

Exhibit A Scope of Work

I. TASK ACRONYM/TERM LISTS

A. Task List

Task #	CPR ¹	Task Name
1		General Project Tasks
2	X	Implement and Test Smart Charger Grid Communication Interface
3		Evaluation of Project Benefits
4		Technology/Knowledge Transfer Activities
5		Production Readiness Plan

B. Acronym/Term List

Acronym/Term	Meaning
AB	Assembly Bill
CAM	Commission Agreement Manager
CAO	Commission Agreement Officer
CPR	Critical Project Review
EV	Electric Vehicle
EVSE	Electric Vehicle Supply Equipment
IEC	International Electrotechnical Commission
ISO	International Organization for Standardization
NOS	Network Operating System
OVGIP	Open Vehicle Grid Integration Platform
PEV	Plug-in Electric Vehicle
SOC	State of Charge
TAC	Technical Advisory Committee
VGI	Vehicle Grid Integration

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

A. Purpose of Agreement

The purpose of this Agreement is to fund an applied research and development project to develop grid-vehicle-charging station connectivity methodology and assess the real-time potential for residential smart chargers to respond to utility signaling in order to provide grid stabilization services when aggregated over a distribution circuit.

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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B. Problem/ Solution Statement

Problem

As residential Plug-in Electric Vehicle (PEV) charging loads increase, they will represent significant contributions to local distribution circuits and if not managed, can have negative impacts on local grid stability. Currently there are no adequate communication interfaces that allow communication between utilities, charging stations, and residential (PEV) customers. While there is some capability for aggregated commercial charging applications to provide grid stability, residential PEV participation in grid stabilization requires significantly more fine-grained data collection, coordination of charging at stations owned by different parties, and sensitivity to each driver's needs and preferences as well as a real-time understanding of each vehicle's state of charge (SOC) or charge needed before next departure.

Solution

The project will develop communication interfaces between PEV customers and utilities using cloud-to-cloud OpenADR 2.0b communication with a vehicle charging network and will leverage emerging means for retrieving vehicle information via the emerging International Organization for Standardization (ISO)/ International Electrotechnical Commission (IEC) 15118 standard (<http://www.iso.org/obp/ui/#iso:std:iso:15118:-1ed-1:v2:en>) for consideration in the PEV operator decision process. The communication will be able to gather customer data and receive signals from a third party (utility) for the purpose of optimizing PEV charging in a mutually beneficial manner to the customer and the utility. In addition to investigation and implementation of the ISO/IEC 15118 standard, the project will also investigate using control methods that do not require having vehicle charging information. This project will consider statistical estimation, rate of charge output from charging stations or driver opt-in based on maximum charge needed as the control method.

C. Goals and Objectives of the Agreement

Agreement Goals

The goals of this Agreement are to:

- Provide utilities with fine-grained individual and aggregated visibility to residential PEV charging loads that are logically grouped to coincide with local distribution areas;
- Establish robust communication protocols and information flows to allow utilities to use PEV charging as a tool to proactively manage local distribution circuit load;
- Leverage vehicle to charger emerging communication standards, such as ISO/IEC 15118, to vary and optimize the rate of individual vehicle charging while ensuring the total PEV charge needed is not compromised;
- Enhance grid services with residential PEV smart charging by leveraging emerging standards to use real time information from charging stations and vehicles; and
- Gather data and provide analysis on home charging behavior and preferences to determine the feasibility for drivers to opt in to energy management programs when real time state-of-charge information is not known.
- Assess ratepayer benefits associated with increased penetration of residential smart chargers.

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Ratepayer Benefits:² This Agreement will result in the ratepayer benefits of greater electricity reliability and lower or deferred costs in upgrading local distribution infrastructure by providing a mechanism for demand management for local distribution networks, specifically managing PEV charging with input from PEV customers, vehicles, and utility signals. Visibility and management of demand will lower electrical generation costs by leveling the power demand curve, and will increase distribution system reliability by reducing power fluctuations across distribution level electrical equipment. Additionally, ratepayers will receive benefits from improved air quality and reduced greenhouse gas emissions from the efficient management of electricity generating resources and from increased PEV utilization.

