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

A) New Agreement # PIR-21-006 (to be completed by CGL office)

B) Division	Agreement Manager:	MS-	Phone
ERDD	Jeffrey Sunquist	43	916-776-0816

C) Recipient's Legal Name	Federal ID Number
The Regents of the University of California, on behalf of the Los Angeles campus	95-6006143

D) Title of Project
Corrosion Control Knowledge and Technology Integration for Safer California Natural Gas Pipeline System

E) Term and Amount

Start Date	End Date	Amount
7/1/2022	3/31/2026	$ 1,000,000

F) Business Meeting Information

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

Proposed Business Meeting Date 6/8/2022 ☐ Consent ☒ Discussion

Business Meeting Presenter Jeffrey Sunquist Time Needed: 5 minutes

Please select one list serve. NaturalGas (NG Research Program

Agenda Item Subject and Description:

The Regents of the University of California, on behalf of the Los Angeles Campus.
Proposed resolution approving Agreement PIR-21-006 with The Regents of the University of California, on behalf of the Los Angeles Campus, for a $1,000,000 grant to integrate corrosion detection technologies, corrosion risk assessment methodologies, and risk management optimization approaches to create a new corrosion risk management approach, and adopting staff's determination that this action is exempt from CEQA. (Gas R&D Funding) Contact: Jeffrey Sunquist (Staff Presentation: 5 minutes)

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, § 15306
      ☐ Common Sense Exemption. 14 CCR 15061 (b) (3)

      Explain reason why Agreement is exempt under the above section: Cal. Code Regs., tit. 14, sect. 15306 consists of basic data collection, research,

experimental management, and resource evaluation activities which do not result in a serious or major disturbance to an environmental resource. This project involves computer modeling and paper studies to conduct a corrosion risk assessment of gas pipelines. This work will not result in a serious or major disturbance to an environmental resource. For these reasons, the proposed project will have no significant effect on the environment and is categorically exempt under section 15306.

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**
TBD - Consultant	$ 30,000
DNV GL USA, Inc.	$ 302,059
	$
	$
	$
	$
	$
	$
	$
	$

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

Legal Company Name:
The Regents of the University of California, Los Angeles
The Regents of the University of California, Los Angeles

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J) Budget Information

Funding Source	Funding Year of Appropriation	Budget List Number	Amount
NG Subaccount, PIERDD	20-21	501.001O	$1,000,000
			$
			$
			$
			$
			$

R&D Program Area: ESRO: ETSI TOTAL: $ 1,000,000

Explanation for "Other" selection

Reimbursement Contract #: Federal Agreement #:

K) Recipient's Contact Information

1. Recipient's Administrator/Officer

Name: Flora O'Brien

Address: 420 Westwood Plz

City, State, Zip: Los Angeles, CA 90095-8357

Phone:

E-Mail:

Address: 404 Westwood Plz Ste 480A

City, State, Zip: Los Angeles, CA 90095-8357

Phone: 424-320-1340

E-Mail: eald@ucla.edu

2. Recipient's Project Manager

Name: Enrique Droguett

L) Selection Process Used

☒ Competitive Solicitation Solicitation #: GFO-21-506

☐ First Come First Served Solicitation Solicitation #:

☐ Non-Competitive Bid Follow-on Funding (SB 115)

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
The Regents of the University of California, on behalf of the Los Angles campus

I. TASK ACRONYM/TERM LISTS

A. Task List

Task #	CPR[1]	Task Name
1		General Project Tasks
2		Engagement with California Gas IOUs to Help the Development of Toolkit
3	X	Evaluation of Existing and Emerging Corrosion Detection Technologies
4	X	Integration of Corrosion Risk Models
5		Development of Training Guidelines
6	X	Demonstration of the Pilot Test Toolkit
7		Evaluation of Project Benefits
8		Technology/Knowledge Transfer Activities

