



# GRANT REQUEST FORM (GRF)

### A) New Agreement # EPC-20-009 (to be completed by CGL office)

B) Division	Agreement Manager:	MS-	Phone
ERDD	Felix Villanueva	51	916-327-2206

C) Recipient's Legal Name	Federal ID Number
The Regents of the University of California, on behalf of the San Diego Campus	95-2872494

D) Title of Project
Smart Plug Load Controls Integrated with Building Energy Management Systems

### E) Term and Amount

Start Date	End Date	Amount
3/1/2021	1/31/2025	\$ 1,028,125

### F) Business Meeting Information

ARFVTP agreements \$75K and under delegated to Executive Director  
 Proposed Business Meeting Date 2/10/2021  Consent  Discussion  
 Business Meeting Presenter Felix Villanueva Time Needed: 5 minutes  
 Please select one list serve. EPIC (Electric Program Investment Charge)

### Agenda Item Subject and Description:

#### The Regents of the University of California, on behalf of the San Diego Campus

Proposed resolution approving agreement EPC-20-009 with The Regents of the University of California, on behalf of the San Diego Campus for a \$1,028,125 grant to demonstrate cost-effective reduction of energy use in buildings by integrating Smart Plug Load Controls with the existing Building Energy Management System, and adopting staff's determination that this action is exempt from CEQA. (EPIC funding) Contact: Felix Villanueva.

### G) California Environmental Quality Act (CEQA) Compliance

1. Is Agreement considered a "Project" under CEQA?

- Yes (skip to question 2)
- No (complete the following (PRC 21065 and 14 CCR 15378)):

Explain why Agreement is not considered a "Project":

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

- a)  Agreement **IS** exempt.
  - Statutory Exemption. List PRC and/or CCR section number:
  - Categorical Exemption. List CCR section number: Cal. Code Regs., tit. 14, § 15301
  - Common Sense Exemption. 14 CCR 15061 (b) (3)

Explain reason why Agreement is exempt under the above section: Cal. Code Regs., tit. 14, sect. 15301 provides that projects which consist of the operation,



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repair, maintenance, permitting, leasing, licensing, or minor alteration of existing public or private structures, facilities, mechanical equipment, or topographical features, and which involve negligible or no expansion of use beyond that existing at the time of the lead agency's determination, are categorically exempt from the provisions of the California Environmental Quality Act. The activities funded by this agreement are exempt under Cal. Code Regs., tit. 14, § 15301 because they involve minor energy efficient installation of plug load controls to an existing college campus and office buildings and will not have a significant effect on the environment. These technologies involve no expansion of existing use, with interior/exterior alterations to improve building performance.

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

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

Legal Company Name:	Budget
Johnson Controls, Inc.	\$ 301,217
Best Energy Reduction Technologies, LLC	\$ 305,493
National Renewable Energy Laboratory	\$ 25,000
Baker Electric, Inc.	\$ 42,500

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

Legal Company Name:

**J) Budget Information**

Funding Source	Funding Year of Appropriation	Budget List Number	Amount
EPIC	19-20	301.001G	\$1,028,125
			\$
			\$

R&D Program Area: EERO: Buildings

TOTAL: \$ 1,028,125

Explanation for "Other" selection

Reimbursement Contract #:      Federal Agreement #:

**K) Recipient's Contact Information**



**GRANT REQUEST FORM (GRF)**

**1. Recipient's Administrator/Officer**

Name: Mary Mansfield  
Address: 9500 Gilman Dr. MC 0934  
City, State, Zip: La Jolla, CA 92093-0934  
Phone: 858-534-9482  
E-Mail: mamansfield@ucsd.edu

**2. Recipient's Project Manager**

Name: Jan Kleissl  
Address: 9500 Gilman Dr. MC 0411  
City, State, Zip: La Jolla, CA 92093-0411  
Phone: 858-534-8087  
E-Mail: jkleissl@ucsd.edu

**L) Selection Process Used**

- Competitive Solicitation      Solicitation #: GFO-20-303
- First Come First Served Solicitation Solicitation #:

**M) The following items should be attached to this GRF**

- |                                                     |                                     |          |
|-----------------------------------------------------|-------------------------------------|----------|
| 1. Exhibit A, Scope of Work                         | <input checked="" type="checkbox"/> | Attached |
| 2. Exhibit B, Budget Detail                         | <input checked="" type="checkbox"/> | Attached |
| 3. CEC 105, Questionnaire for Identifying Conflicts | <input checked="" type="checkbox"/> | Attached |
| 4. Recipient Resolution                             | <input checked="" type="checkbox"/> | N/A      |
| 5. CEQA Documentation                               | <input checked="" type="checkbox"/> | N/A      |
|                                                     | <input type="checkbox"/>            | Attached |
|                                                     | <input type="checkbox"/>            | Attached |

\_\_\_\_\_  
**Agreement Manager**

\_\_\_\_\_  
**Date**

\_\_\_\_\_  
**Office Manager**

\_\_\_\_\_  
**Date**

\_\_\_\_\_  
**Deputy Director**

\_\_\_\_\_  
**Date**

# EXHIBIT A

## Scope of Work

### I. TASK ACRONYM/TERM LISTS

#### A. Task List

Task #	CPR <sup>1</sup>	Task Name
1		General Project Tasks
2		Plug Load Controller Deployment
3	X	Building Energy Management System Integration
4	X	Advanced Plug Load Control Operation
5		Evaluation of Project Benefits
6		Technology/Knowledge Transfer Activities

#### B. Acronym/Term List

Acronym/Term	Meaning
BEMS(s)	Building Energy Management System(s)
CAM	Commission Agreement Manager
CAO	Commission Agreement Officer
CEC	California Energy Commission
CPR	Critical Project Review
PL(s)	Plug Load(s)
PLC(s)	Plug Load Controller(s)
TAC	Technical Advisory Committee

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

#### A. Purpose of Agreement

The purpose of this Agreement is to demonstrate a unique innovation and advancement in plug load controls (PLCs) integrated into building energy management systems (BEMSs). This research will demonstrate the potential reduction in building energy use and electrical loads and shifting of these loads to reduce carbon emissions.

#### B. Problem/ Solution Statement

##### Problem

Twenty-seven percent of California's commercial electricity consumption in 2018 was due to plug loads, which is an increasing trend. Many of these devices have no power management capabilities and are left on continuously. Though plug load controllers (PLCs) have reduced plug load (PL) energy use by 10-20 percent based on occupancy schedules, there is an opportunity to further reduce energy bills and greenhouse emissions by integrating them with the BEMSs. PLCs

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<sup>1</sup> 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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and BEMSs individually are mature, commercially available technologies. However, integrated systems of both are not widely deployed and optimized.

#### **Solution**

This project will demonstrate the integration of existing BEMS with advanced PLCs. The goals of the demonstration are to 1) demonstrate potential for automation in PLC setup and configuration through machine learning-based clustering methods; and 2) demonstrate dynamic PLCs to leverage demand response opportunities. The marrying of PLC and BEMS technologies will provide building owners with PLC opportunities that are easier to integrate into their existing BEMS thus allowing for full optimization of a building with control of heating, ventilation, and air conditioning, lighting, and plug loads that will result in greater energy, carbon, and cost savings.

#### **C. Goals and Objectives of the Agreement**

##### **Agreement Goals**

The goals of this Agreement are to:

- Reduce PLCs setup costs;
- Reduce PLCs operation costs;
- Reduce plug load energy consumption of each building using the integration of the PLCs and BEMS by 20 percent;
- Demonstrate enhanced PLCs energy savings; and
- Demonstrate demand response potential.

Ratepayer Benefits:<sup>2</sup> This Agreement will result in the ratepayer benefits of greater electricity reliability, lower costs, and improved safety.

Greater reliability will result from participation of PL in demand response programs. More aggressive PLC during demand response events is enabled through concurrent occupancy sensing in the BEMS.

Lower costs will result from reducing kWh of plug load consumption, reducing demand charges, and participating in demand response events. Lower costs will also result from reduced PLC operating costs, increased equipment protection from electrical surges or other anomalies, and increased equipment life based on shorter operating hours.

