**California Energy Commission**
**February 12, 2025 Business Meeting**
**Backup Materials for Lawrence Berkeley National Laboratory**

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

[PROPOSED]

**RESOLUTION NO: 25-212-09e**

**STATE OF CALIFORNIA**

**STATE ENERGY RESOURCES**
**CONSERVATION AND DEVELOPMENT COMMISSION**

**RESOLUTION: Lawrence Berkeley National Laboratory**

**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 EPC-24-041 with Lawrence Berkeley National Laboratory for a $1,999,917 grant. This agreement will develop and implement novel and interoperable control sequences, workflows, tools and products to deploy energy-efficient and demand-flexible controls in large commercial buildings at scale (OBC-FLEX). These sequences will be integrated into at least five commercial Building Energy Management Systems (BEMS) and deployed in up to nine buildings within the Contra Costa Community College District and three California State Universities, which is expected to reduce energy demand by 10% during summer peak periods; and

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

***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 adopted at a meeting of the CEC held on February 12, 2025.

AYE:
NAY:
ABSENT:
ABSTAIN:

Dated:

_____
Kristine Banaag
Secretariat

STATE OF CALIFORNIA
CALIFORNIA ENERGY COMMISSION

CEC-270 (Revised 01/2024)

# GRANT REQUEST FORM (GRF)

## A. New Agreement Number

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

**New Agreement Number**: EPC-24-041

## B. Division Information

1. Division Name: ERDD
2. Agreement Manager: Brad Williams
3. MS-:51
4. Phone Number: 916-776-0825

## C. Recipient's Information

1. Recipient's Legal Name: DOE- Lawrence Berkeley National Laboratory
2. Federal ID Number: 94-2951741

## D. Title of Project

Title of project: OBC-FLEX: Enabling Interoperable Demand Flexibility in Commercial Buildings

## E. Term and Amount

1. Start Date: 4/1/2025
2. End Date: 3/30/2029
3. Amount: $1,999,917

## F. Business Meeting Information

1. Are the ARFVTP agreements $75K and under delegated to Executive Director? No
2. The Proposed Business Meeting Date: 2/12/2025 .
3. Consent or Discussion? Discussion
4. Business Meeting Presenter Name: Dustin Davis
5. Time Needed for Business Meeting: 5 minutes.
6. The email subscription topic is:  EPIC (Electric Program Investment Charge).

**Agenda Item Subject and Description:**

Lawrence Berkeley National Laboratory. Proposed resolution approving agreement EPC-24-041 with Lawrence Berkeley National Laboratory for a $1,999,917 grant, and adopting staff's recommendation that this action is exempt from CEQA. This agreement will develop and implement novel and interoperable control sequences, workflows, tools and products to deploy energy-efficient and demand-flexible controls in large commercial buildings at scale (OBC-FLEX). These sequences will be integrated into at least five commercial Building Energy Management Systems (BEMS) and deployed in up to nine buildings within the Contra Costa Community College District and three California State Universities, which is expected to reduce energy demand by 10% during summer peak periods. (EPIC funding) Contact: Dustin Davis

## 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?
Yes

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 ; Cal. Code Regs., tit. 14, § 15306 ;

Common Sense Exemption? 14 CCR 15061 (b) (3)
No

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

California Code of Regulations, title 14, Section 15301, provides that projects which consist of the operation, repair, maintenance, permitting, licensing, or minor alteration of existing public or private structures, facilities, mechanical equipment, or topographical features, and which involve negligible or no expansion of existing or former use, are categorically exempt from the provisions of the California Environmental Quality Act (CEQA). The proposed project will involve potential upgrades of existing controllers/servers and/or software to enable advanced demand flexibility. Depending on the site, there may be a need to install additional networking gateways. At the LBNL main campus, work will involve software development, simulation and bench-top testing of electronic control systems and controls testing in appropriately outfitted office and laboratory spaces. At the demonstration locations, work will include control networking and software retrofits. Therefore, since this project will involve minor alterations of existing sites with negligible to no expansion of existing or former use, the project is exempt from CEQA under Section 15301.

