

GRANT REQUEST FORM (GRF)

CEC-270 (Revised 10/2015)

CALIFORNIA ENERGY COMMISSION

New Agreement EPC-16-011 (To be completed by CGL Office)

Division	Agreement Manager:	MS-	Phone
ERDD	Cecelia Golden	51	916-327-1423

Recipient's Legal Name	Federal ID Number
Kennedy/Jenks Consultants, Inc.	94-2147007

Title of Project
Novel Membrane Technology to Improve Energy Efficiency and Water Savings in Wastewater Treatment Operations

Term and Amount	Start Date	End Date	Amount
	9/1/2016	4/30/2019	\$ 882,430

Business Meeting Information
 ARFVTP agreements under \$75K delegated to Executive Director.

Proposed Business Meeting Date	8/10/2016	<input type="checkbox"/> Consent	<input checked="" type="checkbox"/> Discussion
Business Meeting Presenter	Cecelia Golden	Time Needed:	5 minutes

Please select one list serve. EPIC (Electric Program Investment Charge)

Agenda Item Subject and Description

KENNEDY/JENKS CONSULTANTS. Proposed resolution approving agreement EPC-16-011 with Kennedy/Jenks Consultants for a \$882,430 grant to pilot test the efficiency of a novel membrane technology that can minimize fouling of membrane surfaces in wastewater treatment operations, thus increasing water recovery and lowering energy demand. The proposed project will test the membrane technology at a regional water treatment facility in the Central Valley and will collect comprehensive data to demonstrate the economic viability and effectiveness of implementing this energy-saving technology.



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":

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

2. If Agreement is considered a "Project" under CEQA:

a) Agreement **IS** exempt. (Attach draft NOE)

Statutory Exemption. List PRC and/or CCR section number: _____

Categorical Exemption. List CCR section number: Cal. Code Regs., tit 14, §§ 15301, 15303, 15306

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

Explain reason why Agreement is exempt under the above section:

Cal. Code Regs., tit. 14, sec. 15301 provides that projects which consist of the operation, repair, maintenance, permitting, leasing, licensing, or minor alteration of existing public or private structures, facilities, mechanical equipment, or topographical features, and which involve negligible or no expansion of use beyond that existing at the time of the lead agency's determination, are categorically exempt from the provisions of the California Environmental Quality Act. This project involves the installation of an innovative surface modified amphiphilic membrane/anti-adhesive membrane technology, for treatment of surface water, wastewater, industrial water, and desalination of brackish waters. The technology will be skid mounted and include minor modifications to tie into hydraulic, piping, and electrical systems at an existing microfiltration water treatment facility, the California Water Services Company (Cal Water) in Kern County. A built-in software program within the pilot unit will facilitate system operations. Located in rural NE Bakersfield, the existing facility sits on roughly 10 acres, and has a current design capacity to treat 22 MGD of water from the Kern River. The plant has the capability to expand to 60 MGD should future growth or regulatory change warrant. The facility has a concrete pretreatment basin and several metal buildings which house the filtration process as well as process support equipment. The amphiphilic membrane technology to be installed will consist of membranes bundled together in a plastic housing (module). Each module is approximately 66 inches long, and 10 inches in diameter. A skid mounted unit amphiphilic membrane unit is installed inside a 20' ISO high cube container (21.5' L x 8' W x 9.5' H) (approximately 160 SF and 20 ft high) and comes complete with interconnecting process pipework. The pilot unit consists of two (2) ultrafiltration (UF) trains, which can be operated independently. The total footprint of the technology installations will be approximately 600 SF (800 SF including the exterior plumbing). Also added to the installation will be data measurement equipment including water flow meters installed in the piping systems (of minimal size). The installations will result in no expanded capacity at the Cal Water facility. The technology will be integrated with the existing host facility plumbing lines, utility connections, and infrastructure, which will require only minor ancillary equipment (e.g., valves) and materials (e.g., fittings.) for installation. Installation of equipment necessary for measurement and verification activities will be limited to instrumentation for data collection and analysis and will not alter existing facility equipment or operations. Therefore, the project will not have a significant effect on the environment and falls within section 15301.

