STATE OF CALIFORNIA
GRANT REQUEST FORM (GRF)
CEC-270 (Revised 12/2019) CALIFORNIA ENERGY COMMISSION

A) New Agreement # PIR-20-006 (to be completed by CGL office)

B) Division	Agreement Manager:	MS-	Phone
ERDD	Ilia Krupenich	51	916-776-0782

C) Recipient's Legal Name	Federal ID Number
Gallo Glass Company	94-1384142

D) Title of Project
Commercial Demonstration of an Economically Viable Advanced Oxy-Fuel Combustion Glass Melting Process to Decrease Natural Gas Consumption and Reduce NOx and CO2 Emissions

E) Term and Amount

Start Date	End Date	Amount
5/15/2021	3/31/2025	$ 5,573,860

F) Business Meeting Information

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

Proposed Business Meeting Date 4/14/2021 ☒ Consent ☐ Discussion

Business Meeting Presenter Ilia Krupenich Time Needed: 5 minutes

Please select one list serve. NaturalGas (NG Research Program

Agenda Item Subject and Description:

GALLO GLASS COMPANY. Proposed resolution approving agreement PIR-20-006 with Gallo Glass Company for a $5,573,860 grant to demonstrate an economically viable advanced oxygen-enriched combustion system, and adopt staff's determination that this action is exempt from CEQA. (PIER NG funding) Contact: Ilia Krupenich.

G) California Environmental Quality Act (CEQA) Compliance

1. Is Agreement considered a "Project" under CEQA?
   ☒ Yes (skip to question 2)
   ☐ No (complete the following (PRC 21065 and 14 CCR 15378)):

   Explain why Agreement is not considered a "Project":

2. If Agreement is considered a "Project" under CEQA:
   a) ☒ Agreement **IS** exempt.
   ☐ Statutory Exemption. List PRC and/or CCR section number:
   ☒ Categorical Exemption. List CCR section number: Cal. Code Regs., tit. 14, § 15302
   ☐ Common Sense Exemption. 14 CCR 15061 (b) (3)

   Explain reason why Agreement is exempt under the above section: This project will use existing building, will be located at the same glass manufacturing plant, and will replace existing oxygen-enriched combustion system with a more advanced one. Plant's capacity and production rate are supposed to stay the

same with decreased natural gas and electricity consumption, and resulting decreased emissions.

b) Agreement **IS NOT** exempt. (consult with the legal office to determine next steps)

Check all that apply

- ☐ Initial Study
- ☐ Negative Declaration
- ☐ Mitigated Negative Declaration
- ☐ Environmental Impact Report
- ☐ Statement of Overriding Considerations

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

Legal Company Name:	**Budget**
Linde, Inc.	$ 517,480
TBD Engineering	$ 200,000
PLC Programming	$ 51,000
TBD - Electrical	$ 255,000
TBD	$ 472,500
TBD - Mechanical Contractor	$ 656,500
TBD - Materials	$ 780,000
	$
	$
	$

I) List all key partners: (attach additional sheets as necessary)

Legal Company Name:

J) Budget Information

Funding Source	**Funding Year of Appropriation**	**Budget List Number**	**Amount**
NG Subaccount, PIERDD	19-20	501.001N	$5,573,860
			$
			$
			$
			$
			$

R&D Program Area: EERO: IAW TOTAL: $ 5,573,860

Explanation for "Other" selection

Reimbursement Contract #: Federal Agreement #:

K) Recipient's Contact Information

1. Recipient's Administrator/Officer

Name: Nigel Dart
Address: 605 S Santa Cruz Ave

City, State, Zip: Modesto, CA 95354-4254
Phone: 209-341-6550
E-Mail: nigel.dart@ejgallo.com

2. Recipient's Project Manager

Name: Nigel Dart
Address: 605 S Santa Cruz Ave

City, State, Zip: Modesto, CA 95354-4254
Phone: 209-341-6550
E-Mail: nigel.dart@ejgallo.com

L) Selection Process Used

☒ Competitive Solicitation Solicitation #: GFO-20-501
☐ First Come First Served Solicitation Solicitation #:

