



**CALIFORNIA  
ENERGY COMMISSION**



**California Energy Commission  
June 16, 2023 Business Meeting  
Backup Materials for Agenda Item No 03f:  
The Regents of the University of California on behalf of the  
Davis Campus**

The following backup materials for the above-referenced agenda item are available in this PDF packet as listed below:

1. Proposed Resolution
2. Contract Request Form
3. Scope of Work

**STATE OF CALIFORNIA**  
**STATE ENERGY RESOURCES**  
**CONSERVATION AND DEVELOPMENT COMMISSION**

**RESOLUTION: The Regents of the University of California on behalf of the Davis Campus**

**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 600-22-009 with the Regents of the University of California on behalf of the Davis Campus (UCD) for a \$953,168 contract for UCD's Plug-In Hybrid & Electric Vehicle Research Center to research electric vehicle charger reliability through field testing chargers operating in California. This contract will focus on characterizing the extent and nature to which chargers in California are able to successfully charge consumers' electric vehicles as well as the failure modes that lead to unsuccessful charges; and

**FURTHER BE IT RESOLVED**, that the Executive Director or their 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 June 16, 2023.

AYE:  
NAY:  
ABSENT:  
ABSTAIN:

Dated:

\_\_\_\_\_  
Liza Lopez  
Secretariat



## CONTRACT REQUEST FORM (CRF)

### A. New Agreement Number

**IMPORTANT:** New Agreement # to be completed by Contracts, Grants, and Loans Office.

New Agreement Number: 600-22-009

### B. Division Information

1. Division Name: Fuels and Transportation
2. Agreement Manager: Dustin Schell
3. MS-6
4. Phone Number: 916.237.2551

### C. Contractor's Information

1. Contractor's Legal Name: The Regents of the University of California, Davis Campus
2. Federal ID Number: 94-6036494

### D. Title of Project

Title of project: Measuring Charging Infrastructure Reliability in California

### E. Term and Amount

1. Start Date: June 16, 2023
2. End Date: June 30, 2026
3. Amount: \$953,168

### F. Business Meeting Information

1. Operational agreement to be approved by Executive Director? No
2. Are the ARFVTP agreements \$75K and under delegated to Executive Director? N/A
3. The Proposed Business Meeting Date: 6/16/2023
4. Consent or Discussion? Discussion
5. Business Meeting Presenter Name: Dustin Schell
6. Time Needed for Business Meeting: 5 minutes
7. The email subscription topic is: Clean Transportation Program

#### Agenda Item Subject and Description:

The Regents of the University of California, Davis Campus. Proposed resolution approving Agreement 600-22-009 with the Regents of the University of California, Davis Campus (UCD) for a \$953,168 contract for UCD's Plug-In Hybrid & Electric Vehicle Research Center to research electric vehicle charger reliability through field testing chargers operating in California and adopting staff's determination that this action is exempt from CEQA. This contract will focus on characterizing the extent and nature to which chargers in California are able to successfully charge consumers' electric vehicles as well as the failure modes that lead to unsuccessful charges. (Clean Transportation Program Funding) Contact: Dustin Schell (Staff Presentation: 5 minutes)

### G. California Environmental Quality Act (CEQA) Compliance

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

Yes

If yes, skip to question 2.



If no, complete the following (PRC 21065 and 14 CCR 15378) and explain why Agreement is not considered a "Project":

**2. If Agreement is considered a "Project" under CEQA answer the following questions.**

**a) Agreement IS exempt?**

Yes

Statutory Exemption?

No

If yes, list PRC and/or CCR section number(s) and separate each with a comma. If no, enter "None" and go to the next question.

PRC section number: PRC section number 1, PRC section number 2. Or, "None"

CCR section number: CCR section number 1, CCR section number 2. Or, "None"

Categorical Exemption?

Yes

If yes, list CCR section number(s) and separate each with a comma. If no, enter "None" and go to the next question.

CCR section number: Cal. Code Regs., Tit. 14, § 15306.

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

Enter Yes or No

If yes, explain reason why Agreement is exempt under the above section. If no, enter "Not applicable" and go to the next section.

The proposed Agreement is exempt under Cal. Code Regs., Tit. 14, § 15306 because it is a data collection effort. This Agreement proposes sending testers in rented electric vehicles to publicly available electric vehicle chargers to attempt to charge these vehicles using a test protocol developed as part of the agreement. Data collected by testers will be analyzed in at UC Davis Campus facilities and reported to the CEC.

