California Energy Commission
October 03, 2024 Business Meeting
Backup Materials for Caliskaner Water Technologies, Inc.

The following backup materials for the above-referenced agenda item are available in this PDF packet as listed below:

1. Proposed Resolution
2. Grant Request Form
3. Scope of Work

[PROPOSED]

RESOLUTION NO: 24-1003-07a

STATE OF CALIFORNIA

STATE ENERGY RESOURCES
CONSERVATION AND DEVELOPMENT COMMISSION

RESOLUTION: Caliskaner Water Technologies, Inc.

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

RESOLVED, that the CEC approves agreement EPC-24-019 with Caliskaner Water Technologies, Inc. for a $4,492,887 grant. This agreement will design, fabricate, install, and evaluate innovative advanced water reclamation technologies in Olivehurst, Los Angeles, and Redwood City with the goal of demonstrating reduced energy usage, reduced capital and operational costs, and improved treatment performance with reduced system footprint; 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 October 3, 2024.

AYE:
NAY:
ABSENT:
ABSTAIN:

Dated:

_____
Kristine Banaag
Secretariat

STATE OF CALIFORNIA
CALIFORNIA ENERGY COMMISSION

CEC-270 (Revised 01/2024)

GRANT REQUEST FORM (GRF)

A. New Agreement Number

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

New Agreement Number: EPC-24-019

B. Division Information

1. Division Name: ERDD
2. Agreement Manager: Anish Gautam
3. MS-:51
4. Phone Number: 916-776-0759

C. Recipient's Information

1. Recipient's Legal Name: Caliskaner Water Technologies, Inc.
2. Federal ID Number: 85-2235177

D. Title of Project

Title of project: Demonstration of Cost and Energy Efficient Novel Separation Technologies for Decarbonization of Water Reclamation Systems

E. Term and Amount

1. Start Date: 11/18/2024
2. End Date: 3/31/2029
3. Amount: $4,492,887.00

F. Business Meeting Information

1. Are the ARFVTP agreements $75K and under delegated to Executive Director? No
2. The Proposed Business Meeting Date: 10/3/2024 .
3. Consent or Discussion? Discussion
4. Business Meeting Presenter Name: Michael Lozano
5. Time Needed for Business Meeting: 5 minutes.
6. The email subscription topic is: EPIC (Electric Program Investment Charge).

Agenda Item Subject and Description:

Caliskaner Water Technologies, Inc. Proposed resolution approving agreement EPC-24-019 with Caliskaner Water Technologies, Inc. for a $4,492,887 grant, and adopting staff's determination that this action is exempt from CEQA. This agreement will design, fabricate, install, and evaluate innovative advanced water reclamation technologies in Olivehurst, Los Angeles, and Redwood City with the goal of demonstrating reduced energy usage, reduced capital and operational costs, and improved treatment performance with reduced system footprint. (EPIC funding) Contact: Anish Gautam

G. California Environmental Quality Act (CEQA) Compliance

1. **Is Agreement considered a "Project" under CEQA?**
   Yes

   If yes, skip to question 2.

If no, complete the following (PRC 21065 and 14 CCR 15378) and explain why Agreement is not considered a "Project":

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

2. **If Agreement is considered a "Project" under CEQA answer the following questions.**

a) Agreement **IS** exempt?

Yes

Statutory Exemption?
No

If yes, list PRC and/or CCR section number(s) and separate each with a comma. If no, enter "None" and go to the next question.

PRC section number: None

CCR section number: None

Categorical Exemption?
Yes

If yes, list CCR section number(s) and separate each with a comma. If no, enter "None" and go to the next question.

CCR section number: Cal. Code Regs., tit. 14, §§ 15301, 15306

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

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

California Code of Regulations, title 14, section 15301 provides that projects which consist of the operation, repair, maintenance, permitting, licensing, or minor alteration of existing public or private structures, facilities, mechanical equipment, or topographical features, and which have negligible or no expansion of existing or former use, are categorically exempt from the provisions of the California Environmental Quality Act (CEQA). This project involves the operation of existing wastewater treatment facilities with minor alterations of mechanical equipment with negligible or no expansion of existing use. This project involves temporary small size pipelines to convey wastewater and reclaimed water between existing secondary treatment units and demonstration water reclamation systems. All work will occur within existing wastewater treatment plant site boundaries. At the completion of the activities, the temporary pipelines and demonstration units will be removed. Therefore, this project is exempt from CEQA under section 15301.

California Code of Regulations, title 14, section 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 involves basic data collection, research, experimental management, and resource evaluation activities which do not result in serious or major disturbance to an environmental source. This project involves mechanical design studies and engineering analyses of energy efficient wastewater treatment technologies.

Technology demonstration activities will be in a controlled environment at existing facilities. This work will not result in a serious or major disturbance to an environmental resource. Therefore, the project is exempt from CEQA under section 15306.

This project does not involve impacts on any particularly sensitive environment; does not involve any cumulative impacts of successive projects of the same type in the same place that might be considered significant; does not involve unusual circumstances that might have a significant effect on the environment; will not result in damage to scenic resources within a highway officially designated as a state scenic highway; the project site is not included on any list compiled pursuant to Government Code section 65962.5; and the project will not cause a substantial adverse change in the significance of a historical resource. Therefore, none of the exceptions to categorical exemptions listed in CEQA Guidelines section 15300.2 apply.

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

No

If yes, answer yes or no to all that applies. If no, list all as “no” and “None” as “yes”.

Additional Documents	Applies
Initial Study	No
Negative Declaration	No
Mitigated Negative Declaration	No
Environmental Impact Report	No
Statement of Overriding Considerations	No
None	Yes

H. Is this project considered “Infrastructure”?

No

I. Subcontractors

List all Subcontractors listed in the Budget (s) (major and minor). Insert additional rows if needed. If no subcontractors to report, enter “No subcontractors to report” and “0” to funds. **Delete** any unused rows from the table.

Subcontractor Legal Company Name	CEC Funds	Match Funds
Linda County Water District	$ 178,331	**$**31,280
Tomorrow Water	$ 524,780	**$**560,900
H2O Innovation USA, Inc.	$ 75,000	**$**10,920
Nexom	$ 95,500	**$**238,000

Subcontractor Legal Company Name	CEC Funds	Match Funds
Xylem Water Solutions U.S.A., Inc.	$ 40,000	$230,000
TBD	$ 97,200	$126,000
California FilmTec Corporation	$ 77,200	$60,000
AECOM Technical Services	$ 300,001	$40,173
Los Angeles County Sanitation District	$ 0	$ 255,000
Silicon Valley Clean Water	$ 0	$ 50,000

J. Vendors and Sellers for Equipment and Materials/Miscellaneous

List all Vendors and Sellers listed in Budget(s) for Equipment and Materials/Miscellaneous. Insert additional rows if needed. If no vendors or sellers to report, enter “No vendors or sellers to report” and “0” to funds. **Delete** any unused rows from the table.