B. Acronym/Term List

Acronym/Term	Meaning
CAM	Commission Agreement Manager
CAO	Commission Agreement Officer
CEC	California Energy Commission
CEQA	*California Environmental Quality Act, California Public Resources Code Section 21000 et seq.*
CPR	Critical Project Review
DOT	United States Department of Transportation
Disadvantaged Community	These are communities in the top 25% scoring areas from CalEnviroScreen along with other areas with high amounts of pollution and low populations. *(https://oehha.ca.gov/calenviroscreen/report/calenviroscreen-40)*
DNV	Det Norske Veritas (entity legal name: DNV GL USA, Inc.)
IOUs	*Investor-owned utilities*
MIC	*Microbiologically Influenced Corrosion*, metal loss influenced by exposure of the metal surface to microbial activity
PHMSA	Pipeline and Hazardous Materials Safety Administration
Pilot Test	*Pilot test* means small scale testing in the laboratory or testing on a small portion of the production line of the affected industry. Pilot tests help to verify the design and validity of an approach, and adjustments can be made at this stage before full-scale demonstrations
TAC	Technical Advisory Committee
TRL	Technology readiness levels, are a method for estimating the maturity of technologies during the acquisition phase of a program.

[1] Please see subtask 1.3 in Part III of the Scope of Work (General Project Tasks) for a description of Critical Project Review (CPR) Meetings.

Exhibit A
Scope of Work
The Regents of the University of California, on behalf of the Los Angles campus

Acronym/Term	Meaning
	Source: U.S. Department of Energy, "Technology Readiness Assessment Guide". https://www2.lbl.gov/dir/assets/docs/TRL%20guide.pdf
UCLA/Recipient	The Regents of the University of California, on behalf of the Los Angeles Campus

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

A. Purpose of Agreement

The purpose of this Agreement is to fund the development of a toolkit to inspect and evaluate the risks of corrosion in gas pipelines.

B. Problem/ Solution Statement

Problem

Recurrent pipeline failures continue to be a source of safety and economic risk related to processing, transporting, and distributing gas. Studies have shown the lack of comprehensive, integrated, and accessible risk-informed integrity management tools for gas pipeline operators is a major contributor. Corrosion has the potential to simultaneously compromise pipelines over broad regions, leading to leaks and/or bursts and widespread disruption of gas supply. While the existence of this threat is well known, there are specific challenges to assess gas pipelines risk including the following:

- The risk assessment must deal with slow processes difficult to detect.
- The risk assessment must deal with discrete components over spatially extended systems.
- Older pipelines and gas wells were built according to old standards and operating conditions.
- Qualitative risk assessments are fast but limited by subjectivity of the tools.
- Quantitative risk assessments require data that may not be available or may be uncertain.
- Currently applied methods and means are inadequate for communicating risks to various stakeholders in a manner that allows for optimum decisions making at various stages of the corrosion management process (*i.e.,* gathering more data *vs* risk mitigation).

Solution

This research and development project is targeted towards meeting this urgent need by following these objectives:

1. **Apply state-of-the-art procedures to define corrosion contributors that threaten pipeline infrastructure**, including internal and external corrosion, localized corrosion (pitting), erosion, stress corrosion cracking, and Microbiology Influenced Corrosion (MIC).
2. Develop internal and external corrosion prediction models to **determine the size of uniform corrosion, pitting and cracks** on both the internal and external surfaces of the pipelines over time.
3. **Formulate a performance-based cost-effective risk assessment and management approach** that is sufficiently flexible, yet quantitative, to quantify and predict the corrosion risks for gas pipelines and optimize mitigation actions based on the corrosion risks. This

approach will help reduce the corrosion risks by optimizing data gathering activities (*e.g.,* sensor placement, schedule inspections) and the risk mitigation actions (*e.g.,* maintenance activities, pipe section replacement).

