

GRANT REQUEST FORM (GRF)

CEC-270 (Revised 10/2015)

CALIFORNIA ENERGY COMMISSION

New Agreement EPC-16-062 (To be completed by CGL Office)

ERDD	Cyrus Ghandi	51	916-327-1506
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Regents of the University of California, Davis	94-6036494
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Advancing Demand Response in the Water Sector

6/5/2017	12/31/2020	\$ 2,984,983
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 ARFVTP agreements under \$75K delegated to Executive Director.

Proposed Business Meeting Date	5/10/2017	<input type="checkbox"/> Consent	<input checked="" type="checkbox"/> Discussion
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Business Meeting Presenter	Cyrus Ghandi	Time Needed:	5 minutes
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Please select one list serve. EPIC (Electric Program Investment Charge)

Agenda Item Subject and Description

UNIVERSITY OF CALIFORNIA, DAVIS. Proposed resolution approving Agreement EPC-16-062 with the Regents of the University of California, on behalf of the Davis campus, for a \$2,984,983 grant to develop a demand management system technology and strategy to enable a water utility to reduce or shift energy loads based on different utility tariff structures. This will allow the water utility to participate in demand response and load shifting programs and reduce energy costs. The technology will be tested at the Moulton Niguel Water District in Orange County.

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, § 15306 and § 15301 Common Sense Exemption. 14 CCR 15061 (b) (3)

Explain reason why Agreement is exempt under the above section:

Cal. Code Regs., tit. 14, sect. 15306 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 under CEQA. This project will involve installation of energy sub-meters, pressure and water meters at 24 locations across the water systems of Moulton Niguel Water District in Orange County, CA. and will be collecting data for software modeling from these meters. The project will not result in a serious or major disturbance to an environmental resource.

Cal. Code Regs., tit. 14, sect. 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, involving negligible or no expansion of use beyond that existing at the time of the determination are categorically exempt under CEQA. This project will involve the installation of energy sub-meters, pressure and water meters at 24 existing water district pump stations and will be limited to the operation and minor alteration of those sites and involve negligible or no expansion of use beyond that currently existing.

 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

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Legal Company Name:	Budget
Helio Energy Management Solutions, Inc.	\$ 1,379,305
Moulton Niguel Water District	\$ Match only
R Systems, Inc.	\$ 99,934
To Be Determined	\$ 78,000
	\$
	\$

EXHIBIT A Scope of Work

TASK ACRONYM/TERM LISTS

A. Task List

Task #	CPR ¹	Task Name
1		General Project Tasks
2	X	Demand Management System Development
3		Water System Analysis & Test Pilot
4		Measurement and Verification
5		Net Grid Impact Modeling & Analysis
6		Evaluation of Project Benefits
7		Technology/Knowledge Transfer Activities
8		Production Readiness Plan

B. Acronym/Term List

Acronym/Term	Meaning
CAM	Commission Agreement Manager
CAO	Commission Agreement Officer
CPR	Critical Project Review
CWEE	Center for Water-Energy Efficiency
DMS	Demand Management System
DR	Demand Response
HEMS	Helio Energy Management Solutions, Inc.
MNWD	Moulton Niguel Water District
TAC	Technical Advisory Committee
M&V	Measurement and Verification

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

A. Purpose of Agreement

The purpose of this Agreement is to fund the development and a pilot of a demand management system (DMS) that can enable a water utility distribution system to reduce or shift energy demand loads, or ramp up energy demands, in response to different tariff structures. Additionally, the short and long-term net grid impacts from water utility demand management will be analyzed for a specific water utility and also on a state-wide basis (given widespread adoption) using a smart grid optimization model.

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

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B. Problem/ Solution Statement

Problem

The water utility sector currently has few options for controlling their energy demand during specific time periods - including reducing, shifting, or ramping up loads to adhere to different energy rate structures. Typically, water distribution systems are managed by meeting customer water demands which fluctuate throughout the day and over the course of a week. To ensure customer needs are met, water system operators focus on meeting demands. Optimizing energy use to save costs is often an afterthought (or simply unmanageable). There is a gap in knowledge of how to effectively manage the energy demands of tens to hundreds of pumps within a distribution system, while still ensuring customer water demands are sufficiently met. In addition, evaluating energy use and costs under different energy rate structures and changing operational practices to reduce, shift, or increase demands during specific time periods is challenging and requires continuous data analysis (which can be outside the technical ability of a water utility). Due to the complexity of energy demand management in the water utility sector and the lack of knowledge in the form of effective market solutions, water utilities are often unable to participate in demand response events, or shift energy loads outside peak hours to reduce impact to the grid and reduce energy costs. This problem has not yet been addressed widespread because the solution requires accessing real-time water and energy data and an analysis engine to define and quantify reduction opportunities.

