New Agreement EPC-14-077 (To be completed by CGL Office)

Division	Agreement Manager:	MS-	Phone
ERDD	Reynaldo Gonzalez	43	916-327-1334

Recipient's Legal Name	Federal ID Number
Center for Sustainable Energy	33-0936366

Title of Project
Enable Standardized Vehicle-Grid Integration through Development of Universal Standard

Term and Amount	Start Date	End Date	Amount
	6/30/2015	6/30/2018	$ 1,499,999

Business Meeting Information			
☐ ARFVTP agreements under $75K delegated to Executive Director.			
Proposed Business Meeting Date	5/27/2015	☐ Consent	☒ Discussion
Business Meeting Presenter	Reynaldo Gonzalez	Time Needed:	5 minutes
Please select one list serve. Select			

Agenda Item Subject and Description

CENTER FOR SUSTAINABLE ENERGY. Proposed resolution approving agreement EPC-14-077 with Center for Sustainable Energy for a $1,499,999 grant to develop a standards-based communication platform to analyze current grid loads as well as predict plug-in electric vehicle (PEV) charging schedules to forecast projected loads. The platform will consolidate and optimize the collected data to provide a viable pathway to using PEVs to manage variable grid conditions and renewable energy intermittency.

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 the research team is developing a new standards-based communication platform that will be demonstrated in a small group of new electric vehicle charging stations.
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:
   - ☐ Common Sense Exemption. 14 CCR 15061 (b) (3)

   Explain reason why Agreement is exempt under the above section:

   ☐ b) Agreement **IS NOT** exempt. (Consult with the legal office to determine next steps.)
   Check all that apply
   - ☐ Initial Study
   - ☐ Negative Declaration
   - ☐ Mitigated Negative Declaration
   - ☐ Environmental Impact Report
   - ☐ Statement of Overriding Considerations

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

Legal Company Name:	Budget
KnGrid	$ 554,526
Energy Solutions International	$ 56,000
Strategen	$ 95,000
The Regents of the University of California, on behalf of the San Diego campus	$ 85,000

List all key partners: (attach additional sheets as necessary)
Legal Company Name:
NONE

Budget Information				
Funding Source		**Funding Year of Appropriation**	**Budget List No.**	**Amount**
EPIC		13-14	301.001A	$1,499,999
R&D Program Area:	EGRO: Transportation		TOTAL:	$1,499,999
Explanation for "Other" selection				
Reimbursement Contract #:			Federal Agreement #:	

Recipient's Administrator/ Officer				**Recipient's Project Manager**			
Name:	Mike Ferry			Name:	Brett Williams		
Address:	9325 Sky Park Ct Ste 100			Address:	9325 Sky Park Ct Ste 100		
City, State, Zip:	San Diego, CA 92123-4380			City, State, Zip:	San Diego, CA 92123-4380		
Phone:	858-244-7287 /	Fax:	- -	Phone:	858-429-5139 /	Fax:	- -
E-Mail:	mike.ferry@energycenter.org			E-Mail:	brett.williams@energycenter.org		

Selection Process Used	
☒ Competitive Solicitation	Solicitation #: PON-14-310
☐ 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**

I. TASK ACRONYM/TERM LISTS

A. Task List

Task #	CPR	Task Name
1		General Project Tasks
2		Develop ISO/IEC 15118 Demand Clearing House Server Specification
3	X	Design and Develop Demand Clearing House Server Software
4		Demonstrate Ability to Connect to SDG&E OpenADR Server and CAISO Market Pricing Data
5	X	Demonstrate Ability to Deliver Grid Profile Tariff Tables to ISO/IEC 15118 Charging Stations and Vehicles
6		Conduct 6-Month Study of Vehicle Charging Response to Real-Time Pricing, Grid Constraints, and Owner Mobility Needs
		Report on Ratepayer Benefits of Full Deployment of Standards-Based Smart Charging and Develop Policy Recommendations for California's Smart Charging Future
8		Evaluation of Project Benefits
9		Technology/Knowledge Transfer Activities
10		Production Readiness Plan

