STATE OF CALIFORNIA

GRANT REQUEST FORM (GRF)

CEC-270 (Revised 02/13)

CALIFORNIA ENERGY COMMISSION

New Agreement EPC-14-039 (To be completed by CGL Office)

Division	Agreement Manager:	MS-	Phone
ERDD	Pam Doughman	51	916-445-5297

Recipient's Legal Name	Federal ID Number
TRC Engineers, Inc.	33-0648915

Title of Project
Cultural Factors in the Energy Use Patterns of Multifamily Tenants

Term and Amount	Start Date	End Date	Amount
	5/8/2015	12/22/2017	$ 379,019

Business Meeting Information

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

Proposed Business Meeting Date	4/8/2015	☐ Consent	☒ Discussion
Business Meeting Presenter	Pam Doughman	Time Needed:	5 minutes

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

Agenda Item Subject and Description

Proposed resolution approving Agreement EPC-14-039 with TRC Engineers, Inc. for a $379,019 grant to study cultural and demographic factors that correlate with multifamily tenants' electric energy use patterns, before and after energy efficiency upgrades and how cultural factors influence tenant interest in consumer level technologies that can reduce electricity use, especially for lighting and plug loads. (EPIC Funding) Contact: Pam Doughman (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 the proposed work consists only of data collection (surveys, focus groups, and interviews of multifamily building occupants) regarding energy usage; creation of a lending library of consumer energy efficiency measures; and allowing building occupants to try consumer energy efficiency products. Data collection will result in a paper study of ethnographic research and data analysis on sociocultural factors related to energy efficiency measure adoption. The proposed work will not involve any construction nor will it require any permit or license.

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
Ghoulem Research	$ 76,500
	$

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	13-14	301.001A	$379,019
			$
R&D Program Area: EDMFO: EDMF		TOTAL:	$379,019
Explanation for "Other" selection			
Reimbursement Contract #:		Federal Agreement #:	

Recipient's Administrator/ Officer		Recipient's Project Manager	
Name:	Abhijeet Pande	Name:	Scott Kessler
Address:	436 14TH ST STE 1020	Address:	436 14TH ST STE 1020
City, State, Zip:	OAKLAND, CA 94612-2724	City, State, Zip:	OAKLAND, CA 94612-2724
Phone:	916-844-0150 / Fax: - -	Phone:	916-844-0148 / Fax: - -
E-Mail:	APande@trcsolutions.com	E-Mail:	SKessler@trcsolutions.com

Selection Process Used

☒ Competitive Solicitation Solicitation #: PON-14-306

☐ 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

A. Task List

Task #	CPR[1]	Task Name
1		General Project Tasks
2	X	Research Plan
3	X	Recruitment and Project Launch
4	X	Data Collection and Analysis
5		Evaluation of Project Benefits
6		Technology/Knowledge Transfer Activities

B. Acronym/Term List

Acronym/Term	Meaning
CAM	Commission Agreement Manager
CAO	Commission Agreement Officer
CPR	Critical Project Review
MF	Multifamily
MUP	Multifamily Upgrade Program
PG&E	Pacific Gas and Electric Company
TAC	Technical Advisory Committee
RASS	Residential Appliance Saturation Study
Energy Commission	California Energy Commission
CPUC	California Public Utilities Commission
IDA	Interval data analysts

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

A. Purpose of Agreement

The purpose of this Agreement is to fund a study of cultural and demographic factors that correlate with multifamily tenants' electric energy use patterns, before and after building retrofits and tenant engagement activities.

B. Problem/ Solution Statement

<u>Problem</u>
Currently, one third of all Californians live in multifamily housing,[2] and that percentage will be even larger in the future, since multifamily units have represented 50 percent of all new housing

[1] Please see subtask 1.3 in Part III of the Scope of Work (General Project Tasks) for a description of Critical Project Review (CPR) Meetings.
[2] KEMA, Inc. 2010. 2009 California Residential Appliance Saturation Study. California Energy Commission. Publication number: CEC-200-2010-004-ES.

starts in the state since 2009.[3] However, energy patterns and cultural factors in multifamily settings have been woefully understudied. Of the fourteen studies reviewed by the recipient, only one explicitly mentions multifamily housing in their sample group.[4]

A better understanding of energy usage patterns in multifamily settings will provide important insight into the future of California energy use as this housing type becomes an increasingly common and essential component of any zero-net energy strategy for the state.

Solution
Pacific Gas and Electric Company (PG&E) will provide match funding for this project to provide data from its Multifamily Upgrade Program (MUP), including interval energy use data and demographic information about its customers at study sites and lists of retrofit upgrade measures installed through the MUP. Starting with the MUP data, the Recipient will conduct a field study of multifamily electric energy use patterns, among a subset of participants in PG&E's new Multifamily Upgrade Program (MUP). The recipient will recruit a subsample of MUP participants, i.e. Multifamily (MF) building owners and managers, to facilitate communication with building tenants about MUP and its benefits. Some tenants will receive an opportunity for direct experience with consumer energy efficiency products that may help reduce their electricity use. The study will use energy consumption interval data from tenant meters to analyze the electric energy use patterns of tenants selected for this study. The energy use data will include data from: 1) before and after building participation in PG&E's MUP; and 2) before and after tenant participation in the tenant engagement activities in this study. The recipient will study these patterns of energy use relative to cultural, demographic and attitudinal information collected from a variety of sources, including existing databases, such as PGE's MUP database, the US Census database, and California Residential Appliance Saturation Surveys, as well as tenant surveys, focus groups, and interviews.

The study will provide insight into how cultural and demographic factors predict patterns of energy use and consumer efficiency measure adoption for this population. It will identify propensity for 'bounce back' or deeper energy savings from additional measure adoption after building retrofits. The study will also provide program design guidance for future multifamily upgrade programs that can target tenants in addition to building owners.

C. Goals and Objectives of the Agreement

Agreement Goals
The goals of this Agreement are to:

- Provide insight into electric energy use patterns of multifamily building occupants.
- Identify cultural and demographic factors that predict differences in energy use and consumer efficiency measures before and after building retrofits from PG&E's MUP.
- Provide guidance on new multifamily retrofit program design that can include tenant engagement.

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[3] Housing Starts." California Building Industry Association, n.d. Web. 2 Nov. 2014. <http://www.cbia.org/go/newsroom/housing-statistics/housing-starts/>.
[4] Gavankar, S. & Geyer, R. (2010). The Rebound Effect: Start of the Debate and Implications for Energy Efficiency Research. Bren School of Environmental Science and Management, University of California, Santa Barbara.