Solution

The Recipient will develop and test an integrated approach to increase water utility participation in demand response (DR) through optimizing demand management. The Center for Water-Energy Efficiency (CWEE) at the University of California, Davis will combine water system hydraulic modeling and the Helio Energy Management Solutions (HEMS) PredictEnergy™ analytics software and data acquisition system. PredictEnergy™ analytics will be configured as a DMS and analyze the energy loads of the Moulton Niguel Water District (MNWD). The project will focus on optimizing energy demand management under different energy rate structures for both the potable and recycled water systems at MNWD (both systems operate independently and have unique operational needs and system demands).

The PredictEnergy™ DMS will provide the critical knowledge needed to understand the daily and seasonal energy and water demands of the system. This knowledge will be used to develop a customized water system operational guide for water system operators to detail strategies for energy demand management. The operational recommendations will include plans for both daily and seasonal operational changes to either decrease, ramp up, or shift energy demand, as needed to satisfy different rate structures under both the Southern California Edison (SCE) and San Diego Gas and Electric (SDGE) energy suppliers (as the primary electricity suppliers of the MNWD service territory). A pilot evaluation will then be performed on both MNWD distribution systems to determine the ability of MNWD to adopt the recommended operational changes and verify their ability to reduce demand and shift energy loads in response to different tariff structures or demand response events.

C. Goals and Objectives of the Agreement

Agreement Goals

The goals of this Agreement are to develop a DMS technology and an operational strategy to enable a water utility to reduce costs by participating in load shifting and demand response (DR) in response to different IOU rate structures.

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Ratepayer Benefits:² This Agreement will result in the ratepayer benefits of greater electricity reliability and lower costs by reducing or shifting the energy demand of water distribution systems during peak hours. Currently, most water utilities have little means to reduce their peak energy demand and consumption or shift energy demand loads. This project will develop the technological and operational methodologies for enabling water utilities to participate in demand response and load shifting. If widely adopted by public water agencies in California, the impact to the grid during peak hours could be significant, leading to greater electricity reliability and lower costs to consumers.

Technological Advancement and Breakthroughs:³ This Agreement will lead to technological advancement and breakthroughs to overcome barriers to the achievement of the State of California's statutory energy goals. The development of a water system DMS tool to enable water utility participation in demand response and load shifting, along with marketing and communicating the technology benefits, will help to gain the acceptance needed for widespread deployment. Given the impact of energy consumption by the water industry in California, widespread use of the proposed methodology will help achieve energy demand reduction and support the state's energy goals.

Agreement Objectives

The objectives of this Agreement are to perform the following:

- Develop a DMS for a water distribution system capable of providing actionable intelligence for water system energy demand management.
- Use the DMS to analyze the system and develop an operational plan for flexible operation of water systems in response to applicable energy tariff structures.
- Demonstrate a pilot utilizing the water system operational plan and assess the ability of the water district to reduce, ramp up, or shift energy loads, as desired
- Develop a smart grid optimization model to analyze the grid impacts from water system demand management, and optimize grid operations under different supply and demand scenarios

II. 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

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.

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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.

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.

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- 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.

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

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- 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*.

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.

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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.

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.

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- 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.

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.

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- 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
- Acceptance of Final Report Outline

Subtask 1.6.2 Final Report

The Recipient shall:

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

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- 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 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

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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.
- 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

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this Agreement, with the exception of costs incurred by University of California recipients. Permits must be identified and obtained before the Recipient may incur any costs related to the use of the permit(s) for which the Recipient will request reimbursement.

