

**GRANT REQUEST FORM (GRF)**

CEC-270 (Revised 10/2015)

CALIFORNIA ENERGY COMMISSION

New Agreement EPC-15-047 (To be completed by CGL Office)

Division	Agreement Manager:	MS-	Phone
ERDD	Jamie Patterson	43	916-327-2342

Recipient's Legal Name	Federal ID Number
SLAC National Accelerator Laboratory	94-1156365

Title of Project
Powernet - A Cloud Based Method for Managing Distribution Resources

Term and Amount	Start Date	End Date	Amount
	5/18/2016	3/29/2019	\$ 2,210,720

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

Proposed Business Meeting Date	5/17/2016	<input type="checkbox"/> Consent	<input checked="" type="checkbox"/> Discussion
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Business Meeting Presenter	Consuelo Sichon	Time Needed:	5 minutes
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Please select one list serve. EPIC (Electric Program Investment Charge)

**Agenda Item Subject and Description**

SLAC NATIONAL ACCELERATOR LABORATORY (OPERATED BY STANFORD UNIVERSITY FOR THE U.S. DEPARTMENT OF ENERGY). Proposed resolution approving agreement EPC-15-047 with SLAC National Accelerator Laboratory (operated by the Stanford University for the U.S. Department of Energy) for a \$2,210,720 grant to further develop Powernet, a cloud based method to manage energy resources in homes and businesses. This project includes a pilot test of Powernet, to automatically control and coordinate distributed energy resources both behind the meter and at the distribution system for residential and commercial ratepayers. (EPIC Funding)  
Contact: Jamie Patterson (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

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: PRC 21080.35 (Rooftop Solar Exemption)

Categorical Exemption. List CCR section number: Cal. Code Regs., tit 14, § 15301 -- Cal. Code Regs., tit 14, § 15302 -- Cal. Code Regs., tit 14, § 15303

Common Sense Exemption. 14 CCR 15061 (b) (3)  
 Explain reason why Agreement is exempt under the above section:

This project will develop and pilot test a cloud-based energy management control software to operate a new Nest thermostat along with photovoltaics, electric storage, and vehicle chargers within existing buildings. Specifically, this project involves:

- Developing software architecture for a cloud-based system and for the Hub (integration hardware for behind-the meter systems).
- Researching and designing market mechanisms to support the interactions of the cloud-based system and the Hubs.
- Developing prototypes of the Hub and laboratory testing them with the cloud-based system.
- Installing commercially available roof-top solar photovoltaic panels, an electric vehicle charger, a storage battery, and small measuring equipment in 20 existing U.S. Navy-operated residential homes in Monterey California. The electrical vehicle charger and storage battery will be placed in existing, attached garages of the residences. The storage battery is a wall-mounted, rechargeable lithium ion battery with liquid thermal control. The battery has a 6.4 kWh capacity and measures about 51 inches by 34 inches by 7 inches. The roof-top solar photovoltaic panels will have a capacity of about 1 kW.

The installation of the solar photovoltaic panels on the residential rooftops is statutorily exempt under Public Resources Code 21080.35. The installations are on the roofs of existing buildings. The associated equipment with the solar panels takes up less than 500 square feet of ground surface and will be located on the same or immediately adjacent parcel as the solar panels. The installation of the solar panels does not require any of the permits listed in Public Resources Code 21080.35(d).

The needed minor electrical conveyance work for each residence meets the categorical exemption under 14 CCR 15302. Each residence already contains electrical conveyances that may have to be upgraded or replaced to accommodate the items being installed.

This project meets the categorical exemptions under 14 CCR sections 15301 and 15303. The small new equipment being installed only consists of minor alterations to existing residences, and there is no expansion of use. The electricity generated by the solar panels and stored in the battery will offset on-site use of the inhabitants. Likewise, the electric vehicle charger installed in the garage is for use by the inhabitants and not a publically accessible charger.

