STATE OF CALIFORNIA
CALIFORNIA ENERGY COMMISSION

CEC-270 (Revised 01/2024)

GRANT REQUEST FORM (GRF)

A. New Agreement Number

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

New Agreement Number: EPC-24-028

B. Division Information

1. Division Name: ERDD
2. Agreement Manager: Nathan Lubega
3. MS-: 51
4. Phone Number: 916-633-0048

C. Recipient's Information

1. Recipient's Legal Name: DNV USA INC.
2. Federal ID Number: 76-0187362

D. Title of Project

Title of project: Integrated Smart Brine Management Approach to Reduce Geothermal Plant Operating Costs and Improve Mineral Recovery

E. Term and Amount

1. Start Date: 1/1/2025
2. End Date: 10/8/2027
3. Amount: $2,460,222

F. Business Meeting Information

1. Are the ARFVTP agreements $75K and under delegated to Executive Director? No
2. The Proposed Business Meeting Date: 12/11/2024
3. Consent or Discussion? Discussion
4. Business Meeting Presenter Name: Nathan Lubega
5. Time Needed for Business Meeting: 5 minutes.
6. The email subscription topic is: Geothermal.

Agenda Item Subject and Description:

G. Proposed resolution approving agreement EPC-24-028 with DNV USA INC. for a $2,460,222 grant, and adopting staff's recommendation that this action is exempt from CEQA. This agreement will fund the development and demonstration of an advanced, computer software prediction model for managing and reducing the corrosion and scaling impacts of geothermal fluids on geothermal power plant components. The model will be developed in laboratories in Los Angeles and Sonoma counties and field tested at a geothermal power plant in the Salton Sea region. (EPIC Funding) Contact: Nathan Lubega (Staff Presentation: 5 minutes)

H. California Environmental Quality Act (CEQA) Compliance

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

   If yes, skip to question 2.

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

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

a) Agreement **IS** exempt?

Yes

Statutory Exemption?

No

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

PRC section number: None

CCR section number: None

Categorical Exemption?

Yes

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

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

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

No

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

California Code of Regulations, title 14, section 15301 provides that projects which consist of the operation, repair, maintenance, permitting, licensing, or minor alteration of existing public or private structures, facilities, mechanical equipment, or topographical features, and which have negligible or no expansion of existing or former use, are categorically exempt from the provisions of the California Environmental Quality Act (CEQA). This project involves the development, testing, and demonstration of advanced, system-level corrosion and mineral deposit model for geothermal power plants. The project will involve development of the model in an existing lab facility and testing of the model at existing geothermal power plant facilities. The testing at existing geothermal power plants will not expand their existing use. Therefore, the project is exempt from the provisions of CEQA under section 15301.

California Code of Regulations, title 14, section 15306 provides that projects which consist of basic data collection, research, experimental management, and resource evaluation activities which do not result in a serious or major disturbance to an environmental resource are categorically exempt from the provisions of CEQA. This project involves the development, testing, and demonstration of advanced, system-level corrosion and mineral deposit model for geothermal power plants. The development and testing of the model will involve basic data collection, research,

and experimental management at an existing lab facility and existing geothermal power plant facilities. Therefore, the project is exempt from the provisions of CEQA under section 15306.

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

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

No

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

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

I. Is this project considered “Infrastructure”?

No

J. Subcontractors

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

Subcontractor Legal Company Name	CEC Funds	Match Funds
California State Polytechnic University, Pomona	$ 150,000	**$**15,000
THERMOCHEM, INC.	$ 193,348	**$**21,486
Corr Instruments, Inc	$ 50,000	**$**5,000

Subcontractor Legal Company Name	CEC Funds	Match Funds
OLI Systems, Inc.	$ 140,000	**$**0
MC CONSULT LLC	$ 315,000	**$**35,000

K. Vendors and Sellers for Equipment and Materials/Miscellaneous

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

Vendor/Seller Legal Company Name	CEC Funds	Match Funds
No vendors to report	**$**	**$**

