

GRANT REQUEST FORM (GRF)

CEC-270 (Revised 10/2015)

CALIFORNIA ENERGY COMMISSION

New Agreement EPC-15-048 (To be completed by CGL Office)

Division	Agreement Manager:	MS-	Phone
ERDD	Dustin Davis	51	916-327-2223

Recipient's Legal Name	Federal ID Number
Alternative Energy Systems Consulting, Inc.	33-0596185

Title of Project
Residential Intelligent Energy Management Solution: Advanced Intelligence to Enable Integration of Distributed

Term and Amount	Start Date	End Date	Amount
	5/30/2016	3/31/2020	\$ 3,996,560

Business Meeting Information
 ARFVTP agreements under \$75K delegated to Executive Director.

Proposed Business Meeting Date	5/17/2016	<input type="checkbox"/> Consent	<input checked="" type="checkbox"/> Discussion
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Business Meeting Presenter	David Hungerford	Time Needed:	5 minutes
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Please select one list serve. Select

Agenda Item Subject and Description

ALTERNATIVE ENERGY SYSTEMS CONSULTING, INC. Proposed resolution approving agreement EPC-15-048 with Alternative Energy Systems Consulting, Inc. for a \$3,996,560 grant to test and validate an intelligent software solution that continuously learns, adapts, and manages residential energy usage to provide a scalable solution that maximizes value to the utilities, solar providers, and end-users.

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, § 15301 -- Cal. Code Regs., tit 14, § 15306

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

Explain reason why Agreement is exempt under the above section:

Exemption 15306 applies to this project since the work involves basic data collection, research, experimental management, and resource evaluation activities that do not result in major disturbances to an environmental resource. This project will collect energy usage data for the purpose of reducing residential peak demand energy usage. This data will be collected from 100 residential homes via a wireless gateway, which is similar in size and functionality to a typical wireless internet router. The wireless gateway will house software and will be used to transmit data on home energy usage. This work will not result in any significant environmental impact and is therefore exempt under section 15306.

Exemption 15301 applies to this project since work involves minor alterations of existing public or private structures, facilities, mechanical equipment, or topographical features, and which involve negligible or no expansion of use beyond that existing. This project will install monitoring devices and replace small equipment in approximately 100 existing residential homes. Work to be done in homes as part of this project includes: installation of electricity storage battery which will attach to the residence's wall and be wired into existing electrical main or sub-panels, approximately 26" x 51" x 14"; upgrade existing EV charger, if any, with a smart charger utilizing existing wires and electrical panels, approximately the size of a parking meter; replacement of existing thermostats with smart thermostats, approximately the size of a cellphone; replacement of existing pool pump controllers with smart pool pump controllers, approximately 8" x 5" x 3"; and replacement of existing PV inverters with smart inverters, approximately 4" x 3" x 1". In addition, these devices will be tested in an existing laboratory prior to installation. For these reasons, the project will not have a significant environmental impact and is exempt under section 15301.

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

Check all that apply

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<input type="checkbox"/> Initial Study <input type="checkbox"/> Negative Declaration <input type="checkbox"/> Mitigated Negative Declaration	<input type="checkbox"/> Environmental Impact Report <input type="checkbox"/> Statement of Overriding Considerations
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List all subcontractors (major and minor) and equipment vendors: (attach additional sheets as necessary)	
Legal Company Name:	Budget
Qualcomm Intelligent Solutions, Inc.	\$ 1,696,000
Black & Veatch	\$ 751,989
Center for Sustainable Energy	\$ 453,608
KnGrid	\$ 494,974
	\$
	\$
	\$
	\$
	\$

EXHIBIT A Scope of Work

I. TASK ACRONYM/TERM LISTS

A. Task List

Task #	CPR ¹	Task Name
1		General Project Tasks
2		System Integration and Testing
3		Rate Analysis and Modeling
4	X	Sample Design and Recruitment
5		Residential Participant Retrofits
6		Installation of Qualcomm's Intelligent Energy Management Solution (iEMS) Hub
7		Integration of Distributed Energy Resources and Demand Clearing House
8		Operations and Maintenance
9		Data Collection and Analysis
10		Assessment of Tariffs
11		Evaluation of Project Benefits
12		Technology/Knowledge Transfer Activities
13		Production Readiness Plan <i>(delete if inapplicable)</i>

