STATE OF CALIFORNIA

# GRANT REQUEST FORM (GRF)

CEC-270 (Revised 12/2019) CALIFORNIA ENERGY COMMISSION

**A) New Agreement** # EPC-19-058 (to be completed by CGL office)

| B) Division | Agreement Manager: | MS- | Phone |
|---|---|---|---|
| ERDD | Joseph Sit | | 916-327-1315 |

| C) Recipient's Legal Name | Federal ID Number |
|---|---|
| Antelope Valley Water Storage, LLC | 20-8945728 |

| D) Title of Project |
|---|
| Long Duration 50 kW Energy Storage with Aquifer Pumped Hydro |

**E) Term and Amount**

| Start Date | End Date | Amount |
|---|---|---|
| 7/18/2020 | 3/31/2024 | $ 2,000,000 |

**F) Business Meeting Information**

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

Proposed Business Meeting Date 7/8/2020 ☐ Consent ☒ Discussion

Business Meeting Presenter Quenby Lum Time Needed: 5 minutes

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

**Agenda Item Subject and Description:**
ANTELOPE VALLEY WATER STORAGE, LLC. Proposed resolution approving agreement EPC-19-058 with Antelope Valley Water Storage, LLC for a $2,000,000 grant to fund a behind the meter demonstration of an aquifer pumped hydro (APH) system and adopting staff's determination that this action is exempt from CEQA. The project will assist in better understanding APH and define the value and benefits that longer duration APH energy storage can provide, especially when applied in disadvantaged communities and low-income communities.

**G) California Environmental Quality Act (CEQA) Compliance**

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

   Explain why Agreement is not considered a "Project":

   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.
      ☐ Statutory Exemption. List PRC and/or CCR section number:
      ☒ Categorical Exemption. List CCR section number: 15303
      ☐ Common Sense Exemption. 14 CCR 15061 (b) (3)

      Explain reason why Agreement is exempt under the above section: Cal. Code Regs., tit 14, § 15303

Cal. Code Regs., tit. 14, sec. 15303 exempts projects consisting of the construction and location of limited numbers of new, small facilities or structures; the installation of small new equipment and facilities in small structures; and the conversion of existing small structures from one use to another where only minor modifications are made in the exterior of the structure. This project will involve the construction of a new small onsite reservoir with connections; the conversion retrofit of an existing well motor for aquifer pumped hydro requiring minor modifications; and the installation of a new small energy storage device, and is therefore exempt under CEQA.

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

Check all that apply

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

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

| **Legal Company Name:** | **Budget** |
|---|---|
| HDR Engineering, Inc | $ 650,000 |
| TBD Design Build Aquifer Pump Hydro | $ 300,000 |
| 3RValve LLC | $ 150,000 |
| Rosamond Community Services District | $ 70,000 |
| Water and Energy Consulting Inc. | $ 400,000 |
| Kern County Administrative Office | $ 80,000 |
| TBD Administrator | $ 0 |
| TBD Geotechnical Drilling | $ 25,000 |
| TBD Survey | $ 25,000 |

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

| **Legal Company Name:** |
|---|
| |

**J) Budget Information**

| **Funding Source** | **Funding Year of Appropriation** | **Budget List Number** | **Amount** |
|---|---|---|---|
| EPIC | 18-19 | 301.001F | $2,000,000 |
| | | | $ |

R&D Program Area: ESRO: ETSI TOTAL: $ 2,000,000

Explanation for “Other” selection

Reimbursement Contract #: Federal Agreement #:

## K) Recipient's Contact Information

### 1. Recipient's Administrator/Officer

Name: Zachary Ahinga
Address: 1672 W Avenue J Ste 207
City, State, Zip: Lancaster, CA 93534-2861
Phone: 323-960-7483
E-Mail: ZAhinga@cimgroup.com

Address: 1672 W Avenue J Ste 207
City, State, Zip: Lancaster, CA 93534-2861
Phone: 323-860-4829
E-Mail: mbeuhler@wswaterbank.com

### 2. Recipient's Project Manager

Name: Mark Beuhler

## L) Selection Process Used

☒ Competitive Solicitation Solicitation #: GFO-19-306
☐ First Come First Served Solicitation Solicitation #:

## M) ) The following items should be attached to this GRF

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

_____ _____
**Agreement Manager** **Date**

_____ _____
**Office Manager** **Date**

_____ _____
**Deputy Director** **Date**

# EXHIBIT A
# Scope of Work
# Antelope Valley Water Storage, LLC

## I. TASK ACRONYM/TERM LISTS

### A. Task List

| Task # | CPR[1] | Task Name |
|---|---|---|
| 1 | | General Project Tasks |
| 2 | | Economics and Metrics |
| 3 | | APH Experience Incorporation |
| 4 | X | Design and Construction of Facilities |
| 5 | | Community Outreach |
| 6 | | Deployment in Disadvantaged and Low-Income Communities |
| 7 | X | Operations and Field Tests |
| 8 | | Project Benefits |
| 9 | | Technology/Knowledge Transfer Activities |

### B. Acronym/Term List

| Acronym/Term | Meaning |
|---|---|
| APH | Aquifer Pumped Hydro (APH) is a form of pumped storage technology that uses the groundwater aquifer as the lower reservoir and a small, earthen reservoir on the ground surface as the upper reservoir. The individual Aquifer Pumped Hydro unit consists of a reversible pump/turbine, a well, and related equipment. The pump/turbine generates electricity from water flowing down the well hole. It stores electricity at other times by pumping water up the well to the surface using electric power. |
| CAM | Commission Agreement Manager |
| CAO | Commission Agreement Officer |
| CPR | Critical Project Review [1] |
| Disadvantaged Community | Disadvantaged Community (DAC) is defined as an area representing census tracts scoring in the top 25 % in CalEnviroScreen 3.0. (https://oehha.ca.gov/calenviroscreen/report/calenviroscreen-30) |
| IOU | Investor Owned Utility |
| Low-Income Community | Low-income Community is defined as a community within census tracts with median household incomes at or below 80 percent of the statewide median income, or at or below the threshold designated as low-income by the California Department of Housing and Community Development. (http://www.hcd.ca.gov/grants-funding/income-limits/index.shtml) |
| NEM | The APH technology is behind-the-meter and will require a Net Energy Metering (NEM) interconnection/agreement with SCE. For the demonstration, the stored energy will be discharged to provide on-peak power to SCE during the evening ramp up and recharged off-peak. |
| PSPS | Public Safety Power Shut Off |
| Regeneration | Regeneration wells are retrofitted for pumped storage to release energy as well as extract water |

[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 |
|---|---|
| SCE | Southern California Edison |
| SGMA | The Sustainable Groundwater Management Act (SGMA), which aims to manage California's groundwater basins sustainably. The Central Valley is currently over-drafted. Pumping is greater than the recharge, causing subsidence. To fix this problem, SGMA requires that all basins reduce extractions to match recharge. This may require additional recharge, fallowing of farmland, or both. |
| TAC | Technical Advisory Committee |

## II. GOALS AND OBJECTIVES

### A. Purpose of Agreement

The purpose of this Agreement is to fund a behind the meter demonstration of a non-lithium ion energy storage technology, Aquifer Pumped Hydro (APH), which can provide a minimum of 10 hours of energy storage/discharge capability at a minimum rating of 50 kilowatts. The project will assist in better understanding APH and define the value and benefits that longer duration APH energy storage can provide over lithium-ion energy storage, especially when applied in Disadvantage Communities (DAC) and Low-Income Communities.

### B. Problem/ Solution Statement

**Problem**
The increased emphasis on resiliency in the state is driving the need for longer duration energy storage backup capabilities. Longer duration energy storage and energy discharge is needed to respond to unplanned grid outages, curtailment risk, Public Safety Power Shutoffs (PSPS) and to increase renewables penetration. DAC and Low-Income Communities are especially vulnerable to preemptive shutoffs. Many of them cannot afford emergency generators. As wildfires become more common, new energy storage/discharge technologies are needed that provide economical, standalone power when the grid is down.

