STATE OF CALIFORNIA

GRANT REQUEST FORM (GRF)

CEC-270 (Revised 10/2015) CALIFORNIA ENERGY COMMISSION

New Agreement EPC-15-051 (To be completed by CGL Office)

Division	Agreement Manager:	MS-	Phone
ERDD	Adel Suleiman	51	916-327-3313

Recipient's Legal Name	Federal ID Number
Lawrence Berkeley National Laboratory	94-2951741

Title of Project

The Value Proposition for Cost-Effective, Demand Response-Enabling, Nonresidential Lighting System Retrofits in California Buildings

Term and Amount	Start Date	End Date	Amount
	6/1/2016	6/30/2018	$ 500,000

Business Meeting Information

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

Proposed Business Meeting Date	5/11/2016	☐ Consent	☒ Discussion
Business Meeting Presenter	David Hungerford	Time Needed:	5 minutes

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

Agenda Item Subject and Description

LAWRENCE BERKELEY NATIONAL LABORATORY. Proposed resolution approving agreement EPC-15-051 with Lawrence Berkeley National Laboratory for a $500,000 grant to identify, quantify and evaluate the costs and benefits for implementing Demand Response lighting controls required by the California Energy Code across California's existing, non-residential building stock. (EPIC funding) Contact: Adel Suleiman. (Staff presentation: 5 minutes)

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 it would entail computer and desktop research and report-writing activities, all of which would be conducted in existing, appropriate office environments and by existing staff and researchers.
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 ☐ Environmental Impact Report
   ☐ Negative Declaration ☐ Statement of Overriding Considerations
   ☐ Mitigated Negative Declaration

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

Legal Company Name:	Budget
Energy Solutions International	$ 179,916
NEXT Associates Inc.	$ 40,000
	$

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

Budget Information			
Funding Source	**Funding Year of Appropriation**	**Budget List No.**	**Amount**
EPIC	14-15	301.001B	$500,000
			$
R&D Program Area: EERO: Buildings		TOTAL:	$500,000
Explanation for "Other" selection			
Reimbursement Contract #:		Federal Agreement #:	

Recipient's Administrator/ Officer				**Recipient's Project Manager**			
Name:	Peter Schwartz			Name:	Peter Schwartz		
Address:	1 Cyclotron Rd Stop 90R1121			Address:	1 Cyclotron Rd Stop 90R1121		
City, State, Zip:	Berkeley, CA 94720-8120			City, State, Zip:	Berkeley, CA 94720-8120		
Phone:	510-486-6926	Fax:	510-486-4089	Phone:	510-486-6926	Fax:	510-486-4089
E-Mail:	pmschwartz@lbl.gov			E-Mail:	pmschwartz@lbl.gov		

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

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

Agreement Manager	**Date**	**Office Manager**	**Date**	**Deputy Director**	**Date**

Exhibit A
Scope of Work

I. TASK ACRONYM/TERM LISTS

A. Task List

Task #	CPR[1]	Task Name
1	N/A	General Project Tasks
2		Analyze Statewide Demand Response Potential for Lighting
3	X	Quantify Benefits and Costs from Automated Demand Response Enabled Systems
4	X	Design Value Proposition Framework
5		Evaluation of Project Benefits
6		Technology/Knowledge Transfer Activities

B. Acronym/Term List

Acronym/Term	Meaning
Auto-DR	Automated Demand Response
CAM	Commission Agreement Manager
CAO	Commission Agreement Officer
CEC	California Energy Code
CPR	Critical Project Review
CPUC	California Public Utilities Commission
DR	Demand Response
Energy Commission	California Energy Commission
HVAC	Heating, Ventilation, and Air Conditioning
IOU	Investor-Owned Utility
NEBs	Non-Energy Benefits
OEM	Original Equipment Manufacturer
REIT	Real-Estate Investment Trust
Sub-LAP	Sub-Load Aggregation Point (Electricity Grid)
T&D	Transmission and Distribution (Electrical System)
TAC	Technical Advisory Committee
ZNE	Zero Net Energy

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

A. PURPOSE OF AGREEMENT

The purpose of this agreement is to determine the statewide potential for lighting demand response (DR), and to identify strategies for overcoming technical, institutional, and regulatory barriers to expanding lighting DR in non-residential sectors and matching load-reduction capabilities with system needs.
The research project will quantify the value proposition of implementing code-compliant, DR-Enabling lighting controls for retrofitting various non-residential building types. Implicit in this

[1] Please see subtask 1.3 in Part III of the Scope of Work (General Project Tasks) for a description of Critical Project Review (CPR) Meetings.

effort, is the establishment of a means to make this process sustainable for future policy initiatives and implementation efforts through designing a rigorous framework for determining the value proposition for lighting controls related to DR, and to identify key implementation and policy barriers and possible ways to overcome them.

