New Agreement EPC-15-084 (To be completed by CGL Office)

Division	Agreement Manager:	MS-	Phone
ERDD	Matthew Fung	43	916-327-1422

Recipient's Legal Name	Federal ID Number
BMW of North America, LLC	22-2139469

Title of Project
Total Charge Management: Advanced Charge Management for Renewable Integration

Term and Amount	Start Date	End Date	Amount
	6/30/2016	3/31/2019	$ 3,999,900

Business Meeting Information

☐ ARFVTP agreements under $75K delegated to Executive Director.

Proposed Business Meeting Date	5/17/2016	☐ Consent	☒ Discussion
Business Meeting Presenter	David Hungerford	Time Needed:	5 minutes

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

Agenda Item Subject and Description

BMW OF NORTH AMERICA, LLC. Proposed resolution approving Agreement EPC-15-084 with BMW of North America, LLC for a $3,999,900 grant to utilize real-time vehicle information, predictive travel behavior, grid location data, and energy market price data to manage a vehicle's charging.

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:
   ☒ a) Agreement **IS** exempt. (Attach draft NOE)
   ☐ Statutory Exemption. List PRC and/or CCR section number:
   ☒ Categorical Exemption. List CCR section number: Cal. Code Regs., tit 14, § 15306
   ☐ Common Sense Exemption. 14 CCR 15061 (b) (3)
   Explain reason why Agreement is exempt under the above section:
   This project is exempt under the Categorical Exemption. Cal. Code Regs., tit 14, § 15306 Information Collection because BMW is collecting and analyzing electric vehicle driving data and conducting paper studies which will not result in more cars on the road and that will not result in serious or major disturbance to an environmental resource.
   ☐ b) Agreement **IS NOT** exempt. (Consult with the legal office to determine next steps.)
   Check all that apply
   ☐ Initial Study ☐ Environmental Impact Report
   ☐ Negative Declaration ☐ Statement of Overriding Considerations
   ☐ Mitigated Negative Declaration

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

Legal Company Name:	Budget
The Regents of the University of California, Berkeley	$ 425,000
Kevala, Inc.	$ 499,134
Olivine, Inc.	$ 381,737
To Be Determined	$ 814,967

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

Legal Company Name:
The Regents of the University of California, Berkeley
Kevala, Inc.
Olivine, Inc.

STATE OF CALIFORNIA

GRANT REQUEST FORM (GRF)

CEC-270 (Revised 10/2015)

CALIFORNIA ENERGY COMMISSION

Budget Information			
Funding Source	**Funding Year of Appropriation**	**Budget List No.**	**Amount**
EPIC	14-15	301.001B	$3,999,900
			$
R&D Program Area: EERO: Buildings		TOTAL:	$3,999,900
Explanation for "Other" selection			
Reimbursement Contract #:		Federal Agreement #:	

Recipient's Administrator/ Officer		Recipient's Project Manager	
Name:	Sabine Radl	Name:	Adam Langton
Address:	2606 Bayshore Pkwy	Address:	2606 Bayshore Pkwy
City, State, Zip:	Mountain View, CA 94043-1013	City, State, Zip:	Mountain View, CA 94043-1013
Phone:	201-571-5365 / Fax: - -	Phone:	201-675-2701 / Fax: - -
E-Mail:	sabine.sr.radl@bmwnaext.com	E-Mail:	adam.langton@bmwna.com

Selection Process Used	
☒ Competitive Solicitation	Solicitation #: GFO-15-311
☐ First Come First Served Solicitation	

The following items should be attached to this GRF		
1. Exhibit A, Scope of Work		☒ Attached
2. Exhibit B, Budget Detail		☒ Attached
3. CEC 105, Questionnaire for Identifying Conflicts		☒ Attached
4. Recipient Resolution	☒ N/A	☐ Attached
5. CEQA Documentation	☐ N/A	☒ Attached

Agreement Manager	Date	Office Manager	Date	Deputy Director	Date

EXHIBIT A
Scope of Work

I. TASK ACRONYM/TERM LISTS

A. Task List

Task #	CPR[1]	Task Name
1		General Project Tasks
2		Resource Enrollment and Data Collection Protocols
3	X	Evaluate the Effectiveness of Vehicle Telematics as a Performance Data Source
4		Test Optimization of DR and Over-generation Across Daytime and Nighttime Charging Events
5		Test and Analyze Local Marginal Price Optimization
6		Evaluation of Project Benefits
7		Technology/Knowledge Transfer Activities