The project will not impact an environmental resource of hazardous or critical concern where designated, precisely mapped, and officially adopted pursuant to law by federal, state, or local agencies; does not involve any cumulative impacts of successive projects of the same type in the same place that might be considered significant; does not involve unusual circumstances that might have a significant effect on the environment; will not result in damage to scenic resources within a highway officially designated as a state scenic highway; the project site is not included on any list compiled pursuant to Government Code section 65962.5; and the project will not cause a substantial adverse change in the significance of a historical resource. Therefore, none of the exceptions to categorical exemptions listed in CEQA Guidelines section 15300.2 apply to this project, and this project will not have a significant effect on the environment.



b) Agreement **IS NOT** exempt.

**IMPORTANT:** consult with the legal office to determine next steps.

Enter Yes or No

If yes, answer yes or no to all that applies. If no, list all as “no” and “None” as “yes”.

Additional Documents	Applies
Initial Study	No
Negative Declaration	No
Mitigated Negative Declaration	No
Environmental Impact Report	No
Statement of Overriding Considerations	No
None	Yes

**H. Subcontractors**

List all Subcontractors listed in the Budget (s). Insert additional rows if needed. If no subcontractors to report, enter “No subcontractors to report” and “0” to funds. **Delete** any unused rows from the table

Subcontractor Legal Company Name	Budget
No subcontractors to report	\$0

**I. Key Partners**

List all key partner(s). Insert additional rows if needed. If no key partners to report, enter “No key partners to report.” **Delete** any unused rows from the table.

Key Partner Legal Company Name
Plug-In Hybrid & Electric Vehicle Research Center

**J. Budget Information**

Include all budget information. Insert additional rows if needed. If no budget information to report, enter “N/A” for “Not Applicable” and “0” to Amount. **Delete** any unused rows from the table.

Funding Source	Funding Year of Appropriation	Budget List Number	Amount
ARFVTF	2020-21	600.118J	\$399,850
ARFVTF	2021-22	600.118K	\$553,318

**TOTAL Amount: \$953,168**

R&D Program Area: N/A

Explanation for “Other” selection N/

A Reimbursement Contract #: N/A

Federal Agreement #: N/A



## K. Contractor's Contact Information

### 1. Contractor's Administrator/Officer

Name: Mike Barry  
Address: 1605 Tilia St  
City, State, Zip: Davis, CA 95616  
Phone: 530.752.6548  
Mail: mcbarry@ucdavis.edu

### 2. Contractor's Project Manager

Name: Dahlia Garas  
Address: 1605 Tilia St  
City, State, Zip: Davis, CA 95616  
Phone: 530.752.2570  
E-Mail: dmgaras@ucdavis.edu

## L. Selection Process Used

There are three types of selection process. List the one used for this CRF.

Selection Process	Additional Information
Competitive Solicitation #	N/A
Non Competitive Bid ( <i>Attach DGS-GSPD-09-007</i> <a href="https://www.dgs.ca.gov/PD/Forms">https://www.dgs.ca.gov/PD/Forms</a> )	N/A
Exempt	Other Governmental Entity

## M. Contractor Entity Type

Contractor Entity Type	Yes or No?
Private Company ( <i>including non-profits</i> )	No
CA State Agency ( <i>including UC and CSU</i> )	Yes
Government Entity ( <i>i.e. city, county, federal government, air/water/school district, joint power authorities, university from another state</i> )	No

## N. Is Contractor a certified Small Business (SB), Micro Business (MB) or Disabled Veterans Business Enterprise (DVBE)?

The contractor is a certified: N/A.

## O. Civil Service Considerations

- Not Applicable (Agreement is with a CA State Entity or a membership/co-sponsorship)? Yes
- Public Resources Code 25620, et seq., authorizes the Commission to contract for the subject work. (PIER) No



**c. The Services Contracted: No**

If no, go to the next question. If yes, which of the following applies to the contract? More than one can apply, list each answer choice, and separate them with a comma:

- are not available within civil service
- cannot be performed satisfactorily by civil service employee
- are of such a highly specialized or technical nature that the expert knowledge, expertise, and ability are not available through the civil service system

The following applies to the contract: Services contracted are of such a highly specialized or technical nature that the expert knowledge, expertise, and ability are not available through the civil service system.