M) The following items should be attached to this GRF

1.	Exhibit A, Scope of Work		☐ Attached
2.	Exhibit B, Budget Detail		☐ Attached
3.	CEC 105, Questionnaire for Identifying Conflicts		☐ Attached
4.	Recipient Resolution	☐ N/A	☐ Attached
5.	CEQA Documentation	☐ N/A	☐ Attached

Agreement Manager **Date**

Office Manager **Date**

Deputy Director **Date**

EXHIBIT A
Scope of Work

I. TASK ACRONYM/TERM LISTS

A. Task List

Task #	CPR[1]	Task Name
1		General Project Tasks
2	X	Design and Procurement of Technology, Equipment, and Materials
3		Baseline Furnace Measurement
4	X	Installation of Advanced Oxy-Fuel Combustion Glass Melting Technology and Equipment and Replacement of Flue Ducts and Stack
5	X	Commissioning and Monitoring of Advanced Oxy-Fuel Combustion Glass Melting System
6		Evaluation of Project Benefits
7		Technology/Knowledge Transfer Activities

B. Acronym/Term List

Acronym/Term	Meaning
AOGM	Advanced Oxy-Fuel Combustion Glass Melting
BPH	Batch Preheater
CAM	Commission Agreement Manager
CAO	Commission Agreement Officer
CEC	California Energy Commission
CFD	Computational Fluid Dynamics
CO_2	Carbon Dioxide
CPH	Cullet Heat Exchanger
CPR	Critical Project Review
GHG	Greenhouse Gas
NOx	Oxides of Nitrogen, especially as Atmospheric Pollutants
OFC	Oxy-fuel Combustion
TAC	Technical Advisory Committee
TRL	Technical Readiness Level

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

A. Purpose of Agreement

The purpose of this Agreement is to demonstrate an economically viable advanced oxygen-enriched combustion system at the Recipient's glass manufacturing facility. The Recipient will partner with a Subcontractor that will provide the proposed technology, measure the performance, and transfer the demonstrated technology to the global glass market. Another Subcontractor will design, engineer, and supervise the installation and commissioning of the proposed technology. This project will leverage California Energy Commission (CEC) funding and matching funds from the Recipient to demonstrate this economically viable advanced combustion technology, which is

[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.

anticipated to decrease natural gas consumption on the installed glass furnace by 25 percent and reduce oxides of nitrogen (NOx) and carbon dioxide (CO_2) emissions from combustion also by 25 percent, as compared with oxy-fuel combustion (OFC) process currently used for glass melting.

B. Problem/ Solution Statement

Problem

Most glass furnaces worldwide use air and regenerative furnaces to conduct a conventional gas combustion process. The outgoing exhaust gases typically exit the regenerator at 450ºC and carry away some 30 percent of the heating value from the natural gas combustion. It has long been desired in the glass industry to use this wasted heat to preheat the incoming raw materials and thus reduce natural gas firing rates. However, significant barriers exist: despite multiple attempts, raw material preheaters have not found widespread commercial application due to performance issues and high capital costs, creating a financial barrier to adoption.

Conventional OFC substantially reduces NOx emissions thus benefitting the environment, however, oxy-fuel furnaces are typically more expensive to operate than air-gas furnaces due to the added cost of producing oxygen, a barrier to implementation. This higher cost has limited the number of oxy-fuel furnaces implemented worldwide. In addition, adopting OFC technology without any advanced technology or enhanced equipment still results in about 30 percent of the heat generated by natural gas combustion being carried away with the oxy-fuel furnace exhaust gas.

Solution

The project – a commercial demonstration of an Advanced Oxy-Fuel Combustion Glass Melting (AOGM) Process, recycles waste heat and creates a more economically viable advanced combustion process for industrial applications that would result in a decrease of natural gas use and higher level of GHG emission reductions.

To facilitate wider market deployment, demonstration of this advanced oxygen-enriched combustion process will be completed at large scale (470 metric tons per day) with several improvements both in performance and maintenance requirements. The heat exchanger design with compact cullet preheater (CPH) and batch preheater (BPH) modules enables the installation within the existing furnace floor space without interrupting the furnace operation.