B. Acronym/Term List

Acronym/Term	Meaning
API	Application Programming Interface
BMW	Bayerische Motoren Werke
CAISO	California Independent System Operator
CAM	Commission Agreement Manager
CAO	Commission Agreement Officer
CPR	Critical Project Review
DR	Demand Response
IOU	Investor-Owned Utility
LMP	Locational Marginal Price
MW	Megawatt
PEV	Plug-in electric vehicle
subLAP	Sub Load Aggregation Point
TAC	Technical Advisory Committee
Total Charge Management	Where electric vehicle charging is managed across multiple charging events to maximize vehicle load flexibility
TSS	Transactive Signal Server
VEE	validating, editing, and estimating
XML	Extensible Markup Language

[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.

EXHIBIT A
Scope of Work

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

A. Purpose of Agreement

The purpose of this Agreement is to fund research exploring the benefits and opportunities of Total Charge Management, where electric vehicle charging is managed across multiple charging events to maximize vehicle load flexibility. The project will test how flexible electric vehicle load can be if managed across a driver's daily or weekly charge events. This flexibility will utilize several pricing mechanisms to estimate the benefits of the Total Charge Management approach.

B. Problem/ Solution Statement

Problem

Smart charging has typically been viewed as a means of managing charging within a particular charging or parking event, usually at work during the day or at home during the night. This approach loses effectiveness as energy costs become less predictable due to increases in renewables and the inclusion of granular distribution/energy price signals. The future electricity grid will face new balancing needs that change dynamically throughout the day and night as utilities and grid operators attempt to align renewable generation with customer load. As the grid becomes more dynamic, optimizing vehicle charging will require moving charging from night to day, from hour to hour, or from one grid location to another. As California faces steadily an increasing numbers of electric vehicles with larger batteries, and utilities continue to add more renewables, it is now time for the state to begin exploring advanced means for managing vehicle charging.

Solution

Total Charge Management can increase the flexibility of vehicle charging to meet the dynamic needs of the grid. The development of advanced vehicle telematics present a new opportunity for utilities and grid operators to align vehicle battery status, driver mobility needs and grid conditions. Collaboration between the grid and the driver can yield a charging load profile that minimizes energy costs by aligning daily and weekly charging events to best meet grid needs. While the mobility of a vehicle is typically viewed as a constraint in its role as a grid resource, under a holistic charge management approach, mobility enhances grid functionality by supporting the grid when and where it is needed most.

C. Goals and Objectives of the Agreement

Agreement Goals

The goals of this Agreement are to:

- Improve utility grid stability
- Reduce utility cost of grid services
- Integrate renewables into the grid
- Decrease carbon emissions from vehicle charging

Ratepayer Benefits:[2] This Agreement will result in the ratepayer benefits of greater electricity reliability and lower costs by significantly increasing the functionality of electric vehicle charging as a controllable grid resource.

Electricity Reliability: Total Charge Management represents an opportunity to significantly increase the functionality of vehicle charging to meet grid reliability. New tools will be needed to incentivize drivers to modify their charging behavior to the dynamic needs of the electric utility 'duck curve'. California Independent System Operator (CAISO) predicts that the growth in renewables will create new dynamics in the daily load curve. They anticipate the need to add load during the solar peak in the afternoon, use responsive load to follow nighttime wind power, and reduce load during the new peak load hours in the evening (5-9pm). Doing so will give the utilities and CAISO a new tool to help integrate intermittent renewables. The load shape that results from Total Charge Management can be designed to not only support renewables, but also optimized to address congestion on the local distribution system.

Lower costs: The functionality enabled by Total Charge Management allows vehicles to serve as a cost effective alternative to other grid management resources. Controlled charging is likely much cheaper than stationary storage. Vehicle charging will require no capital investment on the part of ratepayers and, under Total Charge Management, can provide similar advanced functionality as stationary storage. The fact that vehicles move around on the grid is an additional attribute that allows utilities far greater flexibility than any non-mobile resource. As the knowledge gained from this project enters the market, there are likely to be cost savings associated with charge optimization that result in lower costs to end users, increasing the penetration of electric vehicles and furthering the state's environmental goals.

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 helping the state understand the possible flexibility of electric vehicle charging as a grid resource and the potential ratepayer benefits that can be realized from doing so. The project will help develop new metering/telemetry options for vehicle resources that will enhance the ability of vehicles to provide grid services through vehicle usage. Optimal charging load patterns will be identified that can capture grid benefits using a variety of grid price signals. The state can evaluate the effectiveness of different types of incentives in engaging drivers to provide grid services. The project will pioneer an understanding of not only the temporal benefits of controlled charging, but also the possible benefits that can be derived from being able to influence the location of charging by utilizing the fact that vehicles move throughout the grid during their daily and weekly driving routines.