Technological Advancement and Breakthroughs:³ 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 enhancing communication between electric vehicles, residential charging stations, and the grid. The project will result in technological advancement that provides utilities visibility into residential PEV charging loads and to have the ability to influence charging schedules. The technology advancement and novel communication system will offer demand management and/or response (supporting AB 32, AB 118 & CPUC DRP), and clean transportation (supporting CPUC Alternative Fueled Vehicle Programs, Tariffs, and Policies Order R.13-11-007).

Agreement Objectives

The objectives of this Agreement are to:

- Add prototype software components to existing ChargePoint Network Operating System (NOS) providing utilities, via a customer opt-in system, visibility into real-time charging load data across specific distribution circuits;
- Add prototype software components to existing ChargePoint NOS allowing both utilities and customers to provide real-time data inputs to charging optimization across a distribution network;
- Enhance ChargePoint Home Level 2 residential PEV chargers with a communications interface enabling fine-grained data collection and control;
- Integrate communications interface into a prototype BMW i3 and verify proof-of-concept vehicle to charger communication;
- Analyze residential customer charging data and behaviors to propose vehicle-grid communication programs mutually beneficial to utilities and drivers;
- Gain a better understanding of the potential for VGI technologies to the driver, ratepayers and the grid ecosystem.

III. TASK 1 GENERAL PROJECT TASKS

PRODUCTS

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).

³ California Public Resources Code, Section 25711.5(a) also requires EPIC-funded projects to lead to technological advancement and breakthroughs to overcome barriers that prevent the achievement of the state's statutory and energy goals.

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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)**. 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

- 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.
- Submit the final product to the CAM once agreement has been reached on the draft. The CAM will provide written approval of the final product within 15 days of receipt, unless otherwise specified in the task/subtask for which the product is required.
- If the CAM determines that the final product does not sufficiently incorporate his/her comments, submit the revised product to the CAM within 10 days of notice by the CAM, unless the CAM specifies a longer time period.

For products that require a final version only

- Submit the product to the CAM for approval.
- If the CAM determines that the product requires revision, submit the revised product to the CAM within 10 days of notice by the CAM, unless the CAM specifies a longer time period.

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**
Submit all data and documents required as products under this Agreement in an electronic file format that is fully editable and compatible with the Energy Commission’s 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 memory stick or CD-ROM.

The following describes the accepted formats for electronic data and documents provided to the Energy Commission 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.

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- Text documents will be in MS Word file format, version 2007 or later.
- Documents intended for public distribution will be in PDF file format. The Recipient must also provide the native Microsoft file format.
- 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 Energy Commission'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.

The Recipient shall:

- Attend a "Kick-off" meeting with the CAM, the Commission Agreement Officer (CAO), and any other Energy Commission 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;

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- 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 and invoices (subtask 1.5);
 - Final Report (subtask 1.6);
 - Technical Advisory Committee meetings (subtasks 1.10 and 1.11); and
 - Any other relevant topics.
- Provide an *Updated Project Schedule*, *List of Match Funds*, and *List of Permits*, 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:

- Updated Project Schedule (*if applicable*)
- Updated List of Match Funds (*if applicable*)
- Updated List of Permits (*if applicable*)

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 Energy Commission 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 Energy Commission 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 Energy Commission.

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 Energy Commission, but they may take

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place at another location, or may be conducted via electronic conferencing (e.g., WebEx) as determined by the CAM.

The Recipient shall:

- Prepare 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.
- Submit the CPR Report along with any other *Task Products* that correspond to the technical task for which the CPR meeting is required (i.e., if a CPR meeting is required for Task 2, submit the Task 2 products along with the CPR Report).
- 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* and 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)
- Task Products (draft and/or final as specified in the task)

CAM Products:

- CPR Agenda
- List of Expected CPR Participants
- Schedule for Providing a Progress Determination
- Progress Determination

Subtask 1.4 Final Meeting

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

The Recipient shall:

- Meet with Energy Commission 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.

