing (e.g., WebEx), with approval of the CAM.

The administrative portion of the meeting will include discussion of the following:

- Terms and conditions of the Agreement;
- Invoicing and auditing procedures;
- Administrative products (subtask 1.1);
- CPR meetings (subtask 1.3);
- Match fund documentation (subtask 1.7);
- Permit documentation (subtask 1.8);
- Subcontracts (subtask 1.9); and
- Any other relevant topics.

The technical portion of the meeting will include discussion of the following:

- The CAM’s expectations for accomplishing tasks described in the Scope of Work;
 - An updated Project Schedule;
 - Technical products (subtask 1.1);
 - Progress reports (subtask 1.5);
 - Final Report (subtask 1.6);
 - Technical Advisory Committee meetings (subtasks 1.10 and 1.11); and
 - Any other relevant topics.
- Provide *Kick-off Meeting Presentation* to include but not limited to:
 - Project overview (i.e., project description, goals and objectives, technical tasks, expected benefits, etc.)
 - Project schedule that identifies milestones
 - List of potential risk factors and hurdles, and mitigation strategy
 - Provide an *Updated Project Schedule, Match Funds Status Letter, and Permit Status Letter*, as needed to reflect any changes in the documents.

The CAM shall:

- Designate the date and location of the meeting.
- Send the Recipient a *Kick-off Meeting Agenda*.

Recipient Products:

- Kick-off Meeting Presentation
- Updated Project Schedule (*if applicable*)
- Match Funds Status Letter (subtask 1.7) (*if applicable*)
- Permit Status Letter (subtask 1.8) (*if applicable*)

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CAM Product:

- Kick-off Meeting Agenda

Subtask 1.3 Critical Project Review (CPR) Meetings

The goal of this subtask is to determine if the project should continue to receive CEC funding, and if so whether any modifications must be made to the tasks, products, schedule, or budget. CPR meetings provide the opportunity for frank discussions between the CEC and the Recipient. As determined by the CAM, discussions may include project status, challenges, successes, advisory group findings and recommendations, final report preparation, and progress on technical transfer and production readiness activities (if applicable). Participants will include the CAM and the Recipient and may include the CAO and any other individuals selected by the CAM to provide support to the CEC.

CPR meetings generally take place at key, predetermined points in the Agreement, as determined by the CAM and as shown in the Task List on page 1 of this Exhibit. However, the CAM may schedule additional CPR meetings as necessary. The budget will be reallocated to cover the additional costs borne by the Recipient, but the overall Agreement amount will not increase. CPR meetings generally take place at the CEC, but they may take place at another location, or may be conducted via electronic conferencing (e.g., WebEx) as determined by the CAM.

The Recipient shall:

- Prepare and submit a *CPR Report* for each CPR meeting that: (1) discusses the progress of the Agreement toward achieving its goals and objectives; and (2) includes recommendations and conclusions regarding continued work on the project.
- Attend the CPR meeting.
- Present the CPR Report and any other required information at each CPR meeting.

The CAM shall:

- Determine the location, date, and time of each CPR meeting with the Recipient's input.
- Send the Recipient a *CPR Agenda* with a list of expected CPR participants in advance of the CPR meeting. If applicable, the agenda will include a discussion of match funding and permits.
- Conduct and make a record of each CPR meeting. Provide the Recipient with a schedule for providing a Progress Determination on continuation of the project.
- Determine whether to continue the project, and if so whether modifications are needed to the tasks, schedule, products, or budget for the remainder of the Agreement. If the CAM concludes that satisfactory progress is not being made, this conclusion will be referred to the Deputy Director of the Energy Research and Development Division.
- Provide the Recipient with a *Progress Determination* on continuation of the project, in accordance with the schedule. The Progress Determination may include a requirement that the Recipient revise one or more products.

Recipient Products:

- CPR Report(s)

CAM Products:

- CPR Agenda
- Progress Determination

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Subtask 1.4 Final Meeting

The goal of this subtask is to complete the closeout of this Agreement.

The Recipient shall:

- Meet with CEC staff to present project findings, conclusions, and recommendations. The final meeting must be completed during the closeout of this Agreement. This meeting will be attended by the Recipient and CAM, at a minimum. The meeting may occur in person or by electronic conferencing (e.g., WebEx), with approval of the CAM.

The technical and administrative aspects of Agreement closeout will be discussed at the meeting, which may be divided into two separate meetings at the CAM's discretion.