Vendor/Seller Legal Company Name	CEC Funds	Match Funds
General Contractor - Electrical (TBD)	$ 94,500	$0
BASE Energy, Inc.	$ 53,000	$0
George Tchobanoglous	$ 25,000	$12,000
Water Environment Research Foundation	$ 50,566	$8,000
Hyperion Analytical LLC	$ 74,950	$70,950
General Contractor - Civil (TBD)	$ 95,000	$0
General Contractor - Mechanical (TBD)	$ 80,000	$0
General Contractor - Instrumentation & Controls	$ 78,000	$0

K. Key Partners

List all key partner(s). Insert additional rows if needed. If no key partners to report, enter "No key partners to report." **Delete** any unused rows from the table.

Key Partner Legal Company Name
No key partners to report

L. Budget Information

Include all budget information. Insert additional rows if needed. If no budget information to report, enter "N/A" for "Not Applicable" and "0" to Amount. **Delete** any unused rows from the table.

Funding Source	Funding Year of Appropriation	Budget List Number	Amount
EPIC	22-23	301.001J	$ 4,492,887

TOTAL Amount: $ 4,492,887

R&D Program Area: ICMB: IAW

Explanation for "Other" selection Not applicable

Reimbursement Contract #: Not applicable

Federal Agreement #: Not applicable

M. Recipient's Contact Information

1. Recipient's Administrator/Officer

Name: Onder Caliskaner

Address: 2733 Brookshire Cir

City, State, Zip: Woodland, CA 95776-5534

Phone: 530-219-067

E-Mail: onder@cwatertech.com

3. Recipient's Project Manager

Name: Onder Caliskaner

Address: 2733 Brookshire Cir

City, State, Zip: Woodland, CA 95776-5534

Phone: 530-219-067

E-Mail: onder@cwatertech.com

N. Selection Process Used

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

Selection Process	Additional Information
Competitive Solicitation #	GFO-22-301r2

First Come First Served Solicitation #	Not applicable
Other	Not applicable

O. Attached Items

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

Item Number	Item Name	Attached
1	Exhibit A, Scope of Work/Schedule	Yes
2	Exhibit B, Budget Detail	Yes
3	CEC 105, Questionnaire for Identifying Conflicts	Yes
4	Recipient Resolution	No
5	Awardee CEQA Documentation	Yes

Approved By

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

Agreement Manager: Anish Gautam

Approval Date: 8/12/2024

Branch Manager: Cody Taylor

Approval Date: 8/14/2024

Director: Cody Taylor for Jonah Steinbuck

Approval Date: 8/14/2024

EXHIBIT A
Scope of Work
Caliskaner Water Technologies, Inc.

I. TASK ACRONYM/TERM LISTS

A. Task List

Task #	CPR[1]	Task Name
1		General Project Tasks
2		Design, Fabrication, and Installation of Advanced Water Reclamation Technologies
3		Monitoring of Baseline (Conventional) Treatment System
4	X	Operation and Monitoring of Advanced Water Reclamation Technologies
5	X	Performance Evaluation of Advanced Water Reclamation Technologies
6		Economic Evaluation of Advanced Water Reclamation Technologies versus Conventional Systems
7		Project Measurement and Verification
8		Evaluation of Project Benefits
9		Technology/Knowledge Transfer Activities

B. Acronym/Term List

Acronym/Term	Meaning
AGS	Aerobic Granular Sludge
ASF	Activated Sludge Filter
AWR	Advanced Water Reclamation
AWRT	Advanced Water Reclamation Technologies
Benchmark-1	Existing secondary treatment system will be followed by granular media filtration for conventional wastewater treatment
Benchmark-2	Existing secondary treatment system will be followed by membrane bioreactor for conventional wastewater treatment
Benchmark-3	Existing secondary treatment system will be followed by granular media filtration, low pressure membranes and reverse osmosis for potable reuse treatment
BOD	Biochemical Oxygen Demand
CAM	Commission Agreement Manager
CAO	Commission Agreement Officer
CEC	California Energy Commission
CFAGS + MBR	Continuous Flow Aerobic Granular Sludge – Membrane Bioreactor
CMF	Cloth Media Filter
COD	Chemical Oxygen Demand
CPR	Critical Project Review
GHG	Greenhouse Gas
GMF	Granular Media Filtration
HLR	Hydraulic Loading Rate
IMPACT-RO	Intelligent Micro-Disrupting Parallel and Cascading Train Reverse Osmosis
LPM	Low Pressure Membrane
M&V	Measurement and Verification
MBR	Membrane Bioreactor
MLE	Modified Ludzack Ettinger

[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.

Acronym/Term	Meaning
AGS	Aerobic Granular Sludge
NTU	Nominal Turbidity Unit
Proposed-1	Innovative non-potable Mita cloth media filter will be compared to Benchmark-1 to replace granular media filter
Proposed-2	Demonstration of Taron treatment system after primary treatment to replace conventional secondary treatment for non-potable reuse
Proposed-3	Primary treatment effluent will be treated by Tomorrow Waters BeFlow AGS and membrane bioreactor for non-potable reuse
Proposed-4	Combination of Tomorrow Water's BeFlow CFAGS system (with secondary treatment) followed by Mita cloth filter, UB-UF and IMPACT RO for potable reuse
RO	Reverse Osmosis
SC	Secondary Clarifier
SLR	Solids Loading Rate
TAC	Technical Advisory Committee
TDS	Total Dissolved Solids
TN	Total Nitrogen
TP	Total Phosphorus
TSS	Total Suspended Solids
UB-UF	Ultrabore Ultrafiltration
UF	Ultrafiltration
WWTP	Wastewater Treatment Plant

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

A. Purpose of Agreement

The purpose of this Agreement is to fund the design, fabrication, installation, and evaluation of innovative advanced water reclamation technologies (AWRT) with the goal of demonstrating energy efficient systems when compared to conventional reclamation technologies while reducing greenhouse gas emissions (GHGs) as well as the capital and operational costs to a significant degree. Reduced energy usage, capital and operational costs, and treatment footprint, as well as improved treatment performance and capacity, are the main advantages of the AWRT.