B. PROBLEM/ SOLUTION STATEMENT

Problem

- Insufficiently defined value proposition—while the California Building Energy Efficiency Code (Title 24) mandates DR capability in some instances, to date, there has been very little focus on the lighting DR value proposition and integrating that into the broader commercialization path for DR-enabling lighting controls.
- California Title 24 code compliance challenges—existing code automated demand response (Auto-DR) requirements were based primarily on societal time dependent valuation calculations, and thus had a very specific focus on the value proposition at large. Due to the unclear value proposition to end use consumers, it is likely that most code compliant projects do the minimum amount of control to meet the requirements, while many others choose to not meet code requirements. The end result is lower code compliance in installing DR enabled projects, as well as lower participation in DR programs.
- Quantifying non-energy benefits (NEBs)—many advanced lighting controls systems investments are made on NEBs, and this is expected to become an increasingly large component of the lighting controls value proposition.

Solution

- Advanced lighting controls have considerable DR value both to the customer and the grid, especially through their ability to inform and control other loads such as heating, ventilation, and air conditioning (HVAC) and plug loads. This project will quantify the lighting DR capabilities value, which will enable accelerated market adoption. By quantifying the costs and benefits of various ways to meet the Title 24 energy code, this project will help overcome adoption barriers by communicating a stronger value proposition that could increase the uptake of Auto-DR capable systems. This research will serve as the groundwork for re-shaping Auto-DR program designs from both a marketing and valuation perspective.
- The project will develop a value proposition framework on which future technology developments could easily be evaluated and the resulting information promulgated to the key industry stakeholders from policymakers to end-users.

C. GOALS AND OBJECTIVES OF THE AGREEMENT

Agreement Goals

- Promote wider adoption of cost-effective, DR-enabling technologies within California in support of the State's energy policy goals for Zero Net Energy (ZNE) buildings, sustainability, and electric grid reliability.
- Identify the conditions under which investments in DR-enabling lighting control systems are cost-effective for customers in the existing, non-residential building market and to characterize and quantify this technology's electricity grid value —including operational and infrastructure benefits.

- Accelerate advanced lighting controls technology innovation to ensure that the market evolution related to the "Internet of things" and smart grid infrastructure improvements (new highly variable, distributed supply and demand side), such as lower electric loads increase grid functionality, and improve communication and establishment of transactive energy capabilities.

Ratepayer Benefits:[2] This Agreement will provide greater reliability and lower energy costs, to California ratepayers, both in the form of reduced energy use for indoor lighting, and also by advancing the state-of-the art for intelligent, network controls to become dynamically controlled, dispatchable grid resources.

- Increased grid reliability will be achieved through better knowledge of the local planning area system potential to address local electricity grid vulnerabilities through DR lighting technology applications.
- Lower costs will be achieved by better documenting the very powerful value proposition associated in installing DR-enabling, advanced lighting systems in California ratepayer facilities that goes well beyond basic energy savings and unleashes significant customer value (reflected in the identified NEBs) and investor-owned utility (IOU) transmission and distribution (electrical system) (T&D) value through deferred infrastructure investments which can delay future electricity rate increases.

Technological Advancement and Breakthroughs:[3] The advancements developed from this Agreement will help California achieve its statutory energy goals in the following ways:

- Shifting to systems level solutions, rather than component ("widget/gadget")-based technologies, to accelerate the requisite energy savings needed to achieve California's aggressive state energy goals of ZNE commercial buildings by 2030.
- Code compliance is currently very reliant on predicted performance from design review. A shift to outcome-based compliance will enable much higher rates of compliance over time, accelerating the state's progress towards its energy goals.
- The advanced controls developed in this project will ease building participation in Auto-DR programs, improving grid reliability and resiliency.
- Significantly moving network-controlled lighting systems towards DR-enabling systems greatly mitigates California IOUs and California Independent System Operator risk relative to highly variable loads as represented in the 'Duck Curve' due to their dynamically-responsive capability.
- Improved user interfaces for lighting systems reduce energy waste and support user satisfaction, at essentially zero incremental cost.
- IOUs have traditionally deployed DR programs to cost-effectively provide an alternative to peaking power plants for system-wide reliability. This project's research approach targeted at the sub-load aggregation point (electricity grid) (Sub-LAP) level will enable IOUs and others to geographically target DR deployments as a cost-effective means to T&D infrastructure upgrades for local reliability, too.