Agreement Objectives

The objectives of this Agreement are to:

- Measure the total megawatt of flexibility that can be enabled from Total Charge Management.

[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.

- Define the limitations to Total Charge Management as a factor of the total time of day and total load (kilowatt) that can be moved without interfering with a customer's mobility needs.
- Measure the cost savings to the utility from utilizing Total Charge Management to incorporate renewables into the grid.
- Measure the cost savings to the utility from utilizing Total Charge Management to minimize Locational Marginal Price (LMP) cost.
- Analyze the potential ways that Total Charge Management can be incorporated into utility programs, such as demand response, or investments, such as plug-in electric vehicle charging stations.

All tasks under this Agreement shall be performed in accordance with the Information Practices Act of 1977 as detailed in the terms and conditions.

III. TASK 1 GENERAL PROJECT TASKS

PRODUCTS

Subtask 1.1 Products

The goal of this subtask is to establish the requirements for submitting project products (e.g., reports, summaries, plans, and presentation materials). Unless otherwise specified by the Commission Agreement Manager (CAM), the Recipient must deliver products as required below by the dates listed in the **Project Schedule (Part V).** Products that require a draft version are indicated by marking **"(draft and final)"** after the product name in the "Products" section of the task/subtask. If "(draft and final)" does not appear after the product name, only a final version of the product is required. With respect to due dates within this Scope of Work, **"days"** means working days.

The Recipient shall:

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

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

For products that require a final version only

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

For all products

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

Instructions for Submitting Electronic Files and Developing Software:

- **Electronic File Format**

  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.
  - 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 asppects 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 <u>administrative portion</u> of the meeting will include discussion of the following:

  - Terms and conditions of the Agreement;
  - 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 <u>technical portion</u> 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 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.

  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 progress made on all Agreement activities as specified in the scope of work for the preceding month, including accomplishments, problems, milestones, products, schedule, fiscal status, and an assessment of the ability to complete the Agreement within the current budget and any anticipated cost overruns. See the Progress Report Format Attachment for the recommended specifications.
- Submit a monthly or quarterly *Invoice* that follows the instructions in the “Payment of Funds” section of the terms and conditions, including a financial report on Match Fund and in-state expenditures.

Products:

- Progress Reports
- Invoices

Subtask 1.6 Final Report

The goal of this subtask is to prepare a comprehensive Final Report that describes the original purpose, approach, results, and conclusions of the work performed under this Agreement. The CAM will review 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 the 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. *(See Task 1.1 for requirements for draft and final products.)*

Recipient Products:

- Final Report Outline (draft and final)

CAM Product:

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

Subtask 1.6.2 Final Report

The Recipient shall:

- Prepare a *Final Report* for this Agreement in accordance with the approved Final Report Outline, Style Manual, and Final Report Template provided by the CAM with the following considerations:
    - Ensure that the report includes the following items, in the following order:
        - Cover page
        - Credits page on the reverse side of cover with legal disclaimer
        - Acknowledgements page (optional)
        - Preface
        - Abstract, keywords, and citation page
        - Table of Contents (followed by List of Figures and List of Tables, if needed)
        - Executive summary
        - Body of the report
        - References (if applicable)
        - Glossary/Acronyms (If more than 10 acronyms or abbreviations are used, it is required.)
        - Bibliography (if applicable)
        - Appendices (if applicable) (Create a separate volume if very large.)
        - Attachments (if applicable)
    - Ensure that the document is written in the third person.
    - Ensure that the Executive Summary is understandable to the lay public.
        - Briefly summarize the completed work. Succinctly describe the project results and whether or not the project goals were accomplished.

        - Identify which specific ratepayers can benefit from the project results and how they can achieve the benefits.
        - If it's necessary to use a technical term in the Executive Summary, provide a brief definition or explanation when the technical term is first used.
    - Follow the Style Guide format requirements for headings, figures/tables, citations, and acronyms/abbreviations.
    - Ensure that the document omits subjective comments and opinions. However, recommendations in the conclusion of the report are allowed.
    - Include a brief description of the project results in the Abstract.
- Submit a draft of the report to the CAM for review and comment. The CAM will provide written comments to the Recipient on the draft product within 15 days of receipt
- Consider incorporating all CAM comments into the Final Report. If the Recipient disagrees with any comment, provide a written response explaining why the comment was not incorporated into the final product
- Submit the revised Final Report and responses to comments within 10 days of notice by the CAM, unless the CAM specifies a longer time period or approves a request for additional time.
- Submit one bound copy of the *Final Report* to the CAM along with *Written Responses to Comments on the Draft Final Report*.