B. Problem/ Solution Statement

Problem

Today the world is struggling to achieve the globally established sustainable development goals (SDGs). Effective wastewater management and water reclamation can play an important role in achieving the SDGs. In this context, wastewater treatment plants (WWTPs) must also be considered as alternative sources of water and energy. Water reclamation will reduce the stress on the existing freshwater supply, eliminate the need to transport water and minimize energy requirements related to water extraction. WWTPs are also one of the largest energy consumers in most of the cities. About 3% of global electricity consumption results from the operation of

WWTPs[2]. WWTPs are not only major energy consumers, but also are greenhouse gas (GHG) emitters. In 2010, the degradation of organics in a WWTP contributed approximately $7.7x10^8$ metric tons of CO_2-equivalent GHG emissions, equivalent to nearly 1.57% of global GHG emissions ($4.9x10^{10}$ metric tons CO_2e)[3]. Wastewater treatment is also a major contributor of non-CO_2 GHG emissions (i.e., methane and nitrous oxide), accounting for $5.6x10^8$–$7.1x10^8$ metric tons CO_2e per year between 2005 and 2030. This amount of emission is equivalent to 4.6–5.2% of the global total non-CO_2 GHG emissions[4]. Using reclaimed water will reduce the dependency on freshwater resources and water extraction processes. Development of innovative water reclamation technologies with reduced energy consumption and GHG emissions will be an important step in achieving SDGs and decarbonization goals.

Currently granular media filters (GMF) (using sand, anthracite, or garnet) and Disk Filters are two conventional technologies commonly used in water reclamation facilities for non-potable reuse in California. These technologies coupled with conventional secondary activated sludge systems [e.g., biological nutrient removal system utilizing the Modified Ludzack Ettinger (MLE) process] followed by a secondary clarifier are energy intensive processes, which increase GHG emissions and Operational and Maintenance expenditures. Similarly, to achieve potable effluent standards, the low-pressure membrane (LPM) and reverse osmosis (RO) technologies currently used are both energy intensive and have high operational costs associated with the membranes used (shorter lifetime due to intensive fouling and chemical cleaning).

Solution

Implementing innovative water reclamation technologies will help to reduce WWTP energy and footprint requirements. With advanced and efficient technologies, WWTPs could operate with high energy efficiency while significantly reducing GHGs for water reclamation purposes. The project will demonstrate five promising advanced water reclamation technologies, three of which will produce reclaimed water suitable for unrestricted **non-potable** use purposes (e.g., golf course irrigation, landscape irrigation, agricultural irrigation of crops with edible portion above ground) effluent quality, while the two of them will be integrated to produce reclaimed water to meet **potable water quality**. AWRT, by comparison, offer significant competitive advantages when compared to conventional water reclamation technologies including high treatment efficiency, energy and cost savings, carbon footprint and GHG reductions, and footprint reductions. The goal for the technologies for unrestricted potable reuse is to reduce total suspended solids (TSS) down to 2-3 mg/L and turbidity less than 2 NTU with major reductions in total nitrogen (TN) and total phosphorus (TP). The goal for the technologies for potable reuse is to remove all impurities to comply with drinking water standards. With all the technologies the goal is to reduce footprint and operational energy requirements and chemical addition. When compared to conventional treatment systems such as GMF, or conventional RO, all technologies, will offer smaller equipment footprints with improved design and high hydraulic rates resulting in much more economic manufacturing in addition to energy savings and significant GHG reductions.

C. Goals and Objectives of the Agreement

Agreement Goals

The goals of this Agreement are to:

[2] Lu, L., Guest, J. S., Peters, C. A., Zhu, X., Rau, G. H., & Ren, Z. J. (2018). "Wastewater treatment for carbon capture and utilization". Nature Sustainability, *1*(12), 750-758.
[3] IPCC Climate Change 2014: Mitigation of Climate Change (eds Edenhofer, O. et al.) (Cambridge Univ. Press, 2014).
[4] Global Anthropogenic Non-CO_2 Greenhouse Gas Emissions: 1990–2030 (USEPA, 2012)

- Demonstrate three AWRT [Mita Cloth Media Filter (CMF), Taron Activated Sludge Filter (Taron ASF) and BeFlow Continuous Flow Aerobic Granular Sludge (CFAGS) coupled with membrane bioreactor (BeFlow CFAGS+MBR)] to be used to recover non-potable water from wastewater and compare their energy, treatment efficiency and cost benefits against conventional technologies (e.g., conventional activated sludge system using MLE followed by secondary clarifier and GMF).
- Demonstrate two AWRT [Ultrabore Ultrafiltration (UB-UF) and IMPACT-RO] to be used to recover potable water from wastewater and compare their energy, treatment efficiency and cost benefits against conventional technologies (MLE coupled with GMF followed by conventional membrane filtration and RO).
- Conduct independent measurement and verification study to evaluate the feasibility of the AWR technologies as technically viable and commercially attractive approaches against conventional water reclamation technologies. The project's goals are to prove the following benefits for WWTPs and reclamation facilities:
    - Decrease GHG emissions by 34 to 80%.
    - Achieve significant energy savings in water reclamation (25 to 80% reduction).
    - Decrease capital, operational and maintenance costs by 25 to 80 %.
    - Decrease footprint by 50 to 85%.

Ratepayer Benefits:[5] This Agreement will result in the ratepayer benefits for GHG reductions, greater electrical cost savings, electrical reliability, and operational & capital cost savings from using advanced and innovative water reclamation technologies instead of less efficient conventional water reclamation treatment technologies. Assuming a market penetration of 20% oof advancedwater reclamation (AWR) systems in CA, based on total water reclamation of 252 MGD, it is anticipated that about 7,160 metric tons CO_2e of GHG emission can be avoided and 20 GWh of energy to be saved every year. The electricity savings from the implementation of AWR technologies can also reduce the peak electric loads for WWTPs. Locally, this results in reduced congestion on utility distribution circuits and subsequent demand charges incurred by these facilities as large industrial customers. Grid-wide, this reduces reliance on more expensive, less efficient peaking power plants to balance the electric load, reducing the marginal cost of electricity. Reductions in electric load and increases in facility energy self-sufficiency increase the resilience of these facilities against disruptions from broader electric grid outages.