Increased safety results from improvements in cybersecurity of buildings and plug load controllers.

Technological Advancement and Breakthroughs:<sup>3</sup> This Agreement could lead to technological advancement and breakthroughs in PLC process automation and machine learning-based

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<sup>2</sup> 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](http://docs.cpuc.ca.gov/PublishedDocs/WORD_PDF/FINAL_DECISION/167664.PDF)).

<sup>3</sup>

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### Scope of Work

clustering methods. These optimizers will cluster and mine historical PL and occupancy data to identify PLC opportunities and dynamically reschedule PLCs. Improved data taxonomies and integrating user feedback will simplify the installation and operation of PLCs in different buildings.

#### **Agreement Objectives**

The objectives of this Agreement are to:

- Demonstrate the technology integration of existing BEMS with advanced PLCs in existing commercial buildings larger than 100,000 square feet, or combined totaling larger than 100,000 square feet, with usage types such as offices, warehouses, and libraries and install controlled devices.
- Reduce plug load energy consumption of each building using the advanced PLC integrated with the BEMS by more than 20 percent.
- Reduce PLC installation costs.
- Develop advanced machine learning-based clustering techniques to automate PLC, scheduling, fault detection, fault resolution, and cybersecurity alerts in the integrated BEMS.
- Ensure complete cyber security of all connected devices in the integrated BEMS.
- Earn revenue in demand-response markets based on the predictability and scope of PLC.
- Establish the economic viability and potential for the widespread commercialization of the integrated PLCs and BEMS technology by achieving a return-on-investment (ROI) of five years or less.
- Conduct technology transfer to apply the research results to other locations, building types, markets, users, and companies.

### 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)**. All products submitted which will be viewed by the public, must comply with the accessibility requirements of Section 508 of the federal Rehabilitation Act of 1973, as amended (29 U.S.C. Sec. 794d), and regulations implementing that act as set forth in Part 1194 of Title 36 of the Federal Code of Regulations. All technical tasks should include product(s). 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

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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 California Energy Commission's (CEC) 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 a memory stick.

The following describes the accepted formats for electronic data and documents provided to the CEC 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.
- 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.

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- 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 CEC'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 CEC 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;
- Invoicing and auditing procedures;
- 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 (subtask 1.5);
  - Final Report (subtask 1.6);
  - Technical Advisory Committee meetings (subtasks 1.10 and 1.11); and
  - Any other relevant topics.
- Provide *Kick-off Meeting Presentation* to include but not limited to:
    - Project overview (i.e. project description, goals and objectives, technical tasks, expected benefits, etc.)
    - Project schedule that identifies milestones
    - List of potential risk factors and hurdles, and mitigation strategy
  - Provide an *Updated Project Schedule*, *Match Funds Status Letter*, and *Permit Status Letter*, as needed to reflect any changes in the documents.



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#### **The CAM shall:**

- Designate the date and location of the meeting.
- Send the Recipient a *Kick-off Meeting Agenda*.

#### **Recipient Products:**

- Kick-off Meeting Presentation
- Updated Project Schedule (*if applicable*)
- Match Funds Status Letter (subtask 1.7) (*if applicable*)
- Permit Status Letter (subtask 1.8) (*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 CEC 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 CEC 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 CEC.

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 CEC, 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 and submit 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.
- 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* with 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

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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)

#### **CAM Products:**

- CPR Agenda
- 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 CEC 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 procured equipment.
  - The CEC'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 copies of *All Final Products* on a USB memory stick, organized by the tasks in the Agreement.

#### **Products:**

- Final Meeting Agreement Summary (*if applicable*)
- Schedule for Completing Agreement Closeout Activities
- All Final Products

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### 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 Funds and in-state expenditures.

#### Products:

- Progress Reports
- Invoices

#### Subtask 1.6 Final Report

The goal of this subtask is to prepare a comprehensive Final Report that describes the original purpose, approach, results, and conclusions of the work performed under this Agreement. When creating the Final Report Outline and the Final Report, the Recipient must use the CEC 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 *Energy Commission Style Manual* provided by the CAM.

