



**CALIFORNIA
ENERGY COMMISSION**



**California Energy Commission
July 26, 2023 Business Meeting
Backup Materials for Agenda Item No 09a:
Electric Power Research Institute, Inc.**

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

STATE OF CALIFORNIA

STATE ENERGY RESOURCES
CONSERVATION AND DEVELOPMENT COMMISSION

RESOLUTION: Electric Power Research Institute, Inc.

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-23-001 with Electric Power Research Institute, Inc. for a \$1,535,556 grant to demonstrate and evaluate the cost-effectiveness and benefits of an interior-mounted, energy-efficient, high-performance, secondary window retrofit system to be installed in elementary schools located in a low-income and disadvantaged community in Bakersfield; 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 July 26, 2023.

AYE:

NAY:

ABSENT:

ABSTAIN:

Dated:

Kristine Banaag
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-23-001

B. Division Information

1. Division Name: ERDD
2. Agreement Manager: Jeanie Mar
3. MS-:None
4. Phone Number: 916-776-0791

C. Recipient's Information

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

D. Title of Project

Title of project: Cost-effective Advanced Window Retrofits for Schools

E. Term and Amount

1. Start Date: 8/16/2023
2. End Date: 3/31/2027
3. Amount: \$1,535,556.00

F. Business Meeting Information

1. Are the ARFVTP agreements \$75K and under delegated to Executive Director? No
2. The Proposed Business Meeting Date: 7/26/2023
3. Consent or Discussion? Discussion
4. Business Meeting Presenter Name: Jeanie Mar
5. Time Needed for Business Meeting: 5 minutes.
6. The email subscription topic is: NaturalGas (NG Research Program).

Agenda Item Subject and Description:

Electric Power Research Institute, Inc. Proposed resolution approving agreement PIR-23-001 with Electric Power Research Institute, Inc. for a \$1,535,556 grant to demonstrate and evaluate the cost-effectiveness and benefits of an interior-mounted, energy-efficient, high-performance secondary window retrofit system to be installed in elementary schools located in a low-income and disadvantaged community in Bakersfield, and adopting staff's determination that this project is exempt from CEQA. (PIER NG funding) Contact: Jeanie Mar

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.

This project fits within Cal. Code Regs. tit. 14, sect. 15301 because it involves minor alteration and installation of equipment at an existing facility, with no expansion of capacity. This installation is at an existing, developed site on land that is not environmentally sensitive. No historical resources or buildings will be affected. Noise and odors will not be generated by these installations in excess of existing permitted amounts. The installation will not increase traffic to these sites and will not require permits for air, water, conditional use, building expansion, hazardous waste, or rezoning. Additionally, Cal. Code Regs. tit. 14, sect. 15306 applies because this project also involves basic data collection, research, experimental management, and resource evaluation activities which do not result in serious or major disturbance to an environmental resource.

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



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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. 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
CLEAResult Consulting Inc.	\$ 81,472	\$0
WexEnergy LLC	\$ 776,472	\$235,513
Intertek Testing Services NA Inc.	\$ 50,400	\$0
SOUND ENVIRONMENT, INC.	\$ 44,037	\$0

I. 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
SOUND ENVIRONMENT, INC.	\$591,179	\$83,326

J. 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

K. 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.



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Funding Source	Funding Year of Appropriation	Budget List Number	Amount
NG Subaccount, PIERDD	20-21	501.001OS	\$ 1,417,633
NG Subaccount, PIERDD	20-21	501.001O	\$ 117,923

TOTAL Amount: \$ 1,535,556

R&D Program Area: EERB: Buildings

Explanation for "Other" selection Not applicable

Reimbursement Contract #: Not applicable

Federal Agreement #: Not applicable

L. Recipient's Contact Information

1. Recipient's Administrator/Officer

Name: Jessica Carrese

Address: 942 Corridor Park Blvd

City, State, Zip: Knoxville, TN 37932-3723

Phone:

E-Mail: JCarrese@epri.com

3. Recipient's Project Manager

Name: Sara Beaini

Address: 3420 Hillview Ave

City, State, Zip: Palo Alto, CA 94304-1355

Phone:

E-Mail: sbeaini@epri.com

M. Selection Process Used

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

Selection Process	Additional Information
Competitive Solicitation #	GFO-22-501
First Come First Served Solicitation #	Not applicable
Other	Not applicable

N. Attached Items

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



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Grant Request Form
CEC-270 (Revised 9/2022)

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: Jeanie Mar

Approval Date: 05/30/2023

Branch Manager: Virginia Lew

Approval Date: 05/31/2023

Director: Virginia Lew for Angela Gould

Approval Date: 06/01/2023

EXHIBIT A
Scope of Work
Electric Power Research Institute Inc.