B. Acronym/Term List

Acronym/Term	Meaning
API	Application Programming Interface
CAISO	California Independent System Operator
CAM	Commission Agreement Manager
CAO	Commission Agreement Officer
CPR	Critical Project Review
CPUC	California Public Utilities Commission
DCH	Demand Clearing House
Energy Commission	California Energy Commission
EVSP	Electric Vehicle Service Provider
IOU	Investor-owned Utility
ISO/IEC 15118	International Organization for Standardization and International Electrotechnical Commission technical specification for Road Vehicles – Vehicle to grid communication interface
M&V	Measurement and Verification
OpenADR	Open Automated Demand Response
PEV	Plug-in Electric Vehicle
PG&E	Pacific Gas & Electric
RWE	German utility
RWE Effizienz	RWE “Efficiency,” Research and Development Subsidiary of German utility RWE
SAE	Society of Automotive Engineers
SDG&E	San Diego Gas & Electric
TAC	Technical Advisory Committee
UCSD	University of California, San Diego

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

A. Purpose of Agreement

The purpose of this agreement is to fund the design, development, and testing of an International Organization of Standardization (ISO)/International Electrotechnical Commission (IEC) 15118 Demand Clearing House (DCH), as defined in the ISO/IEC 15118 protocol.[1] ISO/IEC 15118 is currently the only internationally recognized standard for vehicle-grid integration (VGI), and the development of an ISO/IEC 15118 DCH is an essential element in commercializing the standard. The developed DCH will generate ISO/IEC 15118 "grid profiles," or Tariff Tables, that reflect pricing offers and power-level availability to compatible plug-in electric vehicles (PEVs) from electric system operators using complementary communications standards such as Open Automated Demand Response (OpenADR) 2.0b. Additionally, this agreement will fund six months of real-world vehicle testing utilizing the DCH and ISO/IEC 15118 protocols and subsequent analysis and reporting to the California Energy Commission.

B. Problem/ Solution Statement

Problem

Mass-market uptake of PEVs presents both challenges as well as unprecedented opportunities for both electric system operators and vehicle manufacturers to create cross-cutting benefits to PEV owners, electric system operators, and the environment. An enabling technology for VGI is the development of a common, unique standard for smart charging communications. One such standard, ISO/IEC 15118, was developed over the last six years in an international effort involving over 140 key stakeholders. However, a critical next step in the ISO/IEC 15118 roadmap, the development a Demand Clearing House, has not yet taken place.

Solution

The Recipient will develop a DCH, the first in the world, able to translate common utility smart grid protocols such as Open ADR 2.0b into ISO/IEC 15118 Tariff Tables that compatible vehicles and charging stations can respond to. The Recipient will work with the California Independent System Operator (CAISO), San Diego Gas & Electric (SDG&E), Pacific Gas & Electric (PG&E), and other utilities to reflect both distribution and system-wide conditions in the generated Tariff Tables offered to charging station providers, third-party aggregators, and vehicle owners. ISO/IEC 15118 is currently in production on all new PEVs equipped with the SAE (Society of Automotive Engineers) "Combo Connector" for DC charging and on certain PEVs with AC Level 2 charging. The standard calls for the creation of a DCH, but to date a complete, fully-integrated DCH has not been developed. Without a DCH in place, electric system operators and Electric Vehicle Service Providers (EVSP) have no way to communicate pricing and power level availability to ISO/IEC 15118-enabled vehicles and charging stations. Subsequently, the full range of potential VGI benefits cannot be realized.

C. Goals and Objectives of the Agreement

[1] https://www.iso.org/obp/ui/#iso:std:iso:15118:-1:ed-1:v2:en

Agreement Goals

The goals of this Agreement are to:

- Develop a pathway to a standards-based, scalable solution for smart charging in California;
- Leverage existing smart grid communications technologies already in place, specifically, the international ISO/IEC 15118 standard;
- Lay the foundations for bi-directional energy (V2G) from series production PEVs through standards; and
- Help California achieve cross-cutting benefits made possible by plug-in electric vehicles able to serve as distributed energy storage resources, including higher penetration of renewable energy resources and electric system reliability.

Ratepayer Benefits:[2] This Agreement will result in the ratepayer benefit[s] of greater electricity reliability and lower costs by managing PEV electric loads to respond to the variability of renewable energy sources and distribution grid capacity constraints.

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 creating the world's first DCH that enables delivery of dynamic energy prices and optimized grid capacity to PEVs in a scalable standards-based format. Additionally, the ISO/IEC 15118 DCH lays out a pathway for all series production PEVs to eventually serve as distributed energy storage for grid support applications able to facilitate the integration of variable renewable energy sources called for in State RPS goals and lower the cost of implementing AB 2514 goals for energy storage. At the same time, monetizing these cross-cutting benefits to the grid can help accelerate the California Governor's Office goals for 1 million PEVs by 2020 by lowering total ownership costs.