C. Goals and Objectives of the Agreement

Agreement Goals

The goal of this Agreement is to demonstrate a new economically-viable advanced combustion system at the Recipient's Modesto facility, which is expected to improve efficiency, reduce costs, and reduce environmental impact, compared to conventional OFC systems.

Ratepayer Benefits: This Agreement will validate the technical performance of the AOGM Process, creating a more economically viable advanced combustion process for industrial applications that would result in a decrease of natural gas use as well as a decrease in electricity use.

This will result in ratepayer benefit of reduced natural gas consumption of approximately 25 percent, directly leading to lower utility costs. A 25 percent reduction in O_2 requirements as a

result of this project will also lower electricity consumed in oxygen production by about 140 kW, which also will result in lower electricity costs.

With the adoption of the AOGM at the Recipient' facility, the total reduction in natural gas consumption at the Modesto site would be estimated to be 5.2 million therms per year. Electricity consumption is expected to decrease by 560 kW due to the reduced O_2 requirements. The reduced natural gas consumption and O_2 requirements result in a net reduction in CO_2 emissions of ~32,000 short tons per year. NOx reductions on an annual basis is expected to be ~172,000 lbs/yr. This will directly benefit ratepayers in the disadvantaged and low-income community where the Recipient is located.

It is highly likely that the adoption of this technology by other industrial natural gas users will yield similar results and positive benefits for additional California ratepayers.

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 demonstrating technology at a major natural gas user that will reduce carbon emissions from natural gas sources, helping to achieve AB32 goals of 40 percent lower CO_2 generation from 1990 levels by 2030.

The technology would provide immediate benefits of a 25 percent reduction in natural gas use, directly leading to costs savings on utility bills.

Agreement Objectives

The objectives of this Agreement are to:

- Procure and install technologies to allow for the demonstration and validation of the technical performance of the AOGM.
- Analyze results of this demonstration project and prepare recommendations to improve the system's characteristics in order to overcome barriers for broad market adoption.
- Share results widely with industrial natural gas users to advance adoption of technology and positively impact GHG emission reductions to meet the State of California's statutory energy goals.

III. TASK 1 GENERAL PROJECT TASKS

PRODUCTS

Subtask 1.1 Products

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

EXHIBIT A
Scope of Work

The 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.

MEETINGS

Subtask 1.2 Kick-off Meeting

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

The Recipient shall:

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

  The administrative portion of the meeting will include discussion of the following:
  - Terms and conditions of the Agreement;
  - Invoicing and auditing procedures;
  - Administrative products (subtask 1.1);
  - CPR meetings (subtask 1.3);
  - Match fund documentation (subtask 1.7);
  - Permit documentation (subtask 1.8);
  - Subcontracts (subtask 1.9); and
  - Any other relevant topics.

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

- Provide *Kick-off Meeting Presentation* to include but not limited to:
  - Project overview (i.e. project description, goals and objectives, technical tasks, expected benefits, etc.)
  - Project schedule that identifies milestones
  - List of potential risk factors and hurdles, and mitigation strategy

- Provide an *Updated Project Schedule, Match Funds Status Letter,* and *Permit Status Letter*, as needed to reflect any changes in the documents.

The CAM shall:

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

Recipient Products:

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

CAM Product:

- Kick-off Meeting Agenda

Subtask 1.3 Critical Project Review (CPR) Meetings

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

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

The Recipient shall:

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

The CAM shall:

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

- Provide the Recipient with a *Progress Determination* on continuation of the project, in accordance with the schedule. The Progress Determination may include a requirement that the Recipient revise one or more products.

Recipient Products:
- CPR Report(s)

CAM Products:
- CPR Agenda
- Progress Determination

Subtask 1.4 Final Meeting
The goal of this subtask is to complete the closeout of this Agreement.

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

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

Products:
- 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 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* 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
- 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.