L. Key Partners

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

Key Partner Legal Company Name
No key partners to report

M. Budget Information

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

Funding Source	Funding Year of Appropriation	Budget List Number	Amount
EPIC	23-24	301.001K	$ 2,460,222

TOTAL Amount: $ 2,460,222

R&D Program Area: ESB: Renewables

Explanation for "Other" selection Not applicable

Reimbursement Contract #: Not applicable

Federal Agreement #: 101

N. Recipient's Contact Information

1. Recipient's Administrator/Officer

Name: Lynsay Bensman

Address: 155 Grand Ave Ste 500

City, State, Zip: Oakland, CA 94612-3747

Phone: 614-761-1214

E-Mail: lynsay.bensman@dnv.com

3. Recipient's Project Manager

Name: Francois Ayello

Address: 155 Grand Ave Ste 500

City, State, Zip: Oakland, CA 94612-3747

Phone: 614-761-1214

E-Mail: Francois.Ayello@dnv.com

O. Selection Process Used

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

Selection Process	Additional Information
Competitive Solicitation #	GFO-23-304
First Come First Served Solicitation #	Not applicable
Other	Not applicable

P. Attached Items

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

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

Approved By

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

Agreement Manager: Nathan Lubega

Approval Date: 9/19/2024

Branch Manager: Kevin Uy

Approval Date: 10/22/2024

Director: Kevin Uy on behalf of Jonah Steinbuck

Approval Date: n/a

Exhibit A
Scope of Work
DNV USA INC.

I. TASK ACRONYM/TERM LISTS

A. Task List

Task #	CPR [1]	Task Name
1		General Project Tasks
2		System Level Assessment: Comprehensive Brine Chemistry Model
3	X	Laboratory Testing
4		System Installation and Real Time Monitoring
5		Evaluation of Project Benefits
6		Technology Transfer Activities

B. Acronym/Term List

Acronym/Term	Meaning
CAM	Commission Agreement Manager
CAO	Commission Agreement Officer
CAPEX	Capital Expenditure
CEC	California Energy Commission
CMAS	Coupled Multielectrode Array Sensor (Corrosion sensor)
CPR	Critical Project Review
OLI	OLI brine chemistry model
OPEX	Operating Expenses
PH	Potential of Hydrogen
TAC	Technical Advisory Committee
TRL	Technology Readiness Level

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

A. Purpose of Agreement

The purpose of this Agreement is to fund the development of a comprehensive brine chemistry system level model that utilizes an existing commercial sensor to inform real time system performance in geothermal plants. The proposed system level model will take existing brine chemistry, corrosion, and scaling models already used by California geothermal facilities and develop an automated system that will be coupled with corrosion sensors to allow geothermal operators to assess changes in brine chemistry

[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.

from lithium recovery or enhanced geothermal systems and provide real time guidance on geothermal plant operation. The system level model will address two major challenges for making geothermal energy cost effective and more reliable (*i.e.*, corrosion and scaling) and one new revenue stream (*i.e.*, change in brine chemistry due to lithium recovery).

B. Problem/ Solution Statement

Problem

The cost of geothermal power is driven by the chemistry of geothermal brines. These brines contain significant concentrations of ionic species causing scaling and corrosion. Although existing models like the OLI brine chemistry model exist to address each issue individually, no system level model exists that can address these combined threats (especially in real time). The brine's effects on materials increase both operating expenses (OPEX) and capital expenditure (CAPEX) for geothermal power. This creates two barriers: (1) high OPEX makes geothermal power less competitive than more conventional approaches (*e.g.*, natural gas power generation) (2) high CAPEX limit the construction of new geothermal power plants in California (only a small fraction of the geothermal resources in California with the potential to generate power have been developed). It is urgent to create a system level model for brine chemistry management that can address both threats (scaling and corrosion) and predict its effect of the main barriers (CAPEX, OPEX) while considering a new opportunity for mineral recovery (e.g., lithium recovery).