Ratepayer Benefits:[5] This Agreement will result in the ratepayer benefits of greater electricity reliability and lower costs by informing the design of electricity forecasts, potential studies, and program designs for the multifamily residential energy efficiency market. The study examines how cultural factors can influence tenant interest in consumer level technologies that can reduce electricity use, especially for lighting and plug loads.

Technological Advancement and Breakthroughs:[6] This Agreement will lead to technological advancement and breakthroughs to overcome barriers to the achievement of the state of California's statutory energy goals via better understanding of the cultural and demographic factors that impact electric usage patterns of multifamily residents. Insight into the electric energy use patterns of multifamily building occupants and the identification of cultural and demographic factors that predict differences in energy use will:

- Enhance demand forecasting and potential models.
- Improve ability to identify and recruit participants for energy efficiency programs.
- Provide research to support program design enhancements.
- Create better understanding of consumer efficiency product acceptance and adoption by specific demographic groups.

Agreement Objectives

The objectives of this Agreement are to:

- Collect and analyze interval meter data to reveal patterns of electricity use of a variety of multifamily tenants.
- Collect and analyze cultural, demographic and attitudinal information about the participating tenants, and compare that data to the larger residential population.
- Test hypotheses about methods of tenant engagement that may facilitate communication with multifamily tenants and increase adoption rates for certain consumer efficiency products.

[5] 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).

[6] 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

II. TASK 1 GENERAL PROJECT TASKS

PRODUCTS

Subtask 1.1 Products
The goal of this subtask is to establish the requirements for submitting project products (e.g., reports, summaries, plans, and presentation materials). Unless otherwise specified by the Commission Agreement Manager (CAM), the Recipient must deliver products as required below by the dates listed in the **Project Schedule (Part V).** Products that require a draft version are indicated by marking **"(draft and final)"** after the product name in the "Products" section of the task/subtask. If "(draft and final)" does not appear after the product name, only a final version of the product is required. With respect to due dates within this Scope of Work, **"days"** means working days.

The Recipient shall:

For products that require a draft version

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

For products that require a final version only

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

For all products

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

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

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

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

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

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

MEETINGS

Subtask 1.2 Kick-off Meeting
The goal of this subtask is to establish the lines of communication and procedures for implementing this Agreement.

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

  The administrative portion of the meeting will include discussion of the following:
  - Terms and conditions of the Agreement;

- Administrative products (subtask 1.1);
- CPR meetings (subtask 1.3);
- Match fund documentation (subtask 1.7);
- Permit documentation (subtask 1.8);
- Subcontracts (subtask 1.9); and
- Any other relevant topics.

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

- The CAM's expectations for accomplishing tasks described in the Scope of Work;
- An updated Project Schedule;
- Technical products (subtask 1.1);
- Progress reports and invoices (subtask 1.5);
- Final Report (subtask 1.6);
- Technical Advisory Committee meetings (subtasks 1.10 and 1.11); and
- Any other relevant topics.

- Provide an *Updated Project Schedule, List of Match Funds,* and *List of Permits*, as needed to reflect any changes in the documents.

The CAM shall:

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

Recipient Products:

- Updated Project Schedule *(if applicable)*
- Updated List of Match Funds *(if applicable)*
- Updated List of Permits *(if applicable)*

CAM Product:

- Kick-off Meeting Agenda

Subtask 1.3 Critical Project Review (CPR) Meetings

The goal of this subtask is to determine if the project should continue to receive Energy Commission funding, and if so whether any modifications must be made to the tasks, products, schedule, or budget. CPR meetings provide the opportunity for frank discussions between the Energy Commission and the Recipient. As determined by the CAM, discussions may include project status, challenges, successes, advisory group findings and recommendations, final report preparation, and progress on technical transfer and production readiness activities (if applicable). Participants will include the CAM and the Recipient, and may include the CAO and any other individuals selected by the CAM to provide support to the Energy Commission.

CPR meetings generally take place at key, predetermined points in the Agreement, as determined by the CAM and as shown in the Task List on page 1 of this Exhibit. However, the CAM may schedule additional CPR meetings as necessary. The budget will be reallocated to cover the additional costs borne by the Recipient, but the overall Agreement amount will not increase. CPR meetings generally take place at the Energy Commission, but they may take place at another location, or may be conducted via electronic conferencing (e.g., WebEx) as determined by the CAM.

The Recipient shall:

- Prepare a *CPR Report* for each CPR meeting that: (1) discusses the progress of the Agreement toward achieving its goals and objectives; and (2) includes recommendations and conclusions regarding continued work on the project.
- Submit the CPR Report along with any other *Task Products* that correspond to the technical task for which the CPR meeting is required (i.e., if a CPR meeting is required for Task 2, submit the Task 2 products along with the CPR Report).
- Attend the CPR meeting.
- Present the CPR Report and any other required information at each CPR meeting.

The CAM shall:

- Determine the location, date, and time of each CPR meeting with the Recipient's input.
- Send the Recipient a *CPR Agenda* and a *List of Expected CPR Participants* in advance of the CPR meeting. If applicable, the agenda will include a discussion of match funding and permits.
- Conduct and make a record of each CPR meeting. Provide the Recipient with a *Schedule for Providing a Progress Determination* on continuation of the project.
- Determine whether to continue the project, and if so whether modifications are needed to the tasks, schedule, products, or budget for the remainder of the Agreement. If the CAM concludes that satisfactory progress is not being made, this conclusion will be referred to the Deputy Director of the Energy Research and Development Division.
- Provide the Recipient with a *Progress Determination* on continuation of the project, in accordance with the schedule. The Progress Determination may include a requirement that the Recipient revise one or more products.

Recipient Products:

- CPR Report(s)
- Task Products (draft and/or final as specified in the task)

CAM Products:

- CPR Agenda
- List of Expected CPR Participants
- Schedule for Providing a Progress Determination
- Progress Determination

Subtask 1.4 Final Meeting

The goal of this subtask is to complete the closeout of this Agreement.

The Recipient shall:

- Meet with Energy Commission staff to present project findings, conclusions, and recommendations. The final meeting must be completed during the closeout of this Agreement. This meeting will be attended by the Recipient and CAM, at a minimum. The meeting may occur in person or by electronic conferencing (e.g., WebEx), with approval of the CAM.