- The technical portion of the meeting will involve the presentation of findings, conclusions, and recommended next steps (if any) for the Agreement. The CAM will determine the appropriate meeting participants.
- The administrative portion of the meeting will involve a discussion with the CAM and the CAO of the following Agreement closeout items:
 - Disposition of any procured equipment.
 - The CEC's request for specific "generated" data (not already provided in Agreement products).
 - Need to document the Recipient's disclosure of "subject inventions" developed under the Agreement.
 - "Surviving" Agreement provisions such as repayment provisions and confidential products.
 - Final invoicing and release of retention.
- Prepare a *Final Meeting Agreement Summary* that documents any agreement made between the Recipient and Commission staff during the meeting.
- Prepare a *Schedule for Completing Agreement Closeout Activities*.
- Provide copies of *All Final Products* on a USB memory stick, organized by the tasks in the Agreement.

Products:

- Final Meeting Agreement Summary (*if applicable*)
- Schedule for Completing Agreement Closeout Activities
- All Final Products

REPORTS AND INVOICES

Subtask 1.5 Progress Reports and Invoices

The goals of this subtask are to: (1) periodically verify that satisfactory and continued progress is made towards achieving the project objectives of this Agreement; and (2) ensure that invoices contain all required information and are submitted in the appropriate format.

The Recipient shall:

- Submit a monthly *Progress Report* to the CAM. Each progress report must:
 - Summarize progress made on all Agreement activities as specified in the scope of work for the preceding month, including accomplishments, problems, milestones, products, schedule, fiscal status, and an assessment of the ability to complete the Agreement within the current budget and any anticipated cost overruns. See the

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Progress Report Format Attachment for the recommended specifications.

- Submit a monthly or quarterly *Invoice* that follows the instructions in the “Payment of Funds” section of the terms and conditions, including a financial report on Match Funds and in-state expenditures.

Products:

- Progress Reports
- Invoices

Subtask 1.6 Final Report

The goal of this subtask is to prepare a comprehensive Final Report that describes the original purpose, approach, results, and conclusions of the work performed under this Agreement. When creating the Final Report Outline and the Final Report, the Recipient must use the CEC Style Manual provided by the CAM.

Subtask 1.6.1 Final Report Outline

The Recipient shall:

- Prepare a *Final Report Outline* in accordance with the *Energy Commission Style Manual* provided by the CAM.

Recipient Products:

- Final Report Outline (draft and final)

CAM Product:

- Energy Commission Style Manual
- Comments on Draft Final Report Outline
- Acceptance of Final Report Outline

Subtask 1.6.2 Final Report

The Recipient shall:

- Prepare a *Final Report* for this Agreement in accordance with the approved Final Report Outline, Energy Commission Style Manual, and Final Report Template provided by the CAM with the following considerations:
 - Ensure that the report includes the following items, in the following order:
 - Cover page (**required**)
 - Credits page on the reverse side of cover with legal disclaimer (**required**)
 - Acknowledgements page (optional)
 - Preface (**required**)
 - Abstract, keywords, and citation page (**required**)
 - Table of Contents (**required**, followed by List of Figures and List of Tables, if needed)
 - Executive summary (**required**)
 - Body of the report (**required**)
 - References (if applicable)
 - Glossary/Acronyms (If more than 10 acronyms or abbreviations are used, it is required.)
 - Bibliography (if applicable)

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- Appendices (if applicable) (Create a separate volume if very large.)
- Attachments (if applicable)

- Submit a draft of the Executive Summary to the TAC for review and comment.
- Develop and submit a *Summary of TAC Comments* received on the Executive Summary. For each comment received, the recipient will identify in the summary the following:
 - Comments the recipient proposes to incorporate.
 - Comments the recipient does propose to incorporate and an explanation for why.
- Submit a draft of the report to the CAM for review and comment. The CAM will provide written comments to the Recipient on the draft product within 15 days of receipt.
- Incorporate all CAM comments into the *Final Report*. If the Recipient disagrees with any comment, provide a *Written Responses to Comments* explaining why the comments were not incorporated into the final product.
- Submit the revised *Final Report* electronically with any *Written Responses to Comments* within 10 days of receipt of CAM's *Written Comments on the Draft Final Report*, unless the CAM specifies a longer time period or approves a request for additional time.

Products:

- Summary of TAC Comments
- Draft Final Report
- *Written Responses to Comments (if applicable)*
- Final Report

CAM Product:

- *Written Comments on the Draft Final Report*

MATCH FUNDS, PERMITS, AND SUBCONTRACTS

Subtask 1.7 Match Funds

The goal of this subtask is to ensure that the Recipient obtains any match funds planned for this Agreement and applies them to the Agreement during the Agreement term.