I. TASK ACRONYM/TERM LISTS

A. Task List

Task #	CPR¹	Task Name
1		General Project Tasks
2		Site Audit and Window Preparations
3		Technology Lab Evaluation
4		Field Measurement and Verification
5	X	Installer Training and Technology Installation
6	X	Performance Modeling and Technology Assessment with School District Feedback
7		Market Deployment Plan
8		Evaluation of Project Benefits
9		Technology/Knowledge Transfer Activities

B. Acronym/Term List

Acronym/Term	Meaning
CAM	Commission Agreement Manager
Cal TF	California Technical Forum
CAO	Commission Agreement Officer
CEC	California Energy Commission
CPR	Critical Project Review
M&V	Measurement and Verification
SHGC	Solar Heat Gain Coefficient
VT	Visible Light Transmittance
TAC	Technical Advisory Committee
TRL	Technology Readiness Level

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

A. Purpose of Agreement

The purpose of this Agreement is to fund the demonstration and evaluation of interior-mounted window retrofit technology to determine cost-effectiveness, benefits and resulting building energy performance (gas and electricity consumption).

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.

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B. Problem/ Solution Statement

Problem

Windows are the most thermally porous component of the building envelope. Single-pane models are inefficient and a contributor to building inefficiency. Aging windows of all kinds can contribute to reduced building thermal performance. Windows also are very expensive to upgrade or replace, relative to other building envelope improvements. Consequently, poorly performing windows are often left unaddressed, especially in low-income or disadvantaged communities.

Solution

The project will demonstrate and evaluate the cost-effectiveness and building performance improvement resulting from the installation of an interior-mounted window retrofit technology. The technology would reduce thermal energy loss from aging and underperforming windows, be minimally disruptive to building occupants and be cost-effective. The window retrofit technology acts as an interior window insulation panel that snaps on to each corner of a windowpane. The patented construction optimizes insulation by sealing and controlling the air gap between the inserted panel and windowpane. For operable windows, windows open and close just as they did before. The technology is feather-weight and rigid for easy installation and low shipping cost.

This research project includes laboratory testing, field installation and Measurement & Verification (M&V). The technology will be installed at public-schools located in a disadvantaged and low-income community. The project will also include performance modeling, obtaining community/stakeholder feedback, and developing a market deployment plan. This project will provide valuable feedback and data on the practical aspects of the technology's adoption – such as convenience of installation, cost-effectiveness, avoidance of asbestos or lead removal, and other considerations.

C. Goals and Objectives of the Agreement

Agreement Goals

The goals of this Agreement are to:

- Demonstrate cost-effectiveness and benefits of interior-mounted window retrofit technology;
- Reduce building gas and electric energy consumption by at least 15% when compared to current HVAC energy use with existing single-pane windows; and
- Accelerate high-performance window installations in the commercial building retrofit market.

Ratepayer Benefits: This Agreement will result in the ratepayer benefits of lower costs through improving the building envelope and reducing building energy use and cost. The interior-mounted window retrofit technology would save building owners the cost of window replacements which are more expensive and may typically require construction permits.

Technological Advancement and Breakthroughs: 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 advancing the technology from Technology Readiness Level (TRL) 8 to TRL 9. This technology could increase building envelope efficiency at a lower

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cost than whole window replacement. The technology will be demonstrated in public schools in a low-income and disadvantaged community, which has one of the highest air pollution levels in the state. The Agreement will involve a quantitative field M&V study to document the technology's real-world performance and a market adoption plan.