California Code of Regulations, title 14, section 15306, provides that projects which consists 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 are categorically exempt from the provisions of CEQA. The project's goal is to collect data and evaluate resources without causing a major disturbance to environmental resources. Therefore, this project is exempt from CEQA under Section 15306.

Additionally, the project will not impact an environmental resource of hazardous or critical concern where designated, precisely mapped, and officially adopted pursuant to law by federal, state, or local agencies; does not involve 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 site is 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 |
|---|---|---|
| INFOGRID INC | $ 76,070 | **$**0 |

| Subcontractor Legal Company Name | CEC Funds | Match Funds |
|---|---|---|
| FACILAI LLC | $ 89,868 | $0 |
| California State University San Marcos | $ 37,500 | $10,000 |
| Altura, LLC | $ 201,146 | $0 |
| Taylor Engineering LLP | $ 158,000 | $0 |
| TRC Engineers, Inc. | $ 189,935 | $0 |
| Automated Logic Corporation | $ 0 | $100,000 |

## 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 |
|---|---|---|
| TBD 1 | $90,000 | $0 |
| TBD 2 | $30,000 | $0 |

## 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 |
|---|---|---|---|
| EPIC | 23-24 | 301.001K | $ 1,999,917 |

**TOTAL Amount:** $ 1,999,917

R&D Program Area: ICMB: Buildings

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: Joanna Santoro

Address: 1 Cyclotron Rd

City, State, Zip: Berkeley, CA 94720-0001

Phone: 510 486-6824

E-Mail: jlsantoro@lbl.gov

### 3. Recipient's Project Manager

Name: Marco Pritoni

Address: 1 Cyclotron Rd MS #90R2121

City, State, Zip: Berkeley, CA 94720

Phone: 530-220-4394

E-Mail: MPritoni@lbl.gov

## 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-23-309-04 |
| 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 | No |

**Approved By**

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

**Agreement Manager:** Brad Williams

**Approval Date: 1**2/17/2024

**Branch Manager:** Cody Taylor

**Approval Date:** 1/3/2025

**Director:** Cody Taylor

**Approval Date:**1/3/2025

# Exhibit A
# Scope of Work
# Lawrence Berkeley National Laboratory

## I. TASK ACRONYM/TERM LISTS

### A. Task List

| Task# | CPR[1] | Task Name |
|---|---|---|
| 1 | | General Project Tasks |
| 2 | | Development of DF Open Specifications |
| 3 | X | Development of DF Sequences Library |
| 4 | | Integration with Vendors' Platforms |
| 5 | X | Field Deployment and Testing |
| 6 | | Community Engagement |
| 7 | | Evaluation of Project Benefits |
| 8 | | Technology/Knowledge Transfer Activities |

### B. Acronym/Term List

| Acronym/Term | Meaning |
|---|---|
| ASHRAE | American Society of Heating, Refrigerating and Air-Conditioning Engineers |
| BAS | Building Automation System |
| BOPTEST | Building Optimization Testing Framework |
| CAM | Commission Agreement Manager |
| CAO | Commission Agreement Officer |
| CBO | Community Based Organization |
| CDL | Control Description Language |
| CEC | California Energy Commission |
| CPR | Critical Project Review |
| DAC | Disadvantage Community |
| DF | Demand Flexibility |
| EMIS | Energy Management and Information Systems |
| LBNL | Lawrence Berkeley National Laboratory |
| LI | Low Income |
| OBC-Flex | Open Building Control for Flexibility |
| OEM | Original Equipment Manufacturer |
| TAC | Technical Advisory Committee |

[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
# Lawrence Berkeley National Laboratory

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

### A. Purpose of Agreement

The purpose of this Agreement is to fund: 1) the development of best-in-class open specifications for demand flexibility (DF) control sequences[2], 2) their implementation in an open-source, vendor-neutral standard-based software library, 3) their integration into commercial Building Automation System (BAS)[3] and Energy Management and Information System (EMIS)[4] platforms, 4) their field test in 4-9 large commercial buildings across California.