While the costs to obtain and document match funds are not reimbursable under this Agreement, the Recipient may spend match funds for this task. The Recipient may only spend match funds during the Agreement term, either concurrently or prior to the use of CEC funds. Match funds must be identified in writing, and the Recipient must obtain any associated commitments before incurring any costs for which the Recipient will request reimbursement.

The Recipient shall:

- Prepare a *Match Funds Status Letter* that documents the match funds committed to this Agreement. If no match funds were part of the proposal that led to the CEC awarding this Agreement and none have been identified at the time this Agreement starts, then state this in the letter.

If match funds were a part of the proposal that led to the CEC awarding this Agreement, then provide in the letter:

- A list of the match funds that identifies:
 - The amount of cash match funds, their source(s) (including a contact name,

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address, and telephone number), and the task(s) to which the match funds will be applied.

- The amount of each in-kind contribution, a description of the contribution type (e.g., property, services), the documented market or book value, the source (including a contact name, address, and telephone number), and the task(s) to which the match funds will be applied. If the in-kind contribution is equipment or other tangible or real property, the Recipient must identify its owner and provide a contact name, address, telephone number, and the address where the property is located.
- If different from the solicitation application, provide a letter of commitment from an authorized representative of each source of match funding that the funds or contributions have been secured.
- At the Kick-off meeting, discuss match funds and the impact on the project if they are significantly reduced or not obtained as committed. If applicable, match funds will be included as a line item in the progress reports and will be a topic at CPR meetings.
- Provide a *Supplemental Match Funds Notification Letter* to the CAM of receipt of additional match funds.
- Provide a *Match Funds Reduction Notification Letter* to the CAM if existing match funds are reduced during the course of the Agreement. Reduction of match funds may trigger a CPR meeting.

Products:

- Match Funds Status Letter
- Supplemental Match Funds Notification Letter (*if applicable*)
- Match Funds Reduction Notification Letter (*if applicable*)

Subtask 1.8 Permits

The goal of this subtask is to obtain all permits required for work completed under this Agreement in advance of the date they are needed to keep the Agreement schedule on track. Permit costs and the expenses associated with obtaining permits are not reimbursable under this Agreement, with the exception of costs incurred by University of California recipients. Permits must be identified and obtained before the Recipient may incur any costs related to the use of the permit(s) for which the Recipient will request reimbursement.

The Recipient shall:

- Prepare a *Permit Status Letter* that documents the permits required to conduct this Agreement. If no permits are required at the start of this Agreement, then state this in the letter. If permits will be required during the course of the Agreement, provide in the letter:
 - A list of the permits that identifies: (1) the type of permit; and (2) the name, address, and telephone number of the permitting jurisdictions or lead agencies.
 - The schedule the Recipient will follow in applying for and obtaining the permits.

The list of permits and the schedule for obtaining them will be discussed at the Kick-off meeting (subtask 1.2), and a timetable for submitting the updated list, schedule, and copies of the permits will be developed. The impact on the project if the permits are not obtained in a timely fashion or are denied will also be discussed. If applicable, permits will be included as a line item in progress reports and will be a topic at CPR meetings.

- If during the course of the Agreement additional permits become necessary, then provide the CAM with an *Updated List of Permits* (including the appropriate information on each permit) and an *Updated Schedule for Acquiring Permits*.

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- Send the CAM a *Copy of Each Approved Permit*.
- If during the course of the Agreement permits are not obtained on time or are denied, notify the CAM within 5 days. Either of these events may trigger a CPR meeting.

Products:

- Permit Status Letter
- Updated List of Permits (*if applicable*)
- Updated Schedule for Acquiring Permits (*if applicable*)
- Copy of Each Approved Permit (*if applicable*)

Subtask 1.9 Subcontracts

The goals of this subtask are to: (1) procure subcontracts required to carry out the tasks under this Agreement; and (2) ensure that the subcontracts are consistent with the terms and conditions of this Agreement.

The Recipient shall:

- Manage and coordinate subcontractor activities in accordance with the requirements of this Agreement.
- Incorporate this Agreement by reference into each subcontract.
- Include any required Energy Commission flow-down provisions in each subcontract, in addition to a statement that the terms of this Agreement will prevail if they conflict with the subcontract terms.
- If required by the CAM, submit a draft of each *Subcontract* required to conduct the work under this Agreement.
- Submit a final copy of each executed subcontract.
- Notify and receive written approval from the CAM prior to adding any new subcontractors (see the discussion of subcontractor additions in the terms and conditions).

