STATE OF CALIFORNIA

GRANT REQUEST FORM (GRF)

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

New Agreement EPC-15-044- (To be completed by CGL Office)

Division	Agreement Manager:	MS-	Phone
ERDD	Kiel Pratt	43	916-327-1412

Recipient's Legal Name	Federal ID Number
Electric Power Research Institute, Inc.	23-7175375

Title of Project
Certified Open-Source Software to Support the Interconnection Compliance of Distributed Energy Resources

Term and Amount	Start Date	End Date	Amount
	5/18/2016	3/29/2019	$ 816,539

Business Meeting Information			
☐ ARFVTP agreements under $75K delegated to Executive Director.			
Proposed Business Meeting Date	5/11/2016	☐ Consent	☒ Discussion
Business Meeting Presenter	Consuelo Sichon	Time Needed:	5 minutes
Please select one list serve. EPIC (Electric Program Investment Charge)			

Agenda Item Subject and Description

ELECTRIC POWER RESEARCH INSTITUTE, INC. Proposed resolution approving Agreement EPC-15-044 with Electric Power Research Institute, Inc. for a $816,539 grant to develop and demonstrate open-source communication software for distributed energy resources, and to develop certification test procedures for interconnection compliance.

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 this project will develop an open-source software and perform associated test procedures. These activities consist of software development and laboratory-based testing of software communication protocols.
2. If Agreement is considered a "Project" under CEQA:
   ☐ a) Agreement **IS** exempt. (Attach draft NOE)
   - ☐ Statutory Exemption. List PRC and/or CCR section number: ____
   - ☐ Categorical Exemption. List CCR section number: ____
   - ☐ Common Sense Exemption. 14 CCR 15061 (b) (3)

   Explain reason why Agreement is exempt under the above section:

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

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

Legal Company Name:	Budget
SunSpec Alliance	$ 99,916
Xanthus Consulting International, Inc.	$ 60,000
Enphase Energy, Inc.	$ 94,000
QualityLogic, Inc.	$ 97,403
To Be Determined	$ 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	$816,539
				$
R&D Program Area:	ESRO: ETSI		TOTAL:	$816,539
Explanation for "Other" selection				
Reimbursement Contract #:			Federal Agreement #:	

Recipient's Administrator/ Officer		**Recipient's Project Manager**	
Name:	David Morrison	Name:	Sunil Chhaya
Address:	942 Corridor Park Blvd	Address:	3420 Hillview Ave
City, State, Zip:	Knoxville, TN 37932-3723	City, State, Zip:	Palo Alto, CA 94304-1355
Phone:	865-218-8104 / Fax: - -	Phone:	650-855-2148 / Fax: - -
E-Mail:	DMorrison@epri.com	E-Mail:	schhaya@epri.com

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			☒ 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		GENERAL PROJECT TASKS
2		EVALUATION OF PROJECT BENEFITS
3		TECHNOLOGY/KNOWLEDGE TRANSFER ACTIVITIES
4		REQUIREMENTS DETERMINATION
5	X	DEVELOP CLIENT SPECIFICATION
6		DEVELOP OPEN-SOURCE IEEE 2030.5 SOFTWARE
7		DEVELOP COMPLIANCE TEST PROCEDURE
8		IMPLEMENT COMPLIANCE SOFTWARE AND PERFORM CERTIFICATION
9		INTEGRATE OPEN CLIENT INTO COMMERCIAL SYSTEM

B. Acronym/Term List

Acronym/Term	Meaning
CAM	Commission Agreement Manager
CAO	Commission Agreement Officer
CPR	Critical Project Review
CSIP	California Smart Inverter Profile
DER	Distributed Energy Resources
Energy Commission	California Energy Commission
IEEE	Institute of Electrical and Electronics Engineers
PV	Solar Photovoltaic
Rule 21	Electric Rule 21 is a tariff that describes the interconnection, operating and metering requirements for generation facilities to be connected to a utility's distribution system, over which the California Public Utilities Commission has jurisdiction.
TAC	Technical Advisory Committee
VAR	Volt-Amperes Reactive, i.e. Reactive Power

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 free, open-source software to support the interconnection compliance of distributed energy resources (DER). The software will handle communications between the end-user and the grid, will be freely accessible by any company or facility, and can be integrated into any end-device or DER aggregator system. Specifically, the project will develop a

[1] 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.

communication software client to enable DER to easily conform to the Institute of Electrical and Electronics Engineers (IEEE) 2030.5, a protocol specified by the California Public Utility Commission's Electric Rule 21 for grid interconnection. In addition, this project will develop a compliance test procedure for this communication protocol and will apply it to a commercial system to test.