B. Acronym/Term List

Acronym/Term	Meaning
CAM	Commission Agreement Manager
CAO	Commission Agreement Officer
CAISO	California Independent System Operator
CPR	Critical Project Review
CPUC	California Public Utilities Commission
DCH	Demand Clearing House
DER	Distributed Energy Resource
Energy Commission	California Energy Commission
HAN	Home Area Network
iEMS	Qualcomm's Intelligent Energy Management Solution
ISO/IEC 15118	International Organization for Standardization/International Electrotechnical Commission 15118 Road vehicles -- Vehicle to grid communication interface
Recipient	Alternative Energy Systems Consulting, Inc.
SDG&E	San Diego Gas and Electric
TAC	Technical Advisory Committee
TSS	Transactive Signal Server

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

A. Purpose of Agreement

The purpose of this Agreement is to test and validate an intelligent software solution that continuously learns, adapts and manages residential energy usage to provide a scalable solution that maximizes value to the utilities, solar providers, and end-users.

B. Problem/ Solution Statement

Problem

The vision of a smart grid is well established; with a smart grid, central and distributed energy resources (DERs) dynamically interact with smart homes, and smart loads respond to price signals to effectively balance energy supply and demand. The technology in this vision of the future is here today, but the potential to optimize the smart grid and smart homes in concert has yet to be realized due to the lack of an enabling technology.

Solution

Qualcomm's Intelligent Energy Management Solution (iEMS) provides distributed intelligence and dynamic, transactive control of loads. It interacts with the smart grid through bi-directional communication, a closed loop of load forecasts, price signals, and price response.

This project leverages the iEMS machine learning/predictive algorithm software and off the shelf hardware previously developed by Qualcomm. The project proposes using iEMS to automate 100 homes to provide the scale and results needed to validate the mass effectiveness of offering a smart energy solution and the benefits of time-of-use and dynamic pricing. The iEMS enables an electric utility to integrate more renewable energy into their system and nominalizes the electricity usage without the discrepancy known as the "duck" curve. For consumers, the iEMS automates energy management and cost optimization to take advantage of the consumer's tariff without changing his or her lifestyle.

C. Goals and Objectives of the Agreement

Agreement Goals

The goal of this Agreement is to advance the knowledge and practice of coordinated interoperability, reducing to practice what can be achieved when a full suite of intelligent loads and DERs are placed under intelligent synchronized controls in a real world environment operated by real consumers, market actors, and utilities.

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Ratepayer Benefits:² This Agreement will result in the ratepayer benefits of:

- Greater electricity reliability

This project enables distributed electricity storage and usage across 100 homes, with the ultimate goal of facilitating technology that will distribute capacity across millions of homes.

- Greater dispersal of capacity

The project will demonstrate the ability of the product, under mass adoption, to prevent a single point of failure (such as within a large battery storage farm) from creating widespread outages. This technology thus offers substantially greater grid reliability. As a byproduct of balanced electricity consumption and integration of more renewable energy into the grid, greenhouse gas emissions are expected to be reduced.

- Lower costs

iEMS will optimize electricity cost and demand requirements based on time-of-use or dynamic electricity rates, thus yielding maximum cost savings for residents. iEMS applies a novel machine-learning and predictive algorithm to project consumption, generation and comfort level.

- Increased safety

With iEMS, the “duck curve” can be flattened. This reduces utilities’ reliance on large numbers of fossil fuel and nuclear plants ramping up in the evening hours, which minimizes the potential for catastrophic plant failure.

Technological Advancement and Breakthroughs:³ This Agreement will lead to technological advancement and breakthroughs to achieve the State of California’s statutory energy goals - by leveraging advanced machine learning to the task of balancing energy loads and assets across the supply and demand sides, taking into account a multiplex of variables while meeting all use/user requirements. The iEMS algorithms will lower energy costs to the consumer while maintaining high reliability and low production costs to the grid. This will be accomplished based on user comfort requirement initially configured by the consumer. The responsive load and feedback mechanism provided by the iEMS will allow for energy and demand optimization in a price-driven retail energy market.

Agreement Objectives

The objectives of this Agreement are to:

- Integrate and test the iEMS system in 100 homes in various climate zones within the San Diego Gas and Electric (SDG&E) service territory. The homes will be equipped with the appropriate mix of distributed energy resources, loads, and controls to study and

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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document response price signals, various controls strategies, user behavior, and system performance.

- Showcase the benefits of the system to various stakeholders including consumers, solutions providers, utilities, and regulators to help the iEMS gain market acceptance.

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

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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 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.

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The administrative portion 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 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 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.

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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 (**required**)
 - Credits page on the reverse side of cover with legal disclaimer (**required**)
 - Acknowledgements page (optional)
 - Preface (**required**)
 - Abstract, keywords, and citation page (**required**)
 - Table of Contents (**required**, followed by List of Figures and List of Tables, if needed)
 - Executive summary (**required**)
 - Body of the report (**required**)
 - References (if applicable)
 - Glossary/Acronyms (If more than 10 acronyms or abbreviations are used, it is required.)