Products:

- Subcontracts (*draft if required by the CAM*)

TECHNICAL ADVISORY COMMITTEE

Subtask 1.10 Technical Advisory Committee (TAC)

The goal of this subtask is to create an advisory committee for this Agreement. The TAC should be composed of diverse professionals. The composition will vary depending on interest, availability, and need. TAC members will serve at the CAM's discretion. The purpose of the TAC is to:

- Provide guidance in project direction. The guidance may include scope and methodologies, timing, and coordination with other projects. The guidance may be based on:
 - Technical area expertise;
 - Knowledge of market applications; or
 - Linkages between the agreement work and other past, present, or future projects (both public and private sectors) that TAC members are aware of in a particular area.
- Review products and provide recommendations for needed product adjustments, refinements, or enhancements.

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- Evaluate the tangible benefits of the project to the state of California, and provide recommendations as needed to enhance the benefits.
- Provide recommendations regarding information dissemination, market pathways, or commercialization strategies relevant to the project products.
Help set the project team's goals and contribute to the development and evaluation of its statement of proposed objectives as the project evolves.
- Provide a credible and objective sounding board on the wide range of technical and financial barriers and opportunities.
- Help identify key areas where the project has a competitive advantage, value proposition, or strength upon which to build.
- Advocate, to the extent the TAC members feel is appropriate, on behalf of the project in its effort to build partnerships, governmental support and relationships with a national spectrum of influential leaders.
- Ask probing questions that insure a long-term perspective on decision-making and progress toward the project's strategic goals.

The TAC may be composed of qualified professionals spanning the following types of disciplines:

- Researchers knowledgeable about the project subject matter;
- Members of trades that will apply the results of the project (e.g., designers, engineers, architects, contractors, and trade representatives);
- Public interest market transformation implementers;
- Product developers relevant to the project;
- U.S. Department of Energy research managers, or experts from other federal or state agencies relevant to the project;
- Public interest environmental groups;
- Utility representatives;
- Air district staff; and
- Members of relevant technical society committees.

The Recipient shall:

- Prepare a *List of Potential TAC Members* that includes the names, companies, physical and electronic addresses, and phone numbers of potential members. The list will be discussed at the Kick-off meeting, and a schedule for recruiting members and holding the first TAC meeting will be developed.
- Recruit TAC members. Ensure that each individual understands member obligations and the TAC meeting schedule developed in subtask 1.11.
- Prepare a *List of TAC Members* once all TAC members have committed to serving on the TAC.
- Submit *Documentation of TAC Member Commitment* (such as Letters of Acceptance) from each TAC member.

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Products:

- List of Potential TAC Members
- List of TAC Members
- Documentation of TAC Member Commitment

Subtask 1.11 TAC Meetings

The goal of this subtask is for the TAC to provide strategic guidance for the project by participating in regular meetings, which may be held via teleconference.

The Recipient shall:

- Discuss the TAC meeting schedule with the CAM at the Kick-off meeting. Determine the number and location of meetings (in-person and via teleconference) in consultation with the CAM.
- Prepare a *TAC Meeting Schedule* that will be presented to the TAC members during recruiting. Revise the schedule after the first TAC meeting to incorporate meeting comments.
- Prepare a *TAC Meeting Agenda* and *TAC Meeting Back-up Materials* for each TAC meeting.
- Organize and lead TAC meetings in accordance with the TAC Meeting Schedule. Changes to the schedule must be pre-approved in writing by the CAM.
- Prepare *TAC Meeting Summaries* that include any recommended resolutions of major TAC issues.

The TAC shall:

- Help set the project team's goals and contribute to the development and evaluation of its statement of proposed objectives as the project evolves.
- Provide a credible and objective sounding board on the wide range of technical and financial barriers and opportunities.
- Help identify key areas where the project has a competitive advantage, value proposition, or strength upon which to build.
- Advocate on behalf of the project in its effort to build partnerships, governmental support and relationships with a national spectrum of influential leaders.
- Ask probing questions that insure a long-term perspective on decision-making and progress toward the project's strategic goals.
- Review and provide comments to proposed project performance metrics.
- Review and provide comments to the proposed project Draft Technology Transfer Plan.

Products:

- TAC Meeting Schedule (draft and final)
- TAC Meeting Agendas (draft and final)
- TAC Meeting Back-up Materials
- TAC Meeting Summaries

Subtask 1.12 Project Performance Metrics

The goal of this subtask is to finalize key performance targets for the project based on feedback from the TAC and report on final results in achieving those targets. The performance targets should be a combination of scientific, engineering, techno-economic, and/or programmatic

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metrics that provide the most significant indicator of the research or technology's potential success.