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

Products:

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

Subtask 1.8 Permits

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

The Recipient shall:

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

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

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

Products:

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

Subtask 1.9 Subcontracts

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

The Recipient shall:

- Manage and coordinate subcontractor activities in accordance with the requirements of this Agreement.
- Incorporate this Agreement by reference into each subcontract.
- Include any required Energy Commission flow-down provisions in each subcontract, in addition to a statement that the terms of this Agreement will prevail if they conflict with the subcontract terms.
- If required by the CAM, submit a draft of each *Subcontract* required to conduct the work under this Agreement.
- Submit a final copy of 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.
- 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 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 identify key performance targets for the project. 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 draft *Project Performance Metrics Questionnaire* to the CAM prior to the Kick-off Meeting.

- Present the draft *Project Performance Metrics Questionnaire* 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 final *Project Performance Metrics Questionnaire*.
  - TAC comments the recipient does not propose to incorporate with and explanation why.
- Submit a final *Project Performance Metrics Questionnaire* with incorporated TAC feedback.
- 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 Performance Metrics Questionnaire*.
- Discuss the final *Project Performance Metrics Questionnaire* and *Project Performance Metrics Results* at the Final Meeting.

Products:

- Project Performance Metrics Questionnaire (draft and final)
- TAC Performance Metrics Summary
- Project Performance Metrics Results

IV. TECHNICAL TASKS

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

TASK 2: DESIGN AND PROCUREMENT OF TECHNOLOGY, EQUIPMENT, AND MATERIALS

The goal of this task is to complete the required design and engineering specifications of the technology and equipment that will be installed at the Recipient's facility.

All equipment and technology are at technical readiness level (TRL) seven; specifications unique to the Recipient will be designed to ensure project success. Once specifications are made for this industrial site, all technology, equipment, and materials will be procured. The project team will determine detailed operating criteria and objectives, then design equipment to meet the project goals. For the BPH design, computational fluid dynamics (CFD) simulation of flue gas flow distribution in the heat exchanger manifolds will be made to optimize the heat transfer and to achieve preheat temperature of 400^{o}C. CFD simulation will be made to determine the optimum locations in the flue downcomer to connect the inlet and outlet ducts of CPH. The project team will prepare all specifications of manufactured and purchased items. The project team will qualify suitable manufacturers and supervise the manufacturing. Major equipment will be procured and manufactured in California.

The Recipient shall:

- Direct chosen Subcontractors to complete the needed design and engineering specifications for the needed technology and equipment to demonstrate the AOGM process at the Recipient's facility.

- Complete CFD simulations.
- Secure final equipment and installation quotations/bids from California-based vendors.
- Prepare a *Site Preparation and Technology/Equipment Procurement Memo* that shall include, but not be limited to:
    - Summary of the steps to prepare the site(s);
    - Copy of the performance specifications for each equipment purchased by the grant.
    - Summary of the bids received and from whom;
    - Copies of all required permits needed for installation at each site;
    - Copies of the final procurement documents and purchase orders; and
    - Status of the planned installation including preliminary schedule for equipment delivery and installation for each site.
- Prepare *CPR Report #1* in accordance with subtask 1.3 (CPR Meetings).
- Participate in CPR Meeting #1 held jointly with TAC meeting.
- Upon approval from CEC shown in *Progress Determination* (see subtask 1.3), procure all technology, equipment, and supplies for installation of equipment from California-based vendors and confirm delivery date.
- Ensure that *Site Preparation and Technology/Equipment Procurement Memo* and *CPR Report #1* do not include confidential information listed in Attachment C-1.

Products:

- Site Preparation and Technology/Equipment Procurement Memo
- CPR Report #1

TASK 3: BASELINE FURNACE MEASUREMENT

The goal of this task is to collect baseline measurements of natural gas, oxygen, and electric power consumption as well as glass quality and emissions of NOx and other pollutants on the Recipient furnace where the AOGM system will be installed. The furnace will also be optimized to ensure adequate performance needed to successfully demonstrate the AOGM process.

The host furnace is equipped with instrumentation to continuously measure and record all data concerning furnace energy performance. This data will be recorded for one year prior to operation of the AOGM and then recorded for one year after commissioning of AOGM.