Products:

- Final Report (draft and final)
- Written Responses to Comments on the Draft Final Report

CAM Product:

- Written Comments on the Draft Final Report

MATCH FUNDS, PERMITS, AND SUBCONTRACTS

Subtask 1.7 Match Funds

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

While the costs to obtain and document match funds are not reimbursable under this Agreement, the Recipient may spend match funds for this task. The Recipient may only spend match funds during the Agreement term, either concurrently or prior to the use of 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.
- 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.

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;
- 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

IV. TECHNICAL TASKS

*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. **Subtask 1.1 (Products)** describes the procedure for submitting products to the CAM.*

TASK 2 ENROLL GRID RESOURCES AND ESTABLISH DATA COLLECTION PROTOCOLS

The goals of this task are to enroll driver participants in the program and establish how data will be collected. At the end of this task, 250-500 drivers will be enrolled as a real- or pseudo-grid resource that can provide data needed to understand the value and use of Total Charge Management.

The Recipient shall:

- Prepare a *Customer Participation Report* that will include, but not be limited to, the following:
    - Enrollment of 250-500 drivers in the program.
    - Identifies aggregate or redacted relevant customer participant information in accordance with the Information Practices Act of 1977 and Agreement terms and conditions.
    - Work with team members to finalize the overall consumer-facing program design, including:
        - Marketing materials
        - Specific requirements to be met for wholesale market participation
        - Develop customer incentives, which may include cash payments, cash performance incentives, non-cash rewards or other type of customer incentives that mimic potential market incentives
        - Performance metering requirements and measurement methods
        - Customer agreements
        - Other enrollment requirements (e.g., multiple-participation issues, if any).
    - Communicate to current and/or potential plug-in hybrid electric vehicle or battery electric vehicle customers regarding the requirements and incentives.
    - Process customer inquiries and participation applications.
    - Formally enroll customers in the program.
    - Documentation of all participants that have been enrolled and include a checklist for each of the preparation requirements.
- Prepare a *Telematics Data Collection Protocol* that will:
    - Define data collection requirements and delivery protocols for vehicle charging performance data.
    - Describe what telematics data will be collected from the vehicle for use as grid performance data.
    - Identify 2-3 different options for using the vehicle telematics to collect grid performance data that can serve as a proxy for meter data.

  - Identify the requirements for access to this data, including the need to install additional data collection devices on the vehicle and make software changes to the vehicle.
  - Determine which telematics data collection options will be used.
  - Develop any software or communication functionality necessary to support the use of the selected telematics data collection options.
  - Determine validating, editing, and estimating (VEE) requirements for mobile metering to inform the data collection requirements.
- Prepare a *Vehicle Telematics Report* that includes, but not limited to:
  - Update on the development of software to capture telemetry data and present for utility/grid in usable format suitable for comparisons.
  - Set up one test vehicle to test the telematics load data stream.
  - Report test results from test vehicle demonstrating effectiveness of data capture from vehicle telematics.
- Prepare a *Telematics Data Comparison Plan* that will include, but not be limited to, the following:
  - Specify how the telematics data will be evaluated for accuracy through comparisons and other field tests.
  - Specify how telematics performance data will be compared to stationary meter data, both at home and away from home.
  - Determine how telematics performance can be collected and processed into useable grid performance data through coordination between partners.
  - Prepare software backend to collect vehicle and home load information.
  - Provide VEE and compare meter data of various formats, intervals, and techniques.
  - Research and verify data collection pathway.
- Prepare a *Software Backend Report* that includes the following, but not limited to:
  - Vehicle and home load information collection.
  - Ensure that the software on each vehicle can support the data collection and communication requirements identified in this task.
  - Evaluate data needed to understand a customer's tariff, home load shape and presence of solar or battery storage.
- Prepare *Customer Enrollment Lessons Learned Report* that will document the Recipient's experience on the customer enrollment process and lessons learned.
- Prepare *Customer Home Load Report* that will include, but not limited to, the following:
  - Customer home load analysis and future vehicle load management opportunities.
  - Summarize customer's home load shape and the presence of solar and/or battery storage to determine how these resources impact the optimization of charging behavior.

