California Energy Commission
March 17, 2025 Business Meeting
Backup Materials for 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 Amendment Request Form
3. Scope of Work

[PROPOSED]

RESOLUTION NO: 25-0317-03e

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 amendment 1 to agreement 600-22-009 with the Regents of the University of California, on behalf of the Davis Campus (UC Davis) to increase the contract by $220,400, add additional tasks to the scope of work (SOW), change terms and conditions to reflect obligations related to the modified SOW and updated legal requirements. This amendment will increase the budget due to increased costs and to add additional scope and budget to conduct an electric vehicle (EV) charger reliability survey on behalf of the CEC; 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 March 17, 2025.

AYE:
NAY:
ABSENT:
ABSTAIN:

Dated:

_____
Kristine Banaag
Secretariat

STATE OF CALIFORNIA

CONTRACT AMENDMENT REQUEST FORM (CARF)

CEC-276 (Revised 01/2024) CALIFORNIA ENERGY COMMISSION

Original Agreement # 600-22-009 Amendment # 01

Division	Agreement Manager:	MS-	Phone
Fuels and Transportation	Dustin Schell		279-226-1162

Contractor's Legal Name	Federal ID #
The Regents of the University of California, on behalf of the Davis	94-6036494

Revisions: (check all that apply)	Additional Requirements
☐ Term Extension New End Date: / /	Include revised schedule and complete items A, B, C, D, & H below.
☒ Budget Augmentation Amendment Amount: $ 220,400	Include revised budget and complete items A, B, C, D, E, F, & H below.
☐ Budget Reallocation	Include revised budget and complete items A, B, C, D, & H below.
☒ Scope of Work Revision	Include revised scope of work and complete items A, B, C, D, & H below.
☐ Change in Project Location or Demonstration Site	Include revised scope of work and complete items A, B, C, D, G, & H below.
☐ DVBE Replacement	Include revised scope of work and complete items A, B, C, D, F & H below.
☐ Novation/Name Change of Prime Recipient	Include novation documentation and complete items A, B, D, & H below.
☒ Terms and Conditions Modification	Include applicable exhibits with bold/underline/ strikeout and complete items A, B, C, D & H below.

A) Business Meeting Information

Business Meeting approval is not required for the following types of Agreements:

☐ Minor amendments delegated to Executive Director per December 2013 Resolution

Proposed Business Meeting Date 03 / 17 / 2025 ☒ Consent ☐ Discussion

Business Meeting Presenter Dustin Schell Time Needed: 0 minutes

Please select one list serve. Select

Agenda Item Subject and Description:

The Regents of the University of California, on behalf of the Davis Campus. Proposed resolution approving amendment 1 to agreement 600-22-009 with the Regents of the University of California, Davis Campus (UC Davis) to augment the contract by $220,400; add additional tasks to the scope of work; change terms and conditions to reflect obligations related to the modified SOW and updated legal requirements; and adopting staff's

recommendation that this action remains exempt from CEQA. The amendment will increase the budget for the original scope of work to account for increased costs as well as to add additional scope and budget for UC Davis to conduct an electric vehicle charger reliability survey on behalf of the commission. (Clean Transportation Program Funding). Contact: Dustin Schell

B) Amendment Justification (For contract amendments only)

☐ Non Competitive Bid (Attach DGS-GSPD-09-007) https://www.dgs.ca.gov/PD/Forms

☒ Exempt Other Governmental Entity

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

Legal Company Name:	Budget
N/A	$ 0.00
N/A	$ 0.00
N/A	$ 0.00

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

Legal Company Name:
N/A
N/A

E) Budget Information (only include amendment amount information)

Funding Source	Funding Year of Appropriation	Budget List Number	Amount
ARFVTF	2022-23	600.118L	$220,400
Funding Source			$
Funding Source			$
Funding Source			$
Funding Source			$

R&D Program Area: N/A TOTAL: $220,400

Explanation for “Other” selection N/A

Reimbursement Contract #: N/A

Federal Agreement #: N/A

F) Disabled Veteran Business Enterprise Program (DVBE)

1. ☒ Exempt (Interagency/Other Government Entity) Other Government Entity
2. ☐ Meets DVBE Requirements DVBE Amount:$_____ DVBE %:_____
   a) ☐ Contractor is Certified DVBE
   b) ☐ Contractor is Subcontracting with a DVBE:
3. ☐ Contractor selected through CMAS or MSA with no DVBE participation
4. ☐ Requesting DVBE Exemption (attach CEC 95)

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":

Agreement will not cause direct physical change in the environment or a reasonably foreseeable indirect physical change in the environment because .

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

c) ☒ Agreement **IS** exempt.

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

☒ Categorical Exemption. List CCR section number: Tit. 14, § 15306

☐ Common Sense Exemption. 14 CCR 15061 (b) (3) Explain reason why Agreement is exempt under the above section:

The original Agreement was found to be exempt under Cal. Code Regs., Tit. 14, § 15306 because it is a data collection effort. The 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 proposed amendment would not change the fundamental nature of the work as a data collection effort. The proposed amendment to the scope of work is to conduct a survey of electric vehicle drivers. Therefore, the original exemption still applies.