The California grid is facing three issues that could benefit from longer duration energy storage:

1. **Evening Ramp Up:** There is not enough power for the grid during the 5-hour evening ramp up (from 4:00 to 9:00 p.m.) as solar goes offline but consumers turn on appliances. The 2-4 hour discharge of lithium batteries has trouble covering the 5-6 hour ramp up period.

2. **Public Safety Power Shutoffs:** Increased wildfire risks have forced Investor Owned Utilities to shut down transmission lines during high wind events. For example, in October of 2019, power to 800,000 customers (2.5-3.0 million people) was shut off due to wildfire risks. These preemptive shutoffs created major disruptions and may have contributed to at least one death.

3. **Overgeneration:** In non-summer months, especially in the springtime, there is a glut of solar energy in the afternoons and a dearth of generation in the early evening hours. This creates risks of overgeneration and curtailment of renewables.

Over 90% of the energy storage systems built to date in California use lithium ion batteries. Excessive reliance on lithium batteries can create materials and minerals shortages, and safety issues from thermal runaway. Also, lithium batteries have a limited lifetime due to the number of cycles that can be performed, typically 500 to 1,500. With daily use, a lithium battery is worn out in about 3 years. Old lithium batteries create a disposal problem. They are also limited to a 2-4-hour discharge, which is not enough to cover the evening ramp up.

**Solution**
A groundwater storage facility will be used for demonstration of APH technology. Groundwater will be used to fill and drain a small surface reservoir. An existing well at the demonstrate site with at least a 150 kW, or 200 horsepower (HP) nameplate capacity well motor will be retrofitted to also act as generator. At 35% generation efficiency, the well will produce at least 50 kW of power. The technology is behind-the-meter and will require a Net Energy Metering (NEM) interconnection agreement with SCE. For the demonstration, the stored energy will be discharged to provide on-peak power to SCE during the evening ramp up and recharged off-peak. The end-use customer will benefit from the differential between on and off-peak SCE rates.

The facility will be operated for one year to demonstrate that a minimum of 10hour discharges can be produced reliably. The regeneration well will be operated to provide at least 50 kW of energy discharge using local groundwater. They will also be operated with imported water to show 100+ hour energy discharge during simulated PSPS outages.

The test well will be used to demonstrate both the two-way groundwater dependent APH as well as the one-way configuration that stores energy when imported water is available. Using imported water is an added value aspect of this project for DACs and Low-Income Communities that will be negatively impacted by both PSPS and Sustainable Groundwater Management Act (SGMA)[2] events.

## C. Goals and Objectives of the Agreement

**Agreement Goals**
This Agreement will demonstrate and define the necessary technical, financial, and operational resources to assess the potential of energy storage/discharge with APH to provide continuous energy discharge during grid outages, during peak periods, and during PSPS events; which provide end-user benefits that may drive wide-scale adoption of the technology in California.

[2] The Sustainable Groundwater Management Act (SGMA) aims to manage California's groundwater basins sustainably. The Central Valley is currently over-drafted. Pumping is greater than the recharge, causing subsidence. To fix this problem, SGMA requires that all basins reduce extractions to match recharge. This may require additional recharge, fallowing of farmland, or both.

- Demonstrate how APH offers the end user customer the opportunity to receive increased reliability, resiliency, cost saving and other services during times of power interruptions;
- Identify how continuous energy discharge with APH can be applied to avoid disruption of power supply to critical facilities like hospitals, nursing homes, and emergency charging centers during PSPS events;
- Demonstrate how energy storage with APH can provide extra energy discharge during the summer evening ramp up; and address absorption of surplus renewables in the winter and spring on the weekends during off-peak or super off-peak hours, thereby mitigating renewable curtailment;
- Demonstrate how the behind-the-meter APH technology can incentivize participation by IOU customers; and
- Demonstrate the commercial potential of the APH technology in California due to the distributed nature of wells, benefits for transmission congestion, distribution reliability, end-user energy shifting and scalability.
- The APH technology shall have been demonstrated in the field at a Technology Readiness Level (TRL) of at least six with the capability to reach a TRL of seven when entering the demonstration phase. The goal is to advance to a TRL of eight upon completion of this Agreement.