Solution

We propose to create a Comprehensive Brine Management system level model to reduce operating costs and improve mineral recovery. We will combine brine chemistry models, scale deposition models, and material degradation models into one simple to use system level model. The proposed project will create a comprehensive model of the effect of brine chemistry on materials (*i.e.,* corrosion, cracking) and deposits (*i.e.*, unwanted scaling and desired lithium recovery). Also, an in-line sensor will be used to update the model as required. Together, the model and sensor, will provide the geothermal plant the ability to use live corrosion data to predict the brine chemistry in real time (i.e., corrosion and scaling) and improve management of geothermal brines.

C. Goals and Objectives of the Agreement

Agreement Goals

The goal of this Agreement is to create a comprehensive brine chemistry system model to inform brine corrosiveness and scaling tendency in order to reduce impacts from scaling and corrosion at geothermal power plants in California and help improve the recovery of lithium and other valuable minerals from geothermal brines. To reach the main goal four sub-objectives are in place:

- Improve the current brine chemistry and corrosion models already used by geothermal plants using laboratory testing by integrating brine chemistry data from California geothermal plants.

- Create a simple to use comprehensive system level model for brine management. This will require integration of the advanced corrosion and scaling models with in-line sensors and build a real-time system model that can be used by the operators.
- Validate the model through laboratory experiments and field testing at one or more California geothermal plants.
- Transfer knowledge and train geothermal operators in the use of the system level model and sensor.

Ratepayer Benefits:[2] This Agreement will result in the ratepayer benefits of:

1. Improved energy resiliency (by limiting the unplanned downtime of geothermal power plants and helping geothermal operators reduce chemical consumption and waste when it is safe to do so).
2. Producing more energy (by reducing the CAPEX of new geothermal power plants through material selection in combination of brine chemistry).
3. Reduced price of energy (by reducing the cost of maintenance using the main product of this project: a system model for brine management).
4. Job Creation. According to the US Department of Energy, geothermal power creates three times more jobs than natural gas for the same level of power production.
5. New revenue stream for the state of California through energy resiliency and grid reliability, lower cost renewable baseline generation, and job creation.
6. Environmental sustainability, by minimizing chemical waste currently generated at geothermal facilities to mitigate corrosion and scaling impacts.

Technological Advancement and Breakthroughs:[3] The corrosion and scaling in geothermal power plants are relevant to the two major barriers that exist to achieve California's landmark policy SB 100, 2018, requiring 100percent of our electricity to come from renewable energy and zero-carbon resources by 2045. This project will help to address the following barriers: (1) Cost of new geothermal power is high (2) the operating cost of geothermal power is high compared to natural gas power production. The main product of this project: a comprehensive system level model for brine management will help manage geothermal brine at the Salton Sea geothermal field that simultaneously address issues affecting geothermal power production, mineral recovery, and overall efficiency and costs (both OPEX and CAPEX).

[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.

Agreement Objectives

The objectives of this Agreement are to:

- Build a system level model for real-time brine chemistry management (Task 2).
- Perform laboratory test to improve the model and validate the model at one or more California geothermal plants (Task 3).
- Link the model to sensors to perform real-time analysis of the brine effects on corrosion and scaling (Task 4).
- Transfer knowledge and train geothermal operators in California (Task 6).

III. TASK 1 GENERAL PROJECT TASKS

PRODUCTS

Subtask 1.1 Products

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

The Recipient shall:

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

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

For products that require a final version only

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

For all products

- Submit all data and documents required as products in accordance with the following:

Instructions for Submitting Electronic Files and Developing Software:

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

  The following describes the accepted formats for electronic data and documents provided to the CEC as products under this Agreement, and establishes the software versions that will be required to review and approve all software products:
  - Data sets will be in MS Access or MS Excel file format (version 2007 or later), or any other format approved by the CAM.
  - Text documents will be in MS Word file format, version 2007 or later.
  - Project management documents will be in Microsoft Project file format, version 2007 or later.