#### Recipient Products:

- Final Report Outline (draft and final)

#### CAM Product:

- Energy Commission 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, Energy Commission 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:

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- 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.)
  - Bibliography (if applicable)
  - Appendices (if applicable) (Create a separate volume if very large.)
  - Attachments (if applicable)
- Submit a draft of the Executive Summary to the TAC for review and comment.
  - Develop and submit a *Summary of TAC Comments* received on the Executive Summary. For each comment received, the Recipient will identify in the summary the following:
    - Comments the Recipient proposes to incorporate.
    - Comments the Recipient does propose to incorporate and an explanation for why.
  - 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.
  - Incorporate all CAM comments into the *Final Report*. If the Recipient disagrees with any comment, provide a *Written Responses to Comments* explaining why the comments were not incorporated into the final product.
  - Submit the revised *Final Report* electronically with any *Written Responses to Comments* within 10 days of receipt of CAM's *Written Comments* on the Draft Final Report, unless the CAM specifies a longer time period or approves a request for additional time.

#### **Products:**

- Summary of TAC Comments
- Draft Final Report
- *Written Responses to Comments (if applicable)*
- 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 CEC funds. Match funds must be identified in writing, and the Recipient must obtain any associated commitments before

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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 CEC 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 CEC 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.
  - If different from the solicitation application, provide 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.

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#### **The Recipient shall:**

- Prepare a *Permit Status Letter* that documents the permits required to conduct this Agreement. If no permits are required at the start of this Agreement, then state this in the letter. If permits will be required during the course of the Agreement, provide in the letter:
  - A list of the permits that identifies: (1) the type of permit; and (2) the name, address, and telephone number of the permitting jurisdictions or lead agencies.
  - The schedule the Recipient will follow in applying for and obtaining the permits.

The list of permits and the schedule for obtaining them will be discussed at the Kick-off meeting (subtask 1.2), and a timetable for submitting the updated list, schedule, and copies of the permits will be developed. The impact on the project if the permits are not obtained in a timely fashion or are denied will also be discussed. If applicable, permits will be included as a line item in progress reports and will be a topic at CPR meetings.

- If during the course of the Agreement additional permits become necessary, then provide the CAM with an *Updated List of Permits* (including the appropriate information on each permit) and an *Updated Schedule for Acquiring Permits*.
- Send the CAM a *Copy of Each Approved Permit*.
- If during the course of the Agreement permits are not obtained on time or are denied, notify the CAM within 5 days. Either of these events may trigger a CPR meeting.

#### **Products:**

- Permit Status Letter
- Updated List of Permits (*if applicable*)
- Updated Schedule for Acquiring Permits (*if applicable*)
- Copy of Each Approved Permit (*if applicable*)

#### **Subtask 1.9 Subcontracts**

The goals of this subtask are to: (1) procure subcontracts required to carry out the tasks under this Agreement; and (2) ensure that the subcontracts are consistent with the terms and conditions of this Agreement.

#### **The Recipient shall:**

- Manage and coordinate subcontractor activities in accordance with the requirements of this Agreement.
- Incorporate this Agreement by reference into each subcontract.
- Include any required Energy Commission flow-down provisions in each subcontract, in addition to a statement that the terms of this Agreement will prevail if they conflict with the subcontract terms.
- If required by the CAM, submit a draft of each *Subcontract* required to conduct the work under this Agreement.
- Submit a final copy of each 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.
- Help set the project team's goals and contribute to the development and evaluation of its statement of proposed objectives as the project evolves.
- Provide a credible and objective sounding board on the wide range of technical and financial barriers and opportunities.
- Help identify key areas where the project has a competitive advantage, value proposition, or strength upon which to build.
- Advocate, to the extent the TAC members feel is appropriate, on behalf of the project in its effort to build partnerships, governmental support and relationships with a national spectrum of influential leaders.
- Ask probing questions that insure a long-term perspective on decision-making and progress toward the project's strategic goals.

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

## **EXHIBIT A**

### **Scope of Work**

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.