**Ratepayer Benefits:**[3] This Agreement will result in California ratepayer benefits including: (1) reduced peak power cost, (2) power during PSPS event, (3) longer life cycle than lithium battery, and (4) potential for rapid implementation, especially within Low-Income Communities and DACs. APH can also be used to inject water into contaminated aquifers where clay layers prevent conventional recharge with percolation, diluting contamination and improving water quality. The benefits will be measured and verified during the demonstration test. Ratepayer benefits will be obtained from:

- Reliability improvements for the grid a minimum of 10 hours of energy discharge for PSPS event;
- Cost benefits are expected from lower installation cost, lower life cycle cost, competitive capacity costs and reduced transmission needs due to distributed power sources; and
- Safety benefits due to no thermal runaway risk and less GHGs due to improved renewables penetration.

**Technological Advancement and Breakthroughs:**[4] This Agreement will lead to technological advancement and breakthroughs to overcome barriers to the achievement of the State of California's statutory energy goals by providing a cost-effective resilient and

[3] 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).

[4] 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.

reliable APH energy storage technology that will address the need for longer term energy storage and discharge during grid outages and PSPS events, growth in peak load, evening ramp up, over-supply and curtailment issues, and the need for ancillary services.

Technological advancement and breakthroughs are summarized as follows:

- Energy storage at a capacity cost ($381/kWh) that is comparable to lithium ion batteries (~$470 per kWh based on $1876/kW installation cost and 4-hour discharge for lithium);
- Discharge durations of 10 hours or longer;
- Ability to absorb renewables during non-summer season using super off-peak rates;
- Continuous power (50 kW) for critical facilities during PSPS events (100 hours using imported water);
- Scalable and rapid implementation due to the use of existing infrastructure and US-made equipment;
- Targeted development in Low-Income Communities and DACs;
- Distributed storage for transmission congestion relief, distribution reliability, and deferral of upgrades;
- Use of imported recharge water to reduce energy costs and provide recharge co-benefits; and
- No local safety risk due to waste disposal, thermal runaway, & leakage, especially to DACs and Low Income Communities.

When the IOU and investment community gain confidence in APH technology and its long-term performance then the market breakthrough is:

- IOUs will be able to solicit procurements for energy storage/discharge programs with incentives for agricultural and municipal pumpers that intend to mitigate the impacts by SGMA and PSPS events.

**Agreement Objectives**
The objectives of this Agreement are to:

Design and Construction of ground water facilities: Complete the design/build process for a 50 kW APH system to conduct a demonstration of the APH energy storage/discharge capabilities at the ground water facility.

Regeneration Wells Retrofit: Design and retrofit an existing well to enable the injection of water to enable energy storage and discharge for the well regeneration system.

Operations and Field Tests: Perform real-time field demonstration and monitor performance of APH system to determine costs, technical constraints, and define operating parameters. The testing results will be a basis to:

- Quantify the amount of energy needed to recharge the storage system “energy in” to discharge the target power of 50 kW.
- Confirm the energy storage capacity cost is comparable to lithium ion batteries;
- Confirm energy discharge durations of a minimum of 10 hours ;
- Determine the best time to use the minimum of 10 hours of energy discharge

- Confirm ability to absorb renewables during non-summer months using super off-peak rates;
- Confirm ability to provide continuous energy discharge for critical facilities during PSPS events (100 hours using imported water);
- Confirm no local safety risk due to waste disposal, thermal runaway, & leakage, especially to Low-Income Communities and DACs;
- Determining clogging constraints using imported water; and
- Determine life cycle maintenance requirements.

Economics and Metrics**:** Determine the economics of the APH technology by assessing utility tariffs, interconnection requirements, and various operational and other metrics including:

- Cost of interconnection and controls, and utility tariff for NEM contract implications;
- Economics of operation, maintenance and replacement cost over a 30-year life cycle.
- Value of APH during PSPS event when the grid is down;
- Metrics for APH and grid integration; and
- Benefits of modular expansion of APH using less than 50 kW per module.