**d. The Services are of such an urgent, temporary, or occasional nature that the delay to implement under civil service would frustrate their very purpose?**

Temporary.

**Justification:**

**P. Payment Method**

**1. Is the payment method Reimbursement, Advanced Payment, or Other?**

Reimbursement

If Other, explain: N/A

**2. If Reimbursement, is it in arrears based on Itemized Monthly, Itemized Quarterly, Flat Rate, or One-time?**

Itemized monthly

**Q. Retention**

Is Agreement subject to retention? No

If Yes, Will retention be released prior to Agreement termination? N/A

**R. Justification of Rates**

The rates are standardized and negotiated by the Regents of the University of California, Davis and the State of California.

**S. Disabled Veteran Business Enterprise Program (DVBE)**

Provide requested additional information.

**1. Exempt (Interagency/Other Government Entity) Yes**

**2. Meets DVBE Requirements DVBE. N/A.**

Amount: \$ 0 DVBE %:

**3. Is the Contractor Certified DVBE or Subcontracting with a DVBE? If subcontracting with a DVBE, provide the name of the DVBE company. If none applies, enter "Not Applicable".**

Not Applicable

**4. Contractor selected through CMAS or MSA with no DVBE participation N/A.**

**5. Requesting DVBE Exemption (attach CEC 95) No.**

**T. Miscellaneous Agreement Information**



STATE OF CALIFORNIA  
CALIFORNIA ENERGY COMMISSION

Contract Request Form  
CEC-94 (Revised 04/2023)

1. Will there be Work Authorizations? No
2. Is the contractor providing confidential information? No
3. Is the contractor going to purchase equipment? No
4. What is the check frequency of the progress reports? Monthly, Quarterly, or Other? If Other, please provide explanation.

Quarterly

5. Will a final report be required? Yes
6. Is the Agreement, with amendments, longer than three years? If yes, why?

No

**U. The following items should be attached to this CRF (as applicable)**

List all items that should be attached to this CRF by entering "Yes" or "No".

Item Number	Item Name	Attached
1	Exhibit A, Scope of Work/Schedule	Yes
2	Exhibit B, Budget Detail	Yes
3	DGS-GSPD-09-007, NCB Request	No
4	CEC 95, DVBE Exemption Request	No
5	Awardee CEQA Documentation	No
6	Resumes	Yes
7	CEC 105, Questionnaire for Identifying Conflicts	Yes

**Approved By**

Individuals who approve this form must enter their full name and approval date in the MS Word version.

**Agreement Manager:** Dustin Schell

**Approval Date:** 05/02/2023

**Office Manager:** Mike Nicholas

**Approval Date:** 05/02/2023

**Deputy Director:** Melanie Vail

**Approval Date:** 05/02/2023



## Exhibit A – Scope of Work

### Project Summary & Scope of Work

☒ Contract ☐ Grant

**PI Name:** Gil Tal, University of California, Davis Campus

**Project Title:** Measuring Charging Infrastructure Reliability in California

#### Project Summary/Abstract

The reliability of the public charging infrastructure in California is critical to facilitating the adoption and utilization of electric vehicles (EVs) in order to meet the state's zero-emission vehicle sales and emissions reductions goals. Currently, there are at least two perspectives with regards to reliability - that of the electric vehicle service provider (EVSP) and that of the customer. This project aims to investigate and understand the difference in these measurements, the cause of any reliability or charging failures, and provide potential solutions for providers to maximize the reliability of chargers. This project will be focused on Direct Current Fast Chargers (DCFCs) in California, and will separately explore the charging reliability experience in different communities in California including urban, rural, and low-income communities (LIC) and disadvantaged communities (DACs). A small sample of Level 2 (L2) chargers will be evaluated to determine if more investigation is needed.



#### TASK LIST

Task #	Task Name
1	Agreement Management
2	Develop a Sample Methodology and Sampling Plan
3	Develop Data Collection Tools and Procedures
4	Data Collection
5	Data Preparation and Analysis
6	Project Presentation and Policy Brief

#### ACRONYMS

Acronym	Definition
CAM	Commission Agreement Manager
CAO	Commission Agreement Officer

Acronym	Definition
CEC	California Energy Commission
CPO	Charge Point Operator
DAC	Disadvantaged Community
DCFC	Direct Current Fast Charger
EV	Electric Vehicle
EVSE	Electric Vehicle Service Equipment
EVSP	Electric Vehicle Service Provider
L2	Level 2 Charger
LIC	Low-Income Community
QA/QC	Quality Assurance and Quality Control

## **BACKGROUND/PROBLEM STATEMENT**

California currently has more than 3,000 publicly available DCFCs and nearly 30,000 L2 public chargers, numbers that are expected to grow dramatically in coming years. For EV drivers, charging infrastructure reliability means the ability to successfully use the infrastructure to charge their EVs with ease and certainty. The reliability of public chargers is crucial to the success of transitioning to EVs and transforming the transportation system to be electrically fueled to support California's emissions and zero-emission vehicle sales goals.