Agreement Objectives

The objectives of this Agreement are to:

- Establish benchmark thermal ($U \leq 0.22$), air leakage, Visible Light Transmittance (VT) and Solar Heat Gain Coefficient (SHGC) performance properties for the window retrofit product through independent lab evaluation;
- Demonstrate the low-cost window retrofit product at existing schools with single-pane windows in a low-income and disadvantaged community;
- Validate the established performance and installation aspects through a field measurement and verification plan for at least 12 months of pre-installation and at least 12 months of post-installation or shorter as approved by the CAM;
- Interface with the host sites for training, installation and feedback to develop practical implementation lessons in order to further the implementation and application of the technology to other schools and buildings;
- Model performance of standard Title 24 compliant and the advanced windows in all climate zones using CBECC 2022 modeling software, or other CEC approved Title 24 compliant software program as approved by the CAM; and
- Develop a market adoption and deployment plan for the technology, informed by the lab and field performance findings and the community feedback at the host sites.

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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:

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- 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.

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.

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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
 - 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.

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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.
- 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).

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- 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:

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

REPORTS AND INVOICES

Subtask 1.5 Progress Reports and Invoices

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

The Recipient shall:

- Submit a monthly *Progress Report* to the CAM. Each progress report must:
 - Summarize progress made on all Agreement activities as specified in the scope of work for the preceding month, 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. See the Progress Report Format Attachment for the recommended specifications.
- Submit a monthly or quarterly *Invoice* that follows the instructions in the "Payment of Funds" section of the terms and conditions, including a financial report on Match Funds and in-state expenditures.

Products:

- Progress Reports
- Invoices

Subtask 1.6 Final Report

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

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Manual provided by the CAM.

Subtask 1.6.1 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 Product:

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

Subtask 1.6.2 Final Report

The Recipient shall:

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

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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 1.7 Match Funds

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

While the costs to obtain and document match funds are not reimbursable under this Agreement, the Recipient may spend match funds for this task. The Recipient may only spend match funds during the Agreement term, either concurrently or prior to the use of 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:

- 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.

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- At the Kick-off meeting, discuss match funds and the impact on the project if they are significantly reduced or not obtained as committed. If applicable, match funds will be included as a line item in the progress reports and will be a topic at CPR meetings.
- Provide a *Supplemental Match Funds Notification Letter* to the CAM of receipt of additional match funds.
- Provide a *Match Funds Reduction Notification Letter* to the CAM if existing match funds are reduced during the course of the Agreement. Reduction of match funds may trigger a CPR meeting.

Products:

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

Subtask 1.8 Permits

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

The Recipient shall:

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

The list of permits and the schedule for obtaining them will be discussed at the Kick-off meeting (subtask 1.2), and a timetable for submitting the updated list, schedule, and copies of the permits will be developed. The impact on the project if the permits are not obtained in a timely fashion or are denied will also be discussed. If applicable, permits will be included as a line item in progress reports and will be a topic at CPR meetings.

- If during the course of the Agreement additional permits become necessary, then provide the CAM with an *Updated List of Permits* (including the appropriate information on each permit) and an *Updated Schedule for Acquiring Permits*.
- Send the CAM a *Copy of Each Approved Permit*.
- If during the course of the Agreement permits are not obtained on time or are denied, notify the CAM within 5 days. Either of these events may trigger a CPR meeting.

Products:

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

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Subtask 1.9 Subcontracts

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

The Recipient shall:

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

Products:

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

TECHNICAL ADVISORY COMMITTEE

Subtask 1.10 Technical Advisory Committee (TAC)

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

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

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- 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 1.11.
- Prepare a *List of TAC Members* once all TAC members have committed to serving on the TAC.
- Submit *Documentation of TAC Member Commitment* (such as Letters of Acceptance) from each TAC member.

Products:

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

Subtask 1.11 TAC Meetings

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

The Recipient shall:

- Discuss the TAC meeting schedule with the CAM at the Kick-off meeting. Determine the number and location of meetings (in-person and via teleconference) in consultation with the CAM.
- Prepare a *TAC Meeting Schedule* that will be presented to the TAC members during recruiting. Revise the schedule after the first TAC meeting to incorporate meeting comments.
- Prepare a *TAC Meeting Agenda* and *TAC Meeting Back-up Materials* for each TAC

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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 1.12 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.

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- Discuss the *Project Performance Metrics Results* at the Final Meeting.

Products:

- TAC Performance Metrics Summary
- Project Performance Metrics Results

IV. TECHNICAL TASKS

TASK 2: SITE AUDIT AND WINDOW PREPARATIONS

The goals of this task are to conduct assessments for the host sites to determine the baseline metrics and to measure the windows for the technology retrofit, and prepare for technology procurement and installation.