Cal. Code Regs., tit. 14, sec. 15303 provides that projects which consist of construction and location of limited numbers of new, small facilities or structures, installation of small new equipment and facilities in small structures, and the conversion of existing small structures from one use to another where only minor modifications are made in the exterior of the structure, are categorically exempt from the provisions of CEQA. This project consists of replacement of the facility's existing hydrophilic membranes with amphiphilic membranes, a procedure similar to routine scheduled membrane replacements, and installation of a 480v motor connected to the pilot membrane unit feed water pump, as well as installation of equipment necessary to test and evaluate benefits, including increased energy efficiency, reduced greenhouse gas emissions, and reduced operating costs. The total footprint of the technology installations will be approximately 600 SF. Therefore, the project will not have a significant effect on the environment and falls within section 15303.

Cal. Code Regs., tit. 14, sect. 15306 provides that projects which consist of basic data collection, research, experimental management, and resource evaluation activities which do not result in a serious or major disturbance to an environmental resource are categorically exempt from the provisions of CEQA. This project entails extensive data collection and performance evaluation to document energy efficiency, energy cost reductions, installation requirements, and payback period to support adoption by industrial end-users of this innovative approach to increase both energy and water savings and overcome barriers to large-scale deployment. These measurement and verification activities include a software program built into the pilot and

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the installation of instrumentation and data acquisition equipment, including computerized software, which will be tied into the systems for monitoring. The results will include technical reports and presentations to disseminate the results to California water treatment facilities, the California Energy Commission, and the public. For these reasons, the project will not have a significant effect on the environment and falls within 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

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

Legal Company Name:	Budget
BASE Energy, Inc.	\$ 39,950
TBD- Installation Contractor	\$ 15,000
TBD- Shipper	\$ 5,000
TBD- Return Shipper	\$ 5,000
TBD- Lab Analysis and Membrane Autopsy of Data Collection	\$ 71,000
	\$
	\$
	\$
	\$

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List all key partners: (attach additional sheets as necessary)
Legal Company Name:

Budget Information			
Funding Source	Funding Year of Appropriation	Budget List No.	Amount
EPIC	15-16	301.001C	\$882,430
			\$
			\$
			\$
			\$
			\$
R&D Program Area: EERO: IAW		TOTAL:	\$882,430
Explanation for "Other" selection			
Reimbursement Contract #:		Federal Agreement #:	

Recipient's Administrator/ Officer		Recipient's Project Manager	
Name:	Jean Debroux	Name:	Ganesh Rajagopalan
Address:	303 2nd St Ste 300S	Address:	3210 El Camino Real Ste 150
City, State, Zip:	San Francisco, CA 94107-3632	City, State, Zip:	Irvine, CA 92602-1367
Phone:	415-243-2451 / Fax: - -	Phone:	949-261-1577 / Fax: - -
E-Mail:	JeanDebroux@KennedyJenks.com	E-Mail:	RGanesh@KennedyJenks.com

Selection Process Used	
<input checked="" type="checkbox"/> Competitive Solicitation	Solicitation #: GFO-15-317
<input type="checkbox"/> First Come First Served Solicitation	

The following items should be attached to this GRF	
1. Exhibit A, Scope of Work	<input checked="" type="checkbox"/> Attached
2. Exhibit B, Budget Detail	<input checked="" type="checkbox"/> Attached
3. CEC 105, Questionnaire for Identifying Conflicts	<input checked="" type="checkbox"/> Attached
4. Recipient Resolution	<input checked="" type="checkbox"/> N/A <input type="checkbox"/> Attached
5. CEQA Documentation	<input type="checkbox"/> N/A <input checked="" type="checkbox"/> Attached

_____ Agreement Manager	_____ Date	_____ Office Manager	_____ Date	_____ Deputy Director	_____ Date
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Exhibit A Scope of Work

I. TASK ACRONYM/TERM LISTS

A. Task List

Task #	CPR ¹	Task Name
1		General Project Tasks
2	x	Treatment of Surface Water
3		Treatment of Backwash Water
4		Treatment of Organic Spiked Water
5		Measurement and Verification
6		Evaluation of Project Benefits
7		Technology/Knowledge Transfer Activities
8		Production Readiness Plan

B. Acronym/Term List

Acronym/Term	Meaning
Amphiphilic	Both Hydrophobic and Hydrophilic
Anti-Adhesive	Resistance to attachment of particles to the membrane (minimizes the extent of fouling materials that stick on the membrane surface and hinder flow through the pores).
Backwash Water	Reject Water Stream – generated during treatment process
CAM	Commission Agreement Manager
CAO	Commission Agreement Officer
CPR	Critical Project Review
Flux Rate	Water Flow rate through unit surface area of the membrane
Hydrophilic	Materials with affinity for water
Hydrophobic	Materials that naturally repel water
MF	Microfiltration
Organic Spiked Water	Kern River water spiked with humic acid to replicate reclaimed water
RO	Reverse Osmosis Treatment
Surface Water	Pre-treated Membrane Feed Water – Kern River water
TAC	Technical Advisory Committee
TMP	Transmembrane Pressure
UF	Ultrafiltration

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

A. Purpose of Agreement

The purpose of this Agreement is to fund the pilot testing of a novel membrane technology that could minimize fouling of membrane surfaces and, therefore, increase the water flow and improve energy efficiency.