The Recipient shall:

- Complete and submit the project performance metrics from the *Initial Project Benefits Questionnaire*, developed in the Evaluation of Project Benefits task, to the CAM.
- Present the draft project performance metrics at the first TAC meeting to solicit input and comments from the TAC members.
- Develop and submit a *TAC Performance Metrics Summary* that summarizes comments received from the TAC members on the proposed project performance metrics. The *TAC Performance Metrics Summary* will identify:
 - TAC comments the Recipient proposes to incorporate into the *Initial Project Benefits Questionnaire*, developed in the Evaluation of Project Benefits task.
 - TAC comments the Recipient does not propose to incorporate with and explanation why.
- Develop and submit a *Project Performance Metrics Results* document describing the extent to which the Recipient met each of the performance metrics in the *Final Project Benefits Questionnaire*, developed in the Evaluation of Project Benefits task.
- Discuss the *Project Performance Metrics Results* at the Final Meeting.

Products:

- TAC Performance Metrics Summary
- Project Performance Metrics Results

EXHIBIT A

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IV. TECHNICAL TASKS

TASK 2: DEVELOP THE FLEET ENERGY MANAGEMENT SOFTWARE

The goals of this task are to determine the fleet energy requirements, and to design, develop, and optimize the fleet energy management software for the project site.

Subtask 2.1: Determine the Fleet Energy Requirements

The goals of this subtask are to determine the daily and annual energy requirements of the fleet, and determine the optimal generation and storage requirements for charging the system, taking into account what is already available on site.

The Recipient Shall:

- Gather data on bus routes, including field trips and other special uses.
- Determine the daily DER energy requirements of the buses, accounting for average and worst-case weather data.
- Estimate sufficient resilience hub power and energy requirements, and set the load energy specifications for the resilience hub.
- Use analysis software and weather data to determine the requirements for the charging station, including solar canopy and storage capacities.
- Summarize the above into the *Charging System Requirements Technical Memorandum*, to include:
 - Technical discussion of the energy requirements for the buses and resilience hub.
 - Use cases to be supported.
 - Technical analysis to determine recommended solar and storage requirements.
 - A one- to two-page attachment that can be a stand-alone high-level summary of the analysis for non-technical audiences.

Products:

- Charging System Requirements Technical Memorandum

Subtask 2.2: Design and Develop the Fleet Energy Management Software

The goals of this subtask are to define the software specifications for the selected use cases for the site and develop the software to achieve these specifications.

The Recipient Shall:

- Define specifications for the Fleet Energy Management Software. These include the software and communications architecture and the software inputs and outputs as they relate to the use cases under development.
- Modify the fleet energy management software platform for use with EV charging hardware, school buses, and the school district's charging depot and schedule.
- Create a *Fleet Energy Management System Requirements Technical Memorandum* that summarizes the architecture and functionality based on demonstration use cases.
- Prepare a *CPR Report #1* in accordance with subtask 1.3 (CPR Meetings)
- Participate in a CPR meeting.

Products:

- Fleet Energy Management System Requirements Technical Memorandum
- CPR Report #1

EXHIBIT A

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Subtask 2.3: Integrate Software with the Charging System

The goal of this subtask is to integrate the Fleet Energy Management System with the EV charging hardware. This is intended to supplement the lab bench test in Subtask 3.4.

The Recipient Shall:

- Develop the necessary software integration and application programming interface (API) to control the EV charging hardware using the subcontractor's Fleet Energy Management System.
- Use the subcontractor's Fleet Energy Management System to successfully demonstrate a charging cycle command on a lab bench setup.
- Create a video showing the proof-of-concept demonstration.
- Create a *Software Integration Technical Memorandum* that confirms successful software integration.

Products:

- Software Integration Technical Memorandum

TASK 3: DEVELOP THE CHARGING SYSTEM

The goal of this task is to develop and test the system hardware. This includes the EV chargers, DC/DC converters, battery storage, and inverters, all integrated with the subcontractor's software.

Subtask 3.1: Determine the Charging Topology

The goal of this subtask is to analyze several electrical topologies for the charging system (at the block-diagram level) and choose one or more of those topologies for the project. Another objective is to determine the optimal physical location of the photovoltaic array, stationary battery storage, and school bus chargers.