DAC and Low-Income Community Outreach: Identify and reach out to appropriate Low-Income Communities and DAC representatives to develop APH implementation roadmap focused on specific needs of Low-Income Communities and DACs especially vulnerable to preemptive power shutoffs. The focus is outreach with Low-Income Communities and DACs, identify critical facilities, and methods to provide continuous energy discharge to critical facilities.

- Deployment in DAC and Low-Income Communities: Estimate the commercialization potential of long duration storage particularly in DAC and Low-Income Communities that are ground zero for PSPS and SGMA impacts.

Project Benefits: Provide an assessment of resilience, reliability, cost savings, and safety benefits for the IOU ratepayers.

- Overall benefits and co-benefits of the project are summarized in **Table 1 and 2: Benefits and Co-Benefits** below. These benefits will be verified including: (1) reduced peak power cost, (2) power during PSPS event, (3) longer life cycle than lithium battery, and (4) rapid implementation especially within Low-Income Communities and DACs.

**Table 1: APH Evaluation Metrics**

| Measurement | Metric | Calculation | Value | Initial Est. | EPIC* Benefit |
|---|---|---|---|---|---|
| 1. Power | kW | Total rated (nameplate) kW of 1 existing well is 200 HP**, 35% Eff. | Load shifting, grid stability | 150 kW (50 kW actual) | R, C |

| | | | | | |
|---|---|---|---|---|---|
| 2. Discharge Duration | Hours | Hours of water injection down well | Resilience, reliability, load shift, reduced peak power cost | 10 hours | R, C |
| 3. Energy Capacity | kWh | Actual power times the duration | Resilience, reliability, load shift, grid stability | 500 kWh | R, C |
| 4. % on-peak & off-peak power | % | Provide summer on-peak power, absorb winter super off-peak power. | Resilience, reliability, load shift, renewables absorption | 100% discharge during peak hours | R, C, T |
| 5. PSPS Event Discharge | Hours (100+) | Hours of discharge during 7-day PSPS event (imported water) | Resilience, reliability, service for locals | 100 hours | R, S, T |
| 6. Number of Cycles in a life | Cycles/ life | Discharge energy daily, track maintenance and life cycle | Reliability, cost savings, load shift | ≥ 5 yrs. | R, C |
| 7. Actual Capacity Cost | $/kWh | Cost / (energy capacity) = $ 0.5 M*** / 1313 kWh | Cost savings (uses existing well, cuts cost) | $381/ kWh | C |
| 8. Installation Time | Mos./ unit | Reduced installation using existing wells, US-made equip. | Accelerates mitigation of PSPS events for DACs | 3-6 months**** | R, T |
| 9. Benefits Low Income, DAC | % kW in DACs | Rated kW of well retrofits in Low Income or DAC communities | Resilience, critical facility service, DAC jobs | 100% in Low Income /DAC | R, T |
| 10. Storage Density | kW/sq. mi. | Install APH wells across Central Valley, supports transmission and distribution, end users | Resilience, reliability, grid stability, defer transmission & distribution upgrades | 19 kW/ sq. mi. (52.5 kW/2.8 sq. mi.) (WSWB is 1800 acres) | R, C |
| 11. Water Source | Importe d (Y/N) | Imported water for recharge avoids use of extraction energy | Resilience, cost savings, local services for LI and DACs | Yes | R, C, T |

| | | | | | |
|---|---|---|---|---|---|
| 12. Local health, safety, outreach | Local Risks? (Y/N) | Risks from waste disposal, thermal runaway, leakage (battery, natural gas), non-local materials & equip. | Local communities are safer, informed, no legacy risks, GHG reduction, uses local resources | No | C, S, T |

* EPIC ratepayer benefits: greater reliability (R), lower costs (C), and increased safety (S). Also includes technological advancement (T).
** 1 well with 200 HP= 52.5 kW @ 35% efficiency.
*** Cost includes cost of reservoir and retrofitting one well.
**** Assuming electrical modifications take no longer than a month or two.