Technological Advancement and Breakthroughs: This Agreement will lead to technological advancement and breakthroughs to overcome the barriers to achieving the State of California's statutory energy goals by improving the quality of water reclamation at WWTPs. Using innovative and efficient water reclamation technologies to produce effluent suitable for non-potable and potable reuse will reduce the energy requirements to withdraw water from any groundwater or freshwater resource which will eventually reduce energy related GHG emissions. The principal objective of this project is to implement and demonstrate the application of five innovative and high efficiency AWR technologies. AWR technologies are particularly strategic energy saving treatment systems, converting WWTPs to water reclamation facilities with increased energy efficiency to achieve the goal of significantly reducing GHG emissions.

Agreement Objectives

The objectives of this Agreement are to:

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

- Evaluate and quantify treatment removal performances of AWR technologies by monitoring influent and effluent data with respect to water reclamation standards in CA and by comparing results [e.g., Turbidity, TSS, Total Dissolved Solids (TDS)] against benchmark (conventional) reclamation technologies.
- Evaluate and quantify performances of AWR technologies by monitoring hydraulic performances [e.g., hydraulic loading rate (HLR), reject ratio)
- Calculate and evaluate the energy savings benefits of AWR technologies based on observed treatment and hydraulic performance data.
- Calculate and evaluate the reductions in GHG emissions resulting from AWRT based on observed treatment and hydraulic performance data.
- Conduct a measurement and verification (M&V) study to compare conventional wastewater treatment system's energy data to AWR system's energy data and quantify the energy savings and GHG emission reductions achieved by replacing conventional treatment system with AWR technologies.
- Conduct an economic evaluation using established and state of the art cost estimating methods with data obtained from operation and performance evaluation of the AWR systems. Operators' logs, invoices for consumables and replacement parts, field programmable logic controller data on each system, and performance evaluation data will be utilized to conduct a life cycle analysis and estimate construction, capital and operational costs of the advanced water reclamation technologies.
- Conduct technology transfer activities including workshops, a utility engagement program, webinars, end user and conference presentations, and publications.

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, and other CEC staff relevant to the Agreement. The Recipient's Project Manager and any other individuals deemed necessary by the CAM or the Project Manager shall participate in this meeting. The administrative and technical aspects of the Agreement will be discussed at the meeting. Prior to the meeting, the CAM will provide an agenda to all potential meeting participants. The meeting may take place in person or by electronic conferencing (e.g., Teams, Zoom), with approval of the CAM.

  The Kick-off meeting will include discussion of the following:
  - The CAM's expectations for accomplishing tasks described in the Scope of Work;
  - An updated Project Schedule;
  - Terms and conditions of the Agreement;
  - Invoicing and auditing procedures;
  - Travel;
  - Equipment purchases;
  - Administrative and Technical products (subtask 1.1);
  - CPR meetings (subtask 1.3);
  - Monthly Calls (subtask 1.5)
  - Quarterly Progress reports (subtask 1.6)
  - Final Report (subtask 1.7)
  - Match funds (subtask 1.8);
  - Permit documentation (subtask 1.9);
  - Subawards(subtask 1.10);
  - Technical Advisory Committee meetings (subtasks 1.11 and 1.12);
  - Agreement changes;
  - Performance Evaluations; and
  - Any other relevant topics.
- Provide *Kick-off Meeting Presentation* to include but not limited to:
  - Project overview (i.e. project description, goals and objectives, technical tasks, expected benefits, etc.)
  - Project schedule that identifies milestones
  - List of potential risk factors and hurdles, and mitigation strategy
- Provide an *Updated Project Schedule, Match Funds Status Letter,* and *Permit Status Letter*, as needed to reflect any changes in the documents.

The CAM shall:

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

Recipient Products:

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

CAM Product:

- Kick-off Meeting Agenda

Subtask 1.3 Critical Project Review (CPR) Meetings

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

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

The Recipient shall:

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

The CAM shall:

- Determine the location, date, and time of each CPR meeting with the Recipient's input.
- Send the Recipient a *CPR Agenda* with a list of expected CPR participants in advance of the CPR meeting. If applicable, the agenda may include a discussion of match funding and permits.
- Conduct and make a record of each CPR meeting. Provide the Recipient with a schedule for providing a Progress Determination on continuation of the project.
- Determine whether to continue the project, and if so whether modifications are needed to the tasks, schedule, products, or budget for the remainder of the Agreement. A determination of unsatisfactory progress This may result in project delays, including a potential Stop Work Order, while the CEC determines whether the project should continue.

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

Recipient Products:
- CPR Report(s)

CAM Products:
- CPR Agenda(s)
- Progress Determination

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

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

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

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

MONTHLY CALLS, REPORTS AND INVOICES
Subtask 1.5 Monthly Calls

The goal of this task is to have calls at least monthly between the CAM and Recipient to verify that satisfactory and continued progress is made towards achieving the objectives of this Agreement on time and within budget.

The objectives of this task are to verbally summarize activities performed during the reporting period, to identify activities planned for the next reporting period, to identify issues that may affect performance and expenditures, to verify match funds are being proportionally spent concurrently or in advance of CEC funds or are being spent in accordance with an approved Match Funding Spending Plan, to form the basis for determining whether invoices are consistent with work performed, and to answer any other questions from the CAM. Monthly calls might not be held on those months when a quarterly progress report is submitted or the CAM determines that a monthly call is unnecessary.

The CAM shall:

- Schedule monthly calls.
- Provide questions to the Recipient prior to the monthly call.
- Provide call summary notes to Recipient of items discussed during call.

The Recipient shall:

- Review the questions provided by CAM prior to the monthly call.
- Provide verbal answers to the CAM during the call.

Recipient Product:

- Email to CAM concurring with call summary notes.

Subtask 1.6 Quarterly Progress Reports and Invoices
The goals of this subtask are to: (1) periodically verify that satisfactory and continued progress is made towards achieving the project objectives of this Agreement; and (2) ensure that invoices contain all required information and are submitted in the appropriate format.

The Recipient shall:

- Submit a *Quarterly Progress Report* to the CAM. Each progress report must:
    - Summarize progress made on all Agreement activities as specified in the scope of work for the reporting period, including accomplishments, problems, milestones, products, schedule, fiscal status, and an assessment of the ability to complete the Agreement within the current budget and any anticipated cost overruns. Progress reports are due to the CAM the 10th day of each January, April, July, and October. The Quarterly Progress Report template can be found on the ECAMS Resources webpage available at: https://www.energy.ca.gov/media/4691
- Submit a monthly or quarterly *Invoice* on the invoice template(s) provided by the CAM.