4. **Test the methodology** in collaboration with the partnering pipeline operators in California.
5. **Implement the new risk management approach into an easy-to-use, free, open source software toolkit.** The toolkit utilizes the risk assessment and management methodologies to help operators identify and mitigate corrosion risks more efficiently. And develop a guidance and training document to help use the software toolkit.
6. Document the results and **transfer the knowledge gained to gas pipeline operators.**

C. Goals and Objectives of the Agreement

Agreement Goals

The goals of this Agreement are to:

- Work with Gas Investor-Owned Utilities (IOUs) to define needs and requirements of the project (Task 2).
- Evaluate corrosion detection technologies and help improve existing and emerging pipeline inspection technologies (Task 3) (emerging technologies are defined as technology readiness level (TRL) 6 or higher).
- Integrate multiple corrosion risk models already developed (by DNV GL USA, Inc. (DNV), The Regents of the University of California, on behalf of the Los Angeles Campus (UCLA) and California gas operators) (Task 4).
- Develop a toolkit (Task 4) that will improve the accuracy, validity, and accessibility of data collection for corrosion risk modeling by pipeline operators in California.
- Develop training to improve the efficiency and accuracy of data collection activities and corrosion risk management (Task 5).
- Work with Gas IOUs to validate the effectiveness of the toolkit (Task 6).

Ratepayer Benefits: This Agreement will benefit ratepayers by reducing greenhouse gas emissions, costs due to corrosion damages, and the risk of gas pipeline failure. This project will improve pipeline reliability leading to reductions in accidental methane emissions from corrosion damage (potentially $200,000 in social cost of carbon for every major transmission pipeline rupture prevented, based upon the total release gas from a rupture of a 10-mile segment of 30-inch pipeline operating at 600 psi). This estimate could be larger if flow is not interrupted immediately.

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 developing a toolkit to inspect and evaluate the risks of corrosion in gas pipelines. The proposed approach is innovative because it integrates the detection technologies, corrosion risk assessment methodologies, and risk management optimization approaches (Figure 1) and will incorporate the following features unique to the assessment of corrosion risk for gas pipelines including:

1. Link corrosion models for different corrosion types into one corrosion modeling framework.
2. Link corrosion models to gas operators' data using software.

3. Link risk results to gas operators' risk mitigation strategies.
4. Link risk results to gas operators' personnel training.

No corrosion model has ever been used in such a comprehensive manner.

Agreement Objectives

The objectives of this Agreement are to:

- Identify and aggregate state-of-the-art procedures and models for corrosion initiation and growth (including internal and external corrosion, localized corrosion, erosion, stress corrosion cracking, and Microbiology Influenced Corrosion). A solid foundation for such aggregate model has been developed by the project team under previous CEC funded projects.
- Identify existing and emerging technologies for corrosion related data collection, monitoring, and detection, and map such technologies to the various elements of the integrated corrosion model in terms of data coverage, effectiveness, and technology readiness (in case of emerging technologies).
- Formulate a performance-based cost-effective risk assessment and management approach, focusing on identifying optimum use of existing and emerging technologies. The approach will provide a sufficiently flexible procedure to quantify and predict the corrosion risks for gas pipelines and optimize mitigation actions based on the corrosion risks. This approach will help reduce the corrosion risks by optimizing data gathering activities (*e.g.,* sensor placement, schedule inspections) and the risk mitigation actions (*e.g.,* maintenance activities, pipe section replacement).
- Test the methodology in collaboration with the partnering pipeline operators in California.
- Implement the new risk management approach into an easy-to-use, free, open source, software toolkit. The toolkit utilizes the risk assessment and management methodologies to help operators identify and mitigate corrosion risks more efficiently.
- Develop a guidance and training document to help use the software toolkit.
- Document the results and transfer the knowledge gained to gas pipeline operators.

Exhibit A
Scope of Work
The Regents of the University of California, on behalf of the Los Angles campus

III. TASK 1 GENERAL PROJECT TASKS

PRODUCTS

Subtask 1.1 Products

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

The Recipient shall:

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

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

For products that require a final version only

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

For all products

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

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

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

- **Software Application Development**

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

  - Microsoft ASP.NET framework (version 3.5 and up). Recommend 4.0.
  - Microsoft Internet Information Services (IIS), (version 6 and up) Recommend 7.5.
  - Visual Studio.NET (version 2008 and up). Recommend 2010.
  - C# Programming Language with Presentation (UI), Business Object and Data Layers.
  - SQL (Structured Query Language).
  - Microsoft SQL Server 2008, Stored Procedures. Recommend 2008 R2.
  - Microsoft SQL Reporting Services. Recommend 2008 R2.
  - XML (external interfaces).