In an electrical system, reliability measures the degree to which the performance of the system results in electricity being transferred to the customer in the amount the charger was designed to deliver. Therefore, from the perspective of an EV driver, a reliable charger successfully charges their EV, for the expected duration, at an expected rate, after accepting an appropriate payment method. However, from the perspective of most EVSPs, a reliable charger is typically one that meets the minimum uptime requirement of its jurisdiction. Uptime, the most commonly used charging reliability metric, is a measure of the time during which a charger is online and available for operation. This metric does not consider all of the possible technological and logistical challenges within the charging ecosystem that ultimately 1) determine the true reliability of chargers and 2) reflect consumer experiences. Since the definition of charger reliability may differ between consumers and EVSPs, there may be a discrepancy between uptime reported by EVSPs and user satisfaction scores reported by consumers. This study will measure the failures and explore the issue of reliability more holistically from the perspective of the driver.

## **GOALS/OBJECTIVES OF THE AGREEMENT**

The goal of this agreement is to understand the reliability of the public charging infrastructure in California from the perspective of EV drivers. This agreement will examine the failure rate, and reason for failure, and any incompatibility or interoperability issues that arise through direct vehicle and charger testing.

Failure rates will be measured by testing EV chargers operating in California using a standardized testing protocol developed as part of this agreement. Data collected by field testers will be aggregated and analyzed to determine common failure modes and the elements of the charging ecosystem

associated with them. Where feasible, repeat tests will be conducted to understand the time to repair failures.

Success will be measured by completing the required number of tests, with minimal error rate, such that the data can inform the California Energy Commission (CEC) about the reliability of EV chargers in various communities (rural, urban, DAC, and LIC) throughout the state.

## **FORMAT/REPORTING REQUIREMENTS**

### **Deliverables/Reports**

When creating reports, the Contractor shall use and follow, unless otherwise instructed in writing by the Commission Agreement Manager (CAM), the latest version of the Consultant Reports Style Manual published on the CEC's web site:

[http://www.energy.ca.gov/contracts/consultant\\_reports/index.html](http://www.energy.ca.gov/contracts/consultant_reports/index.html)

Each final deliverable shall be delivered as one original, reproducible, 8 ½" by 11", camera-ready master in black ink. Illustrations and graphs shall be sized to fit an 8 ½" by 11" page and readable if printed in black and white.

### **Electronic File Format**

The Contractor shall deliver an electronic copy (CD ROM or memory stick or as otherwise specified by the CAM) of the full text in a compatible version of Microsoft Word (.doc).

The following describes the accepted formats of electronic data and documents provided to the CEC as contract deliverables and establishes the computer platforms, operating systems and software versions that will be required to review and approve all software deliverables.

- Data sets shall be in Microsoft (MS) Access or MS Excel file format.
- PC-based text documents shall be in MS Word file format.
- Documents intended for public distribution shall be in PDF file format, with the native file format provided as well.
- Project management documents shall be in MS Project file format.

### **Software Application Development**

If this scope of work includes any software application development, including but not limited to databases, websites, models, or modeling tools, contractor shall utilize the following standard Application Architecture components in compatible versions:

- 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 Software Application Development requirements above must be approved in writing by the CEC Information Technology Services Branch.

## **TASK 1 AGREEMENT MANAGEMENT**

### **Task 1.1 Kick-off Meeting**

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

#### **The Contractor shall:**

- Attend a “kick-off” meeting with the CAM, the Commission Agreement Officer (CAO), and a representative of the Accounting Office. The meeting will be held remotely. The Contractor shall include their Project Manager, Contracts Administrator, Accounting Officer, and others designated by the CAM in this meeting. The administrative and technical aspects of this Agreement will be discussed at the meeting.
- If necessary, prepare an updated Schedule of Deliverables based on the decisions made in the kick-off meeting.