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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 state-owned equipment.
 - Need to file a Uniform Commercial Code Financing Statement (Form UCC-1) regarding the Energy Commission's interest in patented technology.
 - The Energy Commission'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 *All Draft and Final Written Products* on a CD-ROM or USB memory stick, organized by the tasks in the Agreement.

Products:

- Final Meeting Agreement Summary (*if applicable*)
- Schedule for Completing Agreement Closeout Activities
- All Draft and Final Written 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 all Agreement activities conducted by the Recipient for the preceding month, including an assessment of the ability to complete the Agreement within the current budget and any anticipated cost overruns. See the Progress Report Format Attachment for the recommended specifications.
 - Provide a synopsis of the project progress, including accomplishments, problems,

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milestones, products, schedule, fiscal status, and any evidence of progress such as photographs.

- Submit a monthly or quarterly *Invoice* that follows the instructions in the “Payment of Funds” section of the terms and conditions. In addition, each invoice must document and verify:
 - Energy Commission funds received by California-based entities;
 - Energy Commission funds spent in California (*if applicable*); and
 - Match fund 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. The CAM will review and approve the Final Report, which will be due at least **two months** before the Agreement end date. When creating the Final Report Outline and the Final Report, the Recipient must use a 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 *Style Manual* provided by the CAM.
- Submit a draft of the outline to the CAM for review and comment.
- Once agreement has been reached on the draft, submit the final outline to the CAM. The CAM will provide written approval of the final outline within 10 days of receipt.

Recipient Products:

- Final Report Outline (draft and final)

CAM Product:

- Style Manual
- Comments on Draft Final Report
- Approval 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 and the Style Manual provided by the CAM.
- Submit a draft of the report to the CAM for review and comment. Once agreement on the draft report has been reached, the CAM will forward the electronic version for Energy Commission internal approval. Once the CAM receives approval, he/she will provide written approval to the Recipient.
- Submit one bound copy of the Final Report to the CAM.

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Products:

- Final Report (draft and final)

CAM Product:

- Comments on Draft Final Report Outline

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 Energy Commission 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 Energy Commission 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 Energy Commission 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, 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.
- A copy of 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.

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- 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*.
- 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.

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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 the 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.
- 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.

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;

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- 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.

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.

Products:

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

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IV. TECHNICAL TASKS

TASK 2 Implement and Test Smart Charger Grid Communication Interface

The goals of this task are to 1) implement and test a communications interface (standards-based protocol “stack” with hardware and software components) enabling Level 2 alternating current (AC) chargers to exchange “smart charging” data and control messages with PEVs or other external systems 2) integrate the communications interface with ChargePoint Home Level 2 smart charger and 3) create simulations, engage in pilot programs and gather information to study the impact and participation dynamics of using the communications interface and potential control algorithms.

Task 2 will be composed of four subtasks.

Subtask 2.1 Implement and Test Communications Interface

The Recipient shall:

- Prepare a *Communications Interface Development Report* that includes, but is not limited to, the following:
 - A description of existing technologies and standards;
 - A discussion of challenges specific to residential PEV customers and their participation in smart charging programs;
 - A discussion of development goals for the communications interface, specifically how they address the identified challenges; and
 - A discussion of challenges and lessons learned through the development process.
- Test and qualify a prototype interface (protocol “stack” with hardware and software components) enabling ISO/IEC 15118 communication between the PEV and the charging station;
- Implement a communications interface using OpenADR 2.0b protocol and/or a cloud-based application program interfacing that gives utilities visibility of the fine-grained individual and aggregated near real time charging data and enables utilities to provide signals or time of use pricing to help manage within specified load limits;
- Enhance ChargePoint’s existing customer application which allows for customer defined inputs, opt-out, and information exchange;
- Prepare a *Communications Interface Test Report* that includes, but is not limited to, the following:
 - A description of the goals of the communication interface;
 - A description of how the communications interface will be tested to verify intended functionality;
 - A discussion of the testing process; and
 - A discussion of the test findings.