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- 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.
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- 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

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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:

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- 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*)

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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.

EXHIBIT A

Scope of Work

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: SYSTEM INTEGRATION AND TESTING

The goal of this task is to establish the Recipient's existing WiFi AP (Access Point) with the iEMS hub. The iEMS hub will be implemented as a part of the home area network (HAN) that communicates/controls with other devices. This task covers the development work required for iEMS hub to communicate with the HAN and various devices it needs to control. Based on the log information iEMS collects, it will yield energy usage and cost data.

The Recipient shall:

- Prepare an *Integration Test Plan* that covers but is not limited to the home survey, installation and verification of the following equipment and interconnections:
 - Monitoring device for solar generation

EXHIBIT A

Scope of Work

- Smart thermostat (e.g., Google Nest, Ecobee)
- Battery energy storage controller
- Level II electric vehicle charger
- Pool pump controller
- User applications (smart device)
- iEMS
- Develop an *Integration Readiness Checklist* that covers but is not limited to the following system function verifications:
 - iEMS
 - DER communications
 - Network communications
 - Data generation

Products:

- Integration Test Plan (draft and final)
- Integration Readiness Checklist

TASK 3: RATE ANALYSIS AND MODELING

The goal of this task is to analyze and determine the pilot residential rate structures that maximize customer and system value. Recipient will identify an appropriate rate structure for each particular pilot participant based on their specific situation. Data from the testing period (Task 2) will be used to model other California Public Utilities Commission (CPUC)-approved retail and California Independent System Operator (CAISO) wholesale tariff structures.

The Recipient shall:

- Prepare a *Tariff Analysis Assessment* whitepaper that includes but is not limited to the following issues:
 - Analysis and assessment of CPUC approved and CAISO tariff structures for use in pilot scenario
 - Identification of rate structures that produce higher value (which considers but is not limited to economic factors such as producers' and consumers' return on investment and maximizing customer and system value).

Products:

- Tariff Analysis Assessment (draft and final)

TASK 4: SAMPLE DESIGN AND RECRUITMENT

The goal of this task is to develop a mixed sample that represents wide segments of the residential population. The sample of 100 homes in SDG&E territory will be designed in order to develop initial performance estimates.

The Recipient shall:

- Develop a *Sampling Plan* based on appropriate statistical techniques that includes but is not limited to the following:
 - Determination of important study participant characteristics

EXHIBIT A

Scope of Work

- Development of a sound sampling strategy
- Identification of a target program participant pool
- Recruit program participants and develop a *List of Participants*
- Develop *Use Cases* that maximizes daily operating value to the participant
- Develop a *List of Success Parameters* and obtain Energy Commission approval
- Prepare a *CPR Report* and participate in a CPR Meeting as described in Subtask 1.3.

Products:

- Sampling Plan
- List of Participants
- Use Cases
- List of Success Parameters (draft and final)
- CPR Report

TASK 5: RESIDENTIAL PARTICIPANT RETROFITS

The goal of this task is to engage the 100 participants and retrofit the residences with the necessary equipment according to the Integration Test Plan developed in Task 2. The Recipient will determine if additional equipment, such as battery energy storage, should be installed to fully exercise the capabilities of the research effort.

The Recipient shall:

- Conduct site survey to determine and verify existing equipment
- Install necessary equipment and retrofit residences as needed to accommodate iEMS (necessary equipment includes items identified in Task 2 Integration Test Plan)
- Prepare *Deployment Report* that includes but is not limited to the following items:
 - Construction management overview
 - Participant surveys
 - Equipment installation
 - Control installation
 - Barriers encountered and solutions provided

Products:

- Deployment Report (draft and final)

TASK 6: INSTALLATION OF QUALCOMM'S INTELLIGENT ENERGY MANAGEMENT SOLUTION (IEMS) HUB

The goal of this task is to install the iEMS hub and associated software. The Recipient will initiate system operation and interconnect with the other devices in the residence. All systems will be integrated, tested, configured, calibrated, and commissioned.