#### **The CAM shall:**

- Arrange the meeting including scheduling the date and time.
- Provide an agenda to all potential meeting participants prior to the kick-off meeting.

#### **Deliverables:**

- An Updated Schedule of Deliverables (if applicable)

### **Task 1.2 Invoices**

#### **The Contractor shall:**

- Prepare invoices for all reimbursable expenses incurred performing work under this Agreement in compliance with Exhibit B of the Terms and Conditions of the Agreement. Invoices shall be submitted with the same frequency as progress reports (Task 1.4). Invoices must be submitted to the CEC’s Accounting Office.

#### **Deliverables:**

- Quarterly Invoices

### **Task 1.3 Manage Subcontractors**

The goal of this task is to ensure quality products, to enforce subcontractor Agreement provisions, and in the event of failure of the subcontractor to satisfactorily perform services, recommend solution to resolve the problem.

#### **The Contractor shall:**

- Manage and coordinate subcontractor activities. The Contractor is responsible for the quality of all subcontractor work and the CEC will assign all work to the Contractor. If the Contractor decides to add new subcontractors, they shall 1) comply with the Terms and Conditions of the Agreement, and 2) notify the CAM who will follow the CEC’s process for adding or replacing subcontractors.

### **Task 1.4 Progress Reports**

The goal of this task is to periodically verify that satisfactory and continued progress is made towards achieving the objectives of this Agreement.

**The Contractor shall:**

- Prepare progress reports which summarize all Agreement activities conducted by the Contractor for the reporting period, including an assessment of the ability to complete the Agreement within the current budget and any anticipated cost overruns. Each progress report is due within 15 calendar days after the end of the reporting period. The CAM will provide the format for the progress reports.

**Deliverables:**

- Quarterly Progress Reports

**Task 1.5 Final Report**

The goal of this task is to prepare a comprehensive written Final Report that describes the original purpose, approach, results and conclusions of the work completed under this Agreement. The Final Report shall be prepared in language easily understood by the public or layperson with a limited technical background.

The Final Report must be completed before the termination date of the Agreement in accordance with the Schedule of Deliverables.

The Final Report shall be a public document. If the Contractor has obtained confidential status from the CEC and will be preparing both a public and a confidential version of the Final Report, the Contractor shall perform the following for both the public and confidential versions of the Final Report.

**The Contractor shall:**

- Prepare the draft Final Report for this Agreement in accordance the current CEC style manual.
- Submit the draft Final Report for review and comment. The CAM will provide written comments to the Contractor. The Contractor shall review the comments and discuss any issues with the recommended changes with the CAM.
- Prepare and submit the Final Report, incorporating CAM comments.

**Deliverables:**

- Draft Final Report
- Final Report

**Task 1.6 Final Meeting**

The goal of this task is to discuss closeout of this Agreement and review the project.

**The Contractor shall:**

- Meet with CEC staff prior to the term end date of this Agreement. The meeting will be held remotely. This meeting will be attended by the Contractor Project Manager and the CAM. The CAM will determine any additional appropriate meeting participants. The administrative and technical aspects of Agreement closeout will be discussed at the meeting.
- Present findings, conclusions, and recommended next steps (if any) for the Agreement, based on the information included in the Final Report.
- Prepare a written document of meeting agreements and unresolved activities.

- Prepare a schedule for completing the closeout activities for this Agreement, based on determinations made within the meeting.

#### **Deliverables:**

- Written documentation of meeting agreements
- Schedule for completing closeout activities

### **TECHNICAL TASKS**

#### **Task 2 Develop a Sample Methodology and Sampling Plan**

The goal of this task is to establish a consistent, reliable, and comparable method for measuring the reliability of charging infrastructure. The protocols will be developed in partnership with industry experts to ensure they are based on the latest knowledge and so that the results will be widely accepted by the public.

##### **Task 2.1 Develop Charger Test Protocol**

The goal of this task is to develop the protocol to gather data on reliability of the public charging network from the user's perspective. Researchers will work through an iterative process to develop, test, and refine the charger testing protocol to take into account charger, vehicle, and user variables as well as stakeholder input. A secondary goal of this task is to develop a standard testing protocol that, after refinement, can be used by other public and private organizations to evaluate the health of chargers in California and beyond.