- **Software Application Development**
  Use the following standard Application Architecture components in compatible versions for any software application development required by this Agreement (e.g., databases, models, modeling tools), unless the CAM approves other software applications such as open-source programs:
  - Microsoft ASP.NET framework (version 3.5 and up). Recommend 4.0.
  - Microsoft Internet Information Services (IIS), (version 6 and up) Recommend 7.5.
  - Visual Studio.NET (version 2008 and up). Recommend 2010.
  - C# Programming Language with Presentation (UI), Business Object and Data Layers.
  - SQL (Structured Query Language).
  - Microsoft SQL Server 2008, Stored Procedures. Recommend 2008 R2.
  - Microsoft SQL Reporting Services. Recommend 2008 R2.
  - XML (external interfaces).

  Any exceptions to the Electronic File Format requirements above must be approved in writing by the CAM. The CAM will consult with the CEC's

Information Technology Services Branch to determine whether the exceptions are allowable.

MEETINGS

Subtask 1.2 Kick-off Meeting

The goal of this subtask is to establish the lines of communication and procedures for implementing this Agreement.

The Recipient shall:

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

  The Kick-off meeting will include discussion of the following:
  - The CAM's expectations for accomplishing tasks described in the Scope of Work;
  - An updated Project Schedule;
  - Terms and conditions of the Agreement;
  - Invoicing and auditing procedures;
  - Travel;
  - Equipment purchases;
  - Administrative and Technical products (subtask 1.1);
  - CPR meetings (subtask 1.3);
  - Monthly Calls (subtask 1.5)
  - Quarterly Progress reports (subtask 1.6)
  - Final Report (subtask 1.7)
  - Match funds (subtask 1.8);
  - Permit documentation (subtask 1.9);
  - Subawards(subtask 1.10);
  - Technical Advisory Committee meetings (subtasks 1.11 and 1.12);
  - Agreement changes;
  - Performance Evaluations; and
  - Any other relevant topics.

- Provide *Kick-off Meeting Presentation* to include but not limited to:
  - Project overview (i.e. project description, goals and objectives, technical tasks, expected benefits, etc.)
  - Project schedule that identifies milestones
  - List of potential risk factors and hurdles, and mitigation strategy

- Provide an *Updated Project Schedule, Match Funds Status Letter,* and *Permit Status Letter*, as needed to reflect any changes in the documents.

The CAM shall:

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

Recipient Products:

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

CAM Product:

- Kick-off Meeting Agenda

Subtask 1.3 Critical Project Review (CPR) Meetings

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

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

The Recipient shall:

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

The CAM shall:

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

Recipient Products:

- CPR Report(s)

CAM Products:

- CPR Agenda(s)
- Progress Determination

Subtask 1.4 Final Meeting

The goal of this subtask is to complete the closeout of this Agreement.

The Recipient shall:

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

  The technical and administrative aspects of Agreement closeout will be discussed at the meeting, which may be divided into two separate meetings at the CAM's discretion.
  - The technical portion of the meeting will involve the presentation of findings, conclusions, and recommended next steps (if any) for the Agreement. The CAM will determine the appropriate meeting participants.
  - The administrative portion of the meeting will involve a discussion with the CAM of the following Agreement closeout items:
    - Disposition of any procured equipment.
    - The CEC's request for specific "generated" data (not already provided in Agreement products).

  - Need to document the Recipient's disclosure of "subject inventions" developed under the Agreement.
  - "Surviving" Agreement provisions such as repayment provisions and confidential products.
  - Final invoicing and release of retention.
- Prepare a *Final Meeting Agreement Summary* that documents any agreement made between the Recipient and Commission staff during the meeting.
- Prepare a *Schedule for Completing Agreement Closeout Activities*.
- Provide copies of *All Final Products* organized by the tasks in the Agreement.

Products:

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

MONTHLY CALLS, REPORTS AND INVOICES

Subtask 1.5 Monthly Calls

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

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

The CAM shall:

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

The Recipient shall:

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

Product:

- Email to CAM concurring with call summary notes.

Subtask 1.6 Quarterly Progress Reports and Invoices

The goals of this subtask are to: (1) periodically verify that satisfactory and continued progress is made towards achieving the project objectives of this Agreement; and (2)

ensure that invoices contain all required information and are submitted in the appropriate format.