**Table 2: Benefits and Co-Benefits**

| Benefits to Ratepayer | Measured Value | Metric Number in Measurement and Verification Plan (Table 2) |
|---|---|---|
| a. Reliability, resiliency, sustainability | • Power<br>• Discharge duration<br>• Capacity<br>• Peak power<br>• PSPS power<br>• Storage density | 1<br>2<br>3<br>4<br>5<br>10 |
| b. Impacts/benefits to end customer | • Reduced peak power cost<br>• More peak power reduces cost<br>• Power during PSPS event<br>• Longer life cycle than lithium battery<br>• Rapid implementation, especially for DACs | 2<br>4<br>5<br>6<br>8 |
| c. GHG reductions | • Avoids use of natural gas turbines to meet peaks<br>• Absorbs overgeneration during super off peak | 4<br>4 |
| d. Value of savings | • Longer life cycle than lithium battery<br>• Comparable capacity costs with lithium<br>• Using imported water reduces energy cost | 6<br>7<br>11 |
| e. Value of co-benefits | • Recharge water in over-drafted basins | -<br>8 |

| Benefits to Ratepayer | Measured Value | Metric Number in Measurement and Verification Plan (Table 2) |
|---|---|---|
| | • Rapid installation to relieve PSPS events<br>• Local jobs within DACs<br>• US made and supplied equipment | 9<br><br>8 |
| f. Cost savings vs. business as usual | • Uses existing, redundant infrastructure<br>• Enables recharge in areas with Corcoran clay | 7<br>- |
| g. Benefit value streams | • Generation<br>• Transmission<br>• Distribution<br>• End Users | 1,2,3,4,5<br>10<br>10<br>2,4,5,6,8 |

## III. TASK 1 GENERAL PROJECT TASKS

### PRODUCTS

**Subtask 1.1 Products**

The goal of this subtask is to establish the requirements for submitting project products (e.g., reports, summaries, plans, and presentation materials). Unless otherwise specified by the Commission Agreement Manager (CAM), the Recipient must deliver products as required below by the dates listed in the **Project Schedule (Part V).** Products that require a draft version are indicated by marking **"(draft and final)"** after the product name in the "Products" section of the task/subtask. If "(draft and final)" does not appear after the product name, only a final version of the product is required. With respect to due dates within this Scope of Work, **"days"** means working days.

**The Recipient shall:**

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

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

For products that require a final version only

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

# EXHIBIT A
# Scope of Work
# Antelope Valley Water Storage, LLC

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.
    - 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
  - 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.

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

**Products:**

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

**Subtask 1.8 Permits**

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

**The Recipient shall:**

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

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

**Products:**

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

**Subtask 1.9 Subcontracts**

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

**The Recipient shall:**

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

**Products:**

- Subcontracts *(draft if required by the CAM)*

***TECHNICAL ADVISORY COMMITTEE***

**Subtask 1.10 Technical Advisory Committee (TAC)**

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

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

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

- Researchers knowledgeable about the project subject matter;
- Members of trades that will apply the results of the project (e.g., designers, engineers, architects, contractors, and trade representatives);
- Public interest market transformation implementers;
- Product developers relevant to the project;
- U.S. Department of Energy research managers, or experts from other federal or state agencies relevant to the project;
- Public interest environmental groups;
- 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 shall include the expertise of each proposed TAC member and the value to the project. The list will be discussed at the Kick-off meeting, and a schedule for recruiting members and holding the first TAC meeting will be developed.
- Recruit TAC members. Ensure that each individual understands member obligations and the TAC meeting schedule developed in subtask 1.11.
- Prepare a *List of TAC Members* once all TAC members have committed to serving on the TAC.
- Submit *Documentation of TAC Member Commitment* (such as Letters of Acceptance) from each TAC member.

**Products:**

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

**Subtask 1.11 TAC Meetings**

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

**The Recipient shall:**

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

**The TAC shall:**

- Help set the project team's goals and contribute to the development and evaluation of its statement of proposed objectives as the project evolves.
- Provide a credible and objective sounding board on the wide range of technical and financial barriers and opportunities.
- Help identify key areas where the project has a competitive advantage, value proposition, or strength upon which to build.
- Advocate on behalf of the project in its effort to build partnerships, governmental support and relationships with a national spectrum of influential leaders.
- Ask probing questions that insure a long-term perspective on decision-making and progress toward the project’s strategic goals.