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

- Check all that apply
- |   |   |
|---|---|
| <input type="checkbox"/> Initial Study                  | <input type="checkbox"/> Environmental Impact Report            |
| <input type="checkbox"/> Negative Declaration           | <input type="checkbox"/> Statement of Overriding Considerations |
| <input type="checkbox"/> Mitigated Negative Declaration |   |

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

Legal Company Name:	Budget
	\$
	\$

# GRANT REQUEST FORM (GRF)



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

Legal Company Name:

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\_\_\_\_\_

Budget Information			
Funding Source	Funding Year of Appropriation	Budget List No.	Amount
EPIC	14-15	301.001B	\$2,210,720
			\$
			\$
			\$
R&D Program Area:	ESRO: ETSI	TOTAL:	\$2,210,720
Explanation for "Other" selection			
Reimbursement Contract #:		Federal Agreement #:	

Recipient's Administrator/ Officer		Recipient's Project Manager	
Name:	Cathie Montanez	Name:	Sila Kiliccote
Address:	2575 Sand Hill Rd	Address:	2575 Sand Hill Rd
City, State, Zip:	Menlo Park, CA 94025-7015	City, State, Zip:	Menlo Park, CA 94025-7015
Phone:	650-926-8768 / Fax: - -	Phone:	510-384-1635 / Fax: - -
E-Mail:	cathiem@slac.stanford.edu	E-Mail:	silak@slac.stanford.edu

**Selection Process Used**

Competitive Solicitation      Solicitation #: GFO-15-313

First Come First Served Solicitation

**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	<input type="checkbox"/> Attached
5. CEQA Documentation	<input type="checkbox"/> N/A	<input checked="" 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		EVALUATION OF PROJECT BENEFITS
3		TECHNOLOGY/KNOWLEDGE TRANSFER ACTIVITIES
4	X	DESIGN OF ARCHITECTURE AND SYSTEMS INTEGRATION
5	X	DESIGN AND SIMULATION OF A MARKET MECHANISM
6		IMPLEMENTATION AND OPERATION OF A SAMPLE DESIGN
7		IMPLEMENTATION AND OPERATION AT MULTIPLE SITES
8		EVALUATION OF DEMONSTRATION

#### B. Acronym/Term List

Acronym/Term	Meaning
CAM	Commission Agreement Manager
CAO	Commission Agreement Officer
CPR	Critical Project Review
DER	Distributed Energy Resources
Energy Commission	California Energy Commission
Hub	This is the proposed integration hardware for behind-the-meter systems.
Powernet	The proposed use of information technology for power system reliability and stability
PV	Photovoltaic
TAC	Technical Advisory Committee

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<sup>1</sup> Indicate an "X" in CPR column corresponding to the Task in which the CPR Meeting will occur. Please see Subtask 1.3 in Part III of the Scope of Work (General Project Tasks) for a description of Critical Project Review (CPR) Meetings.

## **EXHIBIT A**

### **Scope of Work**

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

##### **A. Purpose of Agreement**

The purpose of this Agreement is to fund the development of Powernet, an end-to-end open source technology for efficient, scalable and secure coordination of grid resources. It offers integrated hardware and software solutions that are divided between local embedded sensing, computing and control that are networked with cloud-based high-level coordination for real-time optimal operations of not only centralized but also millions of distributed resources of various types.

##### **B. Problem/Solution Statement**

###### **Problem**

The 21st century grid needs to accommodate: large penetrations of distributed intermittent generation (solar photovoltaic (PV) & wind) and storage, two-way power flows; and integration of sensing, communication, computing and control of load, generation, and storage. There is an urgent need to coordinate these distributed resources to (i) minimize costs, (ii) increase consumer quality of service, (iii) preserve stability and (iv) offer services to the grid in an economically sustainable way.

###### **Solution**

This project will develop Powernet, a platform for real-time control of net loads relying on Distributed Energy Resources (DER). Powernet is built on the principle of connecting information networks to the power network. A Hub aggregates resources behind-the meter and connects them to a cloud coordinator. The cloud coordinator optimizes power set points for each Hub to minimize cost while increasing consumer quality of service. Powernet is adaptable and robust while implementing efficient power sharing in the network. Powernet provides the platform to utilize net load control to provide grid services in a cost effective manner. Powernet enabled buildings are able to simultaneously enjoy the benefits of dynamic pricing optimization, and revenues from grid services on the assets they choose to share. Powernet is open-source and open-design to encourage adoption and standardization.