The Recipient shall:

- Conduct at least one site visit to the host sites to confirm the baseline metrics (square footage, window square footage, window to wall ratio, window qualities, orientation, U-factor, R-factor, SHGC, VT, etc.).
- Measure the windows for the technology retrofit.
- Determine the preparations needed for the window technology retrofit procurement and installation.
- Prepare a *Site Audit Memo* that includes but is not limited to:
 - A description with pictures of the host site(s) (e.g., square footage) and other pertinent information on why the site(s) are good candidates for retrofits (e.g., potential to replicate at other schools in the district, year round school);
 - A description of the windows to be retrofitted, including the existing window specifications for each site (e.g., window square footage, window to wall ratio, U-factor, R-factor, SHGC, VT, air leakage, and window orientation, etc.);
 - A discussion of the preparations for the technology procurement and installation that include but is not limited to current window conditions/issues (e.g. draft, condensation, etc.) and air-sealing and/or weatherstripping of the existing window, if required.

Products:

- Site Audit Memo

TASK 3: TECHNOLOGY LAB EVALUATION

The goal of this task is to conduct a laboratory evaluation of the window retrofit technology.

The Recipient shall:

- Prepare a *Laboratory Test Plan* that includes, but is not limited to, descriptions of 1) the preparation and delivery of the retrofit window technology for independent laboratory evaluation of performance compared to Title 24 compliant windows; 2) the different window types that the retrofit will be installed in which includes but is not limited to windows similar to the host site(s), single-pane aluminum casement window, a double-pane aluminum picture window, and others; and 3) the procedures used to test the following at a minimum:

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U-factor, VT, SHGC, air leakage and Condensation index of the entire fenestration assembly.

- Monitor the testing process with the independent laboratory throughout the testing period.
- Prepare a *Technology Laboratory Evaluation Report* that summarizes the independent laboratory's evaluation and testing results which includes but is not limited to retrofitted assembly systems with different window sash materials and condensation potential. The report will include, but not be limited to, a comparison of the retrofit technology with the baseline window metrics (i.e., U-factor, VT, SHGC, air leakage and Condensation index of the entire fenestration assembly).

Products:

- Laboratory Test Plan (draft and final)
- Technology Laboratory Evaluation Report (draft and final)

TASK 4: FIELD MEASUREMENT AND VERIFICATION

The goal of this task is to conduct a field M&V study with the window retrofit technology.

The Recipient shall:

- Prepare a *Field Measurement and Verification Plan* to include at least 12 months of pre-installation and at least 12 months of post-installation of the window retrofit technology, which includes the M&V bill of materials. Adjustments to the duration of the pre- and post-installation monitoring must be approved in advance by the CAM.
- Procure M&V materials and equipment for remote data monitoring.
- Install M&V materials and equipment for remote data monitoring.
- Collect at least 12 months of pre-installation data and at least 12 months of post-installation data which includes both winter and summer seasons. Adjustments to the duration of the pre- and post-installation monitoring must be approved in advance by the CAM.
- Analyze field data results for technology energy savings and other non-energy benefits.
- Document building energy consumption (electric and gas) and savings potential from field results.
- Conduct M&V decommissioning to remove M&V monitoring equipment after the completion of the M&V study.
- Prepare *Field Measurement and Verification Results Report* which includes but is not limited to annual building energy consumption (pre- and post-window retrofit technology), annual energy and cost savings, greenhouse gas emission savings, analysis of non-energy benefits, window metrics that were evaluated in Task 2 and Task 3, and externalities that occurred during the M&V periods that impacted the collected data.

Products:

- Field Measurement and Verification Plan (draft and final)
- Field Measurement and Verification Results Report (draft and final)

TASK 5: INSTALLER TRAINING AND TECHNOLOGY INSTALLATION

The goals of this task are to conduct training for the installers and perform the window retrofit installation.

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The Recipient shall:

- Conduct at least one training and make an installation training video to train installers on proper installation of the window retrofit technology.
- Procure the window retrofit technology product for installation.
- Install the retrofit window technology after the baseline measurement and verification is completed (Task 4).
- Prepare a *Technology Installation Schedule Memo* that summarizes the schedule of technology procurement, training of the installers, technology installation which includes best practices and a link to the training video.
- Prepare a *CPR Report #1* in accordance with subtask 1.3 (CPR Meetings).
- Participate in a CPR meeting.