#### **The TAC shall:**

- Help set the project team's goals and contribute to the development and evaluation of its statement of proposed objectives as the project evolves.
- Provide a credible and objective sounding board on the wide range of technical and financial barriers and opportunities.
- Help identify key areas where the project has a competitive advantage, value proposition, or strength upon which to build.
- Advocate on behalf of the project in its effort to build partnerships, governmental support and relationships with a national spectrum of influential leaders.
- Ask probing questions that insure a long-term perspective on decision-making and progress toward the project's strategic goals.
- Review and provide comments to proposed project performance metrics.
- Review and provide comments to proposed project Draft Technology Transfer Plan.

#### **Products:**



## EXHIBIT A Scope of Work

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

### **Subtask 1.12 Project Performance Metrics**

The goal of this subtask is to identify key performance targets for the project. The performance targets should be a combination of scientific, engineering, techno-economic, and/or programmatic metrics that provide the most significant indicator of the research or technology's potential success.

#### **The Recipient shall:**

- Complete and submit the draft *Project Performance Metrics Questionnaire* to the CAM prior to the Kick-off Meeting.
- Present the draft *Project Performance Metrics Questionnaire* at the first TAC meeting to solicit input and comments from the TAC members.
- Develop and submit a *TAC Performance Metrics Summary* that summarizes comments received from the TAC members on the proposed project performance metrics. The *TAC Performance Metrics Summary* will identify:
  - TAC comments the Recipient proposes to incorporate into the final *Project Performance Metrics Questionnaire*.
  - TAC comments the Recipient does not propose to incorporate with and explanation why.
- Submit a final *Project Performance Metrics Questionnaire* with incorporated TAC feedback.
- Develop and submit a *Project Performance Metrics Results* document describing the extent to which the Recipient met each of the performance metrics in the final *Project Performance Metrics Questionnaire*.
- Discuss the final *Project Performance Metrics Questionnaire* and *Project Performance Metrics Results* at the Final Meeting.

#### **Products:**

- Project Performance Metrics Questionnaire (draft and final)
- TAC Performance Metrics Summary
- Project Performance Metrics Results

## **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: PLUG LOAD CONTROLLER DEPLOYMENT**

The goal of this task is to deploy PLCs in at multiple commercial buildings in different building types such as offices, libraries, and warehouses.

## **EXHIBIT A**

### **Scope of Work**

#### **The Recipient shall:**

- Finalize a selection of commercial buildings and provide a *List of Commercial Building Deployments* for CAM written approval. To ensure applicability of research results to a wide audience. Recipient will select buildings with two different owners and three different building types and obtain all necessary approvals for testing and installation.
- Conduct on-site surveys and provide a copy of *On-site Surveys* for the selected buildings. The on-site surveys will identify all PLs and identify which devices would benefit from additional controls. The site survey of existing PLs will be used to determine whether the project will result in at least 20 percent reduction in PL electricity usage for the building(s). Site surveys include the following:
  - Number of onsite PL devices;
  - Type of PL device (e.g., routers, copiers, printers);
  - Estimated annual energy usage per PL type (kWh/year);
  - Estimated annual operating hours;
  - Current utility rate schedule; and
  - Current controls
- Install logging devices to collect sample data.
- Develop and provide *PLC Installation Schedule*.
- Install PLCs and start collecting two second metering data.
- Benchmark PL energy consumption for three months, or an alternate timeframe as approved by the CAM.
- Develop and provide initial *PLC Control Schedule* that uses occupancy sensors and time schedules to control plug load energy use.
- Identify BEMS/PLC integration points such as occupancy sensors and temperature sensors that will add additional energy savings.
- Continue to monitor PL energy consumption for 12-24 months, as directed by the CAM approval.
- Monitor user override actions for the duration of the deployment.
- Document PL energy (kWh), demand (kW) and electric bill savings for each building in a *Plug Load Energy Savings Presentation*. This presentation will include all assumptions used in determining savings and the status of the plug load energy reduction in each building. More holistic project benefits will be evaluated in Task 5.

#### **Products:**

- List of Commercial Building Deployments
- On-site Surveys
- PLC Installation Schedule
- PLC Control Schedule
- Plug Load Energy Savings Presentation (draft and final)

### **TASK 3: BUILDING ENERGY MANAGEMENT SYSTEM INTEGRATION**

The goal of this task is to integrate PL data and control into the BEMSs.