### B. Problem/ Solution Statement

**Problem**
In pursuit of its ambitious decarbonization objectives, California has committed to achieve a demand-side load shifting goal of 7GW by 2030. Commercial buildings play an important role in reaching this objective. However, implementing advanced controls for demand response, load shift, and energy efficiency in existing buildings is currently laborious, costly, prone to error and hindered by a shortage of skilled workforce. The specification of control sequences still depends on lengthy English documents, which can span hundreds of pages. These documents need to be translated by experts into control code tailored to a vendor's platform and the customer's site--an approach that is hardly scalable. Moreover, as the industry transitions to heat pumps and central plants with thermal energy storage, these sequences are only going to become more complicated. Following today's error-prone sequence deployment processes could result in not only underperforming operations but also in increased energy consumption and/or peak demand. Also, best-in-class DF sequences have not been codified into standards and open-source tools.

**Solution**
To tackle the problem, the team will leverage new American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) interoperability standards, a portfolio of synergistic match-funding projects and an ecosystem of Building Automation System (BAS) and Energy Management and Information Systems (EMIS) partners. The proposed project aims to develop, implement, and showcase innovative and interoperable control sequences, workflows, tools and products to implement energy-efficient and demand-flexible controls in large commercial buildings at scale. These innovative sequences, workflows and tools will be integrated into multiple commercial BAS and EMIS platforms and their performance will be validated in 4-9 real buildings. At the end of the project, the team will develop a scaling strategy including how to extend the technology to other vendors and additional sites. Potential partners include the broader network

[2] Control sequences: a set of instructions or commands that govern the operation of various building systems and equipment in a coordinated manner.
[3] BAS: a computerized intelligent network of electronic devices designed to monitor and control HVAC, lighting and other systems in a building as defined by ASHRAE in GUIDELINE 13-2015: https://www.ashrae.org/technical-resources/bookstore/ashrae-guideline-13-2015-specifying-building-automation-systems (e.g., Carrier/Automated Logic WebCTRL).
[4] EMIS: a broad and rapidly evolving family of tools that monitor, analyze, and control building energy use and system performance as defined by DOE and LBNL in https://www.osti.gov/servlets/purl/1755532 (e.g. Skyfoundry SkySpark).

of 150+ public academic campuses in California. The market transformation team will also engage with ASHRAE to include the sequences developed into Guideline 36, as well as scope out training needs for the new workflows. Partnering with major control vendors, engineering firms, and higher-education campuses, and ASHRAE standard committees will advance market transformation and facilitate the widespread adoption of demand flexibility in large commercial buildings.

### C. Goals and Objectives of the Agreement

**Agreement Goals**
The goals of this agreement are to :

- Develop standardized Demand Flexibility (DF) sequences and new workflows and associated tools to deploy them cost-effectively in large commercial buildings at scale.
- Design and implement the control sequences, workflows, tools and products in 4 to 9 buildings to achieve a building load reduction by at least 10% during the site's monthly peak hour in summer months (May to September) and at least 5% during winter months (November to March).
- Enroll the project sites in an IOU demand response program, when utility metering allows for single building participation. In the instances single building participation is not a feasible option, the team will outline a clear pathway toward scaling the methodology across each campus to enable the entire campus to enroll in DR programs or establish a pathway to do so by the end of the project.