The Recipient shall:

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

Recipient Products:

- Quarterly Progress Reports
- Invoices

CAM Product:

- Invoice template

Subtask 1.7 Final Report

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

Subtask 1.7.1 Final Report Outline

The Recipient shall:

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

Recipient Products:

- Final Report Outline (draft and final)

CAM Products:

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

Subtask 1.7.2 Final Report

The Recipient shall:

- Prepare a *Final Report* for this Agreement in accordance with the approved Final Report Outline, Energy Commission Style Manual, and Final Report Template provided by the CAM with the following considerations:
  - Ensure that the report includes the following items, in the following order:
    - Cover page (**required**)
    - Credits page on the reverse side of cover with legal disclaimer (**required**)
    - Acknowledgements page (optional)
    - Preface (**required**)
    - Abstract, keywords, and citation page (**required**)
    - Table of Contents (**required**, followed by List of Figures and List of Tables, if needed)
    - Executive summary (**required**)
    - Body of the report (**required**)
    - References (if applicable)
    - Glossary/Acronyms (If more than 10 acronyms or abbreviations are used, it is required.)
    - Bibliography (if applicable)
    - Appendices (if applicable) (Create a separate volume if very large.)
    - Attachments (if applicable)
- Submit a draft of the Executive Summary to the TAC for review and comment.
- Develop and submit a *Summary of TAC Comments on Draft Final Report* received on the Executive Summary. For each comment received, the Recipient will identify in the summary the following:
  - Comments the Recipient proposes to incorporate.
  - Comments the Recipient does propose to incorporate and an explanation for why.
- Submit a draft of the report to the CAM for review and comment. The CAM will provide written comments to the Recipient on the draft product within 15 days of receipt.
- Incorporate all CAM comments into the *Final Report*. If the Recipient disagrees with any comment, provide a *Written Responses to Comments* explaining why the comments were not incorporated into the final product.
- Submit the revised *Final Report* electronically with any Written Responses to Comments within 10 days of receipt of CAM's Written Comments on the Draft Final Report, unless the CAM specifies a longer time period or approves a request for additional time.

Products:

- Summary of TAC Comments on Draft Final Report
- Draft Final Report

- Written Responses to Comments *(if applicable)*
- Final Report

CAM Product:

- Written Comments on the Draft Final Report

MATCH FUNDS, PERMITS, AND SUBAWARDS

Subtask 1.8 Match Funds

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

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

The Recipient shall:

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

  If match funds were a part of the application that led to the CEC awarding this Agreement, then provide in the letter:
  - A list of the match funds that identifies:
    - The amount of cash match funds, their source(s) (including a contact name, address, and telephone number), and the task(s) to which the match funds will be applied.
    - The amount of each in-kind contribution, a description of the contribution type (e.g., property, services), the documented market or book value, the source (including a contact name, address, and telephone number), and the task(s) to which the match funds will be applied. If the in-kind contribution is equipment or other tangible or real property, the Recipient must identify its owner and provide a contact name, address, telephone number, and the address where the property is located.
    - If different from the solicitation application, provide a letter of commitment from an authorized representative of each source of match funding that the funds or contributions have been secured.
- At the Kick-off meeting, discuss match funds and the impact on the project if they are significantly reduced or not obtained as committed. If applicable, match funds will be included as a line item in the progress reports and will be a topic at CPR meetings.
- Provide a *Supplemental Match Funds Notification Letter* to the CAM of receipt of additional match funds.

- Provide a *Match Funds Reduction Notification Letter* to the CAM if existing match funds are reduced during the course of the Agreement. Reduction of match funds may trigger a CPR meeting.

Products:

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

Subtask 1.9 Permits

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

The Recipient shall:

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

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

Products:

- Permit Status Letter

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

Subtask 1.10 Subawards
The goals of this subtask are to: (1) procure subawards required to carry out the tasks under this Agreement; and (2) ensure that the subawards are consistent with the terms and conditions of this Agreement.

