



**CALIFORNIA
ENERGY COMMISSION**



**California Energy Commission
April 8, 2026 Business Meeting
Backup Materials for The Regents of the University of California, on behalf of the
Davis campus**

The following backup materials for the above-referenced agenda item are available in this PDF packet as listed below:

1. Proposed Resolution
2. Grant Request Form
3. Scope of Work

CALIFORNIA ENERGY COMMISSION

PROPOSED RESOLUTION: The Regents of the University of California, on behalf of the Davis campus

RESOLUTION NO: 26-0408-XX

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

RESOLVED, that the CEC approves Agreement PIR-25-004 with The Regents of the University of California, on behalf of the Davis campus for an \$800,000 grant. This project will examine impediments to decarbonizing gas end uses in homes, with a focus on supply chain dynamics. Results will deliver a nuanced, location-specific, depiction of challenges and opportunities inherent in residential gas transitions and identify policy options to unlock electrification routes; and

FURTHER BE IT RESOLVED, that the Executive Director or their designee shall execute the same on behalf of the CEC.

APPROVED AND ADOPTED this 8th day of April 2026, by the following vote:

AYE:

NAY:

ABSENT:

ABSTAIN:

CERTIFICATION

The undersigned Secretariat to the CEC does hereby certify that the foregoing is a full, true, and correct copy of a resolution duly and regularly approved and adopted by affirmative vote of the CEC at a meeting held on April 8, 2026.

Kim Todd
Secretariat



GRANT REQUEST FORM (GRF)

A. New Agreement Number

IMPORTANT: New Agreement # to be completed by Contracts, Grants, and Loans Office.

New Agreement Number: PIR-25-004

B. Division Information

1. Division Name: ERDD
2. Agreement Manager: Mithra Moezzi
3. MS-:None
4. Phone Number: 916-232-6332

C. Recipient's Information

1. Recipient's Legal Name: The Regents of the University of California on behalf of the Davis campus

D. Title of Project

Title of project: Frameworks for Optimizing Routes from Gas to Electricity (FORGE): Residential

E. Term and Amount

1. Start Date: 4/9/2026
2. End Date: 8/30/2029
3. Amount: \$800,000.00

F. Business Meeting Information

1. Are the ARFVTP agreements \$75K and under delegated to Executive Director? No
2. The Proposed Business Meeting Date: 4/8/2026 .
3. Consent or Discussion? Discussion
4. Business Meeting Presenter Name: Mithra Moezzi
5. Time Needed for Business Meeting: 5 minutes.
6. The email subscription topic is: General Natural Gas and LNG Issues.

Project Description:

The Regents of the University of California on behalf of the Davis campus. Proposed resolution approving agreement PIR-25-004 with The Regents of the University of California on behalf of the Davis Campus for a \$800,000 grant and adopting staff's recommendation that this action is exempt from CEQA. This project will examine impediments to decarbonizing gas end uses in homes, with a focus on supply chain dynamics. Results will deliver a nuanced depiction of challenges and opportunities inherent in residential gas transitions and identify policy options to unlock electrification routes. (PIER NG funding) Contact: Mithra Moezzi

G. California Environmental Quality Act (CEQA) Compliance

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

Yes

If yes, skip to question 2.

If no, complete the following (PRC 21065 and 14 CCR 15378) and explain why Agreement is not considered a "Project":



Agreement will not cause direct physical change in the environment or a reasonably foreseeable indirect physical change in the environment because:

2. If Agreement is considered a “Project” under CEQA answer the following questions.

a) Agreement **IS** exempt?

Yes

Statutory Exemption?

No

If yes, list PRC and/or CCR section number(s) and separate each with a comma. If no, enter “None” and go to the next question.

PRC section number: None

CCR section number: None

Categorical Exemption?

No

If yes, list CCR section number(s) and separate each with a comma. If no, enter “None” and go to the next question.

CCR section number: Cal. Code Regs., tit 14, § 15301; 14 C.C.R. § 15306; 14 C.C.R. § 15262

Common Sense Exemption? 14 CCR 15061 (b) (3)

Yes

If yes, explain reason why Agreement is exempt under the above section. If no, enter “Not applicable” and go to the next section.

Cal. Code Regs., tit. 14, 15301, Existing Facilities, provides an exemption from CEQA for the operation, repair, maintenance, permitting, leasing, licensing, or minor alteration of existing structures, facilities, mechanical equipment or topographical features involving negligible or no expansion of use beyond that existing. This project will conduct research, database searches, computer modeling, meetings (actual or virtual) within already existing laboratories, office buildings, and for case studies, residences. There will be negligible or no expansion of existing use in any of these structures. Therefore, the project falls within section 15301 and will not have a significant effect on the environment.

Cal. Code Regs., tit. 14, Section 15306, Information Collection, exempts from CEQA projects that consist of basic data collection, research, experimental management, and resource evaluation activities which do not result in a serious or major disturbance to an environmental resource. The proposed project activities fall within these categories. For these reasons, the proposed project will have no significant effect on the environment and is categorically exempt under section 15306.

While the grant may provide information to consumers, middle-market actors, and manufacturers about gas-to-electric equipment conversions, the grant does not include conversions. Therefore, the activities fall within Cal. Code Regs., tit. 14, Section 15262, Feasibility and Planning Studies, which exempts from CEQA projects that are only feasibility or planning studies for possible future actions which the agency, board, or commission has not approved, adopted, or funded.



This project does not involve impacts on any particularly sensitive environment; any cumulative impacts of successive projects of the same type in the same place that might be considered significant; does not involve unusual circumstances that might have a significant effect on the environment; will not result in damage to scenic resources within a highway officially designated as a state scenic highway; the project sites are not included on any list compiled pursuant to Government Code section 65962.5, and the project will not cause a substantial adverse change in the significance of a historical resource. Therefore, none of the exceptions to categorical exemptions listed in CEQA Guidelines section 15300.2 apply to this project, and this project will not have a significant effect on the environment.

b) Agreement **IS NOT** exempt.

IMPORTANT: consult with the legal office to determine next steps.

No

If yes, answer yes or no to all that applies. If no, list all as “no” and “None” as “yes”.