Ratepayer Benefits:[5]
This Agreement will result in the ratepayer benefits through enhanced electricity reliability and reduced costs. It will also directly benefit the demonstration sites, all of which are in Disadvantage Community (DAC) or Low Income (LI) areas, and the local distribution grid, given the large impact of campuses on utility feeders. However, the most significant benefits will likely stem from the improved ability to promote the widespread deployment of demand-flexible controls across California. As the developed technology matures and gains market share, supported by project partners and future stakeholders utilizing the open-source software and tools created by the project, the benefits to ratepayers will increase significantly.

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 by creating:

1) new open-specification for best-in-class DF sequences
2) an open-source implementation of such sequences based on standards
3) integrations of such sequences into commercial BAS and EMIS platforms

[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.

The new approach will also be field validated to boost confidence in the new technology and approach . These advancements are described in more details in Section 1.a of the Narrative.

**Agreement Objectives**
The objective of this Agreement is to:

1) develop new open-specification for best-in-class DF sequences
2) create an open-source implementation of such sequences based on standards
3) integrate such sequences into multiple commercial BAS and EMIS platforms
4) test the sequences and workflows in the field
5) identify a pathway to extend this approach to other buildings in the participating campuses and to other commercial buildings in California.
6) achieve a building load reduction by at least 10% during the site's monthly peak hour in summer months (May to September) and at least 5% during winter months (November to March).
7) enroll the project sites in an IOU demand response program, when utility metering allows for single building participation. In the instances single building participation is not a feasible option, the team will outline a clear pathway toward scaling the methodology across each campus to enable the entire campus to enroll in DR programs or establish a pathway to do so by the end of the project.

## 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.

**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.
  - 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.

# Exhibit A
# Scope of Work
# Lawrence Berkeley National Laboratory

## *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, and other CEC staff relevant to the Agreement. The Recipient's Project Manager and any other individuals deemed necessary by the CAM or the Project Manager shall participate in 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., Teams, Zoom), with approval of the CAM.

  The Kick-off meeting will include discussion of the following:
  - The CAM's expectations for accomplishing tasks described in the Scope of Work;
  - An updated Project Schedule;
  - Terms and conditions of the Agreement;
  - Invoicing and auditing procedures;
  - Travel;
  - Equipment purchases;
  - Administrative and Technical products (subtask 1.1);
  - CPR meetings (subtask 1.3);
  - Monthly Calls (subtask 1.5)
  - Quarterly Progress reports (subtask 1.6)
  - Final Report (subtask 1.7)
  - Match funds (subtask 1.8);
  - Permit documentation (subtask 1.9);
  - Subawards(subtask 1.10);
  - Technical Advisory Committee meetings (subtasks 1.11 and 1.12);
  - Agreement changes;
  - Performance Evaluations; 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
  - 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 may 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 may 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. A determination of unsatisfactory progress This may result in project delays, including a potential Stop Work Order, while the CEC determines whether the project should continue.
- 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(s)
- 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 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* organized by the tasks in the Agreement.

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

***MONTHLY CALLS, 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
- 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
- Approval 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)
    - 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 SUBAWARDS*

**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. 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 application 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 application that led to the CEC 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.
    - 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.
- 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 Subawards**
The goals of this subtask are to: (1) procure subawards required to carry out the tasks under this Agreement; and (2) ensure that the subawards are consistent with the terms and conditions of this Agreement.

**The Recipient shall:**
- Manage and coordinate subrecipients activities in accordance with the requirements of this Agreement.
- Incorporate this Agreement by reference into each subaward.
- Include any required Energy Commission flow-down provisions in each subaward, in addition to a statement that the terms of this Agreement will prevail if they conflict with the subaward terms.
- If requested by the CAM, submit a draft of each *Subaward* required to conduct the work under this Agreement.
- If requested by the CAM, submit a final copy of each executed subaward.
- Notify and receive written approval from the CAM prior to adding any new subrecipient (see the terms regarding of subrecipient additions in the terms and conditions).