Recipient Products:

- Quarterly Progress Reports
- Invoices

CAM Product:
- Invoice template

Subtask 1.7 Final Report
The goal of this subtask is to prepare a comprehensive Final Report that describes the original purpose, approach, results, and conclusions of the work performed under this Agreement. When creating the Final Report Outline and the Final Report, the Recipient must use the CEC Style Manual provided by the CAM.

Subtask 1.7.1 Final Report Outline

The Recipient shall:
- Prepare a *Final Report Outline* in accordance with the *Energy Commission Style Manual* provided by the CAM.

Recipient Products:
- Final Report Outline (draft and final)

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

Subtask 1.7.2 Final Report

The Recipient shall:
- Prepare a *Final Report* for this Agreement in accordance with the approved Final Report Outline, Energy Commission Style Manual, and Final Report Template provided by the CAM with the following considerations:
  - Ensure that the report includes the following items, in the following order:
    - Cover page (**required**)
    - Credits page on the reverse side of cover with legal disclaimer (**required**)
    - Acknowledgements page (optional)
    - Preface (**required**)
    - Abstract, keywords, and citation page (**required**)
    - Table of Contents (**required**, followed by List of Figures and List of Tables, if needed)
    - Executive summary (**required**)
    - Body of the report (**required**)
    - References (if applicable)
    - Glossary/Acronyms (If more than 10 acronyms or abbreviations are used, it is required.)
    - Bibliography (if applicable)
    - Appendices (if applicable) (Create a separate volume if very large.)
    - Attachments (if applicable)
- Submit a draft of the Executive Summary to the TAC for review and comment.
- Develop and submit a *Summary of TAC Comments on Draft Final Report* received on the Executive Summary. For each comment received, the Recipient will identify in the summary the following:

  - Comments the Recipient proposes to incorporate.
  - Comments the Recipient does propose to incorporate and an explanation for why.
- Submit a draft of the report to the CAM for review and comment. The CAM will provide written comments to the Recipient on the draft product within 15 days of receipt.
- Incorporate all CAM comments into the *Final Report*. If the Recipient disagrees with any comment, provide a *Written Responses to Comments* explaining why the comments were not incorporated into the final product.

- Submit the revised *Final Report* electronically with any Written Responses to Comments within 10 days of receipt of CAM's Written Comments on the Draft Final Report, unless the CAM specifies a longer time period or approves a request for additional time.

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

CAM Product:
- Written Comments on the Draft Final Report

MATCH FUNDS, PERMITS, AND SUBAWARDS

Subtask 1.8 Match Funds

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

While the costs to obtain and document match funds are not reimbursable under this Agreement, the Recipient may spend match funds for this task. Match funds must be identified in writing, and the Recipient must obtain any associated commitments before incurring any costs for which the Recipient will request reimbursement.

The Recipient shall:
- Prepare a *Match Funds Status Letter* that documents the match funds committed to this Agreement. If no match funds were part of the application that led to the CEC awarding this Agreement and none have been identified at the time this Agreement starts, then state this in the letter.

  If match funds were a part of the application that led to the CEC awarding this Agreement, then provide in the letter:
  - A list of the match funds that identifies:
    - The amount of cash match funds, their source(s) (including a contact name, address, and telephone number), and the task(s) to which the match funds will be applied.
    - The amount of each in-kind contribution, a description of the contribution type (e.g., property, services), the documented market or book value, the source (including a contact name, address, and telephone number), and the task(s) to which the match funds will be applied. If the in-kind contribution is equipment or other tangible or real property, the Recipient must identify its

owner and provide a contact name, address, telephone number, and the address where the property is located.
    - If different from the solicitation application, provide a letter of commitment from an authorized representative of each source of match funding that the funds or contributions have been secured.
- At the Kick-off meeting, discuss match funds and the impact on the project if they are significantly reduced or not obtained as committed. If applicable, match funds will be included as a line item in the progress reports and will be a topic at CPR meetings.
- Provide a *Supplemental Match Funds Notification Letter* to the CAM of receipt of additional match funds.
- Provide a *Match Funds Reduction Notification Letter* to the CAM if existing match funds are reduced during the course of the Agreement. Reduction of match funds may trigger a CPR meeting.

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

Subtask 1.9 Permits
The goal of this subtask is to obtain all permits required for work completed under this Agreement in advance of the date they are needed to keep the Agreement schedule on track. Permit costs and the expenses associated with obtaining permits are not reimbursable under this Agreement, with the exception of costs incurred by University of California recipients. Permits must be identified and obtained before the Recipient may incur any costs related to the use of the permit(s) for which the Recipient will request reimbursement.

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

  The list of permits and the schedule for obtaining them will be discussed at the Kick-off meeting (subtask 1.2), and a timetable for submitting the updated list, schedule, and copies of the permits will be developed. The impact on the project if the permits are not obtained in a timely fashion or are denied will also be discussed. If applicable, permits will be included as a line item in progress reports and will be a topic at CPR meetings.
- If during the course of the Agreement additional permits become necessary, then provide the CAM with an *Updated List of Permits* (including the appropriate information on each permit) and an *Updated Schedule for Acquiring Permits*.
- Send the CAM a *Copy of Each Approved Permit*.
- If during the course of the Agreement permits are not obtained on time or are denied, notify the CAM within 5 days. Either of these events may trigger a CPR meeting.

Recipient Products:

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

Subtask 1.10 Subawards

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

The Recipient shall:

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

Recipient Products:

- Subawards *(if requested by the CAM)*

TECHNICAL ADVISORY COMMITTEE

Subtask 1.11 Technical Advisory Committee (TAC)

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

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

- Provide a credible and objective sounding board on the wide range of technical and financial barriers and opportunities.
- Help identify key areas where the project has a competitive advantage, value proposition, or strength upon which to build.
- Advocate, to the extent the TAC members feel is appropriate, on behalf of the project in its effort to build partnerships, governmental support, and relationships with a national spectrum of influential leaders.
- Ask probing questions that ensure a long-term perspective on decision-making and progress toward the project's strategic goals.

The TAC may be composed of qualified professionals spanning the following types of disciplines:

- Researchers knowledgeable about the project subject matter;
- Members of trades that will apply the results of the project (e.g., designers, engineers, architects, contractors, and trade representatives);
- Public interest market transformation implementers;
- Product developers relevant to the project;
- U.S. Department of Energy research managers, or experts from other federal or state agencies relevant to the project;
- Public interest environmental groups;
- Utility representatives;
- Air district staff; and
    - Members of relevant technical society committees.