Additional Documents	Applies
Initial Study	No
Negative Declaration	No
Mitigated Negative Declaration	No
Environmental Impact Report	No
Statement of Overriding Considerations	No
None	Yes

H. Is this project considered “Infrastructure”?

No

I. Subcontractors

List all Subcontractors listed in the Budget (s) (major and minor). Insert additional rows if needed. If no subcontractors to report, enter “No subcontractors to report” and “0” to funds.

Delete any unused rows from the table.

Subcontractor Legal Company Name	CEC Funds	Match Funds
Design Avenues LLC	\$ 99,000	\$0

J. Vendors and Sellers for Equipment and Materials/Miscellaneous

List all Vendors and Sellers listed in Budget(s) for Equipment and Materials/Miscellaneous. Insert additional rows if needed. If no vendors or sellers to report, enter “No vendors or sellers to report” and “0” to funds. **Delete** any unused rows from the table.



Vendor/Seller Legal Company Name	CEC Funds	Match Funds
No vendors to report	\$	\$

K. Key Partners

List all key partner(s). Insert additional rows if needed. If no key partners to report, enter “No key partners to report.” **Delete** any unused rows from the table.

Key Partner Legal Company Name
No key partners to report

L. Budget Information

Include all budget information. Insert additional rows if needed. If no budget information to report, enter “N/A” for “Not Applicable” and “0” to Amount. **Delete** any unused rows from the table.

Funding Source	Funding Year of Appropriation	Budget List Number	Amount
NG Subaccount, PIERDD	24-25	501.001	\$ 800,000

TOTAL Amount: \$ 800,000

R&D Program Area: Admin: General

Explanation for “Other” selection Not applicable

Reimbursement Contract #: Not applicable

Federal Agreement #: Not applicable

M. Recipient’s Contact Information

1. Recipient’s Administrator/Officer

Name: Ryan Briard

Address: 215 Sage St Ste 100 Suite 100

City, State, Zip: Davis, CA 95616-7379

Phone: 530-752-6548

E-Mail: rbriard@ucdavis.edu

2. Recipient’s Project Manager

Name: Sarah Outcault

Address: 215 Sage St

City, State, Zip: Davis, CA 95616-8185

Phone: 530-752-2779

E-Mail: smoutcault@ucdavis.edu

N. Selection Process Used



There are three types of selection process. List the one used for this GRF.

Selection Process	Additional Information
Competitive Solicitation #	GFO-24-501
First Come First Served Solicitation #	Not applicable
Other	Not applicable

O. Attached Items

1. List all items that should be attached to this GRF by entering “Yes” or “No”.

Item Number	Item Name	Attached
1	Exhibit A, Scope of Work/Schedule	Yes
2	Exhibit B, Budget Detail	Yes
3	CEC 105, Questionnaire for Identifying Conflicts	Yes
4	Recipient Resolution	No
5	Awardee CEQA Documentation	Yes

Approved By

Individuals who approve this form must enter their full name and approval date in the MS Word version.

Agreement Manager: Mithra Moezzi

Approval Date: 02/23/2026

Branch Manager: Alex Horangic

Approval Date: 02/27/2026

Director: Alex Horangic for Jonah Steinbuck

Approval Date: 02/27/2026

**Exhibit A
Scope of Work**

The Regents of the University of California, on Behalf of the Davis campus

I. TASK ACRONYM/TERM LISTS

A. Task List

Task #	CPR ¹	Task Name
1		General Project Tasks
2		Background research
3	X	Niche Identification and FORGE Framework
4		Residential Case Studies
5	X	Supply Chain Analysis
6		Evaluation of Project Benefits
7		Technology/Knowledge Transfer Activities

B. Acronym/Term List

Acronym/Term	Meaning
CAM	Commission Agreement Manager
CAO	Commission Agreement Officer
CEC	California Energy Commission
CPR	Critical Project Review
FORGE	Frameworks for Optimizing Routes from Gas to Electricity
GHG	Greenhouse gas
TAC	Technical Advisory Committee

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

A. Purpose of Agreement

The purpose of this Agreement is to fund social science research that generates insights on the conversion pathways to residential electrification to support California’s transition away from gas.

B. Problem/ Solution Statement

Problem

Transitioning California buildings away from gas is critical to achieving the state’s statutory energy goals. Building electrification requires shifts in the behavior of a complex array of supply chain actors, as well as consumers. These shifts may not occur without state intervention to address points of friction. Without a nuanced understanding of the various operational challenges that impede the conversion from gas, the state could waste precious resources trying to influence supplier, installer, and consumer choices.

Solution

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.

Exhibit A Scope of Work

The Regents of the University of California, on Behalf of the Davis campus

The Recipient will advance the understanding of pathways to residential gas conversion by applying social science research methods to unlock insights about consumers and stakeholders up and down the supply chain. Three key topics will be addressed to provide policymakers with a clear understanding of the actors and factors that promote or hinder a transition away from gas. A conceptual framework will be developed to map the flow of information, influence, and resources among actors to shape conversion pathways and customer niches, supporting the identification of electrification opportunities for a variety of communities and households. Strategically selected case studies will be conducted to illustrate how home electrification happens (or does not) across a range of contexts and consumer characteristics. To address a critical but underexplored area of the market, the Recipient will use traditional and innovative fieldwork techniques to examine the role and perspectives of middle-actors (e.g., installers, suppliers, designers) in residential gas conversions.

The team's scientific expertise and credentials will serve as valuable assets to the project. Frameworks for Optimizing Routes from Gas to Electricity (FORGE) comprehensive research approach is designed to move beyond theoretical analysis. It aims to develop a practical framework and produce actionable findings. These will generate nuanced insights into the complexities of fossil gas use in California. The research will deepen understanding of the barriers to electrification in the residential sector. Finally, the FORGE team will identify viable pathways for transformation across California's diverse consumer segments, installer practices, and emerging decarbonization market niches.

C. Goals and Objectives of the Agreement

Agreement Goals

The goal of the proposed project is to conduct robust social science research on the challenges and opportunities for residential electrification by gathering insights through fieldwork to collect primary data from key stakeholder groups, guided by socio-technical transition theories and a deep understanding of the policy context and technical aspects of gas conversion technologies.