#### **The Recipient shall:**

- Review and upgrade BEMS hardware such as network automation engines as needed to accommodate the increase in number and frequency of monitoring points.

## **EXHIBIT A**

### **Scope of Work**

- Develop an intuitive and relevant data taxonomy to simplify interfacing PLCs and BEMSs and document it in a *Data Taxonomy Glossary*.
- Integrate PL data and control into the BEMS.
- Integrate additional data such as temperature and signal strength collected by the PLCs.
- Program additional BEMS integration points such as occupancy sensors.
- Train building automation superintendent and staff on BEMS-PLC usage.
- Continue to operate the BEMSs with integrated PLCs for 12-24 months, as directed by the CAM.
- Document PLC incidents and time spent reconfiguring / repairing PLCs in a *Plug Load Control Logbook and Summary Description*.
- Prepare a *CPR Report #1* in accordance with subtask 1.3 (CPR Meetings).
- Participate in a CPR meeting.

#### **Products:**

- Data Taxonomy Glossary
- Plug Load Control Logbook and Summary Description (draft and final)
- CPR Report #1

#### **TASK 4: ADVANCED PLUG LOAD CONTROL OPERATION**

The goal of this task is to deploy advanced PLC algorithms into the BEMSs, monitor the success of their implementation, and refine algorithms for optimal operation.

#### **The Recipient shall:**

- Develop machine learning-based clustering algorithms for PLCs initial configuration, fault detection, reconfiguration, and cybersecurity alerts.
- With concurrence from the CAM, implement at least three advanced PLC strategies to simplify installation and operation of PLCs, such as:
  - Automated and dynamic scheduling of PLCs independent of occupancy data based on PL usage patterns.
  - Integrating occupancy data with PLCs.
  - Automated fault detection and resolution.
  - Additional strategies with CAM written Approval.
- Conduct a systematic design experiment with randomized trials to implement different PLC strategies to understand PLCs performance under similar conditions. On three-week cycles, strategies of no PLCs, fixed-schedule PLCs, and the more advanced PLC strategies will be alternated and PLC performance will be documented.
- Bid PL capacity into the California Independent System Operator Demand Response Action Markets for at least six months.
- Evaluate cost and benefits including energy charges, demand charges, demand response revenue, worker productivity, and BEMS operator convenience.
- Prepare a report on *Advanced Plug Load Operating Strategies in BEMS* that includes the algorithms, discusses the operating strategies and which were most successful, and includes the results of bidding into CAISO DR markets, the results of cost and benefit evaluation and a discussion of whether the goals and objectives described in Section II.C. of this Scope of Work were achieved.
- Prepare a *Best Practices for PLC Brief* that summarizes how building operators can maximize costs and benefits through integration of PLC and BEMS.

## **EXHIBIT A**

### **Scope of Work**

- Prepare a CPR Report #2 in accordance with subtask 1.3 (CPR Meetings).
- Participate in a CPR meeting.

#### **Products:**

- Advanced Plug Load Operating Strategies in BEMS Report (draft and final)
- Best Practices for PLC Brief.
- CPR Report #2

#### **TASK 5: EVALUATION OF PROJECT BENEFITS**

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

#### **The Recipient shall:**

- Complete three Project Benefits Questionnaires that correspond to three main intervals in the Agreement: (1) Kick-off Meeting Benefits Questionnaire; (2) Mid-term Benefits Questionnaire; and (3) Final Meeting Benefits Questionnaire.
- Provide all key assumptions used to estimate projected benefits, including targeted market sector (e.g., population and geographic location), projected market penetration, baseline and projected energy use and cost, operating conditions, and emission reduction calculations. Examples of information that may be requested in the questionnaires include:
  - For Product Development Projects and Project Demonstrations:
    - Published documents, including date, title, and periodical name.
    - Estimated or actual energy and cost savings, and estimated statewide energy savings once market potential has been realized. Identify all assumptions used in the estimates.
    - Greenhouse gas and criteria emissions reductions.
    - Other non-energy benefits such as reliability, public safety, lower operational cost, environmental improvement, indoor environmental quality, and societal benefits.
    - Data on potential job creation, market potential, economic development, and increased state revenue as a result of the project.
    - A discussion of project product downloads from websites, and publications in technical journals.
    - A comparison of project expectations and performance. Discuss whether the goals and objectives of the Agreement have been met and what improvements are needed, if any.
    - Additional Information for Product Development Projects:
      - Outcome of product development efforts, such copyrights and license agreements.
      - Units sold or projected to be sold in California and outside of California.
      - Total annual sales or projected annual sales (in dollars) of products developed under the Agreement.
      - Investment dollars/follow-on private funding as a result of Energy Commission funding.
      - Patent numbers and applications, along with dates and brief descriptions.
    - Additional Information for Product Demonstrations:
      - Outcome of demonstrations and status of technology.
      - Number of similar installations.