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

###### **Agreement Goals**

The goals of this Agreement are to:

- enable penetration of local distributed resources while minimizing the cost and address security and economical scalability challenges;
- develop cloud-based DER management systems and consider their integration with legacy systems for monitoring and controls for all functions within energy-smart communities including smart inverters and smart meter functions to handle renewable intermittency issues; and
- develop low cost plug and play integration platforms for DERs.

## **EXHIBIT A**

### **Scope of Work**

Ratepayer Benefits:<sup>2</sup> This Agreement will result in the ratepayer benefits of greater electricity reliability, lower costs, or increased safety by providing:

- (1) Cost effective power management among individual homes.
- (2) Failsafe operation capability to support ad-hoc connectivity.
- (3) Distributed intelligence to automatically and dynamically balance loads in real-time.
- (4) Ultra-safe and enables plug and play for loads, distributed generators and storage.
- (5) Backward compatible with the legacy grid.
- (6) Bottom up security for control, optimization and communications.
- (7) Scalability from kW to GW so that the infrastructure can grow with individual needs and geographic expansion.
- (8) Support of transparent aggregate services to the grid (e.g. regulation).
- (9) Quality of service guarantees and fairness to consumers.
- (10) Economic viability.

Technological Advancement and Breakthroughs:<sup>3</sup> This Agreement will lead to technological advancement and breakthroughs to overcome barriers to the achievement of the State of California's statutory energy goals by (i) the integration of control, optimization and power electronics that enables novel functionality – stable connect/disconnect from the grid, local and global power sharing and grid services; (ii) the layered structure of the system, which enables the operator to utilize Powernet for a variety of different grid purposes or service offerings with the assurance that those are always done on top of an economically optimal operating point every second; (iii) a robust and securely designed system ; and (iv) adoption of open source standards and establishing an open protocol, for the platform that enables scalable engagement of devices in the future.

#### **Agreement Objectives**

The objectives of this Agreement are to:

- enable penetration of 50% or higher of intermittent renewables while minimizing the cost and addressing security and economical scalability challenges;
- develop cloud-based DER management systems and consider their integration with legacy system for monitoring and controls for all functions within energy-smart communities including smart inverters and smart meter functions to handle renewable intermittency issues; and
- develop low cost plug and play integration platform for DERs residential and/or small commercial buildings.

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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> 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

### 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.

## **EXHIBIT A**

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

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

#### **MEETINGS**

##### **Subtask 1.2 Kick-Off Meeting**

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

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

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

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

- Terms and Conditions of the Agreement;
- Administrative Products (Subtask 1.1);
- CPR Meeting(s) (Subtask 1.3);
- Match fund documentation (Subtask 1.7);

## **EXHIBIT A**

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- 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

## **EXHIBIT A**

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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.

## EXHIBIT A Scope of Work

### 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.

### Recipient 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.

## EXHIBIT A Scope of Work

### The Recipient shall:

- Submit a monthly *Progress Report* to the CAM. Each progress report must:
  - Summarize all Agreement activities conducted by the Recipient for the preceding month, including an assessment of the ability to complete the Agreement within the current budget and any anticipated cost overruns. See the Progress Report Format Attachment for the recommended specifications.
  - Provide a synopsis of the project progress, including accomplishments, problems, milestones, Products, schedule, fiscal status, and any evidence of progress such as photographs.
- Submit a monthly or quarterly *Invoice* that follows the instructions in the “Payment of Funds” section of the terms and conditions, 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 and approve the Final Report, which will be due at least **two months** before the Agreement end date. When creating the Final Report Outline and the Final Report, the Recipient must use a Style Manual provided by the CAM.

#### Subtask 1.6.1 Final Report Outline

##### The Recipient shall:

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

##### Recipient Products:

- Final Report Outline (draft and final)

##### CAM Products:

- Style Manual
- Written Comments on Draft Final Report Outline
- Approval of Final Report Outline

#### Subtask 1.6.2 Final Report

##### The Recipient shall:

- Prepare a *Final Report* for this Agreement in accordance with the approved Final Report Outline, 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**)

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### **Scope of Work**

- Credits page on the reverse side of cover page 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 applicable)
- 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, recommendation 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)

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- 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 upon receipt of additional match funds.