Products:

- Technology Installation Schedule Memo
- CPR Report #1

TASK 6: PERFORMANCE MODELING AND TECHNOLOGY ASSESSMENT WITH SCHOOL DISTRICT FEEDBACK

The goals of this task are to conduct energy performance modeling of the window retrofit technology and the standard Title 24 compliant window using CBECC 2022 modeling software, or other CEC approved Title 24 compliant software program approved by the CAM and to evaluate the technology cost-effectiveness.

The Recipient shall:

- Consult the California Technical Forum (Cal TF) to ensure data collection needs are consistent with Energy Efficient Statewide measure development and complete the Cal TF Measure Proposal Form.
- Conduct energy performance modelling of standard Title 24 compliant and the advanced windows in all 16 California climate zones using CBECC 2022 modeling software, or other CEC approved Title 24 compliant software program if approved by the CAM, such as EnergyPlus using California specific prototypes, climate zones and Alternative Calculation Method schedule assumptions.
- Use quantitative and/or qualitative methods to understand how cost savings and energy and non-energy benefits can be determined for the window retrofit technology to inform the school district.
- Document the technology's cost-effectiveness by evaluating and estimating the system cost (materials and installation per square foot of window) for the installed building type, including simple payback.
- Prepare a *Technology Assessment Report* that includes but is not limited to a summary of the energy performance modeling results, greenhouse gas emission savings, the district feedback, the cost-effectiveness system assessment including simple payback, and the completed Cal TF Measure Proposal Form. This report would inform the Energy Efficient Statewide measure development.
- Prepare a *CPR Report #2* in accordance with subtask 1.3 (CPR Meetings).
- Participate in a CPR meeting.

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Products:

- Technology Assessment Report (draft and final)
- CPR Report #2

TASK 7: MARKET DEPLOYMENT PLAN

The goal of this task is to develop a market deployment plan that will increase installation and market share of the advanced window retrofit technology.

The Recipient shall:

- Develop a *Market Deployment Plan* that includes but is not limited to the following:
 - Strategies for scaling up manufacturing and deployment of the window retrofit technology, including areas for manufacturing process efficiency and cost reduction and availability of a trained work force for installation;
 - Compare current Title 24 compliant window cost to the high-performance new window costs, to include materials and installation per window cost and strategies for cost reductions;
 - Overall analysis of cost effectiveness including payback by building type (e.g., school, office, retail, etc.) informed by Task 6;
 - Analysis to estimate market size and identify most promising market, including all assumptions; and
 - Strategies for increasing installation and market shares of the window technology in commercial buildings with the most potential for retrofit, including identification of potential incentives or tax credits that are available or would be needed to achieve a simple payback of 10 years or less, and how this technology could be included in future public school retrofit or deferred maintenance programs.

Products:

- Market Deployment Plan (draft and final)

TASK 8: 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 December 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.

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- 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.
- 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 9 TECHNOLOGY/KNOWLEDGE TRANSFER ACTIVITIES

The goal of this task is to conduct activities that will accelerate the commercial adoption of the technology being supported under this agreement. Eligible activities include, but are not limited to, the following:

- Scale-up analysis including manufacturing analysis, independent design verification, and process improvement efforts.
- Technology verification testing, or application to a test bed program located in California.
- Legal services or licensing to secure necessary intellectual property to further develop the technology.
- Market research, business plan development, and cost-performance modeling.
- Entry into an incubator or accelerator program located in California.

The Recipient Shall:

- Develop and submit a *Technology Transfer Plan* that identifies the proposed activities the recipient will conduct to accelerate the successful commercial adoption of the technology.
- Present the *Draft Technology 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 Technology Transfer 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 Technology Transfer Plan* to the CAM for approval.
- Implement activities identified in *Final Technology Transfer Plan*.
- Develop and submit a *Technology Transfer Summary Report* that includes high level summaries of the activities, results, and lessons learned of tasks performed relating to implementing the *Final Technology Transfer Plan*. This report should not include any proprietary information.
- When directed by the CAM, develop presentation materials for an CEC- sponsored

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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.

Products:

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

V. PROJECT SCHEDULE

Please see the attached Excel spreadsheet.