Ratepayer Benefits: This Agreement is intended to result in the ratepayer benefit of lower costs of residential electrification technologies by encouraging faster uptake and earlier market maturity, yielding economies of scale. These research findings will support market acceleration by outlining pathways away from gas and points of friction relevant to various customer niches. Such insights will be developed by applying robust social science research methods to explore consumer and supply chain actor perspectives, with a concerted focus on the role of critical middle actors. This information will inform the design and implementation of targeted, cost-effective interventions to address challenges and exploit opportunities to promote residential gas conversions.

Technological Advancement and Breakthroughs: This Agreement is intended to lead to technological advancement and breakthroughs to overcome barriers to the achievement of the State of California's statutory energy goals by conducting both traditional social science research techniques, as well as innovative ones that are emerging to complement established methods. The FORGE team will draw on the socio-technical systems (STS) change literature which combines contemporary and earlier theoretical approaches to complex transitions. A systems-oriented social science approach has rarely been applied to energy transitions, and our expertise in this area offers a rare opportunity to contribute to policy evolution. One such recent innovation is the middle-out perspectives approach, which was pioneered by a member of the

Exhibit A Scope of Work

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FORGE team. We will apply this to supply chain analysis to yield critical insights on the role of often overlooked actors (e.g., installers, designers). The FORGE research approach represents an empirical advancement over previous studies by examining supply and demand side actors with differing degrees of willingness and ability to transition away from gas and well as the interaction of those two, sometimes mismatched, parties.

In addition, the Recipient will use novel, advanced data collection methods including web scraping and Python-based data cleaning to systemically gather and analyze the public discourse among California-based supply chain actors involved in gas conversions (e.g., heat pump installers, plumbers, electricians) on public online discussion platforms. To further enrich findings, the Recipient will also engage in participatory research techniques, i.e., modern digital ethnography, by interacting with online discussion communities designed for supply chain actors. This approach will offer a distinctive opportunity to capture the genuine perspectives of supply chain stakeholders, while enabling real-time insight into emerging trends and user sentiment. It also transcends geographical limitations, facilitating engagement with diverse populations that are often inaccessible through conventional research methodologies and will yield deeper qualitative and quantitative insights into their perspectives on home electrification.

Agreement Objectives

The objectives of this Agreement are to:

- Synthesize relevant literature on socio-technical transitions and prior residential electrification efforts; describe relevant policies, and technology trends and innovations; and gather expert insights;
- Develop a framework outlining pathways to full, partial and failed electrification, customer niches, and points of friction to inform tailored gas transition solutions (Topic 1);
- Conduct comparative analysis of strategically selected case studies of past residential electrification efforts to identify lessons that could improve future planning and outcomes (Topic 3); and
- Analyze the supply chain to identify gas conversion influences and opportunities; inform workforce development to better fit with market niches, and advise research, programs, and policy for feasible gas transition (Topic 2).

III. TASK 1 GENERAL PROJECT TASKS

PRODUCTS

Subtask 1.1 Products

The goal of this subtask is to establish the requirements for submitting project products (e.g., reports, summaries, plans, and presentation materials). Unless otherwise specified by the Commission Agreement Manager (CAM), the Recipient must deliver products as required below by the dates listed in the **Project Schedule (Part V)**. All products submitted which will be viewed by the public, must comply with the accessibility requirements of Section 508 of the federal Rehabilitation Act of 1973, as amended (29 U.S.C. Sec. 794d), and regulations implementing that act as set forth in Part 1194 of Title 36 of the Federal Code of Regulations. All technical tasks should include product(s). Products that require a draft version are indicated by marking “**(draft and final)**” after the product name in the “Products” section of the task/subtask. If “(draft and final)” does not appear after the product name, only a final version of the product is required. With respect to due dates within this Scope of Work, “**days**” means working days.

Exhibit A Scope of Work

The Regents of the University of California, on Behalf of the Davis campus

The Recipient shall:

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

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

For products that require a final version only

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

For all products

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

- **Electronic File Format**

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

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

- Data sets will be in MS Access or MS Excel file format (version 2007 or later), or any other format approved by the CAM.
- Text documents will be in MS Word file format, version 2007 or later.
- Project management documents will be in Microsoft Project file format, version 2007 or later.

- **Software Application Development**

Use the following standard Application Architecture components in compatible versions for any software application development required by this Agreement (e.g., databases, models, modeling tools), unless the CAM approves other software applications such as open source programs:

- Microsoft ASP.NET framework (version 3.5 and up). Recommend 4.0.
- Microsoft Internet Information Services (IIS), (version 6 and up) Recommend 7.5.
- Visual Studio.NET (version 2008 and up). Recommend 2010.

Exhibit A Scope of Work

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- 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 CEC's Information Technology Services Branch to determine whether the exceptions are allowable.

MEETINGS

Subtask 1.2 Kick-off Meeting

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

The Recipient shall:

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

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

- Terms and conditions of the Agreement;
- Invoicing and auditing procedures;
- Administrative products (subtask 1.1);
- CPR meetings (subtask 1.3);
- Match fund documentation (subtask 1.7);
- Permit documentation (subtask 1.8);
- Subcontracts (subtask 1.9); and
- Any other relevant topics.

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

- The CAM's expectations for accomplishing tasks described in the Scope of Work;
 - An updated Project Schedule;
 - Technical products (subtask 1.1);
 - Progress reports (subtask 1.5);
 - Final Report (subtask 1.6);
 - Technical Advisory Committee meetings (subtasks 1.10 and 1.11); and
 - Any other relevant topics.
- Provide *Kick-off Meeting Presentation* to include but not limited to:
 - Project overview (i.e. project description, goals and objectives, technical tasks, expected benefits, etc.)
 - Project schedule that identifies milestones

Exhibit A Scope of Work

The Regents of the University of California, on Behalf of the Davis campus

- List of potential risk factors and hurdles, and mitigation strategy
- Provide an *Updated Project Schedule*, *Match Funds Status Letter*, and *Permit Status Letter*, as needed to reflect any changes in the documents.

The CAM shall:

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

Recipient Products:

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

CAM Product:

- Kick-off Meeting Agenda

Subtask 1.3 Critical Project Review (CPR) Meetings

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

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

The Recipient shall:

- Prepare and submit a *CPR Report* for each CPR meeting that: (1) discusses the progress of the Agreement toward achieving its goals and objectives; and (2) includes recommendations and conclusions regarding continued work on the project.
- Attend the CPR meeting.
- Present the CPR Report and any other required information at each CPR meeting.