#### **The Contractor shall:**

- Develop *Draft Charger Testing Protocols* in coordination with the CAM and identified external experts and submit to CAM.
  - i. The test protocols will take into account charger location, charger manufacturer and network, charging level, charging speed, number of charger ports at a single location, and include a protocol for testing or evaluating the functionality at locations with single or multiple ports. The protocol will include a specific procedure for initiating a charging event, measuring the power and energy transmitted, and set of activities in case of charger failure in the process. The protocol will also include a plan for adding repeat visits to chargers, taking into account the results (functioning or problematic) from the initial test visit.
  - ii. Each charging protocol will include a standard list of data points to collect and general instructions for how to collect that data for each vehicle and charger combination based on the data reported by the vehicle, the charger, the charging application and the in-vehicle display when applicable.
- With input from the CAM, host a workshop to gather input on the draft protocol from users and stakeholders including charging providers.
- Test the draft charging protocols with a variety of vehicle and charger combinations to develop a full set of alternatives in case of failures.
- Refine the charging test protocols and develop *Final Year 1 Charger Testing Protocols* and submit to CAM.
- Revise the sampling frame, testing rate, and timeline based on initial charging testing and final charger testing protocol.
- Develop process to report and update the testing procedures in case of changes to the charger or vehicle performance or unexpected new events.

- Revise the testing protocol for future testing based on the experience and results of the charger testing in year 1 and develop *Revised Charger Testing Protocols* and provide to CAM.

**Deliverables:**

- Draft Charger Testing Protocols
- Final Year 1 Charger Testing Protocols
- Revised Charger Testing Protocols

**Task 2.2 Review of current charging population and ecosystem and develop sampling plan**

The goal of this task is to understand the current ecosystem of charging in California by different charger model provider or charging service network.

**The Contractor shall:**

- Develop *Draft Population Stratification Plan* to explore charging failures and provide to CAM.
- Incorporating feedback from CAM, develop *Final Population Stratification Plan* and provide to CAM.
- Develop a *Draft EVSE Charger Sampling Plan for both DCFC and L2 EVSEs by location and charging type* using CEC guidelines and priorities for the first three years and provide to CAM.
- Update the sampling frame based on data collection, market changes, and policy priorities in consultation with the CEC and incorporate in *Final EVSE Charger Sampling Plan for both DCFC and L2 EVSEs by location and charging type* and provide to CAM.
- Develop *Draft EVSE Charger Testing Timeline Plan* for years one through three that takes into account the availability of students, vehicles, and travel requirements in order to achieve evaluating the proposed sample size of at least 3,600 chargers over three years and submit to CAM.
- Develop *Final EVSE Charger Testing Timeline plan* incorporating CAM input for years one through three and submit to CAM.

**Deliverables:**

- Draft Population Stratification Plan
- Final Population Stratification Plan
- Draft EVSE Charger Sampling Plan for both DCFC and L2 EVSEs by location and charging type
- Final EVSE Charger Sampling Plan for both DCFC and L2 EVSEs by location and charging type
- Draft EVSE Charger Testing Timeline plan for years one through three
- Final EVSE Charger Testing Timeline plan for years one through three

**Task 3 Develop Data Collection Tools and Procedures**

**Task 3.1 Vehicle rental plan**

The goal of this task is to develop a plan to rent or lease a variety of EV makes/models in order to complete the charger testing as developed in Task 2.1.

**The Contractor shall:**

- Develop *Rental Plan* with fleet services on other UC campuses and/or rental companies and provide a copy to CAM.
- Rent vehicles for monthly use for intensive testing periods, and other daily rentals to supplement for less intensive testing periods.

**Deliverables:**

- Rental Plan (updated annually years one through three)

**Task 3.2 Student training**

The goal of this task is to train students, either at UC Davis Campus or at other UC Campuses, who will be hired to complete the charging test protocols.

**The Contractor shall:**

- Develop *Student Training Module* and provide to CAM.
- Conduct local training for UC Davis Campus student research assistants.
- Conduct a soft launch of charger testing with recently trained students to identify issues, questions or concerns that need to be added to the charger testing protocol or student training module.
- Conduct remote training for student research assistants at other UCs.
- Provide CAM *List of Training Sessions Conducted*

**Deliverables:**

- Student Training Module
- List of Training Sessions Conducted

**Task 3.3 Develop Data Collection Tools**

The goal of this task is to create the data collection tools to reliably record and store data gathered during charger testing.