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

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 on Draft Final Report* received on the Executive Summary. For each comment received, the recipient will identify in the summary the following:
  - Comments the recipient proposes to incorporate.
  - Comments the recipient does propose to incorporate and an explanation for why.
- Submit a draft of the report to the CAM for review and comment. The CAM will provide written comments to the Recipient on the draft product within 15 days of receipt.
- Incorporate all CAM comments into the Final Report. If the Recipient disagrees with any comment, provide a *Written Responses to Comments* explaining why the comments were not incorporated into the final product.
- Submit the revised Final Report electronically with any Written Responses to Comments within 10 days of receipt of CAM's Written Comments on the Draft Final Report, unless the CAM specifies a longer time period or approves a request for additional time.

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

CAM Product:
- Written Comments on the Draft Final Report

MATCH FUNDS, PERMITS, AND SUBCONTRACTS

Subtask 1.7 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.

Exhibit A
Scope of Work
The Regents of the University of California, on behalf of the Los Angles campus

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.

Exhibit A
Scope of Work
The Regents of the University of California, on behalf of the Los Angles campus

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).

Exhibit A
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The Regents of the University of California, on behalf of the Los Angles campus

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 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.
- 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 Benefits Questionnaire,* developed in the Evaluation of Project Benefits task.
- Discuss the final *Project Performance Metrics Questionnaire* and *Project Performance Metrics Results* at the Final Meeting.

Products:

- TAC Performance Metrics Summary

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- Project Performance Metrics Results

Exhibit A
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IV. TECHNICAL TASKS

TASK 2 ENGAGEMENT WITH CALIFORNIA GAS IOUS TO HELP THE DEVELOPMENT OF TOOLKIT

The goals of this task are to involve California Gas IOUs and industry partners in a workshop at the beginning of the project to (1) understand the existing corrosion detection technologies being used, (2) understand the existing corrosion risk management process, (3) identify the top challenges in gas pipeline corrosion risk management (including local, state, and federal agencies and regulations), and (4) select a demonstration site.

The Recipient shall:

- Prepare *Workshop Presentation Materials* and hold a workshop to:
  - Present California Gas IOUs' existing corrosion risk management process.
  - Identify the top challenges in corrosion risk management.
  - Define how corrosion models will be used to make decisions (collect more data, better data, mitigate threat etc.)
- Prepare a *Workshop Findings Report* that includes a summary of the stakeholder feedback received from the workshop and a description of how this feedback will guide the development and demonstration of the Pilot Test Toolkit and the selection of demonstration sites.

Products:

- Workshop Presentation Materials
- Workshop Findings Report

TASK 3 EVALUATION OF EXISTING AND EMERGING CORROSION DETECTION TECHNOLOGIES

The goals of this task are to identify internal and external pipeline corrosion threats and identify top technology barriers and challenges in gas pipeline corrosion risk management. A review of industry partners' data gathering capabilities will be performed to identify near-term technology improvements for detecting corrosion. A literature review will be performed to identify emerging corrosion detection technologies not used by industry partners. A technology readiness report will provide advantages and drawbacks of each corrosion detection technology.

The Recipient shall:

- Identify internal pipeline corrosion threats including internal corrosion model, localized corrosion model, erosion model.
- Identify external pipeline corrosion threats including external corrosion model, stress corrosion model, and MIC model.
- Prepare a *Corrosion Detection Technology Readiness Report* reviewing industry and non-industry technological capabilities to gather pipeline corrosion threat data and identifying near term improvements to address internal and external corrosion threats with better accuracy and lower cost

- Prepare a *CPR Report #1* in accordance with subtask 1.3.
- Participate in a CPR meeting.