Agreement Objectives

The objectives of this Agreement are to:

- Objective 1: Develop an ISO/IEC 15118 Demand Clearing House (DCH) capable of collecting wholesale energy prices from the CAISO Day-Ahead Hourly and Fifteen Minute Markets, OpenADR 2.0b signals from SDG&E and other Investor-owned Utilities (IOUs), and PEV owner charging requirements.
- Objective 2: Connect IOU OpenADR 2.0b and CAISO energy markets data to ISO/IEC 15118 Demand Clearing House.
- Objective 3: Generate grid profile Tariff Tables for charging stations and connected PEVs that reflect existing and updated conditions regarding prices and available power levels over time.
- Objective 4: Demonstrate the real-world utilization of ISO/IEC 15118 Tariff Tables with a fleet of 26 ISO/IEC 15118 charging stations and ISO/IEC 15118-compatible vehicles at University of California, San Diego (UCSD).

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[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.

- Objective 5: Analyze, measure, and report on the effectiveness of the ISO/IEC 15118-enabled control system in harmonizing PEV charging with system wide and local grid conditions in real time.

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

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

For products that require a final version only

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

For all products

- Submit all data and documents required as products in accordance with the following Instructions for Submitting Electronic Files and Developing Software:

  - **Electronic File Format**
    Submit all data and documents required as products under this Agreement in an electronic file format that is fully editable and compatible with the Energy Commission's software and Microsoft (MS)-operating computing platforms, or with any other format approved by the CAM. Deliver an electronic copy of the full text of any Agreement data and documents in a format specified by the CAM, such as memory stick or CD-ROM.

The following describes the accepted formats for electronic data and documents provided to the Energy Commission as products under this Agreement, and establishes the software versions that will be required to review and approve all software products:

- Data sets will be in MS Access or MS Excel file format (version 2007 or later), or any other format approved by the CAM.
- Text documents will be in MS Word file format, version 2007 or later.
- Documents intended for public distribution will be in PDF file format. The Recipient must also provide the native Microsoft file format.
- Project management documents will be in Microsoft Project file format, version 2007 or later.

- ***Software Application Development***

Use the following standard Application Architecture components in compatible versions for any software application development required by this Agreement (e.g., databases, models, modeling tools), unless the CAM approves other software applications such as open source programs:

- Microsoft ASP.NET framework (version 3.5 and up). Recommend 4.0.
- Microsoft Internet Information Services (IIS), (version 6 and up) Recommend 7.5.
- Visual Studio.NET (version 2008 and up). Recommend 2010.
- C# Programming Language with Presentation (UI), Business Object and Data Layers.
- SQL (Structured Query Language).
- Microsoft SQL Server 2008, Stored Procedures. Recommend 2008 R2.
- Microsoft SQL Reporting Services. Recommend 2008 R2.
- XML (external interfaces).

Any exceptions to the Electronic File Format requirements above must be approved in writing by the CAM. The CAM will consult with the Energy Commission's Information Technology Services Branch to determine whether the exceptions are allowable.

MEETINGS

Subtask 1.2 Kick-off Meeting

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

The Recipient shall:

- Attend a "Kick-off" meeting with the CAM, the Commission Agreement Officer (CAO), and any other Energy Commission staff relevant to the Agreement. The Recipient will bring its Project Manager and any other individuals designated by the CAM to this meeting. The administrative and technical aspects of the Agreement will be discussed at the meeting. Prior to the meeting, the CAM will provide an agenda to all potential meeting participants. The meeting may take place in person or by electronic conferencing (e.g., WebEx), with approval of the CAM.

The administrative portion of the meeting will include discussion of the following:

- Terms and conditions of the Agreement;
- 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 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 all Agreement activities conducted by the Recipient for the preceding month, including an assessment of the ability to complete the Agreement within the current budget and any anticipated cost overruns. See the Progress Report Format Attachment for the recommended specifications.
    - Provide a synopsis of the project progress, including accomplishments, problems, milestones, products, schedule, fiscal status, and any evidence of progress such as photographs.
- Submit a monthly or quarterly *Invoice* that follows the instructions in the "Payment of Funds" section of the terms and conditions. In addition, each invoice must document and verify:

- Energy Commission funds received by California-based entities;
- Energy Commission funds spent in California *(if applicable)*; and match fund expenditures.
-

Products:
- Progress Reports
- Invoices

Subtask 1.6 Final Report
The goal of this subtask is to prepare a comprehensive Final Report that describes the original purpose, approach, results, and conclusions of the work performed under this Agreement. The CAM will review and approve the Final Report, which will be due at least **two months** before the Agreement end date. When creating the Final Report Outline and the Final Report, the Recipient must use a Style Manual provided by the CAM.