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

Products:
- Subawards *(if requested by the CAM)*

TECHNICAL ADVISORY COMMITTEE

Subtask 1.11 Technical Advisory Committee (TAC)
The goal of this subtask is to create an advisory committee for this Agreement. The TAC should be composed of diverse professionals. The composition will vary depending on interest, availability, and need. TAC members will serve at the CAM's discretion. The purpose of the TAC is to:
- Provide guidance in project direction. The guidance may include scope and methodologies, timing, and coordination with other projects. The guidance may be based on:
  - Technical area expertise;
  - Knowledge of market applications; or
  - Linkages between the Agreement work and other past, present, or future projects (both public and private sectors) that TAC members are aware of in a particular area.
- Review products and provide recommendations for needed product adjustments, refinements, or enhancements.
- Evaluate the tangible benefits of the project to the state of California, and provide recommendations as needed to enhance the benefits.

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

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

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

The Recipient shall:

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

Products:

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

Subtask 1.12 TAC Meetings
The goal of this subtask is for the TAC to provide strategic guidance for the project by participating in regular meetings, which may be held via teleconference.

The Recipient shall:

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

The TAC shall:

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

Products:

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

Subtask 1.13 Project Performance Metrics
The goal of this subtask is to finalize key performance targets for the project based on feedback from the TAC and report on final results in achieving those targets. The performance targets should be a combination of scientific, engineering, techno-

economic, and/or programmatic metrics that provide the most significant indicator of the research or technology's potential success.

The Recipient shall:

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

Products:

- TAC Performance Metrics Summary
- Project Performance Metrics Results

IV. TECHNICAL TASKS

TASK 2: SYSTEM LEVEL ASSESSMENT: COMPREHENSIVE BRINE CHEMISTRY MODEL

The goal of this task is to produce the main deliverable of the project: a comprehensive brine chemistry system model for California geothermal plants. The Brine Chemistry System Model will be informed by corrosion and scaling data generated in Task 3 (Laboratory Testing), and model outputs will be compared to and validated by the electrochemistry data collected in Task 4 (System Installation and Real Time Monitoring).

The Recipient shall:

- Collect current available field data and write *California Geothermal Systems Boundary Conditions Report*
  - Collaborate with California geothermal operators to collect current available field data. This data will be used to create the boundary conditions for the Brine Chemistry System Model (i.e. list of materials, min and max for temperatures, pressures and chemical concentrations).

  - The *California Geothermal Systems Boundary Conditions Report* will describe, at a minimum, the boundary conditions for the Brine Chemistry System Model to include, a list of minerals, minimum and maximum temperatures and pressures, chemical concentrations, and the methodologies used to determine these boundary conditions.
- Consult with TAC on the *Draft California Geothermal Systems Boundary Report* to verify technical feasibility in accordance with subtask 1.10 (Technical Advisory Committee). Incorporate TAC feedback in the *Final California Geothermal Systems Boundary Report* as appropriate.
- Develop improved OLI model, or equivalent as approved by the CAM, and write *OLI Model Improvements Report* to describe how the model was improved by the laboratory data generated by Task 3 (Laboratory Testing).
  - Develop improved OLI model with updated coefficients using Electrochemical Test Data referred in the *Laboratory Corrosion Testing Report* and Scaling Data referred in the *Laboratory Scaling Testing Report* compiled in Task 3 (Laboratory Testing).
  - The *OLI Model Improvements Report* will describe, at a minimum, methodologies used, updated coefficients, and improvements made to existing OLI model
- Consult with TAC on the *Draft OLI Model Improvements Report* to verify technical feasibility in accordance with subtask 1.10 (Technical Advisory Committee). Incorporate TAC feedback in the *Final OLI Model Improvements Report* as appropriate.
- Build (1) Brine Chemistry System Model and write (2) *Brine Chemistry System Model Report*.
  - Build a Brine Chemistry System Model using data from running the improved OLI model. The improved OLI model runs will focus on (1) corrosion and potential prediction for cracking (for materials identified in boundary conditions) and (2) mineral deposits that may aid lithium recovery and/or that result in scaling.
  - The Brine Chemistry System Model will be provided at no cost to California geothermal operators and *Training Materials for California Geothermal Operators* will be created and utilized in accordance with Task 6 (Technology Transfer Activities).
  - The *Brine Chemistry System Model Report* will describe, at a minimum, methodologies and approach used, use cases, a summary of the laboratory testing data generated in Task 3 (Laboratory Testing), and a comparison of the electrochemistry data collected in Task 4 (System Installation and Real Time Monitoring) to validate the Brine Chemistry System Model.
- Consult with TAC on the Brine Chemistry Model development to verify technical feasibility in accordance with subtask 1.10 (Technical Advisory Committee). Incorporate TAC feedback in the *Final Brine Chemistry System Model Report* as appropriate.