**Products:**
- Subawards *( 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, 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 insure 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 1.12.
- 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 insure 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

**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

# Exhibit A
# Scope of Work
# Lawrence Berkeley National Laboratory

## IV. TECHNICAL TASKS

### TASK 2 DEVELOPMENT OF DEMAND FLEXIBILITY OPEN SPECIFICATIONS

The goals of this task are to (1) conduct a review of existing DF strategies (from the scientific literature and industry) (2) gather feedback from researchers, industry and site operators on these strategies and their experiences and (3) publish an open specification of DF strategies in commercial buildings.

**Subtask 2.1 Conduct a review of best practices for DF strategies and gather input from stakeholders**

The goal of this subtask is to compile a list of best-in-class DF strategies in commercial buildings through (1) a review of the scientific and gray literature, public datasets, (2) a survey of existing commercial solutions (3) through interviews with researchers, industry experts and site facility managers.

**The Recipient shall:**

- Review available scientific and gray literature and published datasets available for DF strategies in commercial buildings. The review will cover various types of DF strategies, including but not limited to load shifting, load shedding, and demand limiting.
- Conduct a review of existing commercial platforms and strategies they deploy
- Incorporate project team's experiences, past and ongoing DF projects and field studies, into the review
- Identify objectives, participants and questions for the interview study
- Conduct interviews with researchers, industry exports and site facility managers to learn about the DF strategies they use, feedback on existing DF strategies and challenges and barriers they face during the development and deployment of these strategies.
- Identify data requirements and equipment configuration needed for these strategies
- Prepare a *Memorandum on Review of DF Strategies and Stakeholder Feedback* that documents the results of the literature review, interviews, data requirements and equipment configurations and outlines the strategies and the requirements, their sources and their advantages and disadvantages.

**Products:**

- Memorandum on Review of DF Strategies and Stakeholder Feedback

**Subtask 2.2 Synthesize specifications and requirements for DF control strategies for multiple end-uses**

The goal of this subtask is to compile an open specification of DF sequences for commercial buildings, along with their applicability, communication frequency and I/O requirements, and benefits.

**The Recipient shall:**

- Create DF sequences specifications, based on the literature review, the market survey and the interviews conducted. The specifications will include a natural language description of the sequence, augmented with process flow diagrams and flowcharts.
- Prepare the *Open Specifications for DF Sequences for Commercial Buildings (Draft)* that documents the results of this task and details the DF strategies, their requirements and the benefits and barriers to their deployment.

- Gather and incorporate feedback on this draft specification after project deployment and prepare the *Open Specifications for DF Sequences for Commercial Buildings (Final).*

**Products:**
- Open Specifications for DF Sequences for Commercial Buildings (Draft and Final)

**TASK 3 DEVELOPMENT OF DEMAND FLEXIBILITY SEQUENCES LIBRARY**
The goals of this task are to (1) implement DF strategies from the specification developed in Task 2 using the ASHRAE Standard 231p Control Description Language (CDL),e (2) add semantic models for each sequence to aid auto-configuration, (3) publish an open-source software library containing the machine-readable DF sequences and their requirements, and (4) use a testing framework to evaluate the DF sequences.

**Subtask 3.1 Develop CDL control sequences**
The goal of this subtask is to develop the DF sequences based on the specification from Task 2 using ASHRAE Standard 231p CDL.

**The Recipient shall:**
- Develop DF sequences in CDL, based on the specification from Task 2.
- Publish the *DF Sequences Library* in an existing code repository containing the CDL implementations of the DF sequences.

**Products:**
- DF Sequences Library

**Subtask 3.2 Develop semantic requirements for each sequence in the library**
The goal of this subtask is to represent the semantic data requirements (ASHRAE S223p, Brick, Project-Haystack as needed for the demonstration sites and the vendor platforms) for the DF control sequences in the library.

**The Recipient shall:**
- Represent the semantic requirements of the DF sequences
- Update the sequences in DF Sequences Library with these requirements
- Develop *Semantic Requirements for DF Sequences* and add them to the library developed in Task 3.1 that documents the approach used to represent these requirements in different semantic languages and the requirements themselves.