The Recipient Shall:

- Review several candidate electrical topologies that are technically feasible for the project. The topologies will differ in the electrical location of the stationary storage, and the coupling between solar, storage, vehicles, and grid.
- Compare the candidate topologies along quantitative metrics, such as efficiency and cost, and qualitative metrics, such as feasibility, utility, and scalability.
- Review and evaluate the site-specific considerations in physical location of the solar, storage, and chargers. Include practical considerations such as efficiency and cost. This analysis may also include an evaluation of whether to connect to the site's planned solar parking canopies, and how to best do so.
- Choose a design based on the topology comparison and the specifications from Subtask 2.1.
- Create a *Charger Electrical Design Technical Memorandum* that describes the analysis and decision on topology.

Products:

- Charger Electrical Design Technical Memorandum

Subtask 3.2: Design the Charging System

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The goal of this subtask is to define the hardware specifications and achieve them with the detailed hardware system design.

The Recipient Shall:

- Define the hardware specifications of the system and of each module within the system. These include specifics such as voltage and current capacity of each module.
- Design the electrical schematic and wiring diagram. Include equipment for monitoring and verification as necessary.
- Design the mechanical layout and positioning of the converters and stationary storage.
- Create a *Hardware Design Technical Memorandum* that describes the system's design and specifications.

Products:

- Hardware Design Technical Memorandum

Subtask 3.3: Integrate the System Components and Bench-Test the Full Hardware System

The goal of this subtask is to verify the functionality of site-specific components or systems and to perform a full system lab test prior to installation in the field.

The Recipient Shall:

- Modify the subcontractor's EV chargers to communicate with the school buses. Verify with an EV simulator.
- Interface with the custom DC/DC converter (if needed), and develop the necessary controls for the selected electrical topology.
- Verify the use and control of the stationary storage in the system.
- Obtain a Nationally Recognized Testing Laboratories (NRTL) certification for any modifications or customizations as necessary (e.g., Underwriters Laboratories).
- Bench-test the full hardware system with a school bus and the subcontractor's fleet energy management software. Test the system under various conditions over a week.
- Create a video of the bench test demonstration for effective communication of the results.
- Create a *Hardware Development Report* that describes the design and development of the hardware system that includes:
 - A confirmation of a successful test of all custom components, highlighting where any modifications were necessary.
 - The bench test results and the correspondence between each software command and measured energy output.
 - A URL of where the video can be accessed.

Products:

- Hardware Development Report

TASK 4: DEPLOY THE FULL SYSTEM ON SITE

The goal of this task is the successful permitting and construction of the subcontractor's solar EV charging system on the FMSD site.

Subtask 4.1: Prepare the Construction and Electrical Drawings

The goal of this subtask is to prepare the final engineering and construction documents for the electric bus charging system.

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The Recipient Shall:

- Finalize the construction and electrical specifications and the cost estimates.
- Create a complete schematic design and engineering documents set, ready for permit submission.
- Conduct a relevant and necessary review of options for needed changes to the regulatory and permitting structure to accommodate the project.
- Prepare a *Site Permitting Plan* describing the scope of work for the project and outlining the required permits.
- Prepare a *Construction Design and Engineering Technical Memorandum*, describing at a high level the engineering plans, specifications, and cost estimates for the charging system.

Products:

- Site Permitting Plan
- Construction Design and Engineering Technical Memorandum

Subtask 4.2: Secure the Permitting, CEQA, and Interconnection Agreements

The goal of this subtask is to secure the required permits and execute an interconnection agreement with Pacific Gas and Electric (PG&E) if necessary.

The Recipient Shall:

- Obtain required electrical and building permits from the Division of State Architects (DSA).
- Work with PG&E to facilitate system interconnection, execute an interconnection agreement, and schedule and execute PG&E inspections and testing as necessary.
- Document results of the permit process in a *System Permitting Technical Memorandum*.

Products:

- System Permitting Technical Memorandum

Subtask 4.3: Complete Construction and Installation

The goals of this subtask are to procure equipment and materials, and complete construction and installation of the electric school bus charging system.

The Recipient Shall:

- Construct and install the system according to the design.
- Install any necessary M&V equipment (such as additional meters) at the required locations.
- Prepare a *Construction Technical Memorandum* to document the substantial completion of the construction phase.
- Prepare a *CPR Report #2* in accordance with subtask 1.3 (CPR Meetings).
- Participate in a CPR meeting.

Products:

- Construction Technical Memorandum
- CPR Report #2

Subtask 4.4: Conduct Commissioning

The goal of this subtask is to verify the proper operation of the newly installed charging system.