The Recipient shall:

- Prepare a *List of Potential TAC Members* that includes the names, companies, physical and electronic addresses, and phone numbers of potential members. The list will be discussed at the Kick-off meeting, and a schedule for recruiting members and holding the first TAC meeting will be developed.
- Recruit TAC members. Ensure that each individual understands member obligations and the TAC meeting schedule developed in subtask 1.12.
- Prepare a *List of TAC Members* once all TAC members have committed to serving on the TAC.
- Submit *Documentation of TAC Member Commitment* (such as Letters of Acceptance) from each TAC member.

Recipient Products:

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

Subtask 1.12 TAC Meetings

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

The Recipient shall:

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

Recipient Products:

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

Subtask 1.13 Project Performance Metrics

The goal of this subtask is to finalize key performance targets for the project based on feedback from the TAC and report on final results in achieving those targets. The performance targets should be a combination of scientific, engineering, techno-economic, and/or programmatic metrics that provide the most significant indicator of the research or technology's potential success.

The Recipient shall:

- Complete and submit the project performance metrics section of the *Initial Project Benefits Questionnaire*, developed in the Evaluation of Project Benefits task, to the CAM.
- Present the draft project performance metrics at the first TAC meeting to solicit input and comments from the TAC members.

- Develop and submit a *TAC Performance Metrics Summary* that summarizes comments received from the TAC members on the proposed project performance metrics. The *TAC Performance Metrics Summary* will identify:
    - TAC comments the Recipient proposes to incorporate into the *Initial Project Benefits Questionnaire*, developed in the Evaluation of Project Benefits task.
    - TAC comments the Recipient does not propose to incorporate with and explanation why.
- Develop and submit a *Project Performance Metrics Results* document describing the extent to which the Recipient met each of the performance metrics in the *Final Project Benefits Questionnaire*, developed in the Evaluation of Project Benefits task.
- Discuss the *Project Performance Metrics Results* at the Final Meeting.

Recipient Products:

- TAC Performance Metrics Summary
- Project Performance Metrics Results

IV. TECHNICAL TASKS

TASK 2 DESIGN, FABRICATION, AND INSTALLATION OF ADVANCED WATER RECLAMATION TECHNOLOGIES

The goal of this task is to design and install the demonstration AWRTs at Linda, Los Angeles and Silicon Valley WWTPs.

The Recipient shall:

- Reach an agreement with the authorized representative(s) of the selected deployment sites regarding the project timeline, space reserved for the project, equipment installation, permit and insurance, indemnity, and the Recipient's use of support staff and installation and removal of equipment.
- Work with the CAM to select new deployments site(s) if the selected deployment site becomes unavailable during the project term or to add additional deployment sites,
- Execute Contracts with Deployment Sites and provide *Copy of Contracts with Deployment Sites to the CAM* that confirms the agreement reached above.
- Design and install provisions to the existing equipment and infrastructure at Linda , Los Angeles and Silicon Valley reclamation plants to support the operation of demonstration scale AWR technologies.
- Design, fabricate and install a Mita CMF (with a capacity of 250 gpm) to achieve reclaimed water suitable for unrestricted non-potable effluent. The MITA CMF system will be designed to operate at hydraulic loading rates (HLR) up to 20 gpm/ft^2, which is three times higher compared to conventional CMF systems.
- Design, fabricate, and install one Taron ASF (with a capacity of 20 gpm) to achieve reclaimed water suitable for unrestricted non-potable effluent.
- Design, fabricate, and install one BeFlow AGS coupled with FlexMBR (BeFlow CFAGS+MBR) (with a capacity of 20 gpm) to achieve reclaimed water suitable for unrestricted non-potable effluent.
- Design, fabricate, and install one UB- UF (with a capacity of 70 gpm) suitable for effective downstream IMPACT-RO operation.
- Design, fabricate, and install one IMPACT-RO (with a capacity of 70 gpm) to produce reclaimed water suitable for potable water reuse.

- Prepare and submit to CAM, *Plans, Schedule, and Specifications Report* for all of the AWR technology. The report shall include, but not be limited to, the following:
    - Site-specific piping, mechanical, structural, and electrical requirements
    - Identifying all required site-specific modifications necessary for demonstration of AWR systems (Mita CMF, Taron ASF and BeFlow CFAGS+MBR for non-potable use and UB-UF and IMPACT-RO for potable water use) and all associated support hardware(s) and softwares(s)
- Prepare and provide *Letters of Acceptance* to be signed by Linda, Los Angeles, Silicon Valley WWTP representatives that includes but not limited to: 1) Written documentation that installation of the demonstration systems are complete. 2) Verification that demonstration systems are ready for start-up, operation, monitoring, and verification.

Products:

- Copy of Contracts with Deployment Sites
- Plans, Schedule, and Specifications Report
- Letters of Acceptance

TASK 3 MONITORING OF BASELINE (CONVENTIONAL) TREATMENT SYSTEM

The goals of this task are to collect and analyze data from the operation of the conventional wastewater treatment system and tertiary water reclamation treatment systems at Linda, Los Angeles and Silicon Valley WWTP facilities. The performance data obtained for MLE followed by GMF (non-potable) and UF and RO (for potable) will be used to establish baseline performance data for demonstration of the AWR systems to compare with and quantify the improved treatment, energy, and hydraulic performances.

The Recipient shall:

- Evaluate performance of the conventional systems at Linda, Los Angeles and Silicon Valley WWTPs under normal operating conditions. Baseline performance data will be obtained to include but not limited to the following:
    - TSS
    - Influent and effluent turbidity
    - Biochemical Oxygen Demand (BOD)
    - Chemical Oxygen Demand (COD)
    - Ammonia
    - TN
    - TP
    - Flowrate
    - Filter Solids Loading Rate (SLR)
    - Filter Hydraulic Loading Rate (HLR)
    - Energy requirement
    - Backwash flow (for GMF)
    - Backwash reject ratio (for GMF)
    - Backwash frequency (for GMF)
    - Intensive cleaning frequency (for GMF)
- Conduct inline continuous field measurements related to water reclamation performance.
- Conduct sampling for offsite laboratory analyses. Effluent quality tests will be conducted to (1) evaluate treatment performance for specific constituents, (2) correlate and confirm

electricity savings with the industry operating parameters, and (3) ensure that the overall treatment processes are not negatively impacted by AWR demonstrations and necessary measurements/actions are taken on time if necessary.
- Prepare and provide a *Conventional System Test Plan* to monitor, measure, and evaluate the performance of the conventional systems with respect to the performance data listed above.
- Prepare and provide a *Conventional System Performance Report* to summarize the performance of conventional systems for the performance criteria listed above.