Products:

- California Geothermal Systems Boundary Conditions Report (Draft and Final)
- OLI Model Improvements Report (Draft and Final)
- Brine Chemistry System Model Report (Draft and Final)

TASK 3: LABORATORY TESTING

The goal of this task is to *collect corrosion and scaling data* on synthetic brine to inform the brine chemistry model, or equivalent as approved by the CAM. The data will be compared to the coupled multielectrode array sensor (CMAS) probe field testing in Task 4 (System Installation and Real Time Monitoring) to validate the Brine Chemistry System Model developed in Task 2 (System Level Assessment: Comprehensive Brine Chemistry Model).

The Recipient shall:

- Create a *Corrosion Test Plan* that describes, at a minimum, testing and validation objectives, procedures, conditions, facilities, and equipment including technical specifications.
- Perform laboratory work, compile all Electrotechnical Test Data in Excel and write *Laboratory Corrosion Testing Report.*
  - Perform corrosion testing (i.e., electrochemical test) for simulated brine chemistry as identified in the *Corrosion Test Plan* in collaboration with geothermal operators at one or more Salton Sea geothermal fields.
  - Test the CMAS probe in the lab to ensure its responsiveness to brine chemistries prior to field testing.
  - The *Laboratory Corrosion Testing Report* will describe, at a minimum, the testing and validation methods conducted consistent with the *Corrosion Test Plan* and include how to access the compiled Electrotechnical Test Data in Excel.
- Consult with TAC on the *Draft Laboratory Corrosion Testing Report* to verify technical feasibility in accordance with subtask 1.10 (Technical Advisory Committee). Incorporate TAC feedback in the *Final Laboratory Corrosion Testing Report* as appropriate.
- Create a *Scaling Test Plan* that describes, at a minimum, testing and validation objectives, procedures, conditions, facilities, and testing and validation equipment including technical specifications.
- Perform laboratory work, compile all Scaling Test Data in Excel and write *Laboratory Scaling Report.*
  - Perform coupon test on simulated brine for both corrosion and scaling to detect the type of corrosion (uniform and pitting) and the types of deposits for multiple brine chemistries. Results will be used to validate *OLI* model.
  - Brine data to be collected will likely include: Sodium, Potassium, Calcium, Magnesium, Lithium, Strontium, Zinc, Barium, Iron, Boron, Silica, Aluminum, Antimony, Arsenic, Cadmium, Chromium, Copper, Lead, Manganese, Nickel, Silver, Chloride, Fluoride, Sulfate, Total Alkalinity, Ammonia, Total Inorganic Carbon (as CO2), Total Solids, Density, lab pH vs field pH.

  - The *Laboratory Scaling Testing Report* will describe, at a minimum, the testing and validation methods conducted consistent with the *Scaling Test Plan* and include how to access the compiled Scaling Test Data in Excel for the brine data identified.
- Consult with TAC on the *Draft Laboratory Scaling Testing Report* to verify technical feasibility in accordance with subtask 1.10 (Technical Advisory Committee). Incorporate TAC feedback in the *Final Laboratory Scaling Testing Report* as appropriate.
- Prepare CPR Report #1 in accordance with subtask 1.3 (CPR Meetings) and participate in a CPR meeting.

Products:
- Corrosion Test Plan
- Laboratory Corrosion Testing Report (Draft and Final)
- Scaling Test Plan
- Laboratory Scaling Testing Report (Draft and Final)
- CPR Report #1

TASK 4: SYSTEM INSTALLATION AND REAL TIME MONITORING
The goal of this task is to install the CMAS corrosion probe at one or more California geothermal power plants and demonstrate and validate the use of the Brine Chemistry System Model developed in Task 2 for real time brine management using the corrosion CMAS probe.