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The Recipient Shall:

- Develop a *System Commissioning Plan*, including a system test procedure.
- Implement the plan to verify the proper operation of the system components and the overall systems, and make adjustments as needed.
- Complete the interconnection of the utility distribution grid if necessary.
- Prepare a *System Commissioning Technical Memorandum*.

Products:

- System Commissioning Plan
- System Commissioning Technical Memorandum

TASK 5: MEASUREMENT AND VERIFICATION OF DEPLOYMENT

The goal of this task is to conduct independent measurement and verification (M&V) for a 12-month post installation period for the renewable integration and charging system, to verify that it is meeting the performance targets and delivering the expected benefits.

Subtask 5.1: Develop a Measurement and Verification Plan

The goal of this subtask is to develop an M&V plan to quantify or qualify the designated metrics, in addition to a number of other significant metrics not included in the Project Performance Metrics attachment.

The Recipient Shall:

- Prepare a *Measurement and Verification Plan* that identifies and describes:
 - The calculation or reference for the baseline for each designated metric.
 - Instrumentation and equipment required to collect verification data during the one-year M&V period, such as meters and other monitoring equipment.
 - Data acquisition criteria such as inputs, outputs, sampling rate, and accuracy.
 - An installation plan for any equipment that must be installed during construction
 - The calculations necessary to quantify each of the designated metrics from the verification data.
 - Any other metrics or measurements that are scientifically significant or worthy of calculation. This may include calculated values such as the average driven miles of the vehicles, and other informative analyses such as a modeled comparison to an AC-coupled system with equivalent renewable integration.

Products:

- Measurement and Verification Plan

Subtask 5.2: Conduct Measurement and Verification of the Site

The goal of this subtask is to observe operation of the charging system for the one-year M&V period, analyze the verification data, and consolidate the results into a single readable format.

The Recipient Shall:

- Observe operation and maintenance of the charging system for one year after commissioning.
- Collect data specified in the measurement and verification plan.
- Analyze these data to obtain meaningful results for both the designated metrics, and also any other metrics that are scientifically significant or interesting.

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- Prepare a *System Performance Report* to document assessment results.
- Train the site operators in the operation and maintenance of the installation after the end of the project.
- Develop an *Operational and Maintenance Guide* to guide operation of the renewable charging systems after the end of the project.

Products:

- System Performance Report
- Operational and Maintenance Guide

TASK 6: COMMUNITY ENGAGEMENT

The goal of this task is to benefit the local communities through the following objectives: 1) increase community access to clean energy and sustainable technologies; 2) seek community input on the design of the project; and 3) collaborate with community members to identify critical features and capabilities for the new, local resilience hub.

The Recipient Shall:

- Develop a *Community Engagement Strategy and Plan*, which will seek to achieve the above objectives.
 - Summarize best ways to engage the local communities, using language- and culture-appropriate methods to maximize participation.
 - Choose outreach activities to help residents and local businesses reduce energy use and access sustainable technologies through activities such as: lowering the cost of home and business energy use; scheduling free energy audits; applying for discounted energy rates; and providing assistance in applying for funding and maximum rebates for the purchase of electric or hydrogen-fueled vehicles.
 - Sponsor career exploration and community education events to inform local neighborhoods of job opportunities in emerging green technologies such as solar energy, advanced vehicle repair, etc. (See Attachment 3 Project Narrative 8.1 and 8.2. for details.)
 - Solicit feedback on the project design.
 - Mobilize communities' participation in the development of a resilience hub to identify needed capabilities, features, types and numbers of devices, etc.
 - Collaborate with others addressing local energy/vehicle needs, such as Climate Smart San Jose, the BAAQMD Community Air Risk Evaluation (CARE) Program, San Jose Clean Energy, PG&E, Silicon Valley Clean Cities Coalition, and others.
- Create a *Resilience Hub Requirements Memo* which will summarize these learnings.
- Prepare a *Community Engagement Memo* to document, summarize, and analyze the project community engagement. Summarize activities over the course of the project which could include a community survey analysis, slides and other presentation material, records of meetings/trainings/other activities (including participant demographics), a case study of barriers and facilitators to community engagement and acceptance of the project, and/or others.

Products:

- Community Engagement Strategy and Plan
- Resilience Hub Requirements Memo
- Community Engagement Memo

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TASK 7: EVALUATION OF PROJECT BENEFITS

The goal of this task is to report the benefits resulting from this project.