**Products:**
- Semantic Requirements for DF Sequences

**Subtask 3.3 Test DF sequences in simulation**
The goal of this subtask is to use a testing framework to evaluate the DF sequences and their performance. The testing will leverage both simulation tools such as Modelica and BOPTEST and will also support both a web-interface and a BACnet-interface.

**The Recipient shall:**
- Develop a *CDL Sequences Testing Plan* for the DF sequences using a testing framework.

- Evaluate the performance of the DF sequences using the testing framework.
- Document the results of the testing in a *CDL Sequences Testing Memorandum* with detailed instructions on the sequences, the testing strategy and evaluation criteria.
- Prepare and submit a *CPR Report #1*.

**Products:**
- CDL Sequences Testing Plan
- CDL Sequences Testing Memorandum
- CPR Report #1

**TASK 4 INTEGRATION WITH VENDORS' PLATFORMS**
The goals of this task are to (1) develop the workflow to integrate the CDL DF sequences to BAS and the EMIS platforms and (2) test these sequences after integration.

**Subtask 4.1 Develop specifications for the software and workflow to integrate CDL into vendor platforms**
The goal of this subtask is to develop the specifications for the integrating CDL to BAS and EMIS platforms.

**The Recipient shall:**
- Prepare a *CDL Integration Specification Technical Memorandum* containing software specifications and workflows for integrating CDL sequences into different vendor platforms.

**Products:**
- CDL Integration Specification Technical Memorandum

**Subtask 4.2 Develop the software for integrating CDL to vendor platforms**
The goal of this subtask is to develop the software for integrating CDL sequences into BAS and EMIS platforms.

**The Recipient shall:**
- Develop software solutions to integrate CDL sequences into different vendor platforms.
- Prepare a *Sequences Integration Technical Memorandum* describing the architecture and other implementation details of the software solutions for integrating CDL sequences and open specifications into different vendor platforms.

**Products:**
- Sequences Integration Technical Memorandum

**Subtask 4.3 Test DF sequences in vendor platforms**
The goal of this subtask is to test and evaluate the DF sequences from the DF sequences library after integrating them into vendor platforms and before deploying them on the buildings.

**The Recipient shall:**
- Based on each integration solution, develop a *BAS/EMIS-Integrated DF Sequences Testing Plan* for the DF sequences using a testing framework leveraging simulations tools

such as Modelica and/or BOPTEST. This plan will leverage the one developed internally for Task 3.3

- Once the applicable sequences to be deployed on the buildings have been identified and integrated into the different platforms, conduct the testing and document the results in a *BAS/EMIS-Integrated DF Sequences Testing Memorandum*.

**Products:**

- BAS/EMIS-Integrated DF Sequences Testing Plan
- BAS/EMIS-Integrated DF Sequences Testing Memorandum

**TASK 5 FIELD DEPLOYMENT AND TESTING**

The goals of this task is to confirm the buildings to deploy the sequences on and make necessary changes to support DF sequences, (2) deploy applicable DF sequences to the 4-9 buildings across 5 different BAS and EMIS platforms, (3) identify and enroll in utility DF programs, and (4) evaluate the building's long-term DF performance for each site.

**Subtask 5.1 Confirm and Prepare Sites for Field Demonstrations**

The goals of this subtask are to finalize and prepare the buildings for the tests.

**The Recipient shall:**

- Finalize the buildings to participate in the project
- Assess the existing IT infrastructure, system configuration and sequence of operations of each building
- Identify and enroll sites in applicable utility (IOU, CCA or third-party) demand-response/VPP programs. Publish results in *Utility/CCA Program Enrollment Memorandum.*
- Shortlist applicable DF sequences for the building
- Identify and make modifications (if any) to the building and the BAS or EMIS platform to support these DF sequences
- Prepare a *Site Readiness Memorandum* to describe the site characteristics, whether they are enrolled in specific DR programs, why certain DF sequences were shortlisted and what modifications had to be done at the site, if any.