The Recipient shall:

- Install the iEMS hub and related software
- Initiate system operation

EXHIBIT A

Scope of Work

- Interconnect as needed with other devices in residences
- Integrate systems
- Test systems
- Configure systems
- Calibrate systems
- Commission systems
- Prepare a *Commissioning Report* that includes but is not limited to the following:
 - Internet connectivity and signal strength
 - iEMS software systems installation, functional test, and commissioning
 - System calibrations

Products:

- Commissioning Report

TASK 7: INTEGRATION OF DISTRIBUTED ENERGY RESOURCES AND DEMAND CLEARING HOUSE

The goal of this task is to develop plug-in electric vehicle DERs and integrate the ISO/IEC 15118 intelligent vehicle charging station technology with the iEMS systems. The Recipient will also develop and implement a Demand Clearing House (DCH) to provide pricing and demand response signals to the iEMS hub.

The Recipient shall:

- Install and commission the following items:
 - Electric Vehicle Level II charger, if indicated
 - Electric Vehicle Service Provider
 - DCH
- Prepare *Integration Report* that includes but is not limited to a discussion of integration, installation and commissioning of the following systems:
 - Electric Vehicle Level II charger, if indicated
 - Electric Vehicle Service Provider
 - DCH
- Work with the Group 3 recipient to:
 - Understand all the interfaces to and from the Transactive Signal Server (TSS) developed by the Group 3 awardee
 - 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
- Process/incorporate the transactive signal
- Test the communication mechanisms with the TSS in real time in a staging environment
 - Move to production and repeat test
- Run and provide a demonstration of signal receipt for the CAM
- Prepare a *Dispatch Demonstration Report* which discusses the work with Group 3 recipient and the results and test of the transactive signal

EXHIBIT A

Scope of Work

Products:

- Integration Report (draft and final)
- Dispatch Demonstration Report

TASK 8: OPERATIONS AND MAINTENANCE

The goal of this task is to provide necessary engineering and software support to ensure proper operation and iEMS system maintenance. This will include any modifications as a result of feedback from participant residences during on-going analysis.

The Recipient shall:

- Monitor the performance of the systems installed in Task 6, on an ongoing basis
- Develop a *Operations Procedures Guide* that details but is not limited to the following activities:
 - On-site equipment and system programming support
 - Telephone and emergency contact support
- Develop and maintain a *Maintenance Log* that records but is not limited to the following activities:
 - System operations on an on-going basis
 - System upgrades and updates
 - System repairs

Products:

- Operations Procedures Guide
- Maintenance Log

TASK 9: DATA COLLECTION AND ANALYSIS

The goal of this task is to collect data captured over 12 months during the research project and analyze the results of the project. All installation issues, operational constraints and performance will be fully documented and recorded.

The Recipient shall:

- Develop and prepare an *Operation Summary Report* that includes but is not limited to the following technical and economic data (for a period of 12 months following commissioning):
 - Installation issues
 - Operational constraints
 - Operational performance (energy, demand response, storage, and controllable loads)
- Design and administer *Participant Survey* detailing that includes but is not limited to:
 - Customer perceived issues
 - Customer values
 - Customer benefits

EXHIBIT A Scope of Work

Products:

- Operation Summary Report
- Participant Surveys

TASK 10: ASSESSMENT OF TARIFFS

The goal of this task is to provide an assessment of existing retail tariff options and identify other potential high-value structures. The assessment will include (i) economic benefits to residents (ii) renewable energy usage and (iii) “grid-friendliness” of residents with the installed solution including load factor.

The Recipient shall:

- Coordinate with utilities and regulatory entities to investigate innovative techniques to influence demand impact.
- Analyze and assess:
 - Existing CPUC approved retail and CAISO wholesale tariff structures using real and modeled assessments
 - Alternate innovative tariff structures that could provide higher value and economic benefit to residents
 - Residents’ renewable energy usage
 - Grid compatibility of residents with the iEMS installed, including load factor
 - Identify other potential high-value structures
- Develop a *Tariff Assessment Report* that includes but is not limited to a description of work performed in and results of analysis and assessment described in bullet above.

Products:

- Tariff Assessment Report (draft and final)

TASK 11: 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.

EXHIBIT A

Scope of Work

- 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 as 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.
- 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.

EXHIBIT A

Scope of Work

Products:

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

TASK 12: 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 on the results of the project.
- Provide at least six *High Quality Digital Photographs* (minimum resolution of 1300x500 pixels in landscape ratio) of pre and post technology installation at the project sites.
- 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)

EXHIBIT A

Scope of Work

TASK 13: 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:
 - 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: ALTERNATIVE ENERGY SYSTEMS CONSULTING, INC.

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-15-048 from GFO-15-311 with Alternative Energy Systems Consulting, Inc. for a \$3,996,560 grant to test and validate an intelligent software solution that continuously learns, adapts, and manages residential energy usage to provide a scalable solution that maximizes value to the utilities, solar providers, and end-users; 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