Recipient Products
- Conventional System Test Plan
- Conventional System Performance Report

TASK 4 OPERATION AND MONITORING OF ADVANCED WATER RECLAMATION TECHNOLOGIES

The goals of this task are to start-up and operate AWRT to obtain non-potable and potable effluent quality and seek Title 22 approval for Mita CMF and Taron ASF (non-potable reuse).

The Recipient shall:
- Operate and demonstrate the conventional and advanced water reclamation process trains to achieve non-potable effluent standards.
    - In Benchmark-1 the existing MLE system will be followed by GMF to achieve non-potable effluent standards.
    - The innovative non-potable AWRT Mita CMF (Proposed-1) will be compared to Benchmark-1, while Proposed-2 and Proposed-3 will be compared to Benchmark-2 which is the conventional MBR technology.
    - In Proposed-1, new Mita CMF will follow the existing conventional secondary biological treatment train to replace the conventional filtration system of GMF.
    - In Proposed-2 and Proposed-3, BeFlow CFAGS+MBR and Taron ASF, respectively, will have their individual innovative process configurations combining secondary biological treatment and advanced processes (i.e., filtration) in one integrated system to produce high quality reclaimed water suitable for non-potable reuse.
- Operate and demonstrate the conventional and advanced treatment trains to achieve potable effluent standards.
    - Proposed-4 includes the combination of BeFlow CFAGS [coupled with Secondary Clarifier (SC)] followed by Mita CMF, UB-UF membrane, and IMPACT-RO.
- Prepare and provide a *Demonstration Scale System Test Plan* for each demonstration-phase to evaluate:
    - Critical operational and design criteria (for each AWR system) including hydraulic loading rate, surface solids loading rate, and power demand.
      Test plans will include list of inline continuous field measurements related to effluent quality, RO/UF membrane degradation/wear, wastewater treatment performance, GHG emissions evaluations, and electrical power consumption.
    - Test plans will include sampling protocols for effluent quality monitoring for offsite laboratory analyses.
- Operate the AWRT to compare with performance of Conventional Benchmark System at Task 3 above. Following criteria will be monitored:

  - TSS
  - SLR
  - HLR
  - TN
  - TP
  - Influent and effluent turbidity
  - Energy requirement / Power utilized
  - Headloss
  - Backwash/reject flow
  - Backwash/cleaning frequency
  - Backwash pressure
  - Transmembrane Pressure (TMP) (for IMPACT-RO and UB-UF)
  - Flowrate
  - OPEX
- Prepare *Demonstration Scale System Operational Report* for each proposed AWR to summarize the above criteria compared to Conventional Benchmark System.
- Create and submit *Operation Log* that summarizes operating conditions and hours.
- Participate in CPR per Subtask 1.3 and prepare CPR Report #1.

Recipient Products
- Demonstration Scale System Test Plan
- Demonstration Scale System Operational Progress Reports
- Operations Logs
- CPR Report #1

TASK 5 PERFORMANCE EVALUATION OF ADVANCED WATER RECLAMATION TECHNOLOGIES
The goal of this task is to conduct a detailed performance analysis based on the results obtained from the operation of the AWR systems.

The Recipient shall:
- Compile all of the conventional/baseline treatment/reclamation system's (e.g, MLE + GMF) performance data including inline field measurements and offsite laboratory sampling results.
- Prepare and submit *Energy, GHG, Treatment, and Capacity Performance Analysis Progress Report* for all AWR system. Under this task Energy, GHG, treatment, and capacity performance data will be reviewed and evaluated for the benchmark/conventional and AWR demonstration systems. The performance analysis will also include SLR, HLR to test the performance, influent and effluent turbidity to make sure the effluent meets Title 22 of the California code of regulations for unrestricted reuse.-.
- Prepare *GHG Reduction and Energy Analysis Report* for each AWRT system. Under this task, GHG, power and energy data will be reviewed and evaluated for the baseline and demonstration systems. Power demand and energy consumption for the existing conventional reclamation system will be collected and evaluated.
- Prepare *Process Computer Model Report* for WWTPs using conventional and AWR treatment systems included in the project. Establish, calibrate, and use a computer process model (e.g., SUMO) using the process performance results to simulate performance and benefits for full flow rates of Linda WWTP and Los Angeles WWTP.

- Use an industry accepted GHG emissions prediction model (e.g., BEAM) to estimate the benefits of implementation of AWR systems (i.e., Mita CMF, Taron ASF, BeFlow CFAGS) compared to using conventional benchmark treatment system involving the use of MLE with GMF.
- Prepare *General California WWTP and Reclamation Process Computer Model Report* to evaluate the impacts of AWR systems for plants using different main process treatment trains and at different flow rates.
- Participate in CPR per Subtask 1.3 and prepare CPR Report #2.

Recipient Products:

- Energy, GHG, Treatment, and Capacity Performance Analysis Progress Report
- GHG Reduction and Energy Analysis Report (for each AWRT)
- Process Computer Model Report
- General California WWTP and Reclamation Process Computer Model Report
- CPR Report #2

TASK 6 ECONOMIC EVALUATION OF ADVANCED WATER RECLAMATION TECHNOLOGIES VERSUS CONVENTIONAL SYSTEMS

The goal of this task is to estimate construction/capital and operational costs of the AWR technologies based on results obtained from the project and the Advancement of Cost Engineering (AACE) guidelines.

The Recipient shall:

- Determine the capital costs for each AWRT. Our cost estimating framework will utilize a five level Class System (5, 4, 3, 2, and 1) which corresponds to estimate types prepared at various stages of project development. Class 5 cost estimates are developed at project conception when little project information or scope has been developed. Class 2 estimates are based on detailed unit costs and take off estimates with complete or near complete scope definition. Class 2 and Class 1 estimates are conducted at 60 percent to 100 percent design stages of actual construction projects. During this project Class 3, 4 and Class 5 cost estimates will also be developed. Identify and fine tune the design and operational criteria to develop accurate cost estimates.
- Prepare and submit to the CAM *Capital Cost Estimations for Conventional and AWRT Report* to summarize the above findings.
- Evaluate energy savings by utilizing a third-party energy audit firm. Third party energy audit firm will conduct a Measurement and Verification (M&V) study to quantify the energy savings associated with AWRT by comparing the energy consumption for existing plant's baseline and for the replacement of GMF with Mita CMF, MBR with Taron ASF and BeFlow CFAGS+MBR.
- Compare the overall wastewater treatment and water reclamation performance to conventional process. Prepare and submit *AWRT M&V Findings Report* to summarize the M&V findings for each AWRT with minimum of six months post installation testing.
- Evaluate the operational and cost savings of AWRT versus conventional benchmark systems. Operational costs will be closely monitored for the conventional treatment system and the AWR systems during each demonstration phase. The following will be utilized to evaluate and quantify operational costs:1) Daily logs to track operator time for routine

operations and maintenance activities as well as specialized maintenance tasks 2) Troubleshooting logs that record breakdowns and/or out of spec operation and associated costs to bring the system back online. 3) Invoices for consumables such as chemicals. 4) Invoices for replacement parts. 5) Labor and material costs will be recorded for each AWRT during the demonstration period. If costs are not significant, the project team will coordinate with the manufacturers to estimate remaining lifetime and associated costs.