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

B. Problem/ Solution Statement

Problem

Membrane treatment processes are highly energy intensive. This is largely due to the fouling of the membranes over time. The high energy demand of low pressure membranes (i.e., microfiltration (MF) and ultrafiltration (UF) membranes) is caused by deposition of foulant materials on the membrane surface (cake formation) and in membrane pores, which increases the transmembrane pressure (TMP). Membrane fouling is a very complicated process that is impacted by the hydrophilic (materials with affinity for water)/hydrophobic (materials that naturally repel water) interactions of the foulants with the membrane surface, as well as other mechanisms such as electric charge interactions and polymer entanglement. Types of fouling materials in the feed water include organics in many forms and sizes, as well as minerals, bacteria and their waste products, and algae. Currently, the approach used by the industry for fouling reduction involves incorporation of hydrophilic functional groups on membrane surfaces to repel the organic constituents. By only creating a hydrophilic surface, the major organic components in the feed water can be repulsed initially from the membrane surface, but other types of foulants continue to deposit on the surface. These occupied sites then lead to an altered surface, allowing even organic materials to adhere to them over a period of time. This phenomenon results in layered fouling on membrane surfaces that is very difficult to remove.

Solution

Unlike the past surface modifications that only incorporated hydrophilic functional groups on membrane surfaces to repel hydrophobic foulants, the surface modification proposed in this study involves incorporation of “amphiphilic” functional groups which are a combination of hydrophilic and hydrophobic functional groups concentrated on the membrane surface to keep the organic as well as inorganic foulants away from it. Further, the proposed innovation includes incorporation of anti-adhesive functional groups that retard long-term deposition of foulants. These, in turn, allow for higher flow of water through the membranes (i.e., increased flux rate), increased water yield and improved energy efficiency. The project team will demonstrate the effectiveness of this novel surface modified coating that could significantly improve the flux rate, increase water recovery and lower energy demand.

C. Goals and Objectives of the Agreement

Agreement Goals

The goals of this Agreement are to:

- Demonstrate that membrane fouling can be substantially reduced and the flux rate increased using the proposed surface-modified amphiphilic, anti-adhesive membrane for water treatment.
- Demonstrate that the technology can be successfully used for treatment of various types of feed waters (e.g., surface water, backwash water, organic spiked water).
- Identify range of optimum operating conditions for membrane treatment using the proposed amphiphilic membrane.
- Obtain data regarding the impact of the proposed amphiphilic UF membrane treatment on downstream Reverse Osmosis (RO) treatment that is often used during water reclamation
- Collect operating and maintenance data to develop cost benefit analyses of treatment using the proposed membrane.

Exhibit A Scope of Work

Ratepayer Benefits:² This Agreement could result in the ratepayer benefits of conserving energy during membrane treatment process. For example, a preliminary estimate assuming 40% improvement in efficiency during MF membrane treatment and 20% improvement in energy efficiency RO treatment, at 10 and 50% market penetration indicates annual electricity saving of 8.7 Million and 47 Million kWh. Further, promotion of the use of locally available water resources, through cost effective reclamation, minimizes consumption of energy dependent water supply from outside sources. Preliminary estimates indicate that, at a per capita water use of 125 gpd, the conserved water can provide an annual water supply to a population of approximately 58,000.

Technological Advancement and Breakthroughs:³ This Agreement could lead to technological advancement and breakthroughs to overcome barriers to the achievement of the State of California's statutory energy goals by demonstrating a membrane surface modification technology that can capture and keep the membrane foulants away from the membrane surface. This reduces membrane fouling and improves the energy efficiency of membrane treatment processes.