Products:
- Corrosion Detection Technology Readiness Report
- CPR Report #1

TASK 4 INTEGRATION OF CORROSION RISK MODELS

The goals of this task are to investigate different corrosion mechanisms affecting gas pipelines and integrate corrosion models into risk management support software. Input from industry partners will be critical to select the right corrosion models (i.e., erosion, uniform internal corrosion, localized internal corrosion, stress corrosion cracking, external corrosion, MIC).

Subtask 4.1 Develop an Integrated Corrosion Model Tool

The goal of this subtask is to integrate corrosion models into a single modeling tool. This corrosion modeling tool will provide the capability to use inputs from industry partners and predict a corrosion rate for each corrosion threat.

The Recipient shall:
- Develop a *Corrosion Modeling Report* describing the advancements of an integrated model over models currently used by industry partners and the data requirements of the integrated model. Corrosion models to be considered for integration include, but are not limited to:
    - Internal Corrosion Pipeline Threats:
        - Internal corrosion model (provided by DNV)
        - Localized corrosion model (provided by DNV)
        - Erosion model (provided by DNV)
    - External Corrosion Pipeline Threats:
        - External corrosion model (from CEC funded project PIR-15-016)
        - Stress Corrosion model (from PHMSA US DOT funded project Stress Corrosion Cracking Prioritization and Decision Making Using a Bayesian Network Approach Project 921)
- Integrate models for internal and external gas pipeline corrosion threats in the *Integrated Corrosion Model Tool v1.0 with User Manual*.
- Prepare a *CPR Report #2* in accordance with subtask 1.3
- Participate in a CPR meeting.

Products:
- Corrosion Modeling Report
- Integrated Corrosion Model Tool v1.0 with User Manual
- CPR Report #2

Subtask 4.2 Develop Algorithms for Optimization of Pipeline Inspection and Maintenance

The goals of this subtask are to develop and run algorithms for optimizing inspection and maintenance activities. By selecting the right data type and accuracy we will help our industry partners to increase damage detection probability at a lower cost and reduce error rates and resource waste. The algorithms will focus on where and when to collect data (i.e., location and sample rate), and what data should be collected. We will use UCLA Leading Indicator Methodology developed in CEC funded project PIR 15-016.

The Recipient shall:

- Prepare an *Inspection and Maintenance Optimization Report* including strategies for more effective and reduced cost deployment of corrosion inspection technologies and recommended practices for reliable and cost-effective pipeline maintenance
- Develop pipeline inspection and maintenance optimization algorithms and apply them to the *Integrated Corrosion Model Tool v2.0 with User Manual.*
- Develop interfaces for the Corrosion Model Tool to interoperate with existing pipeline integrity management software such as PSIM.

Products:

- Inspection and Maintenance Optimization Report
- Integrated Corrosion Model Tool v2.0 with User Manual

TASK 5 DEVELOPMENT OF TRAINING GUIDELINES

The goals of this task are to provide training materials to the workforce in utilizing the toolkit's instruments, methods, and software. Training guidelines will be prepared in close collaboration with the operators and stakeholders to improve the efficiency of data collection activities by reducing error rates and resource waste. The training will focus on improving the utility integrity management programs with a focus on mitigating risks and damages caused by corrosion.

The Recipient shall:

- Prepare the *Training Guideline Report* with strategies for (1) deploying pipeline corrosion detection technology for effective and low-cost data collection and (2) using corrosion risk management software to support pipeline inspection and maintenance decision making.

Products:

- Training Guideline Report

TASK 6 DEMONSTRATION OF THE PILOT TEST TOOLKIT

Subtask 6.1 Collect Data for Pilot Test

The goal of this subtask is to request data inputs from industry partners for the pipeline selected for the pilot test during the first workshop (subtask 2.1). Data collection will require a minimum of 24 months to complete. The data collection will include pipeline location, construction parameters, operating conditions, excavation data, and maintenance.