Products:

- Customer Participation Report
- Telematics Data Collection Protocol
- Vehicle Telematics Report
- Telematics Data Comparison Plan
- Software Backend Report
- Customer Enrollment Lessons Learned Report
- Customer Home Load Report

TASK 3 EVALUATE THE EFFECTIVENESS OF VEHICLE TELEMATICS AS A PERFORMANCE DATA SOURCE

The goal of this task is to evaluate the accuracy and effectiveness of using vehicle telematics data as an alternative to meter data to measure grid performance for grid services.

The Recipient shall:

- Prepare a *Size and Categorization Resource Report #1* that documents, but is not limited to, the following,:
  - o Establishment of the aggregated vehicle pool as a real- or pseudo-grid resource while it is charging at home.
  - o Establish the vehicle pool as a formal grid resource through a utility or wholesale market product. If the pool is not concentrated enough to meet the minimum thresholds as a grid resource, the vehicle pool will serve as a simulated resource that responds to grid signals though it is not formally registered as a resource.
  - o The size and categorization of the vehicle pool resource
- Prepare a *Functional Report* that evaluates the issues and opportunities around certainty of mobile location (i.e., matching vehicle location with certainty of physical connection to Electric Vehicle Supply Equipment / home premises) and the expected capabilities from ‘away-from-home’ charging control.
- Collect data and prepare *Vehicle Telemetry Report* that analyzes and discusses the first six months of vehicle telemetry data to compare to home meter data.
- Prepare *Size and Categorization Resource Report #2* that documents the following, but not limited to:
  - o The size and categorization of the vehicle pool resource.
  - o Changes to the support load curtailment away from home.
  - o Vehicle resources as a demand response (DR) and resource adequacy resource at home and away from home, as a real grid resource or as a simulated resource.
- Prepare *Customer Communications Tools Documentation* #1 that documents refinements to customer communication tools based on project test experiences

- Prepare *Report Summary* that includes, but shall not be limited to, the following:
  - Analysis of second six-months of vehicle telematics data to compare to available meter sources.
  - Conclusions of telematics data analysis after 12 months of data.
- Participate in the CPR meeting and prepare a *CPR Report* in accordance with subtask 1.3 (CPR Meetings).

Products:

- Size and Categorization Resource Report #1
- Functional Report
- Vehicle Telemetry Report
- Size and Categorization Resource Report #2
- Customer Communications Tools Documentation #1
- Report Summary
- CPR Report

TASK 4 TEST OPTIMIZATION OF DR AND OVER-GENERATION ACROSS DAYTIME AND NIGHTTIME CHARGING EVENTS

The goal of this task is to evaluate the customer engagement, technical communication functionality, and utility benefits from aligning vehicle charging with renewable generation at the subLAP level to address over generation across daytime and night-time charging events.

The Recipient shall:

- Prepare a *Vehicle-Renewable Integration Analysis Report* that will document the following, but not limited to:
  - Opportunities to align vehicle charging with renewable generation.
  - Test coordination results, identify opportunities to align load shape for renewable absorption and other grid benefits from starting/stopping charging at home and away.
- Prepare an *Away-From-Home Communication Test Results Report* that will test away-from-home communication signals with 5-10 vehicles to test the communication functionality of over-generation.
- Prepare a *Program Design Document* that will include, but not be limited to:
  - Description of the customer incentives and communication used to engage customers in Total Charge Management.
  - Communicate to customers incentives to follow 'away from home' charging requirements.
- Prepare a *Vehicle Grid Resource Report* that discusses the aggregated vehicle pool as a real- or pseudo-grid resource incorporating new opportunities uncovered based on the conclusions of Task 3, including the potential for:
  - Increased utilization of resource.

- Utilizing day-time charging away from home premises (i.e., providing both daytime and nighttime dispatch).
- Providing DR and over-generation capabilities for the utility, wholesale reserve resource for CAISO.

- Prepare a *Customer Communications Tools Documentation* #2 that identifies “best practices” for customer communication based on project test experiences resulting from this task.

Product:

- Vehicle-Renewable Integration Analysis Report
- Away-From-Home Communication Test Results Report
- Program Design Document
- Vehicle Grid Resource Report
- Customer Communications Tools Documentation #2

TASK 5 TEST AND ANALYZE LOCAL MARGINAL PRICE OPTIMIZATION

The goal of this task is to estimate the potential value of optimizing charging against LMPs.