B. Problem/Solution Statement

<u>The Problem</u>
To achieve California's statutory goals for renewable energy, it will be necessary for solar photovoltaic (PV) systems to have smart inverter functionality. But smart inverter functionality requires communication interfaces, and these interfaces must be interoperable from the many end-device manufacturers and aggregators to the investor owned utilities.

California, through the revision process of Rule 21, has recently identified the IEEE 2030.5 protocol in an effort to address this need. This protocol is new, and in particular, its application to support DER as recommended in Rule 21 is new. Without consistent communication software and established compliance test procedures, complex protocols like IEEE 2030.5 will not result in interoperability in the marketplace. Instead, subtle differences in interpretation of the standards and slight differences in implementation of the protocols will prevent systems from working together.

<u>The Proposed Solution</u>
This project will address this problem by providing a free, open-source IEEE 2030.5 client software. "Open-source" means that the actual lines of the software code, not just the executable software, will be provided. The client software, which handles the communications, can then be freely accessed by any company and integrated into any end-device or DER aggregator system. The result is an exact, secure, and consistent handling of communication in each instance.

In the process of development, the project team will clarify the proper usage of the protocol while working together with the investor-owned utilities, and will establish a compliance test procedure that reflects this usage. The communication compliance test can then be applied to any product or system to be used in California to ensure interoperability.

C. Goals and Objectives of the Agreement

<u>Agreement Goals</u>
The goals of this Agreement are to:
- Develop and provide free, open-source client software for the IEEE 2030.5 communication protocol that supports the requirements of Rule 21.
- Develop and demonstrate a compliance test procedure for the IEEE 2030.5 communication protocol that validates Rule 21 compatibility of DER and DER aggregators systems with utilities.

Ratepayer Benefits:[2] This Agreement will result in the ratepayer benefit of lower costs by:

1. Enabling more ratepayers to own and operate more distributed generation and storage. This is made possible by the effectiveness of the DER to be successfully integrated with advanced distribution control systems, receiving commands and providing status information that enables the grid to accommodate more DER. Enabling this broad DER adoption requires a uniform, simple and cost-effective method for end-user equipment to conform to the applicable communications protocol. The software to be developed in this project will provide such a method.
2. Ensuring ratepayer opportunity to participate in markets for grid-supportive services. Distributed generation and storage systems have long service lives and with compatible communication interfaces are enabled to take advantage of opportunities to provide support to the grid, such as volt-VAR service, dynamic reactive current services, phase balancing services, and others.
3. Reducing utility cost of system integration by making end-devices and third-party aggregator systems simpler to communicate with and integrate.

Technological Advancement and Breakthroughs:[3] This Agreement will lead to technological advancement and breakthroughs to overcome barriers to the achievement of the State of California's statutory energy goals by providing ready-to-use open-source code for IEEE 2030.5 - a communication protocol that is complex and difficult to implement. This code will be available to all equipment and software providers and will help them to bring products to market more quickly, with greater interoperability, and with less expense. Without funding, market competitors are not inclined to provide open-source code and without a broad national demand for IEEE 2030.5, certification and compliance test has not been made available.

Agreement Objectives

The objectives of this Agreement are to:

- Support 100% of the DER control and monitoring functionalities specified in revised Rule 21, Phase 2. The resulting open-source communication software will be tested and evaluated in terms of the functional coverage.
- Prove the sufficiency of the IEEE 2030.5 for communication from utilities to both individual DER and DER aggregators.

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[2] California Public Resources Code, Section 25711.5(a) requires projects funded by the Electric Program Investment Charge (EPIC) to result in ratepayer benefits. The California Public Utilities Commission, which established the EPIC in 2011, defines ratepayer benefits as greater reliability, lower costs, and increased safety (See CPUC "Phase 2" Decision 12-05-037 at page 19, May 24, 2012, http://docs.cpuc.ca.gov/PublishedDocs/WORD_PDF/FINAL_DECISION/167664.PDF).

[3] California Public Resources Code, Section 25711.5(a) also requires EPIC-funded projects to lead to technological advancement and breakthroughs to overcome barriers that prevent the achievement of the state's statutory and energy goals.

- Produce a consensus compliance test procedure and associated certification process, culminating with an available Nationally Recognized Testing Laboratory to support product manufacturers serving California.

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:

<u>For Products that require a draft version, including the Final Report Outline and Final Report:</u>

- 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.

<u>For Products that require a final version only</u>

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

<u>For all Products</u>

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

  <u>Instructions for Submitting Electronic Files and Developing Software</u>:

  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.