**The Contractor shall:**

- Develop *Data Collection Tools* that may be in the form of web-based forms, data recording, pictures etc. and will be capable of reliably recording and storing necessary information and provide to CAM.

**Deliverables:**

- Preview of Data Collection Tools

**Task 4 Data Collection**

The goal of this task is to conduct testing of DCFCs and L2 chargers in California in order to meet the test sample developed in Task 2.

**The Contractor shall:**

- Conduct initial DCFC and L2 charger visits according to the sampling plan.
- Conduct repeat DCFC charger visits according to the sampling plan for either functional or problematic DCFC locations by region and charging types.



- After the first 12 months of data collection, revise the sampling frame and methods and update any protocols to ensure the CEC's data and policy needs are met and provide *Year 1 Data Collection Interim Report* to CAM.
- Develop and provide to CAM *Year 2 Data Collection Interim Report* that will include but is not limited to a discussion of data collection changes if applicable.

**Deliverables:**

- Year 1 Data Collection Interim Report
- Year 2 Data Collection Interim Report

**Task 5 Data Preparation and Analysis**

The goal of this task is to upload the collected data to an online data set using mobile data. The data set will be cleaned and validated using additional data sources based on location and time. When applicable, additional data sources will be added to the data collected by the field testers.

**Task 5.1 Data entering and cleaning**

The goal of this task is to conduct quality assurance and quality control (QA/QC) on the data collected by field testers. Broadly accepted QA/QC practices will be employed and all data cleaning processes will be coordinated with the CAM.

**The Contractor shall:**

- Create data collection automatic forms to be used at each location.
- Create data collection validation protocol to verify and clean the data.
- Create a missing data protocol for managing any gaps in data availability. This would identify what gaps are acceptable to still have usable data, and what gaps would render a test unusable.
- Develop and provide a *Quarterly Update* to the CAM that includes data collected, gaps between the collected data and the plan, and changes to the next quarter's workplan.

**Deliverables:**

- Quarterly Update

## Task 5.2 Data Analysis

The goal of this task is to analyze the data gathered to evaluate reliability and generalize the results according to geographic metrics, including disadvantaged and low-income communities, rural and urban locations, vehicle type, charging level and other parameters.

### The Contractor shall:

- Produce a *Reliability Report of Public Charging by Type, Location and Activity* according to the sampling frame and provide to CAM.
- Develop a framework that generalizes the data collected in this study to the public charging population in California and tools to estimate future reliability. This will include regression analysis and time series analysis to analyze repeat visit results and create predictions for current and future installed chargers.
- Develop and submit to CAM *Year 1 Interim Report on Project Status and Testing* at the end of year 1 and *Year 2 Interim Report on Project Status and Testing* at the end of year 2 summarizing project status and results of testing to date. These reports shall include:
  - A comparison of the data gathered to other datasets provided by the CEC or collected by the Electric Vehicle Research Center and prepare *Comparison of Data Gathered* and provide to CAM.
  - A comparison of results with additional studies including but not limited to: surveys and interviews of users at visited charging locations; data supplied by the charging providers; and crowdsourced data and studies conducted by other groups shared in an aggregate or disaggregate forms and prepare *Comparison of Results* and provide to CAM.

### Deliverables:

- Reliability Report of Public Charging by Type, Location, and Activity
- Year 1 Interim Report on Project Status and Testing
- Year 2 Interim Report on Project Status and Testing

## Task 5.3 Data reporting and reliability measures development

The goal of this task is to present the project results and connect the statistical data with current measures of EV charger uptime and reliability.

### The Contractor shall:

- Compile the *Data Gathered* as part of this study according to the sampling frame and provide in format specified by CAM.
- Prepare the *Final Report* according to Task 1.5 that will include, but is not limited to the current state of public charging in California, ways to measure EV charger reliability and dependability, suggested methods to improve data collection and reliability measuring, and policy relevance.

### Deliverables:

- Data Gathered
- Final Report (Task 1.5)

## **Task 6 Project Presentation and Final Report**

The goal of this task is to present the findings included in the Final Report in a public presentation.

### **The Contractor shall:**

- With guidance from the CAM, include the findings of the study in a *Final Project Presentation* to be presented publicly, either in- person or in a webinar format
- With guidance from the CAM, develop a *Final Project Report* that summarizes the findings of the study and submit to CAM.

### **Deliverables:**

- Final Project Presentation
- Final Project Report