The technical and administrative aspects of Agreement closeout will be discussed at the meeting, which may be divided into two separate meetings at the CAM's discretion.

- The technical portion of the meeting will involve the presentation of findings, conclusions, and recommended next steps (if any) for the Agreement. The CAM will determine the appropriate meeting participants.
- The administrative portion of the meeting will involve a discussion with the CAM and the CAO of the following Agreement closeout items:
    - Disposition of any state-owned equipment.
    - Need to file a Uniform Commercial Code Financing Statement (Form UCC-1) regarding the Energy Commission's interest in patented technology.
    - The Energy Commission's request for specific "generated" data (not already provided in Agreement products).
    - Need to document the Recipient's disclosure of "subject inventions" developed under the Agreement.
    - "Surviving" Agreement provisions such as repayment provisions and confidential products.
    - Final invoicing and release of retention.

- Prepare a *Final Meeting Agreement Summary* that documents any agreement made between the Recipient and Commission staff during the meeting.
- Prepare a *Schedule for Completing Agreement Closeout Activities*.
- Provide *All Draft and Final Written Products* on a CD-ROM or USB memory stick, organized by the tasks in the Agreement.

Products:

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

REPORTS AND INVOICES

Subtask 1.5 Progress Reports and Invoices

The goals of this subtask are to: (1) periodically verify that satisfactory and continued progress is made towards achieving the project objectives of this Agreement; and (2) ensure that invoices contain all required information and are submitted in the appropriate format.

The Recipient shall:

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

verify:

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

Products:

- Progress Reports
- Invoices

Subtask 1.6 Final Report

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

Subtask 1.6.1 Final Report Outline

The Recipient shall:

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

Recipient Products:

- Final Report Outline (draft and final)

CAM Product:

- Style Manual

Subtask 1.6.2 Final Report

The Recipient shall:

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

Products:

- Final Report (draft and final)

MATCH FUNDS, PERMITS, AND SUBCONTRACTS

Subtask 1.7 Match Funds

The goal of this subtask is to ensure that the Recipient obtains any match funds planned for this

Agreement and applies them to the Agreement during the Agreement term.

While the costs to obtain and document match funds are not reimbursable under this Agreement, the Recipient may spend match funds for this task. The Recipient may only spend match funds during the Agreement term, either concurrently or prior to the use of Energy Commission funds. Match funds must be identified in writing, and the Recipient must obtain any associated commitments before incurring any costs for which the Recipient will request reimbursement.

The Recipient shall:

- Prepare a *Match Funds Status Letter* that documents the match funds committed to this Agreement. If no match funds were part of the proposal that led to the Energy Commission awarding this Agreement and none have been identified at the time this Agreement starts, then state this in the letter.

  If match funds were a part of the proposal that led to the Energy Commission awarding this Agreement, then provide in the letter:
  - A list of the match funds that identifies:
    - The amount of cash match funds, their source(s) (including a contact name, address, and telephone number), and the task(s) to which the match funds will be applied.
    - The amount of each in-kind contribution, a description of the contribution type (e.g., property, services), the documented market or book value, the source (including a contact name, address, and telephone number), and the task(s) to which the match funds will be applied. If the in-kind contribution is equipment or other tangible or real property, the Recipient must identify its owner and provide a contact name, address, telephone number, and the address where the property is located.
  - A copy of a letter of commitment from an authorized representative of each source of match funding that the funds or contributions have been secured.
- At the Kick-off meeting, discuss match funds and the impact on the project if they are significantly reduced or not obtained as committed. If applicable, match funds will be included as a line item in the progress reports and will be a topic at CPR meetings.
- Provide a *Supplemental Match Funds Notification Letter* to the CAM of receipt of additional match funds.
- Provide a *Match Funds Reduction Notification Letter* to the CAM if existing match funds are reduced during the course of the Agreement. Reduction of match funds may trigger a CPR meeting.

Products:

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

Subtask 1.8 Permits

The goal of this subtask is to obtain all permits required for work completed under this Agreement in advance of the date they are needed to keep the Agreement schedule on track. Permit costs and the expenses associated with obtaining permits are not reimbursable under this Agreement, with the exception of costs incurred by University of California recipients.

Permits must be identified and obtained before the Recipient may incur any costs related to the use of the permit(s) for which the Recipient will request reimbursement.

The Recipient shall:

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

  The list of permits and the schedule for obtaining them will be discussed at the Kick-off meeting (subtask 1.2), and a timetable for submitting the updated list, schedule, and copies of the permits will be developed. The impact on the project if the permits are not obtained in a timely fashion or are denied will also be discussed. If applicable, permits will be included as a line item in progress reports and will be a topic at CPR meetings.
- If during the course of the Agreement additional permits become necessary, then provide the CAM with an *Updated List of Permits* (including the appropriate information on each permit) and an *Updated Schedule for Acquiring Permits*.
- Send the CAM a *Copy of Each Approved Permit*.
- If during the course of the Agreement permits are not obtained on time or are denied, notify the CAM within 5 days. Either of these events may trigger a CPR meeting.

Products:

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

Subtask 1.9 Subcontracts

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

The Recipient shall:

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

Products:

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

TECHNICAL ADVISORY COMMITTEE

Subtask 1.10 Technical Advisory Committee (TAC)

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

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

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

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

The Recipient shall:

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

Products:

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

Subtask 1.11 TAC Meetings

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

The Recipient shall:

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

Products:

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

Exhibit A
Scope of Work

III. TECHNICAL TASKS

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

TASK 2 Research Plan

The goal of this task is to establish the research objectives, approach, data collection methodology, analysis methods, and key decision points necessary for the study. In support of this goal, the task also includes review of the status and format of available input data, from both PG&E and outside sources, and the structure and format needs for analysis output necessary for various forecast and potential models.

Pacific Gas and Electric Company (PG&E) will provide match funding for this project to provide data from its Multifamily Upgrade Program (MUP), including interval data and demographic information about its customers at study sites and lists of retrofit upgrade measures installed through the MUP. Starting with the MUP data, the Recipient will conduct a field study of multifamily electric energy use patterns, among a subset of participants in PG&E's new Multifamily Upgrade Program (MUP).

Subtask 2.1 Review PG&E Data Sources

The goal of this subtask is to review the status and format of PG&E data available to support the project, including: interval meter data for each participating address; PG&E customer information, such as demographics and past program participation; PG&E market segmentation studies.