Products

- Communications Interface Development Report
- Communications Interface Test Report

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Subtask 2.2 Hardware Integration

The Recipient shall:

- Integrate ISO/IEC 15118 interface stack into an existing ChargePoint Home Level 2 smart charger; and
- Prepare a *Hardware Integration Test Plan* that includes, but is not limited to, the following:
 - A description of the goals of the communication interface integration;
 - A description of how the hardware will be tested to verify intended functionality;
 - A discussion of the testing process; and
 - A discussion of the test findings.

Products:

- Hardware Integration Test Plan

Subtask 2.3 Vehicle Proof-of-Concept Testing

The Recipient shall:

- Extend the charging communications interface of a prototype BMW i3 Electric Vehicle by adding a proof-of-concept protocol stack implementation of the ISO/IEC 15118 protocol:
 - Supplement the functionality of the current communication standard (DIN 70121), with features of the grid standard (ISO/IEC 15118), needed to support the ChargePoint VGI smart charging application and trial;
 - Specifically (within the vehicle) provide the ISO/IEC 15118 based mechanisms to request and interpret tariff tables and p-max tables, and pick the offered charging schedule in order to fulfill the customers' mobility needs as known to the vehicle. This includes responses to rescheduling suggestions by both electric vehicle (EV) and Electric Vehicle Supply Equipment (EVSE).
 - The prototype implementation will be a coherent subset or complete implementation of ISO/IEC 15118, suitable for adaptation in production vehicles.
- Test and validate EV-to-EVSE (BMW i3-to-ChargePoint Home) communications using the ISO/IEC 15118 protocol implementation, i.e. the smart charging features mentioned above.
- Host and collaborate on proof-of-concept testing in BMW's Group Technology Office located in Mountain View, California:
 - Install the prototype ChargePoint Home EVSE with ISO/IEC 15118 communications interface at the BMW Group Technology Office;
 - Demonstrate driver/vehicle choice-based adjustment of EV charging using the Target Setting, Charge Scheduling and Re-scheduling (using the ISO/IEC 15118 based renegotiation process), and other features of ISO/IEC 15118 communications between the prototype ChargePoint Home EVSE and the prototype BMW i3 EV;
 - Test EV smart charging control according to simulated, actual, or experimental utility signals for energy price, availability, or other conditions as processed by the smart charging features of ChargePoint's NOS and communicated via the on-site prototype Home EVSE.

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Scope of Work

- Demonstrate the functionality of the value added service channel (“VAS” according to ISO/IEC 15118), which will be offered by the modified ChargePoint Home L2 EVSE (IP packet routing from vehicle to the internet and back).
- Develop a *BMW Proof-of-Concept Test Report* that includes the data and findings from the integration of technology into the BMWi3 in task 2.3.

Products:

- BMW Proof-of-Concept Test Report

Subtask 2.4 Network Simulation and Pilot Testing

The Recipient shall:

- Prepare a *Research Test Plan* that includes, but is not limited to, the following:
 - A description of the data collected;
 - Evaluation of performance of the optimization capabilities; and
 - A discussion of the lessons learned.
 - A description of the goals of the research;
 - A description of the simulated distribution system/feeders; and
 - A discussion of the testing constraints and process.
 - Summary of expected outcomes and benefits
- Develop a network simulation based on LBNL optimization models targeted at actual utility distribution system/feeder locations to validate full control potential in a controlled environment;
- Develop a control algorithm that is capable of limiting the total vehicle-charging load under a virtual aggregation point.
- Validate the performance of the controller using appropriate error metrics capturing the ability to control the aggregate load by reducing the power to individual charging stations for a period of time in order to meet utility load limits while ensuring driver preferences are still respected.
- Study the limitations of managed charging on groups of vehicles where SOC or amount of charge needed is not available through the vehicle interface.
- Implement the Research Test Plan.
- Prepare a *Research Test Report* that includes, but is not limited to, the following:
 - A description of the data collected;
 - Evaluation of performance of the optimization capabilities; and
 - A discussion of the lessons learned.
- Identify, with input from San Diego Gas & Electric, preferred target systems/feeders for pilot-scale residential application.
- Prepare a *Pilot Project Implementation Plan* that includes, but is not limited to, the following:
 - A description of the goals of the pilot project;
 - Experimental design and customer test plan;
 - A description of the recruitment of customers;
 - A discussion of the data to be collected; and
 - A discussion of the analysis to be performed with the collected data.
- Educate and recruit 30 pilot customers of San Diego Gas & Electric, and install ChargePoint chargers for the pilot customers.