The Recipient shall:
- Build and test two CMAS probes
  - Build two CMAS probes with data recording capability to provide real time data for the Brine Chemistry System Model.
  - The two CMAS probes will undergo linear polarization resistance testing to ensure that the measurements and resolutions perform as expected before plant installation.
- Install CMAS probes in a slip stream at one or more geothermal power plants in California, and collect electrochemistry data
  - Identify optimal locations and install the two CMAS probes at one or more geothermal plants in California for a period of 3 – 6 months, or equivalent as approved by the CAM, to record gradual changes in geothermal brine conditions, and perform data collection and interpretation
  - Electrochemistry data will used to compare against results generated by the Brine Chemistry System Model to validate the model outputs and methodologies, and a summary and analysis will be included in the *Brine Chemistry System Model Report* developed in Task 2 (Laboratory Testing).
- Write *CMAS Probe Field Test Report* to include:
  - The *CMAS Probe Field Test Report* will describe, at a minimum, the technical specifications for the CMAS probes, laboratory testing methods, and data

recording and real time measurement capabilities of the probes, the optimal location identification process, installation, data collection, and analysis.

Products:

- CMAS Probe Field Test Report (Draft and Final)

TASK 5: EVALUATION OF PROJECT BENEFITS

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

The Recipient shall:

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

Products:

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

TASK 6: TECHNOLOGY TRANSFER ACTIVITIES

The goal of this task is to conduct activities that will accelerate the commercial adoption of the technology being supported under this agreement. Eligible activities include, but are not limited to, the following:

- Scale-up analysis including manufacturing analysis, independent design verification, and process improvement efforts.
- Technology verification testing, or application to a test bed program located in California.
- Legal services or licensing to secure necessary intellectual property to further develop the technology.
- Market research, business plan development, and cost-performance modeling.
- Entry into an incubator or accelerator program located in California.

The Recipient Shall:

- Create *Training Materials for California Geothermal Plant Operators* on how to install and use the Brine Chemistry System Model in conjunction with CMAS probe for geothermal brine management.
- Utilize *Training Materials for California Geothermal Plant Operators* to train geothermal operator of one or more the geothermal demonstration site.
  - Geothermal plant operators trained will consist of at least one technician and one manager
- Develop and submit a *Technology Transfer Plan* that identifies the proposed activities the recipient will conduct to accelerate the successful commercial adoption of the technology.
- Present the draft *Technology Transfer Plan* to the TAC for feedback and comments.
- Develop and submit a *Summary of TAC Comments* that summarizes comments received from the TAC members on the Draft Technology Transfer Plan. This document will identify:
  - TAC comments the Recipient proposes to incorporate into the final *Technology Transfer Plan*.
  - TAC comments the Recipient does not propose to incorporate with and explanation why.
- Submit the final *Technology Transfer Plan* to the CAM for approval.
- Implement activities identified in final *Technology Transfer Plan*.
- Develop and submit a *Technology Transfer Summary Report* that includes high level summaries of the activities, results, and lessons learned of tasks performed relating to implementing the Final Technology Transfer Plan. This report should not include any proprietary information.
- When directed by the CAM, develop presentation materials for an CEC-sponsored conference/workshop(s) on the project.

- When directed by the CAM, participate in annual EPIC symposium(s) sponsored by the CEC.
- Provide at least (6) six *High Quality Digital Photographs* (minimum resolution of 1300x500 pixels in landscape ratio) of pre and post technology installation at the project sites or related project photographs.

Products:

- Technology Transfer Plan (draft and final)
- Summary of TAC Comments
- Technology Transfer Summary Report (draft and final)
- High Quality Digital Photographs
- Peer-reviewed publications and conference papers
- Training Materials for California Geothermal Plant Operators

V. PROJECT SCHEDULE

Please see the attached Excel spreadsheet.