CFD simulation of the furnace will be made to model the furnace performance with and without preheated batch and cullet. Changes in furnace and glass temperatures and glass quality will be used to optimize the furnace operation for AOGM operation.

The Recipient shall:

- Ensure access to all hardware, software and staff required to conduct the required measurements and analysis during the project term while following utility M&V protocols.
- Collect baseline measurements of natural gas consumption, oxygen consumption, electric power consumption electricity to boost, glass production rate, cullet ratio, process temperatures, equipment power levels, glass quality, flue gas composition (including NOx, CO, O_2, CO_2, criteria air pollutants) and temperature, and other parameters for at least one year to compare against post-project measurements.
- Create a CFD simulation.

- Prepare a *Baseline Measurements Memo* to include all baseline measurements and data collected in this task on the recipient and host furnace, results of CFD simulation and description of any needed furnace optimizations.
- Complete any needed optimizations to the furnace to ensure adequate performance needed to successfully demonstrate the AOGM process.
- Ensure that *Baseline Measurements Memo* does not include confidential information listed in Attachment C-1.

Products:

- Baseline Measurements Memo

TASK 4: INSTALLATION OF ADVANCED OXY-FUEL COMBUSTION GLASS MELTING TECHNOLOGY AND EQUIPMENT AND REPLACEMENT OF FLUE DUCTS AND STACK

The goal of this task is to complete the installation of all AOGM technology and equipment to demonstrate the AOGM process at Recipient's facility. All equipment and technology are at TRL 7.

Recipient currently operates four large oxy-fuel furnaces at its Modesto facility. The project will demonstrate AOGM on one of the Recipient's furnaces. This will be achieved by installation of equipment to add the heat recycle process in two phases. Phase one includes installation of two BPHs and two CPHs, additional ducting and support structures, and modifications to existing flues and stack. Phase two includes replacement of flues and stack to optimize gas flow based on gathered data.

The Recipient shall:

- Secure preliminary schedule for equipment delivery and installation (substantial changes are not anticipated from schedule presented in proposal).
- Develop performance specifications for the equipment, site-specific installation plan and special procedures to ensure continuation of furnace operations
- Develop process control and safety protocols for interfacing with the host site.
- Hold a review meeting at the host site for site-specific requirements, followed by a second meeting to review site readiness for installation.
- Conduct civil, structural engineering analysis for new technology and equipment.
- Conduct site preparation for new technology and equipment.
- Provide a *Technology and Equipment Installation Memo* that shall include, but not be limited to:
    - Summary of the technology and equipment installation requirements at Recipient's facility;
    - Identification of barriers involved during installation and discuss the steps taken to overcome those barriers; and
    - Discuss results of equipment start-up and commissioning with respect to whether the equipment as installed meets the stated performance specifications to achieve Agreement Goals and Performance Metrics listed in Sections I.C. and Subtask 1.12.
- Prepare *CPR Report #2* in accordance with subtask 1.3 (CPR Meetings).
- Participate in CPR meeting #2.
- Ensure that *Technology and Equipment Installation Memo* and *CPR Report #2* do not include confidential information listed in Attachment C-1.

EXHIBIT A
Scope of Work

Products:

- Technology and Equipment Installation Memo
- CPR Report #2

TASK 5: COMMISSIONING AND MONITORING OF ADVANCED OXY-FUEL COMBUSTION GLASS MELTING SYSTEM

The goal of this task is to commission all AOGM technology and equipment to demonstrate the AOGM process . All technology and equipment will be demonstrated at Recipient's location for at least 12 months to validate performance. Natural gas use, oxygen, and electric power consumption as well as emissions of NOx and other pollutants will be recorded up to one year after commissioning and statistically analyzed and compared with the data from the baseline operation.