- o Text documents will be in MS Word file format, version 2007 or later.
- o Documents intended for public distribution will be in PDF file format. The Recipient must also provide the native Microsoft file format.
- o 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:

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

  - o Terms and Conditions of the Agreement;
  - o Administrative Products (Subtask 1.1);
  - o CPR Meeting(s) (Subtask 1.3);

- o Match fund documentation (Subtask 1.7);
- o Permit documentation (Subtask 1.8);
- o Subcontracts (Subtask 1.9); and
- o Any other relevant topics.

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

- o The CAM's expectations for accomplishing tasks described in the Scope of Work;
- o An updated Project Schedule;
- o Technical Products (Subtask 1.1);
- o Progress Reports and Invoices (Subtask 1.5);
- o Final Report (Subtask 1.6);
- o Technical Advisory Committee Meetings (Subtasks 1.10 and 1.11); and
- o 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.

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.

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**)

        - 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, 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 <u>no match funds</u> 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.
- Provide a *Match Funds Reduction Notification Letter* to the CAM if existing match funds are reduced during the course of the Agreement. Reduction of match funds may trigger a CPR Meeting.

Products:

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

Subtask 1.8 Permits

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

The Recipient shall:

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

  The list of permits and the schedule for obtaining them will be discussed at the Kick-off meeting (Subtask 1.2), and a timetable for submitting the updated list, schedule, and copies of the permits will be developed. The impact on the project if the permits are not obtained in a timely fashion or are denied will also be discussed. If applicable, permits will be included as a line item in progress reports and will be a topic at CPR meetings.
- If during the course of the Agreement additional permits become necessary, then provide the CAM with an *Updated List of Permits* (including the appropriate information on each permit) and an *Updated Schedule for Acquiring Permits*.
- Send the CAM a *Copy of Each Approved Permit*.
- If during the course of the Agreement permits are not obtained on time or are denied, notify the CAM within 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)

Subtask 1.9 Subcontracts

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

The Recipient shall:

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

Products:

- Subcontracts (draft if required by the CAM)

TECHNICAL ADVISORY COMMITTEE

Subtask 1.10 Technical Advisory Committee (TAC)

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

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

- Evaluate the tangible benefits of the project to the state of California, and provide recommendations as needed to enhance the benefits.
- Provide recommendations regarding information dissemination, market pathways, or commercialization strategies relevant to the project Products.

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

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

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

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

Subtask 1.11 TAC Meetings
The goal of this subtask is for the TAC to provide strategic guidance for the project by participating in regular meetings, which may be held via teleconference.

The Recipient shall:

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

Products:

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

IV. TECHNICAL TASKS

TASK 2: EVALUATION OF PROJECT BENEFITS

The goals of this task are to determine and report the benefits resulting from the software developed pursuant to 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 For Product Development Projects and Project Demonstrations:
    - ▪ Published documents, including date, title, and periodical name.
    - ▪ Estimated or actual energy and cost savings, and estimated statewide energy savings once market potential has been realized. Identify all assumptions used in the estimates.
    - ▪ Greenhouse gas and criteria emissions reductions.
    - ▪ Other non-energy benefits such as reliability, public safety, lower operational cost, environmental improvement, indoor environmental quality, and societal benefits.
    - ▪ Data on potential job creation, market potential, economic development, and increased state revenue as a result of the project.
    - ▪ A discussion of project product downloads from websites, and publications in technical journals.
    - ▪ A comparison of project expectations and performance. Discuss whether the goals and objectives of the Agreement have been met and what improvements are needed, if any.
    - ▪ Additional Information for Product Development Projects:
      - Outcome of product development efforts, such copyrights and license agreements.
      - Units sold or projected to be sold in California and outside of California.
      - Total annual sales or projected annual sales (in dollars) of products developed under the Agreement.
      - Investment dollars/follow-on private funding as a result of Energy Commission funding.
      - Patent numbers and applications, along with dates and brief descriptions.
    - ▪ Additional Information for Product Demonstrations:
      - Outcome of demonstrations and status of technology.
      - Number of similar installations.
      - 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 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 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.

- 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.
- Prepare a *Final Project Fact Shee*t 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)

TASK 4: REQUIREMENTS DETERMINATION

The goal of this task is to comprehensively identify the set of functional and performance requirements for the communication interface between utilities and DER (both individual and aggregators) in California. This is to ensure that the deliverables produced in subsequent steps serve California's needs.

The Recipient shall:

- Review the current working version of the Rule 21 and develop a *Report on Communication Requirements to Support Rule 21*.
- In close coordination with the California IOUs, assess the IEEE 2030.5 in terms of its sufficiency and gaps to support California's requirements for smart DER devices and DER aggregators. This includes a review of the "California Smart Inverter Profile" , and agreement on the preferred way to apply IEEE 2030.5 to serve each requirement.
- Perform gap assessment and contribute findings to IEEE 2030.5 in the form of a *Report on Required Enhancements to IEEE 2030.5*.