## EXHIBIT A Scope of Work

- 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 five 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*)

## **EXHIBIT A**

### **Scope of Work**

#### **Subtask 1.9 Subcontracts**

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

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

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

#### **Products:**

- Subcontracts (draft if required by the CAM)

### ***TECHNICAL ADVISORY COMMITTEE***

#### **Subtask 1.10 Technical Advisory Committee (TAC)**

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

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

## **EXHIBIT A**

### **Scope of Work**

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.
- 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.

## **EXHIBIT A**

### **Scope of Work**

- 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

#### **TASK 2 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 as copyrights and license agreements.

## **EXHIBIT A**

### **Scope of Work**

- Units sold or projected to be sold in California and outside of California.
- Total annual sales or projected annual sales (in dollars) of products developed under the Agreement.
- Investment dollars/follow-on private funding as a result of Energy Commission funding.
- Patent numbers and applications, along with dates and brief descriptions.
- Additional Information for Product Demonstrations:
  - Outcome of demonstrations and status of technology.
  - Number of similar installations.
  - Jobs created/retained as a result of the Agreement.
- For Information/Tools and Other Research Studies:
  - Outcome of project.
  - Published documents, including date, title, and periodical name.
  - A discussion of policy development. State if the project has been cited in government policy publications or technical journals, or has been used to inform regulatory bodies.
  - The number of website downloads.
    - An estimate of how the project information has affected energy use and cost, or have resulted in other non-energy benefits.
  - An estimate of energy and non-energy benefits.
  - Data on potential job creation, market potential, economic development, and increased state revenue as a result of project.
  - A discussion of project product downloads from websites, and publications in technical journals.
  - A comparison of project expectations and performance. Discuss whether the goals and objectives of the Agreement have been met and what improvements are needed, if any.
- Respond to CAM questions regarding responses to the questionnaires.

The Energy Commission may send the Recipient similar questionnaires after the Agreement term ends. Responses to these questionnaires will be voluntary.

#### **Products:**

- Kick-Off Meeting Benefits Questionnaire
- Mid-Term Benefits Questionnaire
- Final Meeting Benefits Questionnaire

### **TASK 3 TECHNOLOGY/KNOWLEDGE TRANSFER ACTIVITIES**

The goal of this task is to develop a plan to make the knowledge gained, experimental results, and lessons learned available to the public and key decision makers.

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

- Prepare an *Initial Fact Sheet* at start of the project that describes the project. Use the format provided by the CAM.

## EXHIBIT A Scope of Work

- Prepare a *Final Project Fact Sheet* at the project's conclusion that discusses results. Use the format provided by the CAM.
- Prepare a *Technology/Knowledge Transfer Plan* that includes:
  - An explanation of how the knowledge gained from the project will be made available to the public, including the targeted market sector and potential outreach to end users, utilities, regulatory agencies, and others.
    - A description of the intended use(s) for and users of the project results.
    - Published documents, including date, title, and periodical name.
    - Copies of documents, fact sheets, journal articles, press releases, and other documents prepared for public dissemination. These documents must include the Legal Notice required in the terms and conditions. Indicate where and when the documents were disseminated.
    - A discussion of policy development. State if project has been or will be cited in government policy publications, or used to inform regulatory bodies.
    - The number of website downloads or public requests for project results.
    - Additional areas as determined by the CAM.
- Conduct technology transfer activities in accordance with the Technology/Knowledge Transfer Plan. These activities will be reported in the Progress Reports.
- When directed by the CAM, develop *Presentation Materials* for an Energy Commission- sponsored conference/workshop on the results of the project.
- Provide at least six *High-Quality Digital Photographs* (minimum resolution of 1300x500 pixels in landscape ratio) of pre- and post-technology installation at the project sites or related project photographs.
- Prepare a *Technology/Knowledge Transfer Report* on technology transfer activities conducted during the project.

### **Products:**

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

## EXHIBIT A Scope of Work

### IV. TECHNICAL TASKS

#### **TASK 4 DESIGN OF ARCHITECTURE AND SYSTEMS INTEGRATION**

The goal of this task is to focus on building the software architecture for the Cloud Coordinator (to provide Cloud services) and the Hub.

**The Recipient shall:**

- Investigate and design appropriate architectures for a scalable and useful system.
- Investigate and design the functions for the Hub.
- Explore the cloud-based system architectures and design the cloud-based system.
- Provide an *Investigation Findings Report* that includes but is not limited, to literature search, expert interviews, industry and utility discussions.
- Provide a *CPR Report for Task 4* per task 1.3 and participate in a CPR meeting per Subtask 1.3.