The CAM shall:

- Determine the location, date, and time of each CPR meeting with the Recipient's input.
- Send the Recipient a *CPR Agenda* with a list of expected CPR participants in advance of the CPR meeting. If applicable, the agenda will include a discussion of match funding and permits.

Exhibit A Scope of Work

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- 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)

CAM Products:

- CPR Agenda
- Progress Determination

Subtask 1.4 Final Meeting

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

The Recipient shall:

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

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

- The technical portion of the meeting will involve the presentation of findings, conclusions, and recommended next steps (if any) for the Agreement. The CAM will determine the appropriate meeting participants.
- The administrative portion of the meeting will involve a discussion with the CAM and the CAO of the following Agreement closeout items:
 - Disposition of any procured equipment.
 - The CEC's request for specific "generated" data (not already provided in Agreement products).
 - Need to document the Recipient's disclosure of "subject inventions" developed under the Agreement.
 - "Surviving" Agreement provisions such as repayment provisions and confidential products.
 - Final invoicing and release of retention.
- Prepare a *Final Meeting Agreement Summary* that documents any agreement made between the Recipient and Commission staff during the meeting.
- Prepare a *Schedule for Completing Agreement Closeout Activities*.
- Provide copies of *All Final Products* on a USB memory stick, organized by the tasks in the Agreement.

Products:

Exhibit A Scope of Work

The Regents of the University of California, on Behalf of the Davis campus

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

REPORTS AND INVOICES

Subtask 1.5 Monthly Calls

- The goal of this task is to have calls at least monthly between the CAM and Recipient to verify that satisfactory and continued progress is made towards achieving the objectives of this Agreement on time and within budget.
- The objectives of this task are to verbally summarize activities performed during the reporting period, to identify activities planned for the next reporting period, to identify issues that may affect performance and expenditures, to verify match funds are being proportionally spent concurrently or in advance of CEC funds or are being spent in accordance with an approved Match Funding Spending Plan, to form the basis for determining whether invoices are consistent with work performed, and to answer any other questions from the CAM. Monthly calls might not be held on those months when a quarterly progress report is submitted or the CAM determines that a monthly call is unnecessary.

The CAM shall:

- Schedule monthly calls.
- Provide questions to the Recipient prior to the monthly call.
- Provide call summary notes to Recipient of items discussed during call.

The Recipient shall:

- Review the questions provided by CAM prior to the monthly call
- Provide verbal answers to the CAM during the call.

Product:

- Email to CAM concurring with call summary notes.

Subtask 1.6 Quarterly 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 Quarterly Progress Report to the CAM. Each progress report must:
 - Summarize progress made on all Agreement activities as specified in the scope of work for the reporting period, including accomplishments, problems, milestones, products, schedule, fiscal status, and an assessment of the ability to complete the Agreement within the current budget and any anticipated cost overruns. Progress reports are due to the CAM the 10th day of each January, April, July, and October. The Quarterly Progress Report template can be found on the ECAMS Resources webpage available at: <https://www.energy.ca.gov/media/4691>

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The Regents of the University of California, on Behalf of the Davis campus

- Submit a monthly or quarterly Invoice on the invoice template(s) provided by the CAM.

Recipient Products:

- Quarterly Progress Reports
- Invoices

CAM Product:

- Invoice template

Subtask 1.7 Final Report

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

Subtask 1.7.1 Final Report Outline

The Recipient shall:

- Prepare a Final Report Outline in accordance with the Energy Commission Style Manual provided by the CAM.

Recipient Products:

- Final Report Outline (draft and final)

CAM Products:

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

Subtask 1.7.2 Final Report

The Recipient shall:

- Prepare a Final Report for this Agreement in accordance with the approved Final Report Outline, Energy Commission Style Manual, and Final Report Template provided by the CAM with the following considerations:
- Ensure that the report includes the following items, in the following order:
 - Cover page (**required**)
 - Credits page on the reverse side of cover with legal disclaimer (**required**)
 - Acknowledgements page (optional)
 - Preface (**required**)
 - Abstract, keywords, and citation page (**required**)
 - Table of Contents (**required**, followed by List of Figures and List of Tables, if needed)
 - Executive summary (**required**)
 - Body of the report (**required**)
 - References (if applicable)

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- Glossary/Acronyms (If more than 10 acronyms or abbreviations are used, it is required.)
- Bibliography (if applicable)
- Appendices (if applicable) (Create a separate volume if very large.)
- Attachments (if applicable)
- Submit a draft of the Executive Summary to the TAC for review and comment.
- Develop and submit a Summary of TAC Comments on Draft Final Report received on the Executive Summary. For each comment received, the Recipient will identify in the summary the following:
 - Comments the Recipient proposes to incorporate.
 - Comments the Recipient does propose to incorporate and an explanation for why.
 - Submit a draft of the report to the CAM for review and comment. The CAM will provide written comments to the Recipient on the draft product within 15 days of receipt.
 - Incorporate all CAM comments into the Final Report. If the Recipient disagrees with any comment, provide a Written Responses to Comments explaining why the comments were not incorporated into the final product.
 - Submit the revised Final Report electronically with any Written Responses to Comments within 10 days of receipt of CAM's Written Comments on the Draft Final Report, unless the CAM specifies a longer time period or approves a request for additional time.

Products:

- Summary of TAC Comments on Draft Final Report
- Draft Final Report
- Written Responses to Comments (*if applicable*)
- Final Report

CAM Product:

- Written Comments on the Draft Final Report

MATCH FUNDS, PERMITS, AND SUBCONTRACTS

Subtask 1.8 Match Funds

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

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

The Recipient shall:

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

If match funds were a part of the proposal that led to the CEC awarding this Agreement, then provide in the letter:

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

Products:

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

Subtask 1.9 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.

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- 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 1.10 Obtain and Execute Subcontracts and Agreements with Site Hosts

The goals of this subtask are to: (1) procure and execute subrecipients and site host agreements, as applicable, required to carry out the tasks under this Agreement; and (2) ensure that the subrecipients and site host agreements are consistent with the Agreement terms and conditions and the Recipient's own contracting policies and procedures.