The Recipient shall:

- Determine the file format and structure of each PG&E data set including field definitions, time periods, completeness and quality.
- Determine file transfer and security protocols for keeping sources of PG&E data set privileged and secure, including those from PG&E. The data includes interval energy use data and demographic information and lists of retrofit upgrade measures installed through the MUP. File transfer and security protocols shall include point of contact, timing of data requests, special handling, storage and security consistent with all requirements in the Terms and Conditions to this agreement.
- Prepare a *PG&E Data Memo* that includes, but is not limited to, the following:
    - o A description of data types available to support this analysis.
    - o A discussion of data options and limitations.
    - o A discussion of data management and analysis needs to support the use of this data.

Products:

- PG&E Data Memo (draft and final)

Subtask 2.2 Review Demographic and Marketing Data

The goals of this subtask are to collect and review all relevant demographic and marketing data that might contribute to analysis under this project, or serve as a basis of comparison for demographic data of study participants. Examples include: US Census Data for the study population (i.e., MF tenants in Northern California, by census track) and comparison populations (i.e., the California residential population), Residential Appliance Saturation Study (RASS 2009)[7] data on equipment adoption in California homes, and market segmentation studies for efficiency program participants.

The Recipient shall:

- Determine the file format and structure of each PG&E data set including field definitions, time periods, completeness and quality.
- Determine file transfer and security protocols, including point of contact, timing of data requests, special handling, storage and security for data sets used for this subtask consistent with Terms and Conditions for this agreement.
- Prepare a *Demographic Data Memo* that includes but is not limited to the following:
    - A description of data types available to support this analysis.
    - A discussion of data options and limitations.
    - A discussion of data management and analysis needs to support the use of this data.

Product:

- Demographic Data Memo (draft and final)

Subtask 2.3 Review Forecast and Potential Study Inputs

The goal of this subtask is to review current California Public Utilities Commission (CPUC) potential study models and California Energy Commission (Energy Commission) forecast models with the purpose of understanding the basis of and opportunity for any cultural or demographic input variables. The intent is that future energy efficiency forecast and potential models can use the findings (outcomes) from this project as useful inputs.

Similarly, other pre-determined factors, such as reporting demographic outcomes per person, per housing unit, per square foot, or per customer (meter), will be crucial and will inform the collection of data and analysis methods for this project.

The Recipient shall:

- Determine the file format and structure of the relevant forecast and potential models including opportunities to specify cultural and demographic variable inputs.
- Confer with Energy Commission staff at TACs, CPRs, and/or conference call meetings organized by CAM to discuss future forecast and potential models to gain insight into likely methodological options for modeling cultural and demographic influences on energy use and measure adoption.
- Prepare an *Energy Efficiency Forecast and Potential Studies Inputs Memo* that includes, but is not limited to, the following:
    - A description of modeling software and methodologies expected to be used
    - A discussion of options and limitations for cultural and demographics inputs to those models
    - A recommendation of the format for outputs from the analysis of this project to best facilitate uptake by future statewide forecast and potential models

Product:

- Energy Efficiency Forecast and Potential Studies Inputs Memo (draft and final)

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[7] Residential Appliance Saturation Study *(*RASS 2009 http://www.energy.ca.gov/appliances/rass/

Subtask 2.4 Draft and Final Research Plan

The goal of this subtask is to create a report that will document the agreed upon research objectives, approach, data collection methodology, analysis methods, and key decision points for this project.

The Research Plan will serve as a roadmap for the project, articulating the key research questions for the project to address, and determining details of recruitment and sampling goals, tenant engagement lending library and communication materials, data collection methods, analysis methodologies, and outcome formats. Review and approval of the Research Plan is a critical decision point in the project, and must receive input from a wide range of interested parties, including the Project Technical Advisory Committee (TAC), a Critical Project Review (CPR), CAM, and appropriate members of the Energy Commission staff.

The Recipient shall:

- Present the *Draft Research Plan* at both TAC and CPR meetings, seeking input.
- Respond to comments and suggestions, and refine the Plan into a *Final Research Plan*.
- Note any changes to project schedule, budget allocations, or team member assignments as a result of the proposed plan.

Product:

- Research Plan (draft and final)

TASK 3 Recruitment and Project Launch

The goal of this task is to launch the research project based on the approved goals and approach determined in the Final Research Plan described above.

This includes close coordination with the management of the host program, PG&E's MUP, development of outreach materials and methods to recruit research participants, development of data collection instruments such as survey forms, development of the database structure and protocols needed to collect and transfer data, actual study participant recruitment (both building owners and target building occupants), and a memo on the results of this effort.

Subtask 3.1 Coordinate with Multifamily Upgrade Program

The goals of this subtask are to establish lines of communication with MUP program managers, and work with the CAM to ensure that all the procedures, schedules, and activities for this research project align, and are compatible with those of the MUP and the terms and conditions of this agreement. It is especially important to ensure that MUP managers first approve any contact with program participants. The objective of the research project is to avoid any disruption to the on-going MUP activities, and ideally to provide added value to the operation of the MUP whenever possible.

The Recipient shall coordinate with MUP through on-going meetings with MUP managers and the CAM. Recipient must maintain meeting notes to document all discussions and record decisions.

Any changes to schedules, methods, or communication protocols must be approved by the CAM.

The Recipient shall:

- Schedule regular meetings with MUP managers (schedule TBD) and the CAM to:

  - Coordinate schedules, activities, and communications with MUP participants;
  - Resolve any potential conflicts between the MUP and this study;
  - Look for opportunities and synergies to improve the research projects methods, the program delivery, or both.
- Record *MUP Meeting Notes* from each MUP meeting, noting discussion points, and CAM approval of any changes in schedules, methods, or communication protocols.

Product:

- MUP Meeting Notes (draft and final)

Subtask 3.2 Develop Outreach Materials

The goal of this task is to develop the text and graphic format for project participant (research subject) recruitment materials. The research plan and meetings with MUP managers will inform the development of such materials. Examples may include, but are not limited to: a prospectus to show to building owners about the benefits of participating in this research study, PowerPoint presentations to use at multifamily industry events to recruit participants, mailers to tenants to announce the research project and any opportunities for their participation, MUP website announcements of the project aimed at participants, and/or posters for apartment common areas announcing tenant engagement activities. The Recipient will develop and deliver these materials as needed, which may be at multiple points in the research project. The research plan, the research project team, and the MUP managers will also help determine material development timeframes.