Products:

- Report on Communication Requirements to Support Rule 21
- Report on Required Enhancements to IEEE 2030.5

TASK 5: DEVELOP CLIENT SPECIFICATION

The goal of this task is to develop a written software specification to guide the development of the IEEE 2030.5 client software that will be produced in the following task.

The Recipient shall:

- Facilitate a series of meetings with the California investor-owned utilities to determine consensus requirements.
- Document the resulting programming language, architecture, application programming interface, functional scope and performance requirements of the open client. These will be captured in a *Report on IEEE 2030.5 Client Specifications for DER*.
- Prepare a *CPR Report* and participate in a CPR meeting per subtask 1.3

Products:

- Report on IEEE 2030.5 Client Specifications for DER
- CPR Report

TASK 6: DEVELOP Open-source IEEE 2030.5 Software

The goal of this task is to produce the open-source IEEE 2030.5 communication protocol software based on the consensus specification developed in Task 5.

The Recipient shall:

- Develop the communication protocol software.
- Perform unit / software quality assurance testing on the software. This is not the same as the certification testing of Tasks 7 and 8, but rather common quality assurance checking of the code quality and stability.
- After compliance testing per Task 7, post the executable software, plus source code with inline comments, for public consumption (e.g. SourceForge or another platform as determined by the CAM).
- Create a *Report on Development and Availability of Open-Source IEEE 2030.5 Client Software for DER* that describes the purpose of the software tool and provides user instructions.

Products:

- Report on Development and Availability of Open-Source IEEE 2030.5 Client Software for DER

TASK 7: DEVELOP COMPLIANCE TEST PROCEDURE

The goal of this task is to produce a compliance test procedure by which any IEEE 2030.5 client software implemented by a software developer or commercial enterprise (e.g. the communication interface to a solar PV plant or solar aggregator) can be certified.

The Recipient shall:

- Develop a *Protocol Implementation Conformance Statement* that sets forth the specific communication protocol features and options needed to meet California's Rule 21 Phase 1 and Phase 2 requirements.
- Develop a specific test procedure for compliance testing, including the command sequence and test environment requirements, including for aggregated DERs.
- Develop product certification criteria: certification issuance, revocation, and security procedures; and develop certificate archiving processes.
- Document Task 7 activities in a *Report on DER Compliance Test Procedure for IEEE 2030.5*.

Products:

- Protocol Implementation Conformance Statement
- Report on DER Compliance Test Procedure for IEEE 2030.5

TASK 8: IMPLEMENT COMPLIANCE SOFTWARE AND PERFORM CERTIFICATION

The goal of this task is to make communication compliance testing software available that supports California's Rule 21 DER requirements, and to certify the open IEEE 2030.5 communication software to ensure that it meets all requirements, including for aggregated DERs.

The Recipient shall:

- Develop test software that carries out the test procedure developed in Task 7.
- Create a *Compliance Test Plan*.
- Use the test software to carry out compliance testing of the IEEE 2030.5 client software developed in Task 6. This will be done prior to open-source release to ensure the quality of what will be posted.
- Document the testing and the availability of compliance testing in a *Report on Compliance Test Results and Compliance Testing Availability*.

Products:

- Compliance Test Plan
- Report on Compliance Test Results and Compliance Testing Availability

TASK 9: Integrate Open Client into Commercial System

The goal of this task is to prove that mass-market commercial products and systems that meet California requirements can be successfully built using the open-source IEEE 2030.5 communication client developed in Task 6.

The Recipient shall:

- Enhance a commercial DER aggregator system to support the Rule 21 communication requirements, utilizing the open-source communication client software from Task 6.
- Develop a *Field Test Plan* to assess the performance of the commercial system interfacing with IEEE 2030.5 servers, such as those used by the California IOUs.
- Conduct field testing and document the *Field Test Results*.

Products:

- Field Test Plan
- Field Test Results

V. PROJECT SCHEDULE

Please see the attached Excel spreadsheet.

RESOLUTION NO: 16-0517-19a

STATE OF CALIFORNIA

STATE ENERGY RESOURCES
CONSERVATION AND DEVELOPMENT COMMISSION

RESOLUTION - RE: ELECTRIC POWER RESEARCH INSTITUTE, INC.

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

RESOLVED, that the Energy Commission approves Agreement EPC-15-044 from GFO-15-313 with Electric Power Research Institute, Inc. for a $816,539 grant to develop and demonstrate open-source communication software for distributed energy resources, and to develop certification test procedures for interconnection compliance; 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