**Product:**

- Investigation Findings Report (draft and final)
- CPR Report for Task 4

#### **TASK 5 DESIGN AND SIMULATION OF A MARKET MECHANISM**

The goal of this task is to design a market mechanism that supports the interactions of the Hubs with each other and with the Cloud Coordinator. This activity includes, but is not limited to, defining the services DERs can deliver or use discussions underway through California Electricity Rule 21, and understanding how to quantify these services from a utility and independent system operator perspective and then developing a market simulation capability to simulate the impact of the markets on the power systems reliability and stability.

**The Recipient shall:**

- Conduct interviews with the utility and independent system operator planners and operators to develop a quantification mechanism for the services available through the resources.
- Develop the concept of resource service value quantification into a full market mechanism.
- Develop a simulator for this new market mechanism and extend the existing GridSpice framework to incorporate this new market.
- Run co-simulations to quantify the resource value and the impact of markets on the stability and reliability of electricity.
- Provide a *Development and Simulation Summary* report or peer reviewed paper summarizing the efforts as well as preliminary results from the simulations.
- Provide a *CPR Report for Task 5* per task 1.3 and participate in a CPR meeting per Subtask 1.3.

**Products:**

- Development and Simulation Summary (draft and final)
- CPR Report for Task 5

## **EXHIBIT A**

### **Scope of Work**

#### **TASK 6 IMPLEMENTATION AND OPERATION OF A SAMPLE DESIGN**

The goals of this task are to implement and operate the Hub and Cloud Coordinator concepts.

**The Recipient shall:**

- Develop several prototypes of the Hub and install them with a variety of DERs at the laboratory location at SLAC.
- Develop a cloud coordinator and show connectivity among Hubs.
- Develop user interfaces and visualization capabilities for monitoring and controls.
- Determine the latencies of communications and controls actions and simulate their impact on system stability.
- Provide a *Preliminary Results Summary* report.

**Products:**

- Preliminary Results Summary (draft and final).

#### **TASK 7 IMPLEMENTATION AND OPERATION AT MULTIPLE SITES**

The goal of this task is to take the proof-of-concept systems from the laboratory environment to the field.

**The Recipient shall:**

- Verify and set up sites to implement the Hub and cloud coordinator.
- Instrument the sites with existing technologies, such as thermostats, PV systems, electric vehicle charging stations and storage devices, as well as the newly developed technologies such as the Hub and establish connectivity among these systems.
- Connect the Hubs via the cloud coordinator component. Recipient will provide aggregated access to the facilities operators and to the utility.
- Operate the systems within the demonstrated sites for at least 8 hours a day for 2 months unless a shorter period of time is approved in writing by the CAM.
- Provide a *Preliminary Findings Summary* report on the summary of preliminary findings from implementation and operation.

**Products:**

- Preliminary Findings Summary (draft and final)

#### **TASK 8 EVALUATION OF DEMONSTRATION**

The goal of this task is to evaluate the demonstration within a market context.

**The Recipient shall:**

- Iterate and refine the implementation at the facilities.
- Evaluate the system for feasibility of adoption from the facility owner/operator perspective as well as the utility's perspective.
- Hold discussions with stakeholders, share findings, and obtain their evaluations.
- Provide a *Final Performance and Stakeholder Evaluations Summary* report summarizing the stakeholder discussions

## **EXHIBIT A**

### **Scope of Work**

#### **Products:**

- Final Performance and Stakeholder Evaluations Summary (draft and final)

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

Please see the attached Excel spreadsheet.

STATE OF CALIFORNIA

STATE ENERGY RESOURCES  
CONSERVATION AND DEVELOPMENT COMMISSION

RESOLUTION - RE: DOE-SLAC NATIONAL ACCELERATOR 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-15-047 from GFO-15-313 with the Department of Energy's SLAC National Accelerator Laboratory (operated by Stanford University) for a \$2,210,720 grant to further develop Powernet, a cloud-based method to manage energy resources in homes and businesses. This project includes a pilot test of Powernet to automatically control and coordinate distributed energy resources behind the meter for residential ratepayers; 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]

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Cody Goldthrite,  
Secretariat