- Prepare and submit *Operational and Capital Cost Savings Report* to summarize the above findings for each AWRT.
- Conduct life cycle cost analysis using the capital, operational, and maintenance costs for conventional and AWR systems over a 30-year period at net discount rate of 3%.
- Estimate rate of return for each AWR technology
- Prepare and submit *Life Cycle Cost Analysis* to summarize the above findings.

Recipient Products:

- Capital Cost Estimations for Conventional and AWRT Report
- AWRT M&V Findings Report
- Operational and Capital Cost Savings Report
- Life Cycle Cost Analysis Report

TASK 7 PROJECT MEASUREMENT AND VERIFICATION

The goal of this task is to conduct an independent third-party measurement and verification (M&V) to measure and quantify project benefits.

The Recipient shall:

- Identify and confirm the specific project benefits to be measured. At a minimum this will include pre- and post-project energy use (kilowatt hours, kilowatts, therms), and calculations of energy cost savings and GHG emissions. This can include pre and post measurements of water use (especially during backwash) (million gallons) and other project benefits, and calculations of the resulting cost savings and GHG reductions.
- Enter into agreement with a M&V vendor.
- Coordinate site visits with the M&V firm at the demonstration site(s) identified.
- Develop M&V Plan for ***pre-install*** measurement of: electrical energy consumed by conventional wastewater treatment and reclamation system (i.e., MLE followed by GMF, LMP, and RO) system through plant supervisory control and data acquisition (SCADA) or data logging.
- Perform pre-install measurements based on the M&V Plan for pre-install.
- Develop M&V Plan for ***post-install*** measurement of: Electrical energy consumed by AWR systems.
- Perform post-install measurements based on M&V Plan for post-install.
- Evaluate audited energy consumption values to quantify the energy savings associated with AWR by comparing the energy consumption for baseline systems for the replacement of GMF with Mita CMF, replacement of MBR with Taron ASF and BeFlow CFAGS+MBR, and replacement of RO with IMPACT-RO, and replacement of conventional UF with UB-UF. The M&V process will be utilized to confirm electrical energy savings associated with using AWR technologies with conventional system.
- The M&V Plans will also include the energy consumption measurements as a function of the variations in effluent quality measurements (e.g., for turbidity, TDS, TN, TP and BOD).

- Prepare *M&V Findings Report* that includes M&V Plan, pre and post install measurements, analysis, and results performed in this task.

Recipient Products:
- M&V Findings Report

TASK 8 EVALUATION OF PROJECT BENEFITS
The goal of this task is to report the benefits resulting from this project.

The Recipient shall:
- Complete *the Initial Project Benefits Questionnaire*. The Initial Project Benefits Questionnaire shall be initially completed by the Recipient with 'Kick-off' selected for the 'Relevant data collection period' and submitted to the CAM for review and approval.
- Complete the *Annual Survey* by January 31st of each year. The Annual Survey includes but is not limited to the following information:
  - Technology commercialization progress
  - New media and publications
  - Company growth
  - Follow-on funding and awards received.
- Complete the *Final Project Benefits Questionnaire*. The Final Project Benefits Questionnaire shall be completed by the Recipient with 'Final' selected for the 'Relevant data collection period' and submitted to the CAM for review and approval.
- Respond to CAM questions regarding the questionnaire drafts.
- Complete and update the project profile on the CEC's public online project and recipient directory on the Energize Innovation website (www.energizeinnovation.fund), and provide *Documentation of Project Profile on EnergizeInnovation.fund*, including the profile link.
- If the Prime Recipient is an Innovation Partner on the project, complete and update the organizational profile on the CEC's public online project and recipient directory on the Energize Innovation website (www.energizeinnovation.fund), and provide *Documentation of Organization Profile on EnergizeInnovation.fund*, including the profile link.

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

TASK 9 TECHNOLOGY TRANSFER ACTIVITIES
The goal of this task is to ensure the technological learning that resulted from the demonstration(s) is captured and disseminated to the range of professions that will be responsible for future deployments of this technology or similar technologies.

The Recipient Shall:

- Develop and submit a *Project Case Study Plan* that outlines how the Recipient will document the planning, construction, commissioning, and operation of the technology or system being demonstrated. The Project Case Study Plan should include:
    - An outline of the objectives, goals, and activities of the case study.
    - The organization that will be conducting the case study and the plan for conducting it.
    - A list of professions and practitioners involved in the technology's deployment.
    - Specific activities the recipient will take to ensure the learning that results from the project is disseminated to those professions and practitioners.
    - Presentations/webinars/training events to disseminate the results of the case study.
- Present the draft *Project Case Study Plan* to the TAC for review and comment.
- Develop and submit a *Summary of TAC Comments* that summarizes comments received from the TAC members on the draft *Project Case Study Plan*. This document will identify:
    - TAC comments the recipient proposes to incorporate into the final *Technology Transfer Plan*.
    - TAC comments the recipient does not propose to incorporate with and explanation why.
- Submit the final *Project Case Study Plan* to the CAM for approval.
- Execute the final Project Case Study Plan and develop and submit a Project Case Study.
- When directed by the CAM, develop presentation materials for a CEC sponsored conference/workshop(s) on the project.
- When directed by the CAM, participate in annual EPIC symposium(s) sponsored by the California CEC.
- Provide at least (6) six High Quality Digital Photographs (minimum resolution of 1300x500 pixels in landscape ratio) of pre and post technology installation at the project sites or related project photographs.

Recipient Products:

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

IV. PROJECT SCHEDULE

Please see the attached Excel spreadsheet.