Agreement Objectives

The objectives of this Agreement are to:

- Improve flux rate of surface water treatment by 25% compared to a conventional hydrophilic membrane
- Lower membrane cleaning frequency by 20% compared to a conventional hydrophilic membrane
- Lower the overall cost of membrane treatment by 20% compared to a conventional hydrophilic membrane

² California Public Resources Code, Section 25711.5(a) requires projects funded by the Electric Program Investment Charge (EPIC) to result in ratepayer benefits. The California Public Utilities Commission, which established the EPIC in 2011, defines ratepayer benefits as greater reliability, lower costs, and increased safety (See CPUC "Phase 2" Decision 12-05-037 at page 19, May 24, 2012, http://docs.cpuc.ca.gov/PublishedDocs/WORD_PDF/FINAL_DECISION/167664.PDF).

³ California Public Resources Code, Section 25711.5(a) also requires EPIC-funded projects to lead to technological advancement and breakthroughs to overcome barriers that prevent the achievement of the state's statutory and energy goals.

Exhibit A Scope of Work

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)**. 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 Energy Commission’s 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 or CD-ROM.

Exhibit A Scope of Work

The following describes the accepted formats for electronic data and documents provided to the Energy Commission 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.
 - Documents intended for public distribution will be in PDF file format. The Recipient must also provide the native Microsoft file format.
 - 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 Energy Commission's Information Technology Services Branch to determine whether the exceptions are allowable.

Exhibit A Scope of Work

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 Energy Commission 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;
- 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 and invoices (subtask 1.5);
 - Final Report (subtask 1.6);
 - Technical Advisory Committee meetings (subtasks 1.10 and 1.11); and
 - Any other relevant topics.
- Provide an *Updated Project Schedule, List of Match Funds, and List of Permits*, 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*.

Exhibit A Scope of Work

Recipient Products:

- Updated Project Schedule (*if applicable*)
- Updated List of Match Funds (*if applicable*)
- Updated List of Permits (*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 Energy Commission 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 Energy Commission 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 Energy Commission.

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 Energy Commission, 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 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.
- Submit the CPR Report along with any other *Task Products* that correspond to the technical task for which the CPR meeting is required (i.e., if a CPR meeting is required for Task 2, submit the Task 2 products along with the CPR Report).
- 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* and 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.

Exhibit A Scope of Work

Recipient Products:

- CPR Report(s)
- Task Products (draft and/or final as specified in the task)

CAM Products:

- CPR Agenda
- List of Expected CPR Participants
- Schedule for Providing a Progress Determination
- 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 Energy Commission 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 state-owned equipment.
 - Need to file a Uniform Commercial Code Financing Statement (Form UCC-1) regarding the Energy Commission's interest in patented technology.
 - The Energy Commission'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 *All Draft and Final Written Products* on a CD-ROM or USB memory stick, organized by the tasks in the Agreement.

Exhibit A Scope of Work

Products:

- Final Meeting Agreement Summary (*if applicable*)
- Schedule for Completing Agreement Closeout Activities
- All Draft and Final Written 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 Fund 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. The CAM will review the Final Report, which will be due at least **two months** before the Agreement end date. When creating the Final Report Outline and the Final Report, the Recipient must use the 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 *Style Manual* provided by the CAM. (*See Task 1.1 for requirements for draft and final products.*)

Recipient Products:

- Final Report Outline (draft and final)

CAM Product:

- Style Manual
- Comments on Draft Final Report Outline
- Approval of Final Report Outline

Exhibit A Scope of Work

Subtask 1.6.2 Final Report

The Recipient shall:

- Prepare a *Final Report* for this Agreement in accordance with the approved Final Report Outline, 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)
 - Ensure that the document is written in the third person.
 - Ensure that the Executive Summary is understandable to the lay public.
 - Briefly summarize the completed work. Succinctly describe the project results and whether or not the project goals were accomplished.
 - Identify which specific ratepayers can benefit from the project results and how they can achieve the benefits.
 - If it's necessary to use a technical term in the Executive Summary, provide a brief definition or explanation when the technical term is first used.
 - Follow the Style Guide format requirements for headings, figures/tables, citations, and acronyms/abbreviations.
 - Ensure that the document omits subjective comments and opinions. However, recommendations in the conclusion of the report are allowed.
 - Include a brief description of the project results in the Abstract.
- 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
- Consider incorporating all CAM comments into the Final Report. 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 Final Report and responses to comments within 10 days of notice by

Exhibit A Scope of Work

the CAM, unless the CAM specifies a longer time period or approves a request for additional time.

- Submit one bound copy of the *Final Report* to the CAM along with *Written Responses to Comments on the Draft Final Report*.