The Recipient shall:

- Prepare a *Data Collection Plan* identifying data inputs, data sources, and data collection timeline for the pipeline selected for the pilot test.
- Collect data for pilot test and prepare the *Pilot Test Anonymized Data Report* to summarize the activities and results from the Data Collection Plan.
- Prepare a *CPR Report #3* in accordance with subtask 1.3.
- Participate in a CPR meeting.

Products:

- Data Collection Plan
- Pilot Test Anonymized Data Report
- CPR Report #3

Subtask 6.2 Run Pilot Test

The goal of this subtask is to utilize the data collected in subtask 2.2 and the Corrosion Management Toolkit to predict corrosion rates (in time and by location), optimize the placement and use of the corrosion detection and data gathering technologies, and identify optimum inspection/maintenance schedule of the pipeline including maintenance types and times, to mitigate corrosion risks in cost-effective ways. Different maintenance activities will be considered such as the use of batch corrosion inhibitors, internal coating, cleaning pigging, and replacement, accounting for the fact that each of these maintenance activities has a related cost, lifetime, and downtime.

The Recipient shall:

- Run a pilot test of the Corrosion Management Toolkit on a test pipeline at the demonstration site.
- Prepare the *Anonymized Pilot Test Results and Toolkit Validation Report* providing the following information:
    - Prediction of the corrosion rates (in time and by location).
    - Optimization of the placement and use of the corrosion detection and data gathering technologies.
    - Optimization of the inspection/maintenance schedule of the pipeline including maintenance types and times, to mitigate corrosion risks in cost-effective ways.
    - How the prediction and management of corrosion risk is improved compared through the application of the toolkit, compared with the current practice of the NGO partners.

Products:

- Anonymized Pilot Test Results and Toolkit Validation Report

Subtask 6.3 Develop Strategy for Iterative Improvements of Toolkit

The goal of this subtask is to develop a strategy for iterative improvements in accuracy, performance, costs, and useability to instruments, methods, and models. The strategy will

prioritize the near-term improvements, while also having the potential to be ongoing past the completion of the project term without requiring further involvement from the project team.

The Recipient shall:

- Prepare the *Strategies to Improve Toolkit Report* using the pilot test results to identify opportunities for improvement in the accuracy, performance, cost, and useability of the Corrosion Management Toolkit.

Products:

- Strategies to Improve Toolkit Report

TASK 7 EVALUATION OF PROJECT BENEFITS

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

The Recipient shall:

- Complete *the Initial Project Benefits Questionnaire*. The Initial Project Benefits Questionnaire shall be initially completed by the Recipient with 'Kick-off' selected for the 'Relevant data collection period' and submitted to the CAM for review and approval.
- Complete the *Annual Survey* by 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.
- Complete and update the project profile on the CEC's public online project and recipient directory on the Energize Innovation website (www.energizeinnovation.fund), and provide *Documentation of Project Profile on EnergizeInnovation.fund*, including the profile link.
- If the Prime Recipient is an Innovation Partner on the project, complete and update the organizational profile on the CEC's public online project and recipient directory on the Energize Innovation website (www.energizeinnovation.fund), and provide *Documentation of Organization Profile on EnergizeInnovation.fund*, including the profile link.

Products:

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

Exhibit A
Scope of Work
The Regents of the University of California, on behalf of the Los Angles campus

TASK 8 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.

Products:

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

Exhibit A
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V. PROJECT SCHEDULE

Please see the attached Excel spreadsheet.

RESOLUTION NO: 22-0608-11

STATE OF CALIFORNIA

STATE ENERGY RESOURCES
CONSERVATION AND DEVELOPMENT COMMISSION

RESOLUTION: THE REGENTS OF THE UNIVERSITY OF CALIFORNIA, ON BEHALF OF THE LOS ANGELES CAMPUS

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-21-006 with The Regents of the University of California, on behalf of the Los Angeles Campus, for a $1,000,000 grant to integrate corrosion detection technologies, corrosion risk assessment methodologies, and risk management optimization approaches to create a new corrosion risk management approach; 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 June 8, 2022.
AYE:
NAY:
ABSENT:
ABSTAIN:

_____
Liza Lopez
Secretariat