[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 (CPUC), 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.

Exhibit A
Scope of Work

Agreement Objectives

The project seeks to achieve the goals stated above , by meeting the following objectives:

- Determine the statewide potential for lighting DR
- Identify strategies for overcoming existing technical, institutional and regulatory barriers to expanding lighting DR to large numbers of non-residential customers across all sectors and matching load reduction capabilities with system needs
- Quantify the value proposition (incremental costs and benefits to California electric ratepayers) of implementing code-compliant, DR-enabling lighting controls systems for different non-residential buildings in retrofit applications
- Design a lighting controls value proposition framework
- Identify areas warranting subsequent research
- Identify key implementation and policy barriers and possible solutions

III. TASK 1 GENERAL PROJECT TASKS

PRODUCTS

Subtask 1.1 Products

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

The Recipient shall:

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

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

For products that require a final version only

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

For all products

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

Instructions for Submitting Electronic Files and Developing Software:

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

  The following describes the accepted formats for electronic data and documents provided to the Energy Commission as products under this Agreement, and establishes the software versions that will be required to review and approve all software products:
  - Data sets will be in MS Access or MS Excel file format (version 2007 or later), or any other format approved by the CAM.
  - Text documents will be in MS Word file format, version 2007 or later.
  - Documents intended for public distribution will be in PDF file format.
  - The Recipient must also provide the native Microsoft file format.
  - Project management documents will be in Microsoft Project file format, version 2007 or later.

- **Software Application Development**

  Use the following standard Application Architecture components in compatible versions for any software application development required by this Agreement (e.g., databases, models, modeling tools), unless the CAM approves other software applications such as open source programs:
  - Microsoft ASP.NET framework (version 3.5 and up). Recommend 4.0.
  - Microsoft Internet Information Services (IIS), (version 6 and up) Recommend 7.5.
  - Visual Studio.NET (version 2008 and up). Recommend 2010.
  - C# Programming Language with Presentation (UI), Business Object and Data Layers.
  - SQL (Structured Query Language).
  - Microsoft SQL Server 2008, Stored Procedures. Recommend 2008 R2.
  - Microsoft SQL Reporting Services. Recommend 2008 R2.
  - XML (external interfaces).

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

MEETINGS

Subtask 1.2 Kick-off Meeting

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

Exhibit A
Scope of Work

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 progress made on all Agreement activities as specified in the scope of

work for the preceding month, including accomplishments, problems, milestones, products, schedule, fiscal status, and an assessment of the ability to complete the Agreement within the current budget and any anticipated cost overruns. See the Progress Report Format Attachment for the recommended specifications.

- Submit a monthly or quarterly *Invoice* that follows the instructions in the "Payment of Funds" section of the terms and conditions, including a financial report on Match Fund and in-state expenditures.

Products:

- Progress Reports
- Invoices

Subtask 1.6 Final Report

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

Subtask 1.6.1 Final Report Outline

The Recipient shall:

- Prepare a *Final Report Outline* in accordance with the *Style Manual* provided by the CAM. *(See Task 1.1 for requirements for draft and final products.)*

Recipient Products:

- Final Report Outline (draft and final)

CAM Product:

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

Subtask 1.6.2 Final Report

The Recipient shall:

- Prepare a Final Report for this Agreement in accordance with the approved Final Report Outline, Style Manual, and Final Report Template provided by the CAM with the following considerations:
  - Ensure that the report includes the following items, in the following order:
    - Cover page (**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)
- Ensure that the document is written in the third person.
- Ensure that the Executive Summary is understandable to the lay public.
  - Briefly summarize the completed work. Succinctly describe the project results and whether or not the project goals were accomplished.
  - Identify which specific ratepayers can benefit from the project results and how they can achieve the benefits.
  - If it's necessary to use a technical term in the Executive Summary, provide a brief definition or explanation when the technical term is first used.
- Follow the Style Guide format requirements for headings, figures/tables, citations, and acronyms/abbreviations.
- Ensure that the document omits subjective comments and opinions. However, recommendations in the conclusion of the report are allowed.
- Include a brief description of the project results in the Abstract.