**Products:**

- Utility/CCA Program Enrollment Memorandum
- Site Readiness Memorandum

**Subtask 5.2 Develop M&V plan for sites**

The goal of this subtask is to develop site-specific measurement and verification plans for each confirmed building to evaluate their DF performance under different scenarios, (e.g. based on the utility programs the site plans to enroll into).

**The Recipient shall:**

- Develop a detailed *Site-Specific Measurement and Verification (M&V) Plan,* to include:
    - Describe the monitoring equipment and instrumentation to be used at each site.
    - Describe the key input parameters and output metrics to be measured.
    - Identify required data acquisition criteria, such as sampling frequency for various parameters.

- Identify additional information necessary to complete the measurement and verification task (e.g., utility tariffs) and complete agreements with IOU/CCA or third-party DF programs if applicable.
- Identify standard operating conditions used as a baseline for the M&V plan.
- Describe the analysis methods to be used to measure all performance criteria listed in the Agreement Objectives section of this Scope of Work.
- Identify metrics for measuring DF capabilities.
- Include in the M&V plan an assessment of energy savings, customer cost savings, and the ability to participate in DF programs.

**Products:**

- Site-Specific M&V Plan

**Subtask 5.3 Deploy the applicable DF sequences to each site**

The goal of this subtask is to deploy the DF sequences on the buildings through the corresponding vendor platform.

**The Recipient shall:**

- Configure the shortlisted sequences to the building's BAS or EMIS platform based on the integration achieved using specification developed in Task 2 and/or the CDL sequences developed in Task 3.
- Deploy and execute these sequences on the BAS or EMIS platform.
- Make any changes necessary to improve the performance of these sequences.
- Prepare a *DF Sequences Deployment Report* to summarize the process and challenges encountered during the DF sequences deployment. It will describe the applicable sequences, integration process and any changes made to the sequences after deployment for each building. The report will also contain the approaches that were used to overcome the challenges and barriers encountered during deployment.

**Products:**

- DF Sequences Deployment Report

**Subtask 5.4 Evaluate performance based on M&V plan**

The goal of this subtask is to conduct a long-term evaluation of buildings according to the measurement and verification plan under the enrolled utility DF programs.

**The Recipient shall:**

- Monitor baseline operation of each building performance according to the Site-Specific Measurement and Verification Plan from Subtask 5.2 and develop a *Baseline Characterization Memorandum.*
- Execute the Site-Specific Measurement and Verification Plan (Subtask 5.1) by testing the operation and performance of the building on each site after deploying the DF sequences.
- Document the results of the tests for each site in a *DF Performance Evaluation Report*.
- Prepare and submit a *CPR Report #2.*

**Products:**

- Baseline Characterization Memorandum,
- DF Performance Evaluation Report

- CPR Report #2

**TASK 6 COMMUNITY ENGAGEMENT**
The goals of this task are to: (1) formulate a plan to scale the proposed approach to additional campuses within the California State University (CSU) and the Contra Costa Community College District (4CD), and (2) share the experiences of the project team with non-participating campuses.

**Subtask 6.1 Gather Feedback from CBO Stakeholders and Inform Technology Development**
The goal of this subtask is to gather feedback from CBO Stakeholders, such as facility and energy managers or sustainability organizations and inform technology requirements to improve the products and processes developed during the project.

**The Recipient shall:**
- Host periodic opportunities for exchanging knowledge between the research team, the community partners and their central offices
- Gather feedback from Facility and Energy Managers
- Communicate lessons learned to the technology vendors and research team
- Prepare a *CBO Stakeholders' Feedback Memorandum* describing the feedback received from the relevant stakeholders on the proposed approach and implementation.