The Recipient shall:

- Develop *Program Outreach Materials*, based on the research plan (see Task 2.4), to communicate with potential research subjects. Materials must be approved by CAM.
- Arrange for the production of those materials, in electronic and/or paper formats.

Product:

- Program Outreach Materials (draft and final)

Subtask 3.3 Develop Data Collection Instruments

The goal of this subtask is to determine the specifications for and create the data collection instruments for use during this project. Examples may include, but are not limited to: building owner questionnaires about their building's equipment, vintages (e.g., year of construction), occupancy patterns, leasing terms and requirements; forms to verify meter addresses and unit physical attributes; occupant surveys about their demographic characteristics, home and equipment operational habits, attitudes and preferences; or on-site observations of verification of subject account, meter data and tenant address, and whether there has been a change in tenant/household occupancy, as well as equipment condition, and operation.

The Recipient shall:

- Create *Catalog of Data Collection Instruments* based on the research plan, communication protocols established with the MUP managers and CAM, and opportunities for useful observations.
- Determine the content and format of each data field, ensuring compatibility with data analysis and modeling needs so the findings (outcomes) from this project can be useful inputs to the CPUC energy efficiency potential study models and Energy Commission energy efficiency forecast models.

- o Include a 'data dictionary' explaining the scope of each field.
- Articulate goals for the precision and completeness of each instrument and each field noting, for example, whether a field is mandatory or optional and whether a field can accept an estimate or requires a precise count.
- Prepare *Data Collection Instruments* that include instructions, per above, and facilitate both data collection and extraction to the project database.

Products:
- Catalog of Data Collection Instruments (draft and final)
- Data Collection Instruments (draft and final)

Subtask 3.4 Set Up Data Management Structures
The goal of this task is to determine the specifications for and create the database structures needed to collect and process the data for use in the analysis of this project.

The project will rely on many sources of data (e.g., energy usage, adopted energy efficiency measures, MUP participation, cultural and demographic data, tenant opinions and preferences related to energy efficiency) for this project, including data that the project team collects, data that PG&E contributes, and data from outside sources such as the US Census. The Recipient will combine and process all of these data sources in the final analysis. To support those processes, the Recipient will create a database structure that can receive these various data types and make them available for later analysis. The database structure shall meet all requirements to keep sources of data privileged and secure (such as those from PG&E) through special security treatment and handling as specified in the terms and conditions for this agreement.

This task will determine those needs, and set up the database structure needed to support data collection and analysis.

The Recipient shall:
- Determine the necessary data types and sources and specifications for the data base structures needed to collect, transfer and analyze that data, consistent with PG&E data security requirements and terms and conditions for this agreement, including:
- Complete requirements for field definitions, data management protocols, naming conventions, expectations for data base sizes, quality control procedures, and timeline for implementation
- Prepare a *Data Management Memo* that includes, but is not limited to, the following:
    - o A description of data sources.
    - o A discussion of data management needs for each.
    - o Recommendations for the structure and management of the resulting database that will support all project needs.
- Participate in CPR per Task 1.3 and provide *CPR Report #1*.

Product:
- Data Management Memo (draft and final)
- CPR Report #1 (draft and final)

Subtask 3.5 Recruit and Manage Participants

The goals of this subtask are to recruit study subjects, based on the objectives defined in the research, and to confirm and manage their participation over the duration of the study.

There will be two types of study subjects:

- Building owners and managers
  - o These will be a subset of participants in the MUP, who have agreed to participate in this research project and have agreed to help facilitate contact with the tenants of their buildings. See terms and conditions for noticing requirements Recipient must follow to comply with the Information Practices Act.
- Tenants in participating MUP buildings
  - o The study will include all tenants in the participating buildings; however, the level of engagement with tenants will vary (in accordance with the research plan developed in Task 2.4).

The Recipient will recruit building owners for the study in collaboration with MUP activities, and will use communication channels and messages that MUP managers and CAM have approved. The sample design outlined in the research plan will likely help set quotas for various types of building participation, based on attributes such as location (coastal versus valley), economics (market rate versus affordable), building type (low-rise, mid-rise, high-rise), vintage (e.g., year of construction), and size (number of units per property).

Recipient shall manage communication continuously via emails, direct phone contact, and occasional site visits. This Recipient shall leverage these communication channels for study participants, and shall be in contact with the subject building owners or managers through the end of the data collection period for this project to ensure that they remain supportive of the research project goals and activities. The Recipient shall communicate with MUP managers and Building owners participating in this study to receive critical pieces of information needed for the project analysis, such as MUP retrofit installation timelines or start and end dates. The study will need this data to inform pre- and post-MUP retrofit analysis periods for each building participating in this study.

The study shall draw upon tenants from participating buildings to form a passive control group and actively contact and recruit volunteers for engagement activities. Tenant recruitment shall align with the objectives and sample design established in the research plan. It is likely the study will employ multiple modes of communication and outreach to recruit tenants.

Another challenge for the project will be verifying the status of tenants (e.g., whether the tenant/household size remains at the same address for the duration of the study period), given the relatively high turnover rates in some multifamily housing, as changes in status can have impacts on energy use and/or PG&E data quality. A portion of the verification process shall include confirming that PG&E databases match subject account and meter data to the correct address. Another task will be to track occupancy, especially when tenants leave a unit, when it is empty, and when a new tenant moves in. In the case of occupancy change during the study period, Recipient shall decide, per the research plan (see Task 2.4), whether to try to recruit the new occupant into the active portion of the study or assign them into a passive control group. If there is a payment/incentive for tenants, the tenant may lose the payment/incentive or receive only a part of the payment/incentive if the tenant moves before the study is completed.

The Recipient shall:

- Recruit building owners to participate in the study, per the objectives and sampling plan described in the research plan
- Stay in contact with these building owner participants in order to:
    - Verify occupant information, including the timing of any change in the occupancy of a given unit
    - Verify retrofit actions and schedules
    - Coordinate on tenant contact and engagement activities
- Recruit tenants of the study buildings to participate in tenant engagement activities, per the objectives and sampling plan described in the research plan
- Stay in contact with these active tenant participants in order to:
    - Verify occupant information, including major changes in household structure
    - Observe tenant engagement actions
    - Obtain insight into behavior, preferences and user experience with any consumer energy efficiency products introduced through the tenant engagement activities
- Prepare *Quarterly Participant Status Memos* that include, but are not limited to:
    - The number and type of participants currently active in the project
    - Changes in status in previous period
    - Upcoming issues that may need resolution to ensure the integrity of the research study population.