Subtask 1.6.1 Final Report Outline

The Recipient shall:
- Prepare a *Final Report Outline* in accordance with the *Style Manual* provided by the CAM.
- Submit a draft of the outline to the CAM for review and comment.
- Once agreement has been reached on the draft, submit the final outline to the CAM. The CAM will provide written approval of the final outline within 10 days of receipt.

Recipient Products:
- Final Report Outline (draft and final)

CAM Products:
- Style Manual
- Comments on Draft Final Report Outline
- Approval of Final Report Outline

Subtask 1.6.2 Final Report

The Recipient shall:
- Prepare a *Final Report* for this Agreement in accordance with the approved Final Report Outline and the Style Manual provided by the CAM.
- Submit a draft of the report to the CAM for review and comment. Once agreement on the draft report has been reached, the CAM will forward the electronic version for Energy Commission internal approval. Once the CAM receives approval, he/she will provide written approval to the Recipient.
- Submit one bound copy of the Final Report to the CAM.

Recipient Products:
- Final Report (draft and final)

CAM Product:
- Comments on 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 <u>no permits</u> 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

TASK 2 DEVELOP ISO/IEC 15118 DEMAND CLEARING HOUSE SERVER SPECIFICATION

The goals of this task are to (1) develop the software specification and architecture of the DCH; (2) develop translation algorithms to impute a blend of Day-Ahead Hourly prices and pricing from the Fifteen Minute Market along with load forecast data from feeder circuits associated with each charging station; and (3) translate that data into ISO/IEC 15118 Tariff Table Syntax.

The Recipient shall:

- Develop an *Initial Demand Clearing House Specification* of functionalities and associated interfaces in consultation with RWE Effizienz[4]; to include, but is not limited to:
  - Intelligent algorithms to accept pricing and power-level availability based on Day-Ahead Hourly, and Fifteen-Minute Energy Markets as well as load forecasts from the local utility
  - Algorithms that convert those grid conditions into ISO/IEC 15118 Tariff Tables
  - Application Programming Interface (API) specifications to interface DCH with RWE's 'ICON' back-end server that controls the UC San Diego charging stations in coordination with RWE Effizienz
  - Translation API from OpenADR 2.0b to Tariff Table Syntax
  - Reporting capabilities to compare accepted grid profiles to actual energy consumed

Products:

- Initial Demand Clearing House Specifications

TASK 3 DEVELOP DEMAND CLEARING HOUSE SERVER SOFTWARE

The goal of this task is to develop the software according to the specifications generated from TASK 2

The Recipient Shall:

- Develop *First Version of DCH Software* that will include, but is not limited to:
  - Technology stack for the DCH
  - Service architecture for the DCH
  - Set of APIs, algorithms and required communication protocols detailed in TASK 2
  - User Interface to manage configuration parameters and user data
  - Log system and reporting functionality to support data analytics tasks
- Develop a *DCH Software Demonstration Report* that will discuss the following, but is not limited to:
  - Technology stack development
  - Standard programming practices and test coverage strategy
  - Service architecture development
  - API, algorithm and required communication development
  - User interface development
  - Log system and reporting functionality development
- Participate in the CPR meeting and prepare CPR Report #1 in accordance with subtask 1.3 (CPR Meetings)

Product:

- First Version of DCH Software (CD-ROM or memory stick)
- DCH Software Demonstration Report
- CPR Report #1

[4] RWE Effizienz ("Efficiency") is a research and development subsidiary of the German utility RWE. RWE Effizienz focuses on new and developing energy markets such as electric mobility and integrated smart homes. See http://www.rwe.com/web/cms/de/249846/rwe-effizienz-gmbh/ueber-rwe-effizienz/http://www.rwe.com/web/cms/de/249846/rwe-effizienz-gmbh/ueber-rwe-effizienz/

[CPR WILL BE HELD IN THIS TASK. See Task 1.2 for details]