The Recipient shall:

- Execute and manage subawards and coordinate subrecipient 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.
- Submit a *Subaward and Site Letter* to the CAM describing the subawards and any site host agreement needed or stating that no subawards or site host agreements are required.
- If required by the CAM, submit a draft of each *Subaward* and any *Site Host Agreement* required to conduct the work under this Agreement.
- If requested by the CAM, submit a final copy of each executed *Subaward* and any *Site Host Agreement*.
- Notify and receive written approval from the CAM prior to adding any new subrecipient (see the discussion subrecipient additions in the terms and conditions).

Products:

- Subaward and Site Letter
- Draft Subawards (*if requested by the CAM*)
- Draft Site Host Agreement (*if requested by the CAM*)
- Final Subawards (*if requested by the CAM*)
- Final Site Host Agreement (*if requested by the CAM*)

TECHNICAL ADVISORY COMMITTEE

Subtask 1.11 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,

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availability, and need. TAC members will serve at the CAM's discretion. The purpose of the TAC is to:

- Provide guidance in project direction. The guidance may include scope and methodologies, timing, and coordination with other projects. The guidance may be based on:
 - Technical area expertise;
 - Knowledge of market applications; or
 - Linkages between the agreement work and other past, present, or future projects (both public and private sectors) that TAC members are aware of in a particular area.
- Review products and provide recommendations for needed product adjustments, refinements, or enhancements.
- Evaluate the tangible benefits of the project to the state of California, and provide recommendations as needed to enhance the benefits.
- Provide recommendations regarding information dissemination, market pathways, or commercialization strategies relevant to the project products.
- Help set the project team's goals and contribute to the development and evaluation of its statement of proposed objectives as the project evolves.
- Provide a credible and objective sounding board on the wide range of technical and financial barriers and opportunities.
- Help identify key areas where the project has a competitive advantage, value proposition, or strength upon which to build.
- Advocate, to the extent the TAC members feel is appropriate, on behalf of the project in its effort to build partnerships, governmental support and relationships with a national spectrum of influential leaders.
- Ask probing questions that ensure a long-term perspective on decision-making and progress toward the project's strategic goals.

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

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

The Recipient shall:

- Prepare a *List of Potential TAC Members* that includes the names, companies, physical and electronic addresses, and phone numbers of potential members. The list will be 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.

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- 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 1.12 TAC Meetings

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

The Recipient shall:

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

The TAC shall:

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

Products:

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

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Subtask 1.13 Project Performance Metrics

The goal of this subtask is to finalize key performance targets for the project based on feedback from the TAC and report on final results in achieving those targets. The performance targets should be a combination of scientific, engineering, techno-economic, and/or programmatic metrics that provide the most significant indicator of the research or technology's potential success.

The Recipient shall:

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

Products:

- TAC Performance Metrics Summary
- Project Performance Metrics Results

IV. TECHNICAL TASKS

TASK 2: BACKGROUND RESEARCH

The goal of this task is to synthesize existing knowledge on residential gas conversion to inform subsequent tasks.

Subtask 2.1: Socio-technical Transitions Theoretical Review

The goal of this subtask is to explore theoretical frameworks, concepts, and models relevant to the phenomenon of residential electrification. This will contribute to theoretical groundwork performed under Tasks 3-5.

The Recipient shall:

- Identify dominant theories of socio-technical transitions in academic literature.
- Compare and contrast concepts, models, and tools associated with dominant theories.
- Analyze relevance of frameworks to residential electrification.
- Analyze studies of similar transitions that use these theoretical lenses.
- Produce brief *Socio-technical Transitions Theoretical Review Deck* highlighting how the theoretical lenses reviewed augment conventional policy views of transitions, presented at a monthly meeting with CAM

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Product:

- Socio-technical Transitions Theoretical Review Deck

Subtask 2.2: Systematic Literature Review of Residential Electrification Projects

The goal of this subtask is to synthesize insights from past studies of residential gas-to-electric conversions to inform research design details of Tasks 3-5, ensuring it builds upon existing knowledge.

The Recipient shall:

- Conduct keyword search of academic databases and gray literature.
- Assess results to identify studies meeting inclusion criteria.
- Analyze and synthesize studies and findings using socio-technical transitions theoretical lens, highlighting contrasts to standard policy-realm models and discourse
- Produce an *Annotated List of Residential Gas-to-Electric Conversion Studies* covering studies that meet inclusion criteria

Product:

- Annotated List of Residential Gas-to-Electric Conversion Studies

Subtask 2.3: Policy Landscape Analysis

The goal of this subtask is to understand policies that may shape consumer and supply chain actor behavior related to residential gas-to-electric transitions.

The Recipient shall:

- Compile and summarize relevant California policy from the California Energy Commission, the California Air Resources Board, the California Public Utilities Commission, and state legislation such as Senate Bill 100 and SB 410. Additionally, draw from a range of industry and advocacy sources (e.g., Energy & Environmental Economics, Natural Resources Defense Council, Rocky Mountain Institute, American Council for an Energy Efficient Economy, and the CA Building Decarbonization listserv) to provide comprehensive coverage of mandates, infrastructure requirements, local government ordinances, and utility programs. Key topics shall include:
 - Incentives: Programs or financial motivations designed to encourage electrification.
 - Building codes: Regulations and standards governing construction and renovation, including electrification mandates, and reach codes, that may dictate or favor electric installations over gas.
 - Emissions restrictions: Policies aimed at reducing greenhouse gas emissions, which indirectly or directly promote electrification.

Subtask 2.4: Industry and Technology Trends

The goal of this subtask is to describe pertinent technical details about selected electrification technologies (i.e., space conditioning heat pumps, heat pump water heaters, induction stoves) and trends in their development to inform work on subsequent tasks.

The Recipient shall:

- Describe key technical features of space conditioning heat pumps, heat pump water heaters, and induction stoves and the implications for replacing gas equipment.

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- Identify key technology development trends driven by regulatory, market, or other forces for the three technologies.
- Summarize key updates from published industry news sources, webinar presentations, testimony in regulatory proceedings, and informal interviews with industry observers to explore decision-making dynamics, technology investments, product R&D and competition, as well as industry participation in policy, regulatory and codes/standards development.