**Products:**

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

## III. TECHNICAL TASK

### TASK 2 ECONOMICS AND METRICS

The goal of this task is to determine the economics and define metrics for a standalone 50kW APH system, particularly to identify the primary benefits the system will deliver to the recipients and Low-Income Communities and DACs. Benefits to be evaluated include increased reliability,

resiliency and other services during times of power interruptions caused by weather, grid system failures or PSPS events.

**The Recipient shall:**

- Determine economics and metrics for 50 kW APH unit
  - Economics of operation, maintenance and replacement cost over a 30-year life cycle.
  - Determine value of APH during PSPS event when the grid is down.
  - Establish metrics for Low-Income Community and DAC PSPS mitigation measures; and
  - Develop applicability/evaluation template for APH for interested parties such as well owners and water agencies to use
  - Summarize findings from economic and metric analysis into *Technical Memo for Economics and Metrics*
- Develop *Template for Interconnection Agreement,*
  - Determine cost of interconnection and controls, and utility tariff for NEM contract implications.
  - Investigate separate interconnection for each well vs single point of interconnection for multiple wells.

**Products:**

- Technical Memo for Economics and Metrics
- Template for Interconnection Agreement

**TASK 3 APH EXPERIENCE INCORPORATION**

The goal of this task is to provide APH experience incorporation into the retrofit of the well to enable use of lessons learned from other well regeneration systems.

**The Recipient shall:**

- Create an *APH Technical Analysis Findings Report* with the APH experience and lessons learned from other regeneration systems incorporated into design, including 1 year of operations with interpretation of operational results during testing period.

**Products:**

- APH Technical Analysis Findings Report

**TASK 4 DESIGN AND CONSTRUCTION OF FACILITIES**

The goal of this task is to provide engineering design and construction services for the APH demonstration site. Demonstration shall be in an IOU electric service territory and at a site that is an IOU customer.

**The Recipient shall:**

- Determine best project delivery approach (such as Design/Bid/Build or Progressive Design/Build with GMP, etc.).
- Perform engineering design for a minimum of 50 kW APH system at the demonstration site for a minimum of 10-hour discharge period.

- Provide construction management and inspection services, including record documents and adjustments made during construction.
- Develop and execute a *Commissioning Plan* with consultation from the CAM and the TAC
- Develop and execute an *Operations and System Test Plan* to cover 12 months with consultation from the CAM and the TAC.
- Summarize the results of Task 4 in a *Facility Certification, Start-Up, and Operational Commissioning Document.*
- Submit a *CPR Report #1* and participate in a CPR Meeting per subtask 1.3.

**Products:**

- Commissioning Plan (draft and final)
- Operations and System Test Plan (draft and final)
- Facility Certification, Start-up and Operational Commissioning Document
- CPR Report #1

**TASK 5 COMMUNITY OUTREACH**

The goal of this task is to reach out to appropriate Low-Income Community and DAC representatives to develop an APH implementation roadmap focused on critical facilities and ways to provide continuous power during PSPS.

**The Recipient shall:**

- Determine the number of Low-Income Community and DAC critical facilities in the selected region that would be impacted by PSPS events.
  - Develop ways to provide continuous power for individual hospitals, nursing homes, and charging facilities; and.
  - Hold field meetings with representative Low-Income Communities and DACs to assess their needs.
- Summarize findings from outreach in *Technical Memo Summarizing Results of Low-Income Community and Disadvantaged Community Outreach.*

**Products:**

- Technical Memo Summarizing Results of *Low-Income Community and* Disadvantaged Community Outreach

**TASK 6 DEPLOYMENT IN DISADVANTAGED AND LOW-INCOME COMMUNITIES**

The goal of this task is to estimate the commercialization potential of long duration storage particularly in DAC and Low-Income Communities in the selected region that are ground zero for PSPS and SGMA impacts.