- Submit a draft of the report to the CAM for review and comment. The CAM will provide written comments to the Recipient on the draft product within 15 days of receipt
- Consider incorporating all CAM comments into the Final Report. If the Recipient disagrees with any comment, provide a written response explaining why the comment was not incorporated into the final product
- Submit the revised Final Report and responses to comments within 10 days of notice by the CAM, unless the CAM specifies a longer time period or approves a request for additional time.
- Submit one bound copy of the *Final Report* to the CAM along with *Written Responses to Comments on the Draft Final Report*.

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

CAM Product:
- Written Comments on the Draft Final Report

MATCH FUNDS, PERMITS, AND SUBCONTRACTS

Subtask 1.7 Match Funds

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

While the costs to obtain and document match funds are not reimbursable under this Agreement, the Recipient may spend match funds for this task. The Recipient may only spend

match funds during the Agreement term, either concurrently or prior to the use of Energy Commission funds. Match funds must be identified in writing, and the Recipient must obtain any associated commitments before incurring any costs for which the Recipient will request reimbursement.

The Recipient shall:

- Prepare a *Match Funds Status Letter* that documents the match funds committed to this Agreement. If no match funds were part of the proposal that led to the Energy Commission awarding this Agreement and none have been identified at the time this Agreement starts, then state this in the letter.
  If match funds were a part of the proposal that led to the Energy Commission awarding this Agreement, then provide in the letter:
- A list of the match funds that identifies:
  - The amount of cash match funds, their source(s) (including a contact name, address, and telephone number), and the task(s) to which the match funds will be applied.
  - The amount of each in-kind contribution, a description of the contribution type (e.g., property, services), the documented market or book value, the source (including a contact name, address, and telephone number), and the task(s) to which the match funds will be applied. If the in-kind contribution is equipment or other tangible or real property, the Recipient must identify its owner and provide a contact name, address, telephone number, and the address where the property is located.
  - A copy of a letter of commitment from an authorized representative of each source of match funding that the funds or contributions have been secured.
- At the Kick-off meeting, discuss match funds and the impact on the project if they are significantly reduced or not obtained as committed. If applicable, match funds will be included as a line item in the progress reports and will be a topic at CPR meetings.
- Provide a *Supplemental Match Funds Notification Letter* to the CAM of receipt of additional match funds.
- Provide a *Match Funds Reduction Notification Letter* to the CAM if existing match funds are reduced during the course of the Agreement. Reduction of match funds may trigger a CPR meeting.

Products:

- Match Funds Status Letter
- Supplemental Match Funds Notification Letter *(if applicable)*
- Match Funds Reduction Notification Letter *(if applicable)*

Subtask 1.8 Permits

The goal of this subtask is to obtain all permits required for work completed under this Agreement in advance of the date they are needed to keep the Agreement schedule on track. Permit costs and the expenses associated with obtaining permits are not reimbursable under this Agreement, with the exception of costs incurred by University of California recipients. Permits must be identified and obtained before the Recipient may incur any costs related to the use of the permit(s) for which the Recipient will request reimbursement.

The Recipient shall:

- Prepare a *Permit Status Letter* that documents the permits required to conduct this Agreement. If no permits are required at the start of this Agreement, then state this in the letter. If permits will be required during the course of the Agreement, provide in the letter:

- A list of the permits that identifies: (1) the type of permit; and (2) the name, address, and telephone number of the permitting jurisdictions or lead agencies.
- The schedule the Recipient will follow in applying for and obtaining the permits.

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

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

Products:

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

Subtask 1.9 Subcontracts

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

The Recipient shall:

- Manage and coordinate subcontractor activities in accordance with the requirements of this Agreement.
- Incorporate this Agreement by reference into each subcontract.
- Include any required Energy Commission flow-down provisions in each subcontract, in addition to a statement that the terms of this Agreement will prevail if they conflict with the subcontract terms.
- If required by the CAM, submit a draft of each *Subcontract* required to conduct the work under this Agreement.
- Submit a final copy of the executed subcontract.
- Notify and receive written approval from the CAM prior to adding any new subcontractors (see the discussion of subcontractor additions in the terms and conditions).