Exhibit A Scope of Work

- Implement the Pilot Project Implementation Plan;
- Prepare a *Pilot Project Report* that includes, but is not limited to, the following:
 - A description of the data collected and methodologies used to evaluate performance;
 - Evaluation of performance;
 - A discussion of the findings; and
 - An assessment of the potential with greater market penetration.
- Prepare a *CPR Report* in accordance with Task 1.3

Products:

- Research Test Plan
- Research Test Report (draft and final)
- Pilot Project Implementation Plan
- Pilot Project Report (draft and final)
- CPR Report

TASK 3 Evaluation of Project Benefits (*Mandatory task*)

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

The Recipient shall:

- Complete three Project Benefits Questionnaires that correspond to three main intervals in the Agreement: (1) *Kick-off Meeting Benefits Questionnaire*; (2) *Mid-term Benefits Questionnaire*; and (3) *Final Meeting Benefits Questionnaire*.
- Provide all key assumptions used to estimate projected benefits, including targeted market sector (e.g., population and geographic location), projected market penetration, baseline and projected energy use and cost, operating conditions, and emission reduction calculations. Examples of information that may be requested in the questionnaires include:
 - For Product Development Projects and Project Demonstrations:
 - Published documents, including date, title, and periodical name.
 - Estimated or actual energy and cost savings, and estimated statewide energy savings once market potential has been realized. Identify all assumptions used in the estimates.
 - Greenhouse gas and criteria emissions reductions.
 - Other non-energy benefits such as reliability, public safety, lower operational cost, environmental improvement, indoor environmental quality, and societal benefits.
 - Data on potential job creation, market potential, economic development, and increased state revenue as a result of the project.

Exhibit A Scope of Work

- A discussion of project product downloads from websites, and publications in technical journals.
- A comparison of project expectations and performance. Discuss whether the goals and objectives of the Agreement have been met and what improvements are needed, if any.
- Additional Information for Product Development Projects:
 - Outcome of product development efforts, such copyrights and license agreements.
 - Units sold or projected to be sold in California and outside of California.
 - Total annual sales or projected annual sales (in dollars) of products developed under the Agreement.
 - Investment dollars/follow-on private funding as a result of Energy Commission funding.
 - Patent numbers and applications, along with dates and brief descriptions.
- Additional Information for Product Demonstrations:
 - Outcome of demonstrations and status of technology.
 - Number of similar installations.
 - Jobs created/retained as a result of the Agreement.
- For Information/Tools and Other Research Studies:
 - Outcome of project.
 - Published documents, including date, title, and periodical name.
 - A discussion of policy development. State if the project has been cited in government policy publications or technical journals, or has been used to inform regulatory bodies.
 - The number of website downloads.
 - An estimate of how the project information has affected energy use and cost, or have resulted in other non-energy benefits.
 - An estimate of energy and non-energy benefits.
 - Data on potential job creation, market potential, economic development, and increased state revenue as a result of project.
 - A discussion of project product downloads from websites, and publications in technical journals.
 - A comparison of project expectations and performance. Discuss whether the goals and objectives of the Agreement have been met and what improvements are needed, if any.
- Respond to CAM questions regarding responses to the questionnaires.