Product:

- Quarterly Participant Status Memos (draft and final)

TASK 4 Data Collection and Analysis

The goal of this task is to collect original data from the study subjects and correlate it to outcomes using appropriate analysis techniques. This task will collect and organize the new observational data about the study subjects, according to the research plan, and provide the basis of findings and insights into how cultural and demographic characteristics may factor into predicting different patterns of energy use, both before and after whole-building retrofits, and before and after tenant engagement activities.

The proposed data collection activities follow a tiered structure, such that each larger study group contains sub-populations. The largest group consists of tenants from buildings voluntarily participating in the host MUP (about 2,500 units), which create the sample population for this study. The second group consists of the tenants of those buildings whose owners have voluntarily agreed to facilitate access and communication with their tenants (about 1,000 units or number of units approved by CAM). The third group will be the subset of those tenants who are recruited to participate voluntarily in the tenant survey, and for whom the study will collect extensive demographic and attitudinal data (more than 500 units or number of units approved by CAM). The fourth group will be the subset of tenants who receive outward communications about the benefits of the MUP retrofit and additional opportunities to reduce personal electricity use and volunteer to be surveyed (more than 250 units or number of units approved by CAM). And finally, the last and smallest group will be the subset of treated tenants who volunteer to participate in tenant engagement activities (more than 50 units or number of units approved by CAM).

Subtask 4.1 Conduct Tenant Survey

The goal of this subtask is to collect information about all participating tenants according to the methods and sampling outlined in the research plan. Methods shall include electronic surveys, paper surveys, interviews, and/or other methods approved by the CAM. The study may offer survey participants a modest incentive to compensate for time to complete the survey. The study will collect data on demographic information, energy use habits, attitudes, and preferences.

To more easily allow for study/result comparison, the methodology of collection and the structure of the survey questions will correlate with other relevant studies, such as the Residential Appliance Saturation Study (RASS) completed for the Energy Commission or the Opinion Dynamics Segmentation Study for the CPUC. Another challenge of the project will be to maintain this database in the face of naturally occurring tenant turnover. To capture information about new tenants, the study will likely need to allow for survey or interview implementation over time.

The Recipient shall:

- Conduct surveys of participating tenants per the research plan in order to:
  - Identify key demographic and cultural characteristics
  - Identify key attitudinal and behavioral patterns that may impact energy use
  - Identify energy use habits and propensity for adoption of efficiency measures
- Provide participant incentives or rewards to compensate for time to complete survey, participate in focus groups, or participate in interviews, as needed, to:
  - Ensure a sufficient population for study; and
  - Maintain the study population, in spite of natural turn over, via follow up activities to recruit new participants over time, per the research plan.
- Enter all survey data into the project data base for later analysis performing appropriate quality control to ensure the integrity of the data.
- Prepare *Monthly Survey Memos* during the duration of the survey period detailing success rates and any issues encountered.

Products:

- Monthly Survey Memos (draft and final)

Subtask 4.2 Tenant Engagement

The goal of this task is to create voluntary opportunities for direct observation of tenant interest and actions relative to the whole-building retrofit occurring in their buildings, and additional consumer efficiency products that they might choose to adopt.

This task shall include outward communications to a selected sub-sample of tenants at participating buildings; these tenants will receive additional information about the building retrofit and opportunities to participate in other ways to save energy. The specific building owner or manager will be requested to help to identify the mode of communication and take advantage of existing communication conduits, such as tenant newsletters or bulletin boards (electronic or paper).

One objective of this communication shall be to convey the benefits of the building retrofit occurring as part of the MUP, and also to reinforce the important role of the building owners and managers in making these improvements, especially via third party validation. Benefits will include tenant energy and cost savings; additional comfort, convenience, and aesthetic improvements that might benefit the tenants; and the wider social value of reduced environmental impacts resulting from the retrofits.

Another objective of this communication shall be to alert the tenants to additional opportunities to save energy that they might personally choose to take. The communication will provide information about ways to learn more via other sources such as existing customer energy dashboards, educational materials, and resources available from PG&E.

Tenants shall receive information about the tenant engagement activities the study has planned for their building. Recipient shall use input from the local building managers to craft activities that provide tenants with an opportunity to test out a range of consumer products that can reduce residential electricity use.

Based on the research plan, Recipient shall select a range of consumer products for inclusion in a lending library for each treated study site. The lending library shall be made up of products representing a range of options from inexpensive to pricey and low-tech to high-tech, which can potentially reduce electricity use for plug loads, lighting, and other miscellaneous electricity uses in homes. Ideally, the activities will center on an on-going focus group of interested tenants and will provide researchers with feedback and insight about the tenants' direct experience of the test products, importantly including their preconceptions, motivations for interest, misconceptions, misapplications, and misuse. The study shall use recorded observations, interviews, focus groups, and/or self-reports, or other data collection methods approved by the CAM, to collect qualitative data collected from these hands-on activities.

The study will link individual tenants who agree to participate in these tenant engagement activities to their unit address and previously collected survey data, following noticing requirements specified in the terms and conditions for this agreement. This will allow us to incorporate observations about the impacts of participation in the final data analysis.

The Recipient shall:

- Work with the participating building owners and managers to:
  - Determine the most appropriate forms of outreach communications for their tenant community.
  - Approve the form and content of all tenant communications with MUP managers.
  - Administer these communications to the selected sample of treated tenants, per the research plan.
- Plan and conduct follow up tenant engagement activities, which will provide:
  - Opportunities for tenants to directly explore various consume efficiency devices, as selected per the research plan.
  - Opportunities for tenants to test out some products of interest in their homes for an extended period of time.
  - Opportunities for tenants to provide experiential feedback on their impressions of, and experience with, the selected devices.
- Collect information about the tenants who respond to the outreach communication and tenant engagement activities to link these responses to the larger project analysis.
- Observe tenant engagement events and collect feedback from tenants on their experiences with the selected products.
- Prepare *Tenant Engagement Activities Plan*, describing the proposed tenant engagement activities, methods, content, and timing by participating building.
- Prepare *Tenant Engagement Findings Memo*, describing the findings and observations resulting from the tenant communication and engagement activities.
- Participate in CPR per Task 1.3 and provide *CPR Report #2.*

Products:
- Tenant Engagement Activities Plan (draft and final)
- Tenant Engagement Findings Memo (draft and final)
- CPR Report #2 (draft and final)

Subtask 4.3 On-Site Data Collection
The goal of this task is to investigate specifics of on-site conditions in accordance with the research plan, and to provide additional insight into electricity use at the study sites as needed.