Products:

- Subcontracts *(draft if required by the CAM)*

Exhibit A
Scope of Work

TECHNICAL ADVISORY COMMITTEE

Subtask 1.10 Technical Advisory Committee (TAC)
The goal of this subtask is to create an advisory committee for this Agreement. The TAC should be composed of diverse professionals. The composition will vary depending on interest, availability, and need. TAC members will serve at the CAM's discretion. The purpose of the TAC is to:

- Provide guidance in project direction. The guidance may include scope and methodologies, timing, and coordination with other projects. The guidance may be based on:
  - Technical area expertise;
  - Knowledge of market applications; or
  - Linkages between the agreement work and other past, present, or future projects (both public and private sectors) that TAC members are aware of in a particular area.
- Review products and provide recommendations for needed product adjustments, refinements, or enhancements.
- Evaluate the tangible benefits of the project to the state of California, and provide recommendations as needed to enhance the benefits.
- Provide recommendations regarding information dissemination, market pathways, or commercialization strategies relevant to the project products.

The TAC may be composed of qualified professionals spanning the following types of disciplines:

- Researchers knowledgeable about the project subject matter;
- Members of trades that will apply the results of the project (e.g., designers, engineers, architects, contractors, and trade representatives);
- Public interest market transformation implementers;
- Product developers relevant to the project;
- U.S. Department of Energy research managers, or experts from other federal or state agencies relevant to the project;
- Public interest environmental groups;
- Utility representatives;
- Air district staff; and
- Members of relevant technical society committees.

The Recipient shall:

- Prepare a *List of Potential TAC Members* that includes the names, companies, physical and electronic addresses, and phone numbers of potential members. The list will be discussed at the Kick-off meeting, and a schedule for recruiting members and holding the first TAC meeting will be developed.
- Recruit TAC members. Ensure that each individual understands member obligations and the TAC meeting schedule developed in subtask 1.11.
- Prepare a *List of TAC Members* once all TAC members have committed to serving on the TAC.
- Submit *Documentation of TAC Member Commitment* (such as Letters of Acceptance) from each TAC member.

Products:

- List of Potential TAC Members
- List of TAC Members
- Documentation of TAC Member Commitment

Subtask 1.11 TAC Meetings

The goal of this subtask is for the TAC to provide strategic guidance for the project by participating in regular meetings, which may be held via teleconference.

The Recipient shall:

- Discuss the TAC meeting schedule with the CAM at the Kick-off meeting. Determine the number and location of meetings (in-person and via teleconference) in consultation with the CAM.
- Prepare a *TAC Meeting Schedule* that will be presented to the TAC members during recruiting. Revise the schedule after the first TAC meeting to incorporate meeting comments.
- Prepare a *TAC Meeting Agenda* and *TAC Meeting Back-up Materials* for each TAC meeting.
- Organize and lead TAC meetings in accordance with the TAC Meeting Schedule. Changes to the schedule must be pre-approved in writing by the CAM.
- Prepare *TAC Meeting Summaries* that include any recommended resolutions of major TAC issues.

Products:

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

IV. TECHNICAL TASKS

*Products that require a draft version are indicated by marking **"(draft and final)"** after the product name in the "Products" section of the task/subtask. If "(draft and final)" does not appear after the product name, only a final version of the product is required. **Subtask 1.1 (Products)** describes the procedure for submitting products to the CAM.*

TASK 2: ANALYZE STATEWIDE DEMAND RESPONSE POTENTIAL FOR LIGHTING

The goal of this task is to analyze statewide DR potential from lighting for different non-residential building and customer types. The recipient will use the 2015 CPUC DR Potential Study and U.S. Department of Energy's: "Getting Beyond Widgets: Developing Utility Programs for Building Systems" to analyze the integrated savings associated with combining advanced lighting controls systems with other building systems (dynamic envelope control, HVAC and plug loads).

The Recipient shall:

- Determine the incremental energy savings achievable in the 13 nonresidential market segments in all 16 of California climate zone areas by installing DR-enabling advanced lighting control systems.