The Recipient shall:

- Conduct start-up and commissioning of all AOGM technology and equipment, making needed adjustments to meet stated performance specifications.
- Conduct safety review with all Recipient personnel and Project Team.
- Collect and measure performance data for at least 12 months, including natural gas consumption, oxygen consumption, electric power consumption electricity to boost, glass production rate, cullet ratio, process temperatures, equipment power levels, glass quality, flue gas composition (including NOx, CO, O2, CO2, criteria air pollutants) and temperature, and other parameters as necessary.
- Conduct a technoeconomic analysis.
- Prepare a *Technoeconomic Analysis Report* that shall include, but not be limited to:
    - Summary of the statistical and measure performance information gathered for at least 12 months
    - Description of how the energy information was normalized against cullet ratio
    - Results of the comparison measure performance to baseline operation in terms of natural gas and electricity use, oxygen, NOx, CO2 and other pollutants.
    - Determine overall project economics including energy and operational cost savings and benefits relative to the overall system cost.
    - Issues identified, impacts on system performance and suggested ways to resolve them
    - Potential ways to further improve energy efficiency, costs and benefits and reduce emissions
    - Discuss whether the performance metrics in Subtask 1.12 and the natural gas, electricity and air emission goals in Section II.A. and II.C. were achieved.
- Prepare a *Confidential M&V Report* that shall include, but not be limited to:
    - Baseline (pre-installation) and post-installation measurements of natural gas consumption, oxygen consumption, electric power consumption electricity to boost, glass production rate, cullet ratio, process temperatures, equipment power levels, glass quality, flue gas composition (including NOx, CO, O_2, CO_2, criteria air pollutants) and temperature, and other parameters;
    - Analysis and summary of the statistical and measure performance information gathered for at least 12 months before installation and 12 months after installation.
- Prepare *CPR Report* #3 in accordance with subtask 1.3 (CPR Meetings).

- Ensure that *Technoeconomic Analysis Report* and *CPR Report* #3 do not include confidential information listed in Attachment C-1.
- Participate in CPR meeting #3.

Products:

- Confidential M&V Report
- Technoeconomic Analysis Report (draft and final)
- CPR Report #3

TASK 6: EVALUATION OF PROJECT BENEFITS

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

The Recipient shall:

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

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

- Jobs created/retained as a result of the Agreement.

- For Information/Tools and Other Research Studies:
  - Outcome of project.
  - Published documents, including date, title, and periodical name.
  - A discussion of policy development. State if the project has been cited in government policy publications or technical journals, or has been used to inform regulatory bodies.
  - The number of website downloads.
  - An estimate of how the project information has affected energy use and cost, or have resulted in other non-energy benefits.
  - An estimate of energy and non-energy benefits.
  - Data on potential job creation, market potential, economic development, and increased state revenue as a result of project.
  - A discussion of project product downloads from websites, and publications in technical journals.
  - A comparison of project expectations and performance. Discuss whether the goals and objectives of the Agreement have been met and what improvements are needed, if any.
- Respond to CAM questions regarding responses to the questionnaires.
- Ensure that *Kick-off Meeting Benefits Questionnaire, Mid-term Benefits Questionnaire,* and *Final Meeting Benefits Questionnaire* do not include confidential information listed in Attachment C-1.

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

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

TASK 7: 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 (Draft/Final)* 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 (Draft/Final)* 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 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.

- Ensure that *Technology Transfer Plan, Summary of TAC Comments, Technology Transfer Summary Report,* and *High Quality Digital Photographs* do not include confidential information listed in Attachment C-1.

Products:

- Technology Transfer Plan (Draft/Final)
- Summary of TAC Comments
- Technology Transfer Summary Report (Draft/Final)
- High Quality Digital Photographs

V. PROJECT SCHEDULE

Please see the attached Excel spreadsheet.

RESOLUTION NO: 21-04-14-12a

STATE OF CALIFORNIA

STATE ENERGY RESOURCES
CONSERVATION AND DEVELOPMENT COMMISSION

RESOLUTION - RE: GALLO GLASS COMPANY

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-20-006 with Gallo Glass Company for a $5,573,860 grant to demonstrate an economically viable advanced oxygen-enriched combustion system; and

FURTHER BE IT RESOLVED, that the Executive Director or his/her 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 April 14, 2021.

AYE:
NAY:
ABSENT:
ABSTAIN:

_____
Patricia Carlos
Secretariat