## **EXHIBIT A**

### **Scope of Work**

- Jobs created/retained as a result of the Agreement.
  
- Respond to CAM questions regarding responses to the questionnaires.

The CEC 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 6: TECHNOLOGY/KNOWLEDGE TRANSFER ACTIVITIES**

The goal of this task is to conduct activities that will accelerate the commercial adoption of the technology being supported under this agreement. Eligible activities include, but are not limited to, the following:

- Scale-up analysis including manufacturing analysis, independent design verification, and process improvement efforts.
- Technology verification testing, or application to a test bed program located in California.
- Legal services or licensing to secure necessary intellectual property to further develop the technology
- Market research, business plan development, and cost-performance modeling.
- Entry into an incubator or accelerator program located in California.

#### **The Recipient Shall:**

- Develop and submit a *Technology Transfer Plan (Draft/Final)* that identifies the proposed activities the Recipient will conduct to accelerate the successful commercial adoption of the technology.
- Present the *Draft Technology Transfer Plan* to the TAC for feedback and comments.
- Develop and submit a *Summary of TAC Comments* that summarizes comments received from the TAC members on the *Draft Technology Transfer Plan*. This document will identify:
  - TAC comments the Recipient proposes to incorporate into the *Final Technology Transfer Plan*.
  - TAC comments the Recipient does not propose to incorporate with and explanation why.
- Submit the *Final Technology Transfer Plan* to the CAM for approval.
- Implement activities identified in *Final Technology Transfer Plan*.
- Develop and submit a *Technology Transfer Summary Report (Draft/Final)* that includes high level summaries of the activities, results, and lessons learned of tasks performed relating to implementing the *Final Technology Transfer Plan*. This report should not include any proprietary information.
- When directed by the CAM, develop presentation materials for an CEC- sponsored conference/workshop(s) on the project.

## **EXHIBIT A**

### **Scope of Work**

- When directed by the CAM, participate in annual EPIC symposium(s) sponsored by the CEC.
- Provide at least (6) six *High Quality Digital Photographs* (minimum resolution of 1300x500 pixels in landscape ratio) of pre and post technology installation at the project sites or related project photographs.

#### **Products:**

- Technology Transfer Plan (Draft/Final)
- Summary of TAC Comments
- Technology Transfer Summary Report (Draft/Final)
- High Quality Digital Photographs

#### **V. PROJECT SCHEDULE**

Please see the attached Excel spreadsheet.

STATE OF CALIFORNIA

STATE ENERGY RESOURCES  
CONSERVATION AND DEVELOPMENT COMMISSION

RESOLUTION - RE: THE REGENTS OF THE UNIVERSITY OF CALIFORNIA, ON BEHALF OF THE SAN DIEGO CAMPUS (UCSD)

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

**RESOLVED**, that the CEC approves Agreement EPC-20-009 with UCSD for a \$1,028,125 grant to demonstrate the integration of advanced Smart Plug Load Controls with the existing Building Energy Management System to provide cost-effective reduction in building energy use; and

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

**CERTIFICATION**

The undersigned Secretariat to the CEC does hereby certify that the foregoing is a full, true, and correct copy of a Resolution duly and regularly adopted at a meeting of the CEC held on February 10, 2021.

AYE:

NAY:

ABSENT:

ABSTAIN:

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Cody Goldthrite  
Secretariat