The Energy Commission may send the Recipient similar questionnaires after the Agreement term ends. Responses to these questionnaires will be voluntary.

Products:

- Kick-off Meeting Benefits Questionnaire
- Mid-term Benefits Questionnaire
- Final Meeting Benefits Questionnaire

Exhibit A Scope of Work

TASK 4 Technology/Knowledge Transfer Activities (*Mandatory task*)

The goal of this task is to develop a plan to make the knowledge gained, experimental results, and lessons learned available to the public and key decision makers.

The Recipient shall:

- Prepare an *Initial Fact Sheet* at start of the project that describes the project. Use the format provided by the CAM.
- Prepare a *Final Project Fact Sheet* at the project's conclusion that discusses results. Use the format provided by the CAM.
- Prepare a *Technology/Knowledge Transfer Plan* that includes:
 - An explanation of how the knowledge gained from the project will be made available to the public, including the targeted market sector and potential outreach to end users, utilities, regulatory agencies, and others.
 - A description of the intended use(s) for and users of the project results.
 - Published documents, including date, title, and periodical name.
 - Copies of documents, fact sheets, journal articles, press releases, and other documents prepared for public dissemination. These documents must include the Legal Notice required in the terms and conditions. Indicate where and when the documents were disseminated.
 - A discussion of policy development. State if project has been or will be cited in government policy publications, or used to inform regulatory bodies.
 - The number of website downloads or public requests for project results.
 - Additional areas as determined by the CAM.
- Conduct technology transfer activities in accordance with the Technology/Knowledge Transfer Plan. These activities will be reported in the Progress Reports.
- When directed by the CAM, develop *Presentation Materials* for an Energy Commission-sponsored conference/workshop on the results of the project.
- Prepare a *Technology/Knowledge Transfer Report* on technology transfer activities conducted during the project.

Products:

- Initial Fact Sheet (draft and final)
- Final Project Fact Sheet (draft and final)
- Presentation Materials (draft and final)
- Technology/Knowledge Transfer Plan (draft and final)
- Technology/Knowledge Transfer Report (draft and final)

TASK 5 Production Readiness Plan

The goal of this task is to determine the steps that will lead to the manufacturing of technologies developed in this project or to the commercialization of the project's results.

The Recipient shall:

- Prepare a *Production Readiness Plan*. The degree of detail in the plan should be proportional to the complexity of producing or commercializing the proposed product, and to its state of development. As appropriate, the plan will discuss the following:

Exhibit A Scope of Work

- Critical production processes, equipment, facilities, personnel resources, and support systems needed to produce a commercially viable product.
- Internal manufacturing facilities, supplier technologies, capacity constraints imposed by the design under consideration, design-critical elements, and the use of hazardous or non-recyclable materials. The product manufacturing effort may include “proof of production processes.”
- The estimated cost of production.
- The expected investment threshold needed to launch the commercial product.
- An implementation plan to ramp up to full production.
- The outcome of product development efforts, such as copyrights and license agreements.
- Patent numbers and applications, along with dates and brief descriptions.
- Other areas as determined by the CAM.

Products:

- Production Readiness Plan (draft and final)

V. PROJECT SCHEDULE

Please see the attached Excel spreadsheet.

STATE OF CALIFORNIA

STATE ENERGY RESOURCES
CONSERVATION AND DEVELOPMENT COMMISSION

RESOLUTION - RE: CHARGEPOINT, INC.

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

RESOLVED, that the Energy Commission approves Agreement EPC-14-078 from PON-14-310 with **ChargePoint, Inc.** for a **\$1,500,000** grant to develop a grid-vehicle-charging station connectivity methodology and assess the real-time potential for residential smart chargers to respond to utility signaling for grid stabilization; and

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

CERTIFICATION

The undersigned Secretariat to the Commission 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 California Energy Commission held on June 10, 2015.

AYE: [List of Commissioners]

NAY: [List of Commissioners]

ABSENT: [List of Commissioners]

ABSTAIN: [List of Commissioners]

Harriet Kallemeyn,
Secretariat