The Recipient shall:

- Submit *Documentation of Investor-Owned Utility (IOU) Commitment* (such as Letters of Commitment) from each participating IOU prior to participant enrollment under Task 2.
- Prepare *Quarterly Management Update Reports* that will include, but not be limited to, the following:
    - Coordination with the CAISO and a California Investor-Owned Utility (IOU) to identify all change management plans for LMP nodes in a California IOU territory during the program timeline, and incorporate those changes into the Application Programming Interface (API) when implemented as identified below and incorporate into the quarterly change management report update.
    - Definitions of geospatial polygons that reflect areas served though substations assigned to individual LMP price nodes for all LMP nodes.
- Design and build an Extensible Markup Language-based (XML-based) *LMP Application Programming Interface (API)* that returns a specific LMP node for any physical location within the project area.
    - Upon receipt of a latitude and longitude pair, API produces an XML return identifying the LMP node, if any, for the physical location in the project area identified by the latitude and longitude pair
- Prepare a *Backend Test Results Report* that includes, but shall not be limited to, the following:
    - Test backend software's ability to identify the LMP node of vehicle in real time and forecast locations (e.g. at a known or probable destination) using vehicles in the field.

- Prepare a *LMP Node Locations and Associated Service Area Polygons Update #1* for all changes identified as a result of the coordination with the CAISO and a California IOU for changes to LMP nodes implemented in the CAISO wholesale market in quarterly change management update report.
- Prepare a *LMP Node Locations and Associated Service Area Polygons Update #2* for all changes identified as a result of the coordination with the CAISO and a California IOU for changes to LMP nodes implemented in the CAISO wholesale market in quarterly change management update report.
- Prepare a *Charging Behavior Optimization Report* that includes, but shall not be limited to, the following:
    - Identify specific opportunities and methods to optimize LMPs based on vehicle location data, charging profile data, LMPs, and other observed charge patterns.
    - Simulate charge optimization across actual LMPs using a subset of the vehicle pool.
- Run a demonstration of signal receipt for the Energy Commission and prepare a *Dispatch Demonstration Report* that provides, at a minimum, a discussion of the following:
    - Work with the Group 3 recipient from GFO-15-311 to:
        - Understand all the interfaces to and from the Transactive Signal Server (TSS) developed by the Group 3 recipient
        - Document end-to-end use cases and sequence diagrams for interactions with the TSS
    - Develop mechanisms to receive the transactive signal made available by the TSS.
    - Test the communication mechanisms with the TSS in real time in a staging environment.
        - Move to production and repeat test

Product:

- Documentation of Investor-Owned Utility (IOU) Commitment
- Quarterly Management Update Reports
- LMP Application Programming Interface (API)
- Backend Test Results Report
- LMP Nodes Locations and Associated Service Area Polygons Update #1
- LMP Nodes Locations and Associated Service Area Polygons Update #2
- Charging Behavior Optimization Report
- Dispatch Demonstration Report

TASK 6 EVALUATION OF PROJECT BENEFITS

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.
    - 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.
    - <u>For Information/Tools and Other Research Studies:</u>
        - 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

TASK 7 TECHNOLOGY/KNOWLEDGE TRANSFER ACTIVITIES

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(s) on the project.
- When directed by the CAM, participate in annual EPIC symposium(s) sponsored by the California Energy Commission.
- Provide at least (6) six *High Quality Digital Photographs* (minimum resolution of 1300x500 pixels in landscape ratio) of pre and post technology installation at the project sites or related project photographs.
- 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)
- High Quality Digital Photographs
- Technology/Knowledge Transfer Plan (draft and final)
- Technology/Knowledge Transfer Report (draft and final)

V. PROJECT SCHEDULE

Please see the attached Excel spreadsheet.

RESOLUTION NO: 16-0517-17c

STATE OF CALIFORNIA

STATE ENERGY RESOURCES
CONSERVATION AND DEVELOPMENT COMMISSION

RESOLUTION - RE: BMW OF NORTH AMERICA, LLC

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

RESOLVED, that the Energy Commission approves Agreement EPC-15-084 from GFO-15-311 with BMW of North America, LLC for a $3,999,900 grant to utilize real-time vehicle information, predictive travel behavior, grid location data, and energy market price data to manage a vehicle's charging; 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 May 17, 2016.

AYE: [List of Commissioners]
NAY: [List of Commissioners]
ABSENT: [List of Commissioners]
ABSTAIN: [List of Commissioners]

Cody Goldthrite,
Secretariat