The Recipient shall:

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

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

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

Products:

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

Subtask 1.9 Subcontracts

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

The Recipient shall:

- Manage and coordinate subcontractor activities in accordance with the requirements of this Agreement.
- Incorporate this Agreement by reference into each subcontract.
- Include any required Energy Commission flow-down provisions in each subcontract, in addition to a statement that the terms of this Agreement will prevail if they conflict with the subcontract terms.
- If required by the CAM, submit a draft of each *Subcontract* required to conduct the work under this Agreement.
- Submit a final copy of the executed subcontract.

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- 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;
- Utility representatives;
- Air district staff; and
- Members of relevant technical society committees.

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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

III. 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 DEMAND MANAGEMENT SYSTEM DEVELOPMENT

The goals of this task are to design and develop a water system DMS for MNWD. This includes creating a full hydraulic model of the MNWD water systems, designing the configuring PredictEnergy™ software and hardware specific for the MNWD potable and recycled water systems, installing all hardware needed on water system infrastructure (e.g. energy sub-meters and water flow meters, as needed), integrating all water system data and configuring data acquisition for the PredictEnergy™ software, and initial testing to ensure the DMS is ready for performing a test pilot in Task 3.

The Recipient shall:

- Organize project meetings with HEMS and MNWD to plan site visits to MNWD to collaborate with water system operators and management teams.
- Understand (in conjunction with HES) the operational requirements and constraints of the MNWD water systems and the system’s energy and water demands over time.
- Create an inventory of all data and informational needs required from MNWD (e.g. GIS maps of the water systems, energy and water data for all distribution pumping systems, pump specifications or energy efficiency reports, water system data regarding operations, etc.).
- Set up data agreements, coordinate data needs and transfers, set up automated data transfers if needed, and phone conferences with MNWD to clarify details of the water distribution systems and operational details.
- Develop an engineering hydraulic model of the water distribution systems (using InfoWater, a GIS based water distribution system modeling software). Develop the hydraulic model to optimize water demand and energy use across the water distribution systems.
- Produce a *Hydraulic Model Display and Results Report* that will include analysis of the results of the hydraulic model.
- Incorporate the output data into the PredictEnergy™ software.
- Oversee HEMS to create a *Project Model Summary* as a roadmap (in direct coordination with MNWD) highlighting the data acquisition and analytics architecture under which the PredictEnergy™ DMS will be designed.
- Oversee the HEMS design and configuration of the PredictEnergy™ water system analytical toolkit.
- Oversee HEMS installation of open source metering hardware for real-time data acquisition of water system parameters such as energy, pressure, and flow for all the district’s water pumping stations and reservoirs.
- Verify that MNWD oversees all hardware installation on water system infrastructure. Oversee HEMS data acquisition: the PredictEnergy™ system will upload data by on-station mini-servers to the cloud and into the servers for access by the PredictEnergy™ analytics software.
- Oversee HEMS to develop configuration to include setting up PredictEnergy™ algorithms, data access, and user interface screens to produce decision-able intelligence for the system user.

EXHIBIT A

Scope of Work

- Oversee MNWD to assist with DMS configuration/calibration as requested.
- Oversee HEMS to create an easy to read, single screen graphical dashboard for the water district, displaying current status, appropriate decision making trends, key performance indicators, and direct access/links to diagnostic details for troubleshooting.
- Oversee HEMS to complete and test PredictEnergy™ DMS Test Version (unreleased version) configured for the MNWD DMS on the HEMS test servers prior to release of the final version.
- Provide *Screenshots of PredictEnergy™ DMS Test Version*
- Prepare a *CPR Report* and participate in a CPR meeting, per Subtask 1.3.

Products:

- Hydraulic Model Display and Results Report
- Project Model Summary
- Screenshots of PredictEnergy™ DMS Test Version
- CPR Report

TASK 3 WATER SYSTEM ANALYSIS & TEST PILOT

The goals of this task are to fully operate the PredictEnergy™ DMS, and develop operational recommendations. This task will analyze: the energy load and operational trends of all system energy components, evaluate and optimize energy use and loads under various rate energy structures, and develop analysis and recommendations for reducing energy use and shifting loads per rate structure type.