The Recipient shall:

- Complete the *Initial Project Benefits Questionnaire*. The *Initial Project Benefits Questionnaire* shall be initially completed by the Recipient with 'Kick-off' selected for the 'Relevant data collection period' and submitted to the CAM for review and approval.
- Complete the *Annual Survey* by December 15th of each year. The Annual Survey includes but is not limited to the following information:
 - Technology commercialization progress
 - New media and publications
 - Company growth
 - Follow-on funding and awards received
- Complete the *Final Project Benefits Questionnaire*. The *Final Project Benefits Questionnaire* shall be completed by the Recipient with 'Final' selected for the 'Relevant data collection period' and submitted to the CAM for review and approval.
- Respond to CAM questions regarding the questionnaire drafts.
- Complete and update the project profile on the CEC's public online project and recipient directory on the [Energize Innovation website \(www.energizeinnovation.fund\)](http://www.energizeinnovation.fund), and provide *Documentation of Project Profile on EnergizeInnovation.fund*, including the profile link.
- If the Prime Recipient is an Innovation Partner on the project, complete and update the organizational profile on the CEC's public online project and recipient directory on the [Energize Innovation website \(www.energizeinnovation.fund\)](http://www.energizeinnovation.fund), and provide *Documentation of Organization Profile on EnergizeInnovation.fund*, including the profile link.

Products:

- Initial Project Benefits Questionnaire
- Annual Survey(s)
- Final Project Benefits Questionnaire
- Documentation of Project Profile on EnergizeInnovation.fund
- Documentation of Organization Profile on EnergizeInnovation.fund

TASK 8: TECHNOLOGY/KNOWLEDGE TRANSFER ACTIVITIES

The goal of this task is to ensure the technological learning that resulted from the demonstration(s) is captured and disseminated to the range of professions that will be responsible for future deployments of this technology or similar technologies.

The Recipient Shall:

- Develop and submit a *Project Case Study Plan (Draft/Final)* that outlines how the Recipient will document the planning, construction, commissioning, and operation of the technology or system being demonstrated. The *Project Case Study Plan* should include:

EXHIBIT A

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- An outline of the objectives, goals, and activities of the case study.
- The organization that will be conducting the case study and the plan for conducting it.
- A list of professions and practitioners involved in the technology's deployment.
- Specific activities the recipient will take to ensure the learning that results from the project is disseminated to those professions and practitioners.
- Presentations/webinars/training events to disseminate the results of the case study.
- Present the *Draft Project Case Study Plan* to the TAC for review and comment.
- Develop and submit a *Summary of TAC Comments* that summarizes comments received from the TAC members on the *Draft Project Case Study Plan*. This document will identify:
 - TAC comments the recipient proposes to incorporate into the *Final Technology Transfer Plan*.
 - TAC comments the recipient does not propose to incorporate an explanation why.
- Submit the *Final Project Case Study Plan* to the CAM for approval.
- Execute the *Final Project Case Study Plan* and develop and submit a *Project Case Study (Draft/Final)*.
- When directed by the CAM, develop presentation materials for a CEC- sponsored conference/workshop(s) on the project.
- When directed by the CAM, participate in annual EPIC symposium(s) sponsored by the California CEC.
- Provide at least (6) six *High Quality Digital Photographs* (minimum resolution of 1300x500 pixels in landscape ratio) of pre- and post-technology installation at the project sites or related project photographs.

Products:

- Project Case Study Plan (Draft/Final)
- Summary of TAC Comments
- Project Case Study (Draft/Final)
- High Quality Digital Photographs

V. PROJECT SCHEDULE

Please see the attached Excel spreadsheet.

STATE OF CALIFORNIA

STATE ENERGY RESOURCES
CONSERVATION AND DEVELOPMENT COMMISSION

RESOLUTION - RE: LAWRENCE BERKELEY NATIONAL LABORATORY

RESOLVED, that the State Energy Resources Conservation and Development Commission (CEC) adopts the staff CEQA findings contained in the Agreement or Amendment Request Form (as applicable); and

RESOLVED, that the CEC approves Agreement EPC-20-040 with Lawrence Berkeley National Laboratory for a \$4,000,000 grant to design, construct, and study an electric school bus depot charging system, featuring a novel and efficient direct current-coupled topology with an integrated solar canopy and stationary storage. Such a system caters to the scalability of EV charging depots because it requires no power from the utility and can also power a resilience hub; and

FURTHER BE IT RESOLVED, that the Executive Director or his/her designee shall execute the same on behalf of the CEC.

CERTIFICATION

The undersigned Secretariat to the CEC does hereby certify that the foregoing is a full, true, and correct copy of a Resolution duly and regularly adopted at a meeting of the CEC held on May 12, 2021.

AYE:

NAY:

ABSENT:

ABSTAIN:

Patricia Carlos
Secretariat