Products:

- Final Report (draft and final)
- Written Responses to Comments on the Draft 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 Energy Commission 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 Energy Commission 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 Energy Commission 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.
- A copy of 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.

Exhibit A Scope of Work

- 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.

Exhibit A Scope of Work

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 the 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.

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;

Exhibit A Scope of Work

- 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.

Products:

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

Exhibit A Scope of Work

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 Treatment of Surface Water

The goal of this task is to test the effectiveness and obtain operating information for treatment of surface water using the surface modified membrane. Pre-treated membrane feed water (Kern River water) will be used for demonstration at a regional water treatment plant in the Central Valley over a period of four months.

The Recipient shall:

- Operate the pilot unit where surface water is treated by the modified membrane and conventional media simultaneously.
- Operate the pilot unit at constant pump pressure and measure the differences in flux rate to demonstrate the effectiveness of the membrane
- Clean membrane after approximately 20% reduction in flux rate. Evaluate nature of fouling (organic and inorganic) by acid cleaning the membrane first and measure increase in flux rate and then alkaline cleaning and measuring the increase in flux rate.
- Evaluate membrane performance after membrane cleaning
- Prepare a *Technical Memorandum for Treatment of Surface Water* that includes but is not limited to the following:
 - Executive Summary
 - Field test Design
 - Method
 - Procedure
 - Results/Evaluation of Performance
 - References
- Participate in CPR Meeting and prepare *CPR Report* per Subtask 1.3

Products:

- Technical Memorandum for Treatment of Surface Water (draft and final)
- CPR Report

TASK 3 Treatment of Backwash Water

The goal of this task is to demonstrate the effectiveness and obtain operating information for treatment of backwash water using the proposed surface modified membrane over a period of four months.

The Recipient shall:

- Operate the pilot unit where the backwash water is treated by the modified membrane and conventional media simultaneously.
- Operate the pilot unit at constant pump pressure and measure the differences in flux rate to demonstrate the effectiveness of the membrane
- Clean membrane after approximately 20% reduction in flux rate. Evaluate nature of fouling (organic and inorganic) by acid cleaning the membrane first and measure increase in flux rate and then alkaline cleaning and measuring the increase in flux rate.
- Evaluate membrane performance after membrane cleaning

Exhibit A

Scope of Work

- Operate bench scale RO cells using permeate from control and proposed UF membrane to obtain fouling information
- Prepare a *Technical Memorandum for Treatment of Backwash Water* that includes but is not limited to the following:
 - Executive Summary
 - Field test Design
 - Method
 - Procedure
 - Results/Evaluation of Performance (M&V)
 - References

Products:

- Technical Memorandum Treatment of Backwash Water (draft and final)

TASK 4 Treatment of Organic Spiked Water

The goal of this task is to demonstrate the effectiveness and obtain operating information for treatment of organic spiked water using the surface modified membrane over a period of four months.

The Recipient shall:

- Operate the pilot unit where organic spiked water is treated by the membrane and conventional media simultaneously.
- Operate the pilot unit at constant pump pressure and measure the differences in flux rate to demonstrate the effectiveness of the membrane
- Clean membrane after approximately 20% reduction in flux rate. Evaluate nature of fouling (organic and inorganic) by acid cleaning the membrane first and measure increase in flux rate and then alkaline cleaning and measuring the increase in flux rate.
- Evaluate membrane performance after membrane cleaning
- Prepare a *Technical Memorandum for Treatment of Organic Spiked Water* that includes but is not limited to the following:
 - Executive Summary
 - Field test Design
 - Method
 - Procedure
 - Results/Evaluation of Performance
 - References

Products:

- Technical Memorandum for Treatment of Organic Spiked Water (draft and final)

TASK 5 Measurement and Verification

The goal of this task is to independently measure energy efficiency during Tasks 2 to 4.

The Recipient shall:

- Prepare a *Measurement and Verification Report*, by an independent subcontractor (Subtask 1.9), that includes but is not limited to the following:
 - A description of the measurement and verification equipment used
 - Listing of the operating parameters

Exhibit A Scope of Work

- Energy consumption of the system pre- and post-modified membrane and other benefits such as on site water reuse that were demonstrated, including performance data in accordance with Tasks 2, 3 and 4.
- A discussion of whether the goals and objectives from Section II, C. were met.