Subtask 2.5: Expert Interviews – Residential Gas Transition Stakeholder Groups

The goal of this subtask is to conduct interviews with a broad range of residential gas transition stakeholder groups, such as program administrators, electrification advocacy and education organizations, construction industry representatives (e.g., contractors, trade groups, unions), code officials, manufacturers, distributors, retailers, design professionals and consultants active in electrification efforts, including cases where alternatives to electrification of natural gas end uses are most relevant. Insights will inform work on Tasks 3-5.

The Recipient shall:

- Develop an interview protocol to outline key areas of inquiry, summarizing the draft protocol in an early-cut *Interview Protocol Instrument Guide*
- Conduct up to 10-15 semi-structured interviews with experts on the residential gas-to-electric transition in California.
- Analyze interview data to identify key themes.

Product:

- Interview Protocol Instrument Guide

Subtask 2.6: Synthesize Background Research – Residential Electrification

The goal of this subtask is to summarize and synthesize the literature reviews (30-50 papers), policy analysis, technology trends, and expert interviews conducted in subtasks 2.1-2.5.

The Recipient shall:

- Summarize and synthesize background research conducted in subtask 2.1-2.5.
- Draft *Residential Electrification Background Report* summarizing methods and key findings from Task 2

Product:

- Residential Electrification Background Report

TASK 3: NICHE IDENTIFICATION AND FORGE FRAMEWORK

The goal of this task is to address Topic 1 (presented in Objectives section above) by identifying market niches and creating a framework that outlines the pathways and factors that influence whether and how households transition away from gas (or not). The framework will be used to identify points of friction relevant to various market customer niches (transcending the “average customer”) and promising strategies to address them.

Subtask 3.1: Develop Initial FORGE Framework – Factors, Actors, and Pathways

The goal of this subtask is to develop, refine, and finalize the FORGE framework drawing on stakeholder input and insights from the other tasks.

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The Recipient shall:

- Outline the factors and actors that influence potential shifts away from residential gas technologies.
- Map various pathways away from gas for key market segments (i.e., single and multifamily, owner-occupied and rental housing), including:
 - Entry and exit points of the gas transition
 - Potential outcomes (i.e., full, partial, failed electrification)
 - Stakeholders (e.g., owner-occupants, building owners, tenants, middle actors)
- Develop an initial draft of the FORGE Framework that illustrates how the following intersect with the gas transition pathways:
 - Flows of information, influence, and resources between various stakeholder groups
 - Technical, economic, practical, and psychological factors that create opportunities and challenges for adoption of electric equipment (and maintenance of the status quo).
- Write and circulate an initial *FORGE Framework Report* to TAC and CEC to request feedback
- Prepare a *CPR Report #1* in accordance with subtask 1.3 (CPR Meetings).
- Participate in a CPR meeting.

Product:

- FORGE Framework Report
- CPR Report #1

Subtask 3.2: Estimate Market Niches and Identify Tailored Strategies

The goal of this subtask is to identify customer niches and estimate their size and potential impact in terms of energy consumption, greenhouse gas (GHG) emissions, gas infrastructure decommissioning strategies, and other factors based on available data, and identify promising strategies tailored to critical customer niches.

The Recipient shall:

- Identify market niches (including difficult-to-convert ones) revealed through the FORGE Framework.
- Gather existing data sources on the relevant attributes defining the niches, including end-use technologies, housing and weather characteristics, and household demographics.
- Estimate the size of niches and their impact potentials in terms of energy consumption, GHG emissions, and other factors.
- Based on the above, define and characterize "critical customer niches".
- Identify points of friction relevant to several critical niches.
- Identify promising strategies for addressing the points of friction based on data collected in literature reviews (Task 2), case studies (Task 4), and stakeholder consultation (Tasks 2, 4, 5).
- Summarize niches and initial list of strategies in a *Working Summary of Gas Transition Niches and Strategies Deck*, presented at a monthly meeting with CAM

Product:

- Working Summary of Gas Transition Niches and Strategies Deck

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Subtask 3.3: Refine FORGE Framework and Create Communication Tools

The goal of this subtask is to create resources in several formats that enable multiple applications of the framework.

The Recipient shall:

- Refine the FORGE Framework to reflect insights gained from other tasks and input received from the TAC and CEC.
- Develop tools to support stakeholders (e.g., programs, policymakers, installers) to identify and prioritize customer niches and the associated strategies to address relevant points of friction. These may include, but not be limited to, a conceptual map of pathways, fact sheets about customer niches, checklists or decision trees for technology selection, recommendations for technology, communication or research needs, and interactive presentations of pathways, niches, and case studies using software platforms such as Prezi, prioritizing low-friction access to these tools. Provide a *Platform for Accessing Tools* accessible to the CEC and select other stakeholders.
- Summarize the framework, customer niches, and strategies in the *Residential Gas Transition Framework Report*

Product:

- Platform for Accessing Tools
- Residential Gas Transition Framework Report

TASK 4: RESIDENTIAL CASE STUDIES²

The goal of this task is to address Topic 3 by conducting case studies strategically sampled to represent much of the range of market segments and pathways to residential gas-to-electric transition, while acknowledging niches or market segments where alternatives to piped natural gas may more readily be served by resources other than grid-connected electricity. The case studies will inform the development of the FORGE Framework (Task 3), illuminate supply-demand side interactions (explored in Task 5), and inform recommendations for policies, programs, and follow-on studies presented in the final report (Task 1).

Subtask 4.1: Develop Case Studies Plan

The goals of this subtask are to develop a sampling plan, identify prospective case studies, and develop plans for case study recruitment.

The Recipient shall:

- Develop inclusion and exclusion criteria for case studies.

² The Information Practices Act, Special Terms and Conditions Exhibit (“IPA Exhibit”) in the grant agreement shall be a required “flow-down” from the Recipient to all subrecipients in their Subawards, in the manner of other specified flow-down terms listed in Exhibit C, section 7(b), Subrecipient Flow-Down Terms. In addition, the IPA Exhibit requirements shall also “survive” in the manner of the itemized list labeled “Survival of the following sections:” in Exhibit C, section 7(b), Subrecipient Flow-Down Terms.

Regarding vendors, if and where the Recipient needs to flow down the IPA Exhibit requirements to any vendor, in order to fulfill Recipient’s obligations to the CEC, then Recipient shall flow-down the IPA Exhibit requirements in the Subaward to the vendor. (See Exhibit C, section 7(c), c. Vendor Flow-Down Terms.)