The Recipient will already know a great deal about the buildings at the participating study sites via their participation in the MUP. Furthermore, PG&E can provide additional information about account activity and other customer details for those building owners and tenants who agree to participate in the study; and this study will directly contact participating building owners for important information such as lease terms, vacancies, and building regulations. To verify and clarify the available data, the Recipient may request participating building owners and tenants to allow the Recipient to conduct an in-person observation of on-site conditions of energy-related building equipment, including the type of equipment installed and operational status.

Based on the research plan, this task provides for on-site audits and/or monitoring of selected end uses and units to help inform the interval meter data analysis. Given past experience with interval data analysis, the research team may decide that limited key information on home equipment densities or usage patterns may help disaggregate end use patterns. Similarly, examination of the past electricity use patterns or the current internal meter data of study units may raise questions about unusually high, low, or atypical electricity use patterns. After receiving agreement from building owners and tenants, this task allows engineers to go on-site to investigate possible explanations for these anomalies. Data collection methodologies shall include observations, interviews, audits, monitoring, and/or other methods approved by the CAM.

The Recipient shall:
- Determine the need for and the methodology of additional on-site investigations in accordance with the research plan, or as needed during the course of the data analysis to help explain anomalous data.
- Conduct any needed on-site investigations with qualified field engineers, after receiving written permission of MUP managers, participating building owners, and tenants (i.e., for in-home audits).
    - If such on-site investigations include in-home equipment audits or monitoring, such will occur only with the written consent of the tenants of those units.
    - Personal information, such as name and address, included in written permission to enter premises shall be maintained as required by the terms and conditions for this agreement.
- Provide *On-Site Data Collection Memos* for each on-site data collection activity as completed, describing all proposed on-site data collection activities, including the rationale, methodologies, and data collection objectives for PG&E.

Products:
- On-Site Data Collection Memos (draft and final)

Subtask 4.4 Data Quality Control and Verification
The goal of this task is to ensure data quality and validity throughout the course of the study.

This study involves collecting and merging vast amounts of data from multiple sources. In order to correctly link those various data bases, identifying information must be complete and reliable. The most obvious need for data validation is to make sure that PG&E interval meter data about customer energy use reliably links to the correct physical location. This is easier said than done, especially in the multifamily arena, where building addresses and unit numbers frequently change. One objective of this task is to verify that addresses and other identifying information in the data bases all match up consistently.

Another key objective of this task is data quality review to describe the completeness, appropriate ranges, and any anomalies of data entered into each field. Verifying that the time periods for each data set appropriate match up will likely be important, as will the reliability of the original sources of the data.

The research plan will call out any known needs for data verification and quality review, but new questions will likely arise during initial data handling and analysis. The final quality of all data analysis depends on the researchers' understanding of quality of the input data. Thus, this task is a critical element of preparing the way for successful and efficient analysis of the final project data set.

The Recipient shall:

- Verify that fields in both imported and project-generated data sets link correctly to each other, and especially to physical locations.
- Generate descriptive statistics for each data set, and flag and investigate anomalous data.
- Provide recommendations for resolution of anomalous data, and coordinate with team members, including PG&E and interval data analyst in order to resolve any data quality issues.
- Provide *Data Quality Memos* (draft and final) for each major data source reporting on its status, completeness, and any resolution needs.

Products:

- Data Quality Memos (draft and final)

Subtask 4.5 Interval Data Analysis

The goal of this task is to analyze the interval meter data from PG&E (for the study subjects) to provide inputs on electricity usage patterns to the final project analysis.

Recipient shall work with PG&E and/or PG&E's subcontractor (as specified by PG&E) to obtain interval data analysis for all study participants in 15 minute increments for existing accounts. The data shall include energy use for at least a year before completion of MUP energy efficiency retrofits and at least a year before tenant communication and engagement activities conducted in this study, or, if data is not available for this period, for an alternate period determined by the CAM.

To ensure unique pre and post period identification for each study subject, Recipient shall flag and communicate time periods for study building retrofits and tenant engagement treatments with PG&E and/or PG&E's subcontractor (as specified by PG&E). Thus, there may be a few weeks or a few months of data that the recipient will exclude from the analysis that include when retrofits occurred at the building site, or when the study introduced a new consumer efficiency device to a subject. Given the timing of recruitment, engagement, and retrofits at the study sites, the time period for interval analysis is likely to span from 24 to 30 months, ideally encompassing a matched set of seasons for the pre and post study periods.

The Recipient shall work with PG&E and/or PG&E's subcontractor (as specified by PG&E) to provide/verify basic information about physical building characteristics and occupant demographics for each study participant, so that analysis can be segmented according to these factors. The Recipient shall work with PG&E and/or PG&E's subcontractor (as specified by PG&E) and the CAM to incorporate any insights gained from on-site data collection, previous analysis, or other sources to help understand the variety of energy use patterns among this population, how they vary according to cultural and demographic factors, and how they vary between pre and post study periods. In order to provide useful inputs to the final study analysis, the Recipient shall work with PG&E and/or PG&E's subcontractor (as specified by PG&E) to provide outputs from the interval analysis in accordance with the research plan and in collaboration with the project research team and the CAM.

The Recipient shall:

- Coordinate with PG&E and/or PG&E's subcontractor (as specified by PG&E)to:
  - Review interval data analysis.
  - Provide appropriate information about building physical characteristics and study subject demographics.
  - Identify time periods for pre and post study periods for each study subject.
- In coordination with CAM, review interim findings from PG&E and/or PG&E's subcontractor (as specified by PG&E) and provide comments and guidance to PG&E and/or PG&E's subcontractor (as specified by PG&E) for additional analysis to ensure useful outputs from the interval analysis for subsequent study.
- Report on the final findings from this task in the *Interval Data Analysis Memo* and provide recommendations on how to incorporate interval data analysis into the final report.

Products:

- Interval Data Analysis Memo (draft and final)

Subtask 4.6 Final Analysis

The goal of this task is to pull together all of the data collection and analysis efforts and insights gained from the research observations for the final report.