- Quantify operational and infrastructure benefits to the grid from developing DR capability in existing buildings.
- Estimate grid benefits and provide a List of Benefits to the Grid in the *Statewide DR Potential Report* associated with participating in different DR programs and provide a range of grid services, based on:
  - Response time – One day ahead, one-hour, 30-minute, five-minute, four-second, etc.
  - Response duration – 4-hour product, 2-hour, etc.
  - Locational benefits (if feasible)
- Identify barriers to recognizing benefits and recommend solutions and provide a List of Barriers and Recommendations to the Grid in the *Statewide DR Potential Report* to recognize achieving the stated grid benefits and potential solutions.
- Develop *Statewide DR Potential Report* which includes a discussion of the lighting DR potential by: 1) Customer type and 2) Location (by Sub-LAP for IOUs and service area for POUs public owned utilities in all 16 of California climate zone areas)and 3) Incremental energy savings achievable in all of the 13 non-residential market segments of all 16 of California climate zone areas.

Products

- Statewide DR Potential Report (Draft and Final)

TASK 3: QUANTIFY BENEFITS AND COSTS FROM AUTOMATED DEMAND RESPONSE ENABLED SYSTEMS

The goal of task is to quantify Auto-DR enabled system benefits and costs. This includes quantifying NEBs, which are frequently the impetus for ratepayers to adopt the DR-enabling, advanced lighting controls technology.

Subtask 3.1 Quantify Energy and Demand Response Enablement Benefits and Costs from Baseline Retrofits

The goals of this subtask are to delineate lighting upgrade drivers instigating the retrofit project and how to account for the system cost related to the DR enabling technology, and to develop a matrix that outlines these issues and provides transparent answers for the basis of the analysis.

The Recipient shall:

- Determine and estimate baseline energy savings and associated costs for bringing a building up to code in all non-residential buildings types in all 16 of California climate zone areas, specifically excluding automated-DR capability requirements.
- Determine and estimate the customer benefits from incremental energy savings and demand reductions associated with Auto-DR capability.
  - Estimate direct DR benefits associated with participating in different DR programs and providing a range of grid services, based on:
    - Response time – Day ahead, one-hour, 30-minute, five-minute, four-second, etc.
    - Response duration – 4-hour product, 2-hour, etc.
  - Identify opportunities and limitations of integrating lighting controls data feeds with energy management systems to enhance overall facility DR and demand management performance (e.g., occupancy data informs HVAC zonal controls). Identify and estimate indirect DR benefits and limitations associated with these reductions in building load triggered by lighting control systems.

  - Compare system benefits derived directly from reduction in lighting power demand with facility wide benefits informed by advanced lighting controls systems.
  - Quantify energy benefits from advanced lighting controls systems that exceed the California Energy Code (CEC) for different retrofit applications, and buildings and customer types. This includes:
    - Energy savings from advanced lighting control strategies that go beyond existing CEC (top trimming, scheduling, etc.)
    - Energy savings from different spatial applications (work station, retail floor, spot lighting, hallway lighting, etc.)
- Determine and estimate the incremental project costs associated with Auto-DR capability.
  - Identify incremental costs associated with control upgrades required to meet DR capability requirements. This includes costs of DR enabling controls systems and building infrastructure upgrades.
- Prepare a *Benefits Quantification Request* that quantifies the value derived from lighting controls, with and without demand response enablement, across building and customer types and retrofit conditions, including matrices of how costing and benefits apply. The report must include all items analyzed in this subtask.

Products

- Benefits Quantification Request (draft and final)

Subtask 3.2 Identify Non-Energy Benefits from Automated Demand Response-Enabled Lighting Control Systems

The goal of this task is to identify NEBs associated with systems that provide controllability.

The Recipient shall:

- Quantify NEBs from advanced lighting controls systems that exceed the CEC for different retrofit applications, and building and customer types. This includes, but is not limited to:
  - Reduced maintenance costs of buildings
  - Improved safety and security of the electric grid
  - Improved business decisions driven by data analytics, occupancy and traffic patterns
  - Improved occupancy comfort
- Review existing literature on NEBs of Auto-DR
- Identify existing studies and information based on discussions with Original Equipment Manufacturer (OEM).
- Visit building sites and discuss with their property management Real-Estate Investment Trusts (REITs) and OEMs all NEBs and get feedback on NEBs that will inform the framework for Auto-DR enabled lighting controls. (Both Asset Managers and IT departments).
  - Identify barriers.
  - Identify NEBs that might overcome barriers and those in which benefits outweigh costs.
- Compare OEMs' feedback with REITs.
- Identify and discuss NEBs with grid operators/ IOUs.
- Prepare a *Non Energy Benefits Report* that summarizes all items analyzed in this subtask and includes an *NEB Matrix for Different Scenarios* that includes an NEB Logic Model and a Matrix for how NEB's apply.