The Recipient shall:

- Oversee the deployment and operation of the DMS.
- Oversee that HEMS releases the PredictEnergy™ DMS final version to MNWD.
- Capture and provide *Screenshots of PredictEnergy™ DMS Final Version*.
- Oversee that HEMS trains and supports MNWD operational staff and management to operate the PredictEnergy™ DMS.
- Oversee that HEMS analyze the suite of PredictEnergy™ software analytics. PredictEnergy™ currently has several existing analytics functions. These will be vetted against project goals to see which ones can be utilized for a water system and where new analysis must be developed.
- Oversee HEMS to perform cost analysis through integration of the appropriate IOU tariff to each specific utility meter (for meters in both SCE and SDGE territories).
- Oversee HEMS to support post deployment of the system with additional facilitation(s) with the MNWD's operational staff.
- Oversee HEMS to provide recommendations for changes to operational processes and configure new analytics and displays as needed to support continued improvement in peak demand and demand cost reductions.
- Develop a *Water System Operational Guide* to detail the recommendations for changes to operational processes for reducing peak demand and cost, and shifting energy loads using the results of the PredictEnergy™ DMS analysis.
- Present a draft of the *Water System Operational Guide* to MNWD and discuss the operational challenges associated with the recommendations. Make modifications to the *Water System Operational Guide* based on the water system operator's input, as needed to ensure feasibility of water system operations and prepare a final draft.

EXHIBIT A

Scope of Work

- Oversee HEMS to coordinate and collaborate with the MNWD operational staff and management team during the test pilot to operate the distribution systems per the *Water System Operational Guide*.
- Oversee MNWD to perform the test pilot. Ensure that MNWD Operational staff and management work on implementing the operational changes through following the final *Water System Operational Guide*, testing the different scenarios throughout the seasons over a 12-month period.
- Coordinate with HEMS to collaborate with MNWD operational staff and management while making operational changes.
- Document and summarize the findings of the test pilot in a *Test Pilot Results Summary*. The summary will also include the successes and challenges of operating the pilot.

Products

- Water System Operational Guide (Draft and Final)
- Screenshots of PredictEnergy™ DMS Final Version
- Test Pilot Results Summary

TASK 4 MEASUREMENT AND VERIFICATION

The goal of this task is to measure the pilot project energy savings (energy consumption or demand savings) and the ability to shift energy loads while responding to different energy rate structures.

The Recipient shall:

- Develop a *Measurement and Verification Plan* detailing how energy peak load reduction and energy savings will be measured and verified for 12 months.
- Visit the deployment sites at least twice during the project pilot testing.
- Interview water system operational staff at the point of the mid-pilot period and at the end of the pilot to determine successes and challenges of operating the pilot.
- Acquire and compile baseline and pilot period utility water and energy consumption data, energy demand and peak demand data, and energy demand and consumption cost data (including MNWD flow meter data and SCE and SDG&E energy billing and interval data for all pumps in the water systems) into a project specific database.
- During the 12-month pilot period, perform measurement and verification (M&V) analysis and develop a *Mid-term Measurement and Verification Progress Report*.
- Evaluate project M&V results and write the *Measurement and Verification Final Report* which will incorporate and summarize all MNWD staff interviews.
- Incorporate the M&V results and the technology investigation results into the Technology/Knowledge Transfer activities.
- Through interviews with staff, evaluate the feasibility of modifying water distribution system operations to be able to achieve load shifting to meet different IOU energy tariffs.

Products

- Measurement and Verification Plan
- Mid-term Measurement and Verification Progress Report
- Measurement and Verification Final Report

EXHIBIT A

Scope of Work

TASK 5 NET GRID IMPACT MODELING & ANALYSIS

The goal of this task is to determine the effect of demand management of MNWD on the grid and vice-versa, by developing a smart grid model specific to the water utility. The model will incorporate the demand changes of optimizing the energy management of the MNWD distribution systems, and then will optimize grid operations (in terms of power sources and power plants) to meet MNWD energy demands.