This footnote is not limited to Task 4 but applies to the entire Scope of Work. This footnote is placed here for the convenience of the reader.

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- Develop the sampling goals for case studies representing various combinations of single-family or multi-family; owner- vs. renter-occupied; partial, total, or failed electrification; and other relevant characteristics (e.g., geographic region, utility territory).
- Compile a list of prospective case studies from online research and referrals from stakeholders interviewed in Tasks 2 and 5 and the team's professional network.
- Select an initial subset of 9-12 case studies that fulfills the sampling goals and backup options in case they are needed.
- Develop plans and materials to recruit case study participants.
- Draft the *Residential Case Studies Plan* explaining criteria, sampling plan, prospective case studies, and recruitment plans, and circulating the Plan to TAC and the CEC

Product:

- Residential Case Studies Plan

Subtask 4.2: Conduct Case Studies

The goal of this subtask is to conduct 9-12 case studies.

The Recipient shall:

- Send recruitment materials to invite prospective case study participants.
- Conduct 9-12 case studies, including:
 - Interviews and/or focus groups with all stakeholders including householders and middle actors (e.g., installers, contractors, design professionals)
- Draft the *Residential Case Studies Report* to document findings of all case studies, analyzed and organized according to the final conceptual framework.
- Revise in response to feedback from CAM and finalize Residential Case Studies Report.

Products:

- Residential Case Studies Report

TASK 5: SUPPLY CHAIN ANALYSIS

The goal of this task to address Topic 2 by gathering data on the residential transition from gas to electric systems through diverse research methodologies, and then perform an integrative analysis to deeply understand the relationships and influence of "middle actors," (e.g., installers, contractors, tradespeople, retailers, manufacturers) to identify the dynamics of "middle-out" change, and pinpoint key frictions and leverage points within the conversion pathways. This task directly supports the broader aim of producing an empirically based analysis of supply chain considerations to inform workforce programs, research, and policy.

Subtask 5.1: Digital Data Mining for Middle Actor Perspectives

The goal of this task is to strategically gather qualitative insights from digital platforms to complement formal literature, identify information gaps, and understand informal flows of information between various actors and decision-makers. This approach aims to capture contextual understanding of practical issues and ground-level challenges related to residential gas-to-electric transitions that may not be fully detailed in formal reports.

The Recipient shall:

- Identify relevant online communities, forums, social media, and review platforms (e.g., Reddit, Facebook, YouTube, Twitter/"X", HVACtalk.com, buildinghub.energy) where

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discussions related to residential gas-to-electric conversions occur, focusing on both consumer and middle actor perspectives will be considered, as these are widely used by industry professionals for sharing insights, troubleshooting, and discussing trends.).

- Systematically collect qualitative data, such as posts, comments, and discussions, applying ethical considerations (e.g., privacy, context) for public data gathering.
- Analyze the collected digital data to identify recurring themes, common questions, challenges, informal solutions, and shared experiences related to gas-to-electric transitions.
- Infer informal flows of information and influence within these digital spaces, noting how information about incentives, technologies, and installation processes is shared and interpreted by decision-makers.
- Identify specific information gaps or practical considerations not extensively covered in formal literature reviews or policy documents, thereby building upon the foundational knowledge established in Task 2 (Subtasks 2.2 and 2.3)
- Interpret data in light of the inherent biases and limitations of digital data sources (e.g., representation bias, self-selection bias).
- Produce *Digital Data Mining Memo* summarizing methods and key findings

Product:

- Digital Data Mining Memo

Subtask 5.2: Digital Ethnography of Middle Actors

The goal of this task is to capture nuanced, current perspectives on practical challenges and decision-making processes surrounding residential gas-to-electric transitions that are not addressed in formal literature or passive data collection. The approach involves actively participating in digital communities by posting specific comments and content, thereby engaging directly with middle actors, deepening contextual understanding, clarifying ambiguities, and filling information gaps identified during digital data mining.

The Recipient shall:

- Choose relevant online communities, forums, social media groups, and review platforms identified in Subtask 5.1, prioritizing those with active discussions about residential gas-to-electric conversions.
- Prepare a structured approach for participant observation and direct engagement, including guidelines for ethical participation (i.e., transparency about researcher identity, and protection of community norms). Produce a short *Digital Ethnography Plan* in deck form for discussion with the CEC.
- Review posts in the past two years (or whatever length appears appropriate in the specific forum) for relevant discussions, especially topics that persist, self-correct, or recur. Where possible, technical misconceptions and errors will be identified.
- Actively post questions, comments, and content designed to elicit responses that address information gaps and ambiguities uncovered in Subtask 5.1. Topics may include challenges in contractor selection, navigating incentives, installation experiences, and user satisfaction with electrification outcomes.
- Systematically record interactions, including thread discussions, responses to researcher posts, and any emergent themes or questions from community members.
- Analyze the qualitative data collected through direct engagement to identify new insights, clarify previous findings, and uncover tacit knowledge or informal strategies employed by stakeholders.

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- Pinpoint information gaps, practical barriers, and opportunities for improvement in the residential electrification process.
- Interpret findings considering the potential biases and limitations inherent in digital ethnography, such as self-selection, researcher influence, and community culture.
- Draft *Digital Ethnography Memo* summarizing methods and key findings, highlighting areas of apparent divergence between abiding “decommissioning industry” and/or state agency framings and middle actor framings.

Product:

- Digital Ethnography Plan
- Digital Ethnography Memo

Subtask 5.3: In-depth Interviews with Middle Actors

The goal of this task is to collect targeted, in-depth qualitative data through interviews with a diverse range of middle actors, specifically prioritizing those whose perspectives might be under-represented in decommissioning industry and state agency framings or who possess unique insights into the conversion process, thereby providing empirical data on decision-making, challenges, and specific frictions or leverage points.