- CPR meeting and *CPR Report #1* per Task 1.3.

Products
- Non Energy Benefits Report (Draft and Final)
- NEB Matrix for Different Scenarios (Draft and Final)
- CPR Report #1

TASK 4: DESIGN VALUE PROPOSITION FRAMEWORK
This task's goal is to identify conditions in which lighting retrofits with Auto-DR capability are cost-effective and specify a program framework that would encourage customers to implement Auto-DR enabling measures, retrofit applications, by customer, building types, and climate zones.

The program framework will be detailed in the form of a decision tree, outlining retrofit conditions across buildings, customer types, climate zone area and the instances in which they are cost-effective and viable. It will include identifying buildings, customer types and climate zone areas that provide greatest grid benefits.

For all cost-effective (or near cost-effective) buildings and customer types, the team will identify program design considerations to maximize uptake and increase adoption throughout California. The research will identify supplemental opportunities to address adoption barriers, such as supporting industry standardization of baselines, quantification of NEBs, etc.

The Recipient shall:
- Identify project conditions across building, customer types, and climate zones under which integration of DR-enabling controls is cost effective. This evaluation may include both energy and NEBs associated with Auto-DR capable lighting controls.
- Identify key adoption barriers and propose program design solutions to effectively address these barriers.
- Specify program framework based on cost-effectiveness data to highlight project conditions across building and customer types which would result in maximum impact.
- Identify NEB approach and the relative magnitude of benefit.
- Determine the magnitude of adoption based on value proposition approach for different customers.
- Prepare a *Value Proposition Framework Report* that includes all items analyzed in this subtask. The report must include an Excel Spreadsheet with all calculations and assumptions performed in the analysis, and must include overlays of matrices developed in Task 3.
- CPR meeting and *CPR Report #2* per Task 1.3

Products
- Value Proposition Framework Report
- CPR Report #2

Exhibit A
Scope of Work

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:
  - o <u>For Product Development Projects and Project Demonstrations:</u>
    - Published documents, including date, title, and periodical name.
    - Estimated or actual energy savings, energy 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. Include all calculations and assumptions used to determine 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.
    - <u>Additional Information for Product Development Projects</u>:
      - 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.
  - o <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 6: 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. LBNL shall presents results at industry conferences and through live webinars to interested parties, in addition to preparing journal articles. These will be detailed in the Technology Transfer Plan.

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 including attending industry conferences and conducting webinars. These activities will be reported in the Progress Reports.

- Develop and host a project web site for broadcast significant findings.
- When directed by the CAM, develop *Presentation Materials* for an Energy Commission-sponsored conference/workshop on the results of the project.
- Provide at least six *High Quality Digital Photographs* (minimum resolution of 1300x500 pixels in landscape ratio) of pre and post technology installation at the project sites.
- Prepare a *Technology/Knowledge Transfer Report* on technology transfer activities conducted during the project.

Products:

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

V. PROJECT SCHEDULE

Please see the attached Excel spreadsheet.

RESOLUTION NO: 16-0517-17j

STATE OF CALIFORNIA

STATE ENERGY RESOURCES
CONSERVATION AND DEVELOPMENT COMMISSION

RESOLUTION - RE: DOE-LAWRENCE BERKELEY NATIONAL LABORATORY

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

RESOLVED, that the Energy Commission approves Agreement EPC-15-051 from GFO-15-311 with the Department of Energy's Lawrence Berkeley National Laboratory for a $500,000 grant to identify, quantify and evaluate the costs and benefits of implementing demand response lighting controls as described in the California Energy Code across California's existing, non-residential building stock; and

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

CERTIFICATION

The undersigned Secretariat to the Commission does hereby certify that the foregoing is a full, true, and correct copy of a Resolution duly and regularly adopted at a meeting of the California Energy Commission held on May 17, 2016.

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

Cody Goldthrite,
Secretariat