The Recipient shall:

- Collect, process, and format data for the MNWD existing grid.
- Modify, format, and process current and historical electricity consumption data of the MNWD water distribution systems.
- Oversee the creation and running of a smart grid optimization model for MNWD:
 - Model the MNWD Reference Energy System focusing on the electrical supply system, transmission, distribution, water utilities and consumers at the end-use sector.
 - Modify and input required load data for MNWD energy system, water consumption, and results of the DMS test pilot of the MNWD systems for the purpose of grid modelling.
 - Develop a dynamic optimization model which connects the electricity supply network to demand at the water utility and consumer level.
 - Run the smart grid model using the output data of the DMS and find the adjusted optimal strategy of the system when smart grid effects are taken into consideration.
 - Extract strategies, conclusions and reports from the MNWD smart grid optimization model results.
- Expand the MNWD smart grid model to develop a California state-wide smart grid model:
 - Gather and process electrical load information for all the water utilities in California (from CAISO or other resources). The optimization model will provide a dynamic characteristic of the supply-demand system based on a smart grid behavior. The optimal behavior shifts the load such that minimum water requirements are met in the system.
 - Collect and process state-wide load data for California electricity grid.
 - Gather existing and historical electricity consumption data of the California water sector.
 - Utilize the output of the MNWD pilot project to update and run MNWD grid optimization model for the State of California.
- Expand the California state-wide smart grid model to develop a long-term optimization model:
 - Operate the statewide optimization model by expanding the results of the pilot project to statewide water utilities expansion of the model to long-term optimization.
 - Expand the model for a long-time horizon smart grid optimization, enabling a look into the change in the capacity expansion relative to business as usual. As capacity expansion in the electricity sector is time consuming and capital intensive, reducing the need for future capacity expansion as a result of increased ability to dynamically shift loads can result in massive cost reductions. By presenting scenarios and sensitivity analysis, we will present policies and additional procedures to enable load shifting in the short-term and have positive overall economic impacts in the long-term.

EXHIBIT A

Scope of Work

- Perform scenarios and sensitivity analysis of the long term and short term grid optimization models.
- Extract strategies, conclusions and reports from model outputs and create a *Water Utility Smart Grid Model Results* document. The document will include: a number of scenarios and model outputs on how the grid would react to supplying different energy sources and minimizing cost in a dynamic market. The model outputs include the optimal water system demand management and the optimal operation of the grid.
- Prepare a *Net Grid Impact Analysis Report* with input from the CAM to include, but not be limited to:
 - Enhanced operation methods on the demand-side based on a dynamic DR market and resources connected to the grid.
 - Long-term benefits of load shifting on capacity expansion for California electric power supply and its effect on new technology installations in the water utility end-use sector.

Products

- Water Utility Smart Grid Model Results
- Net Grid Impact Analysis 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.

EXHIBIT A

Scope of Work

- 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.
 - Jobs created/retained as a result of the Agreement.
- For Information/Tools and Other Research Studies:
 - Outcome of project.
 - Published documents, including date, title, and periodical name.
 - A discussion of policy development. State if the project has been cited in government policy publications or technical journals, or has been used to inform regulatory bodies.
 - The number of website downloads.
 - An estimate of how the project information has affected energy use and cost, or have resulted in other non-energy benefits.
 - An estimate of energy and non-energy benefits.
 - Data on potential job creation, market potential, economic development, and increased state revenue as a result of project.
 - A discussion of project product downloads from websites, and publications in technical journals.
 - A comparison of project expectations and performance. Discuss whether the goals and objectives of the Agreement have been met and what improvements are needed, if any.
- Respond to CAM questions regarding responses to the questionnaires.

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

EXHIBIT A

Scope of Work

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 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 on the results of 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.

EXHIBIT A

Scope of Work

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.

Products:

- Production Readiness Plan (draft and final)

IV. PROJECT SCHEDULE

Please see the attached Excel spreadsheet.

STATE OF CALIFORNIA

STATE ENERGY RESOURCES
CONSERVATION AND DEVELOPMENT COMMISSION

RESOLUTION - RE: UNIVERSITY OF CALIFORNIA, DAVIS

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-16-062 from GFO-16-305 with the Regents of the University of California, on behalf of the Davis campus, for a \$2,984,983 grant to develop a demand management system technology and strategy to enable a water utility to reduce or shift energy loads based on different utility tariff structures. This will allow the water utility to participate in demand response and load shifting programs and reduce energy costs. The technology will be tested at the Moulton Niguel Water District in Orange County; 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 May 10, 2017.

AYE: [List of Commissioners]

NAY: [List of Commissioners]

ABSENT: [List of Commissioners]

ABSTAIN: [List of Commissioners]

Cody Goldthrite,
Secretariat