The research plan shall determine the analysis methods for this task, which will include multivariate regression analysis to quantify the impact of various cultural and demographic factors in predicting patterns of study subjects' energy use, or other data analysis method approved by the CAM. The findings from the interval data analysis in the previous task will be the outcome variables, which Recipient shall study in relationship to all other known information about the study participants, such as their physical and cultural environments.

At the very least, the analysis will consider four types of study periods: pre- and post-MUP retrofit, and for tenants volunteering for surveys and tenant engagement activities, pre- and post-receipt of communication materials and hands-on use of energy efficiency measures from the lending library. The study will also compare at least two types of study groups: the control population and the treated population, (i.e., the volunteers who received tenant engagement communications and activities. Depending on the characteristics of the final study population, the study will also include analysis of all cultural and demographics characteristics that support statistical analysis, such as income or education level, ethnic group, household composition, or assignment to a market segment or persona. This approach will use composite information about the study subjects.

In addition to the quantitative analysis techniques above, this task shall include insights gained from the more qualitative and observational aspects of this study. In sequential order of the project tasks, these include observations about:

- Building owner and manager interest in participating in the study, including:
  - Ease of recruitment according to various characteristics of this population.
  - Motivations for participation or non-participation.
- Building owner and manager engagement with the research project, including:
  - Types and levels of engagement.
  - Suggestions for communication methods and activities to best reach their tenant populations.
- Tenant response to surveys and on-site investigations, including:
  - Ease of recruitment according to various characteristics of this population.
  - Motivations for participation or non-participation.
  - Attitudes towards the retrofit program and its results.
- Tenant response to tenant engagement communication and activities, including:
  - Types and levels of engagement, especially according to population characteristics.
  - Interest in personal actions or equipment adoption that might save additional electric energy.
- Feedback on tenant experience with the specific devices selected for the lending library and likely continued use or interest.

The Recipient shall:

- Conduct quantitative analysis of the whole project data set in accordance with the research plan, and
  - correlate cultural and demographic factors of the study population to any energy usage patterns that the interval data analysis reveals
  - look for factors that may predict differential savings due to retrofit efficiency measures, rebound effects, or propensity to adopt consumer efficiency products
- Summarize qualitative observations and insights gained during the various interventions conducted during the course of the project, including
  - building owner and manager interest in facilitating additional tenant savings
  - tenant interest in adoption and use of consumer efficiency products
- Provide feedback and recommendations on how future utility programs might
  - better target multifamily retrofit programs to accrue the highest savings
  - encourage greater engagement from multifamily tenants in reducing personal energy use
- Report on factors that could be useful in future forecast and potential studies in predicting energy use and savings by:
  - multifamily tenants, according to their cultural and demographic characteristics, and
  - to what extent this information might also be useful for other residential populations

Products:

- Final Analysis Report (draft and final)

TASK 5 Evaluation of Project Benefits

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

The Recipient shall:

- Complete three Project Benefits Questionnaires that correspond to three main intervals in the Agreement: (1) *Kick-off Meeting Benefits Questionnaire*; (2) *Mid-term Benefits Questionnaire*; and (3) *Final Meeting Benefits Questionnaire*.
- Provide all key assumptions used to estimate projected benefits, including targeted market sector (e.g., population and geographic location), projected market penetration, baseline and projected energy use and cost, operating conditions, and emission reduction calculations. Examples of information that may be requested in the questionnaires include:

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

    - <u>For Information/Tools and Other Research Studies:</u>
        - Outcome of project.

  - Published documents, including date, title, and periodical name.
  - A discussion of policy development. State if the project has been cited in government policy publications or technical journals, or has been used to inform regulatory bodies.
  - The number of website downloads.
  - An estimate of how the project information has affected energy use and cost, or has resulted in other non-energy benefits.
  - An estimate of energy and non-energy benefits.
  - Data on potential job creation, market potential, economic development, and increased state revenue as a result of project.
  - A discussion of project product downloads from websites, and publications in technical journals.
  - A comparison of project expectations and performance. Discuss whether the goals and objectives of the Agreement have been met and what improvements are needed, if any.
- Respond to CAM questions regarding responses to the questionnaires.

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

Products:
- Kick-off Meeting Benefits Questionnaire
- Mid-term Benefits Questionnaire
- Final Meeting Benefits Questionnaire

TASK 6 Technology/Knowledge Transfer Activities

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

The Recipient shall:
- Prepare an *Initial Fact Sheet* at start of the project that describes the project. Use the format provided by the CAM.
- Prepare a *Final Project Fact Sheet* at the project's conclusion that discusses results. Use the format provided by the CAM.
- Prepare a *Technology/Knowledge Transfer Plan* that includes:
  - An explanation of how the knowledge gained from the project will be made available to the public, including the targeted market sector and potential outreach to end users, utilities, regulatory agencies, and others.
  - A description of the intended use(s) for and users of the project results.
  - Published documents, including date, title, and periodical name.
  - Copies of documents, fact sheets, journal articles, press releases, and other documents prepared for public dissemination. These documents must include the Legal Notice required in the terms and conditions. Indicate where and when the documents were disseminated.
  - A discussion of policy development. State if project has been or will be cited in government policy publications, or used to inform regulatory bodies.
  - The number of website downloads or public requests for project results.

    - Additional areas as determined by the CAM.
- Conduct technology transfer activities in accordance with the Technology/Knowledge Transfer Plan. These activities will be reported in the Progress Reports.
- When directed by the CAM, develop *Presentation Materials* for an Energy Commission-sponsored conference/workshop on the results of the project.
- Prepare a *Technology/Knowledge Transfer Report* on technology transfer activities conducted during the project.

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

IV. PROJECT SCHEDULE

Please see the attached Excel spreadsheet.

RESOLUTION NO: 15-0408

STATE OF CALIFORNIA

STATE ENERGY RESOURCES
CONSERVATION AND DEVELOPMENT COMMISSION

RESOLUTION - RE: TRC ENGINEERS, INC.

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

RESOLVED, that the Energy Commission approves Agreement EPC-14-039 from PON-14-306 with **TRC Engineers, Inc.** for a **$379,019** grant to study cultural and demographic factors of multifamily tenants' electric energy use patterns, before and after energy efficiency upgrades and how cultural factors influence tenant interest in adoption of more efficient appliances, electronics and lighting; 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 April 8, 2015.

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

Harriet Kallemeyn,
Secretariat