TASK 4 DEMONSTRATE ABILITY TO CONNECT TO IOU OPENADR SERVER AND CAISO WHOLESALE MARKET PRICING DATA

The goals of this task are to: (1) receive pricing information and demand response signals from SDG&E and/or other California IOUs; (2) import CAISO Wholesale Prices; and (3) translate OpenADR signals and CAISO Wholesale Prices to Tariff Table Syntax

The Recipient Shall:

- Develop *OpenADR and CAISO Pricing to Tariff Table Translation Demonstration Report* that includes the following, but is not limited to:
  - Testing and discussion of the DCH ability to communicate with IOU OpenADR Servers
  - Testing and discussion of the DCH ability to receive expected demand response signals and prices
  - Validation of the OpenADR signal and Tariff Table Syntax
  - Configuration of the DCH to import CAISO Oasis pricing

Products:

- OpenADR and CAISO Pricing to Tariff Table Translation Demonstration Report

TASK 5 DEMONSTRATE ABILITY TO DELIVER TARIFF TABLES TO ISO/IEC 15118 CHARGING STATIONS AND VEHICLES

The goals of this task are to: (1) generate simple Tariff Tables with the DCH; and (2) confirm delivery and acceptance of the files by the designated charging stations and connected vehicles at UC San Diego.

The Recipient shall:

- Prepare a *Tariff Table Delivery Demonstration Report* that includes but is not limited to the following:
  - A discussion of the expected results for the following tests:
    - Test the ability of RWE ICON to communicate with the DCH in coordination with RWE Effizienz IT staff in Germany
    - Test the signaling from ICON that requests a Tariff Table when a charging session is initiated by a connected PEV
    - Test the ability of the DCH to generate simple Tariff Tables
  - A discussion of challenges encountered during the tests
  - A description of several Tariff Table test scenarios delivered through the DCH to the PEV
  - A description of the Tariff Tables delivered to ISO/IEC 15118 charging stations and PEVs at UCSD
  - A description of the observed grid profile created by the interaction between the charging station and the PEV once the Tariff Table was received at the charging station
- Participate in the CPR meeting and prepare CPR Report #2 in accordance with subtask 1.3 (CPR Meetings)

Products:
- Tariff Table Delivery Demonstration Report
- CPR Report #2

[CPR WILL BE HELD IN THIS TASK. See Task 1.2 for details]

TASK 6 CONDUCT A 6-MONTH STUDY OF PEV LOAD RESPONSIVENESS TO PRICING AND POWER LEVEL VARIABILITY

The goals of this task are to: (1) collect real-world data on PEV grid profiles generated in response to ISO/IEC 15118 Tariff Tables (2) measure the response times of PEV loads in response to updated Tariff Tables during a charging session (3) measure the effectiveness of ISO/IEC 15118 protecting PEV owner mobility requirements.

The Recipient shall:
- Prepare *Report on Effectiveness of the Control Syste*m that discusses the following, but not limited to:
  - Utilization of existing 26 ISO/IEC 15118 Level 2 charging stations on the UCSD campus plus 1 residential ISO/IEC 15118 Level 2 station to connect to compatible UCSD fleet and privately-owned vehicles in the study.
  - Training of vehicle owners and fleet users to enter vehicle departure time via web interfaces when connecting to the charging stations.
  - Tracking of success metrics for smart charging study:
    - Percentage of time vehicle received needed kWh by departure time (when connected for an adequate period)
    - Response times of PEV loads after receipt of new Tariff Table
    - Document any reliability issues with DCH and connectivity with PEVs, SDG&E or CAISO Oasis.
    - Demonstrate PEV load response to EVSE Cluster Energy Limits

Products:
- Report on Effectiveness of the Control System

TASK 7 ANALYSIS

The goal of this task is to analyze data from DCH development, implementation, and operation of vehicles in order to produce results showing the benefits of the project and, specifically, the establishment of an open platform, standards-based DCH.

Subtask 7.1 Measurement & Verification (M&V) Plan

The goal of this subtask is to describe how project benefits will be measured and quantified for completion of subtask 7.2 and Task 8: Evaluation of Project Benefits.