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.

d) ☐ 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) Is this project considered "Infrastructure"?
No

I) The following items should be attached to this CARF (as applicable)

1. Exhibit A, Scope of Work	☐ N/A	☒ Attached
2. Exhibit B, Budget Detail	☐ N/A	☒ Attached
3. DGS-GSPD-09-007, NCB Request	☒ N/A	☐ Attached
4. CEC 95. DVBE Exemption Request	☒ N/A	☐ Attached
5. CEQA Documentation	☒ N/A	☐ Attached
6. Novation Documentation	☒ N/A	☐ Attached
7. CEC 105, Questionnaire for Identifying Conflicts		☒ Attached

*Dustin Schell*_____ **23 Jan 2025____**
Agreement Manager **Date**

Jaron Weston _____ **23 Jan 2025____**
Office Manager **Date**

___Jennifer Kalafut _____ **28 Jan 2025_____**
Deputy Director **Date**

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
CEC	California Energy Commission
CPO	Charge Point Operator

DAC	Disadvantaged Community
DCFC	Direct Current Fast Charger
EV	Electric Vehicle
Acronym	**Definition**
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

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**, <u>including testing of Tesla North American Charging Standard (NACS) chargers with non-Tesla vehicles.</u>**
- 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 Field Testing Report

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 Policy Brief

Task 7 Develop, Execute, and Analyze a Survey
The goal of this task is to survey households of light duty plug-in electric vehicle users in order to collect data on PEV usage and charging behavior. The survey will be developed by the PEV center researchers in collaboration with CEC staff using UC Davis previous similar surveys and data collection. The survey development will be based on a set of research questions defined by UC Davis and the CEC staff focusing on privately owned LDV PEV users. The survey invitation will be mailed out to PEV owners in California and will provide instructions on how to take the survey online. The purpose of this survey is to evaluate the impacts of user experience as related to factors such as sociodemographics, location, and charging type. Survey analysis will also evaluate compatibility between vehicles and EVSE types. Prior to survey implementation, the Contractor will send the CAM draft versions of both the survey questionnaire as well as the protocol that defines how the questionnaire will be distributed, and what platform will be used to collect and store responses. A final version of both the questionnaire and protocol will be created, the survey will be submitted to IRB, and upon approval will then be initiated.

By linking these findings to the broader results of the overall project, we aim to provide a comprehensive understanding of user behavior, which can help inform strategies for optimizing PEV infrastructure, improving user experience, and supporting future policy development.

Task 7.1 Develop Survey

The goal of this task is to develop and implement an online survey. The survey will be developed with insights from data collected in Tasks 4-5 to ensure a realistic survey is created and valuable insights are gathered.

The Contractor shall:

- **Develop Draft Survey Questionnaire.**
  - **The survey questions will take into account sociodemographics such as urban, rural, and low- income communities (LIC) and disadvantaged communities (DACs), and use patterns and charging experience of current PEV drivers.**
- **Develop a sampling frame based on DMV PEV population.**
- **With input from the CAM, revise the survey questionnaire prior to submitting to IRB for review.**

Deliverables:

- **Draft Survey Questionnaire**
- **Final Survey Questionnaire**
- **Draft Survey Protocol**

Task 7.2 Survey Implementation

The goal of this task is to program the online survey and mail survey recruitment letters to the sample population.

The Contractor shall:

- **Program Online Survey**
- **The project team's programmer will design a survey tool to collect responses**
- **Mail out invitations to survey sample that will include a link to reach the online survey**
- **Manage survey follow up including distribution of incentives**

Deliverables:

- **Draft Invitation Letter**
- **Administer small pilot survey**
- **Administer full survey for data collection**

Task 7.3 Survey Analysis

The goal of this task is to analyze the impacts of user experience as related to factors such as sociodemographics, location type, and charging type. Survey analysis will also evaluate compatibility between vehicle and EVSE types, in order to try to identify any patterns of interoperability issues. Methods such as regression analysis, ANOVA, and discrete choice models will be employed to identify significant trends in how users charge their vehicles across various scenarios.

The Contractor shall:

- **Develop an analysis plan in coordination with the CEC**
- **Clean and validate the survey data with any necessary external datasets**
- **Perform analysis using descriptive statistics to characterize the PEV owners and their charging experiences**
- **Perform additional analysis as defined in the analysis plan**

Deliverables:

- **Present Final Analysis Plan to CAM**

Task 7.4 Survey Results Reporting

The goal of this task is to present the survey results and connect the statistical data with current measures of user charging behavior under different conditions and use cases. This involves not only summarizing key findings from the survey but also conducting in-depth statistical analyses to explore potential correlations and patterns.

The Contractor shall:

The contractor will analyze and report on key trends and charging behavior patterns derived from the survey data, providing valuable insights into how users interact with EV charging infrastructure under various conditions.

Deliverables:

- **Anonymized Dataset of Survey Responses**
- **Draft Report on Survey Results**
- **Final Report on Survey Results**