Products:

- Measurement Verification Report (draft and final)

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:
 - For Product Development Projects and Project Demonstrations:
 - 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.
 - Additional Information for Product Development Projects:
 - 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.
 - Additional Information for Product Demonstrations:
 - Outcome of demonstrations and status of technology.
 - Number of similar installations.

Exhibit A Scope of Work

- 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 has 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.

The Energy Commission 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 develop a plan to make the knowledge gained, experimental results, and lessons learned available to the public and key decision makers.

The Recipient shall:

- Prepare an *Initial Fact Sheet* at start of the project that describes the project. Use the format provided by the CAM.
- Prepare a *Final Project Fact Sheet* at the project's conclusion that discusses results. Use the format provided by the CAM.
- Prepare a *Technology/Knowledge Transfer Plan* that includes:
 - An explanation of how the knowledge gained from the project will be made available to the public, including the targeted market sector and potential outreach to end users, utilities, regulatory agencies, and others.
 - A description of the intended use(s) for and users of the project results.
 - Published documents, including date, title, and periodical name.
 - Copies of documents, fact sheets, journal articles, press releases, and other documents prepared for public dissemination. These documents must include the Legal Notice required in the terms and conditions. Indicate where and when the documents were disseminated. A discussion of policy development. State if project

Exhibit A Scope of Work

has been or will be cited in government policy publications, or used to inform regulatory bodies.

- The number of website downloads or public requests for project results.
- Additional areas as determined by the CAM.
- Conduct technology transfer activities in accordance with the Technology/Knowledge Transfer Plan. These activities will be reported in the Progress Reports.
- When directed by the CAM, develop *Presentation Materials* for an Energy Commission-sponsored conference/workshop(s) on the project.
- When directed by the CAM, participate in annual EPIC symposium(s) sponsored by the California Energy Commission.
- 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.
- Prepare a *Technology/Knowledge Transfer Report* on technology transfer activities conducted during the project.

Products:

- Initial Fact Sheet (draft and final)
- Final Project Fact Sheet (draft and final)
- Presentation Materials (draft and final)
- High Quality Digital Photographs
- Technology/Knowledge Transfer Plan (draft and final)
- Technology/Knowledge Transfer Report (draft and final)

TASK 8 Production Readiness Plan

The goal of this task is to determine the steps that will lead to the manufacturing of technologies developed in this project or to the commercialization of the project's results.

The Recipient shall:

- Prepare a *Production Readiness Plan*. The degree of detail in the plan should be proportional to the complexity of producing or commercializing the proposed product, and to its state of development. As appropriate, the plan will discuss the following:
 - Critical production processes, equipment, facilities, personnel resources, and support systems needed to produce a commercially viable product.
 - Internal manufacturing facilities, supplier technologies, capacity constraints imposed by the design under consideration, design-critical elements, and the use of hazardous or non-recyclable materials. The product manufacturing effort may include "proof of production processes."
 - The estimated cost of production.
 - The expected investment threshold needed to launch the commercial product.
 - An implementation plan to ramp up to full production.
 - The outcome of product development efforts, such as copyrights and license agreements.
 - Patent numbers and applications, along with dates and brief descriptions.
 - Other areas as determined by the CAM.

Exhibit A Scope of Work

Products:

- Production Readiness Plan (draft and final)

V. PROJECT SCHEDULE

Please see the attached Excel spreadsheet for details.

STATE OF CALIFORNIA

STATE ENERGY RESOURCES
CONSERVATION AND DEVELOPMENT COMMISSION

RESOLUTION - RE: KENNEDY/JENKS CONSULTANTS, INC.

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

RESOLVED, that the Energy Commission approves Agreement EPC-16-011 from GFO-15-317 with Kennedy/Jenks Consultants, Inc. for a \$882,430 grant to pilot test the efficiency of a novel membrane technology that can minimize fouling of membrane surfaces in wastewater treatment operations, thus increasing water recovery and lowering energy demand. The proposed project will test the membrane technology at a regional water treatment facility in the Central Valley and will collect comprehensive data to demonstrate the economic viability and effectiveness of implementing this energy-saving technology; and

FURTHER BE IT RESOLVED, that the Executive Director or his/her designee shall execute the same on behalf of the Energy Commission.

CERTIFICATION

The undersigned Secretariat to the Commission 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 California Energy Commission held on August 10, 2016.

AYE: [List of Commissioners]

NAY: [List of Commissioners]

ABSENT: [List of Commissioners]

ABSTAIN: [List of Commissioners]

Cody Goldthrite,
Secretariat