**The Recipient shall:**

- Determine applicability of technology to be used on closed polyfluoroalkyl substances wells and statewide potential impact and include an application template and summarize findings into *APH Application/Evaluation Template.*
- Develop a *Technical Memo on Disadvantaged Community and Low-Income Community Deployment* that includes:

- Determine amounts of recharge needed to comply with SGMA;
- Assess best ways to mitigate PSPS impacts on DACs and Low-Income Communities;
- Assess which wells are idle and how often;
- Assess which wells are redundant due to SGMA; and
- Determine how SGMA impacts statewide correlate with DACs and Low-Income Communities

**Products:**

- APH Application/Evaluation Template
- Technical Memo on Disadvantaged Community and Low-Income Community Deployment

**TASK 7 OPERATIONS AND FIELD TESTS**

The goal of this task is to conduct 1-year of operations to test and demonstrate the 50 kW APH system at the demonstration site.

**The Recipient shall:**

- Create and execute a *Measurement and Verification Plan* with consultation from the CAM on metrics. Metrics shall include, but not be limited to the following: value that longer-duration energy storage provides with specific information on increased resiliency, higher reliability, added cost savings from peak load reductions, load shifting, providing increased services to the electric grid during times of grid stability challenges; benefits to Low-Income Communities and DACs; value of longer-duration storage when compared to the normal 2-4 hours of storage current systems provide.
- Measurement and Verification Plan will include the collection and measurement and verification (M&V) of data on the installation over the one year demonstration period. The duration of data collection may be reduced with prior CAM written approval. M&V includes plots of charge/discharge power levels, storage efficiencies, and ambient temperatures, as a function of time.
- Conduct one-year operations to test and demonstrate the APH system and create a *One-Year Operations Report* that includes, but is not limited to, the following details:
  - Provision of engineering and design services to manage the operation, maintenance and repair of the 50 kW APH system for 12 months during the demonstration period;
  - Provision of management, all labor and materials to operate, maintain and repair the 50 kW APH system for 12 months during the demonstration period;
  - Implementation of operations and testing plan for 12 months;
  - Operation for 4 summer months for 5 hours each weekday during evening ramp up to shift peak load;
  - Operation periodically during the 8 months of winter and spring to absorb surplus renewables and to establish well plugging constraints;
  - Operation of APH system to demonstrate for a minimum of 10-hour discharge periods;
  - Operation of APH system to demonstrate PSPS power for 100 hours;
  - Results of execution of the Measurement and Verification Plan;
  - Determination of clogging constraints using imported water; and
  - Development of life cycle maintenance requirements.
- Submit a *CPR Report #2* and participate in a CPR Meeting per subtask 1.3.

# EXHIBIT A
# Scope of Work
# Antelope Valley Water Storage, LLC

**Products:**

- Measurement and Verification Plan
- One-Year Operations Report (draft and final)
- CPR Report #2

**TASK 8 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:

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

    - o <u>For Information/Tools and Other Research Studies:</u>
        - 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

**TASK 9 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(s) on the project.
- When directed by the CAM, participate in annual EPIC symposium(s) sponsored by the California Energy Commission.
- Provide at least (6) six *High Quality Digital Photographs* (minimum resolution of 1300x500 pixels in landscape ratio) of pre and post technology installation at the project sites or related project photographs.
- Prepare a *Technology/Knowledge Transfer Report* on technology transfer activities conducted during the project.

**Products:**

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

## IV. PROJECT SCHEDULE

Please see the attached Excel spreadsheet.

**RESOLUTION NO: 20-0708-9f**

**STATE OF CALIFORNIA**

**STATE ENERGY RESOURCES**
**CONSERVATION AND DEVELOPMENT COMMISSION**

RESOLUTION - RE: ANTELOPE VALLEY WATER STORAGE, LLC

**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-19-058 with Antelope Valley Water Storage, LLC for a $2,000,000 grant to fund a behind-the-meter demonstration of an aquifer pumped-hydro (APH) system. The project will assist in better understanding APH and define the value and benefits that longer duration APH energy storage can provide, especially when applied in disadvantaged communities and low-income communities; and

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

## ***CERTIFICATION***

The undersigned Secretariat to the CEC does hereby certify that the foregoing is a full, true, and correct copy of a Resolution duly and regularly adopted at a meeting of the CEC held on July 8, 2020.

AYE:
NAY:
ABSENT:
ABSTAIN:

Cody Goldthrite
Secretariat