The Recipient shall:

- Develop a comprehensive interview protocol to outline key areas of inquiry, for example: customer context and characteristics (e.g., building conditions, lifestyle), upstream elements (e.g., how contractors, installers, retailers, and manufacturers make decisions about recommending or installing electric versus gas systems), challenges and barriers (e.g., main obstacles middle actors face when installing or promoting electric versus gas systems).
- Compile a diverse list of potential “middle actor” interview subjects (e.g., installers, contractors, retailers, manufacturers)
- Prepare *Initial Middle Actor Interview Guide* and share with TAC and the CEC
- Conduct 30-60 semi-structured interviews with identified middle actors, aiming for representation across various market segments and pathways to gas-to-electric transitions as informed by the preliminary framework developed in Subtask 3.1.
- Analyze interview data to identify key themes, patterns, and specific examples that illuminate what shapes the value chain.
- Prepare *Supply Chain Interviews Memo* summarizing middle actor interviews
- Prepare a *CPR Report #2* in accordance with subtask 1.3 (CPR Meetings).
- Participate in a CPR meeting.

Product:

- Initial Middle Actor Interview Guide
- Supply Chain Interviews Memo
- CPR Report #2

Subtask 5.4: Mapping the Middle-Out Change Process: Identifying Frictions and Leverage Points

The goal of this task is to synthesize all collected data from Subtasks 5.1, 5.2, and 5.3 to produce an empirically based analysis of considerations and relationships across various parties in the supply chain, focusing on the roles and influence of “middle actors” in driving or impeding the gas-to-electric transition. This subtask will illuminate the dynamics of “middle-out”

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change dynamics, identify existing frictions, clarify a range of middle actor stakes, and pinpoint potential leverage points to inform strategies, workforce programs, and policy development.

The Recipient shall:

- Integrate and cross-reference findings from the literature review (from Task 2.2), policy analysis (from Task 2.3), technology trends (from Task 2.4), digital mining (from Subtask 5.1), digital ethnography (from Subtask 5.2), and middle-actor interviews (from Subtask 5.3).
- Map the complex relationships and interactions between middle actors and various parties that shape the value chain and their influence on conversion decisions.
- Analyze the collected data to understand the "middle-out" change dynamics, detailing how the actions, interests, and practices of middle actors shape installation decisions for or against electrification.
- Systematically identify and characterize frictions impeding conversion from gas across different end uses, consumer characteristics (e.g., building conditions, lifestyle), and upstream elements (e.g., contractor decision process).
- Identify and characterize potential leverage points favoring conversion from gas, including insights and examples relevant to managing identified frictions, considering communications, process, or technology innovations.
- Synthesize findings to illuminate what specifically shapes installation decisions in residential gas-to-electric conversions.
- Create a visual representation of the relationships among middle actors
- Prepare *Supply Chain Report* summarizing methods and key findings from Task 5

Product:

- Supply Chain Report

TASK 6: EVALUATION OF PROJECT BENEFITS

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

The Recipient shall:

- Complete the *Initial Project Benefits Questionnaire*. The Initial Project Benefits Questionnaire shall be initially completed by the Recipient with 'Kick-off' selected for the 'Relevant data collection period' and submitted to the CAM for review and approval.
- Complete the *Annual Survey* by July 15th of each year. The Annual Survey includes but is not limited to the following information:
 - Technology commercialization progress
 - New media and publications
 - Company growth
 - Follow-on funding and awards received
- Complete the *Final Project Benefits Questionnaire*. The Final Project Benefits Questionnaire shall be completed by the Recipient with 'Final' selected for the 'Relevant data collection period' and submitted to the CAM for review and approval.
- Respond to CAM questions regarding the questionnaire drafts.
- Complete and update the project profile on the CEC's public online project and recipient directory on the [Energize Innovation website \(www.energizeinnovation.fund\)](http://www.energizeinnovation.fund), and provide *Documentation of Project Profile on EnergizeInnovation.fund*, including the profile link.

Exhibit A Scope of Work

The Regents of the University of California, on Behalf of the Davis campus

- If the Prime Recipient is an Innovation Partner on the project, complete and update the organizational profile on the CEC's public online project and recipient directory on the [Energize Innovation website \(www.energizeinnovation.fund\)](http://www.energizeinnovation.fund), and provide *Documentation of Organization Profile on EnergizeInnovation.fund*, including the profile link.

Products:

- Initial Project Benefits Questionnaire
- Annual Survey(s)
- Final Project Benefits Questionnaire
- Documentation of Project Profile on EnergizeInnovation.fund
- Documentation of Organization Profile on EnergizeInnovation.fund

TASK 7: KNOWLEDGE TRANSFER ACTIVITIES

The goal of this task is to ensure the scientific and techno-economic analysis and tools developed under this agreement are utilized in the energy policy, and/or planning decisions at the state and/or local levels, academic community and/or commercial sector.

The Recipient Shall:

- Develop and submit a *Knowledge Transfer Plan* that identifies the proposed activities the recipient will conduct to meet the goal of the task. The *Knowledge Transfer Plan* should include at a minimum:
 - Specific policy and planning efforts this project is expected to inform.
 - Specific stakeholder groups and energy policy and planning practitioners who will utilize the results of this project.
 - Proposed activities the recipient will conduct to ensure the tools and results from this project will be utilized and adopted by the groups identified above.
- Present the *Draft Knowledge Transfer Plan* to the TAC for feedback and comments.
- Develop and submit a *Summary of TAC Comments* that summarizes comments received from the TAC members on the *Draft Knowledge Transfer Plan*. This document will identify:
 - TAC comments the recipient proposes to incorporate into the *Final Knowledge Transfer Plan*.
 - TAC comments the recipient does not propose to incorporate with and explanation why.
- Submit the *Final Knowledge Transfer Plan* to the CAM for approval.
- Implement the activities as described in the *Final Knowledge Transfer Plan*.
- Develop a *Knowledge Transfer Summary Report* that includes high level summaries of the activities, results, and lessons learned of tasks performed relating to implementing the *Final Knowledge Transfer Plan*. This report should not include any proprietary information.
- When directed by the CAM, develop presentation materials for an CEC- sponsored conference/workshop(s) on the project.
- Provide at least (6) six *High Quality Digital Photographs* (minimum resolution of 1300x500 pixels in landscape ratio) of pre and post technology installation at the project sites or related project photographs.

**Exhibit A
Scope of Work**

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Products:

- Knowledge Transfer Plan (draft and final)
- Summary of TAC Comments
- Knowledge Transfer Summary Report (draft and final)
- High Quality Digital Photographs

V. PROJECT SCHEDULE

Please see the attached Excel spreadsheet.