**Products:**
- CBO Stakeholders' Feedback Memorandum

**Subtask 6.2 Engage with participating sites and their central office to formulate plan to scale to other campuses/buildings**
The goal of this subtask is to identify how the proposed approach for deploying DF sequences can be scaled to other buildings in each participating campus or other campuses within the CSU and the 4CD system.

- Host workshops and/or dedicated sessions for CSU- and 4CD-system facilities managers and technicians to facilitate knowledge transfer and best practices from the research project and further identify barriers for non-participating campuses.
- Prepare a *Case Study on Scaling DF in University Campuses* based on the results of the project, lessons learned and feedback from the non-participating universities to scale this approach to additional campuses within the CSU or 4CD system.

**Products:**
- Case Study on Scaling DF in University Campuses

**TASK 7: 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 January 31st 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), and provide *Documentation of Project Profile on EnergizeInnovation.fund*, including the profile link.
- 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), 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 8 TECHNOLOGY/KNOWLEDGE TRANSFER ACTIVITIES

The goals of this task are to 1) develop a project case with feedback from the TAC and 2) engage with OEMs, standards and community based organizations to explore the commercialization and the training pathways for the proposed control delivery workflows.

### Subtask 8.1 Develop Project Case Study

The goal of this subtask is to ensure the technological learning that resulted from the demonstration(s) is captured and disseminated to the range of professions that will be responsible for future deployments of this technology or similar technologies.

**The Recipient Shall:**

- Develop and submit a *Project Case Study Plan* that outlines how the Recipient will document the planning, construction, commissioning, and operation of the technology or system being demonstrated. The Project Case Study Plan should include:
    - An outline of the objectives, goals, and activities of the case study.
    - The organization that will be conducting the case study and the plan for conducting it.
    - A list of professions and practitioners involved in the technology's deployment.

  - Specific activities the recipient will take to ensure the learning that results from the project is disseminated to those professions and practitioners.
  - Presentations/webinars/training events to disseminate the results of the case study.
- Present the draft *Project Case Study Plan* to the TAC for review and comment.
- Develop and submit a *Summary of TAC Comments* that summarizes comments received from the TAC members on the draft *Project Case Study Plan*. This document will identify:
  - TAC comments the Recipient proposes to incorporate into the final *Technology Transfer Plan*.
  - TAC comments the Recipient does not propose to incorporate with and explanation why.
- Submit the final *Project Case Study Plan* to the CAM for approval.
- Execute the final Project Case Study Plan and develop and submit a Project Case Study.
- When directed by the CAM, develop presentation materials for a CEC sponsored conference/workshop(s) on the project.
- When directed by the CAM, participate in annual EPIC symposium(s) sponsored by the California CEC.
- 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.

**Products:**

- Project Case Study Plan (draft and final)
- Summary of TAC Comments
- Project Case Study (draft and final)
- High Quality Digital Photographs

**Subtask 8.2 Engage with Standards Organizations, OEMs and CBOs**

The goals of this task are to (1) incorporate the technological learning, the specifications and the sequence library that resulted from the demonstration(s) into standards and guidelines (2) investigate with control OEMs the commercialization pathways for the sequence integration pipelines and (3) scope out the training requirements for new control delivery workflows, particularly for DF sequences.

**The Recipient Shall:**

- Engage with standards organizations such as ASHRAE to incorporate the specifications of DF sequences as part of a new guideline or an existing guideline. Include results into *ASHRAE standards and Guidelines Memorandum*.
- Engage with control OEMs to explore commercialization strategies for the DF sequences integration software developed in this project. Include the results into *Market Transformation Memorandum.*
- Engage with OEMs, standards and CBOs to scope out training needs for implementing new workflows of control delivery to commercial buildings, with a focus on DF sequences deployment.

**Products:**

- ASHRAE standards and Guidelines Memorandum
- Market Transformation Report

## V. PROJECT SCHEDULE

Please see the attached Excel spreadsheet.