The Recipient shall:
- Develop Measurement and Verification Plan
- Develop Measurement and Verification Report

Products:

- Measurement and Verification Plan
- Measurement and Verification Report

Subtask 7.2 Ratepayer Benefits of Full Deployment of Standards-Based Smart Charging and Develop Policy Recommendations for California's Smart Charging Future

The goals of this task are to: (1) highlight ratepayer benefits resulting from the DCH enabling grid services (2) identify the end-use PEV customer DCH-enabled benefits and (3) develop and prioritize a list of policy recommendations based on on-going California Public Utilities Commission (CPUC) and CAISO proceedings and identified barriers to using the DCH in leveraging the full suite of value streams available to grid-connected energy storage.

The Recipient shall:

- Develop *Ratepayers Benefits Report* that will identify and quantify all available value streams to ratepayers as a result of furnishing grid services via the DCH. Value streams are considered to be direct (market) and indirect (non-market). Direct values include those that can be monetized through existing market products, avoided investments, and proxy values that reflect the forecast value of market products currently in development in CPUC or CAISO regulatory proceedings. Indirect values reflect economic value to the IOU ratepayers; however, such value cannot be adequately measured using existing valuation techniques.
- Develop *Policy Recommendations Report* for California's Smart Charging Future. The Recipients will analyze the current policy landscape as it relates to governing the technical and market aspects of using grid-connected PEVs to deliver grid services and prescribe policies to expedite the realization of the value streams enabled by the DCH. Below outlines the steps involved with arriving at the proper policy recommendations.
  - Monitor the latest proceedings at:
    - CPUC for the following:
      - Demand Response (DR). Both supply-side and demand-side DR
      - Distributed Resource Plan (DRP)
      - Integrated Demand Side Management (IDSM)
      - Resource Adequacy (RA)
      - Long-term Procurement Plan
      - Net-energy Metering (NEM)
      - Smart inverter working group
      - Rule 21 (Interconnection)
    - CAISO for the following:
      - Expanding Metering and Telemetry Options Initiative
      - Forthcoming initiative to expand non-generator resource (NGR) eligibility in the proxy demand response (PDR) program
      - Flexible Ramping
      - Interconnection
      - Market rules
  - Develop list of barriers to participating in CAISO markets and CPUC-mandated programs
  - Prioritize participation barriers
  - Evaluate policy options to address the following barriers
    - Rule/tariff changes at CPUC
    - Rule/tariff changes at CAISO
    - Customer incentives

        - Utility incentives
        - Financing
        - Expedite Permitting
        - Standardization
        - Business models (utility vs. 3rd party owned)
    - Prioritize policy options based on:
        - Cost effectiveness
        - GHG impact
        - Complexity
        - Market Development
    - Make policy recommendations

Products:

- Ratepayer Benefits Report
- Policy Recommendation Report

TASK 8 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:

    - <u>For Product Development Projects and Project Demonstrations:</u>
        - 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.
    - <u>Additional Information for Product Demonstrations:</u>
      - 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 has 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 9 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.
- Prepare a *Technology/Knowledge Transfer Report* on technology transfer activities conducted during the project.

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

Task 9.1 Enhanced Knowledge Transfer Activities
The goal of this task is to provide additional knowledge transfer activities.

The Recipient shall:
- Develop and maintain a website to publish all reports and regular project updates.
- Produce a mid-project webinar on *PEV Smart Charging Interoperability Standards* targeting state policy makers, regulators, automakers and industry stakeholders.
- Conduct two mid-project workshops for regulatory and automaker representatives to discuss progress on removing barriers and understanding the need for a standards-based Demand Clearing House to enable the VGI market

Products:
- Dedicated website
- Mid-project webinar
- Two mid-project workshops

TASK 10 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.

RESOLUTION NO: 15-0610

STATE OF CALIFORNIA

STATE ENERGY RESOURCES
CONSERVATION AND DEVELOPMENT COMMISSION

RESOLUTION - RE: CENTER FOR SUSTAINABLE ENERGY

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

RESOLVED, that the Energy Commission approves Agreement EPC-14-077 from PON-14-310 with **Center for Sustainable Energy** for a **$1,499,999** grant to develop a standards-based communication platform to analyze current grid loads and optimize PEV charging schedules with projected loads. The platform will consolidate and optimize the collected data to provide a viable pathway to using PEVs to manage variable grid conditions and renewable energy intermittency; and

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

CERTIFICATION

The undersigned Secretariat to the Commission does hereby certify that the foregoing is a full, true, and correct copy of a Resolution duly and regularly adopted at a meeting of the California Energy Commission held on June 10, 2015.

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

Harriet Kallemeyn,
Secretariat