



**CALIFORNIA
ENERGY COMMISSION**



**California Energy Commission
March 17, 2025 Business Meeting
Backup Materials for Materials Research LLC**

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

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

STATE OF CALIFORNIA
STATE ENERGY RESOURCES
CONSERVATION AND DEVELOPMENT COMMISSION

RESOLUTION: Geothermal Brine Pretreatment and Metal Recovery

WHEREAS, County of Imperial is the Lead Agency for the Hell's Kitchen Power & Lithium Project, proposed by Controlled Thermal Resources (US) Inc. via its subsidiaries, to build a geothermal power plant that will produce up to 49.9 megawatts of net geothermal energy and develop mineral extraction and processing facilities capable of producing lithium hydroxide, silica, and polymetallic products. The project will be located in the Salton Sea Know Geothermal Resource Area; and

WHEREAS, The Imperial County Planning and Development Services, prepared an Environmental Impact Report (EIR) for the Hell's Kitchen Project (SCH# 2022030704), Findings of Fact and Statement of Overriding Considerations (FOFSOC), a Mitigation Monitoring and Reporting Program (MMRP); and Conditional Use Permits (CUP) # 21-0020, for the construction, operation, maintenance, and decommissioning of a geothermal power plan facility, and # 21-0021, for the construction, operation, maintenance, and decommissioning of a mineral extraction and production facility adjacent to a proposed geothermal flash power plant; and

WHEREAS, The Imperial County Board of Supervisors considered and filed the EIR on January 24, 2024, making mitigation measures a condition of approval. The EIR, FOFSOC, MMRP, and CUPs are located at the Imperial County Website. The CEC has provided links to the documents in the backup material; and

WHEREAS, The Energy Commission has reviewed and considered the County's EIR, FOFSOC, MMRP, Resolutions approving the CUPs and the findings contained therein, the filed Notices of Determinations, and the Energy Commission Staff's Findings, which are contained in the Staff Memorandum and CEQA analysis of EPC-24-043, which is included in the backup materials; and

WHEREAS, the Energy Commission is considering the proposed agreement EPC-24-043, Geothermal Brine Pretreatment and Metal Recovery, a grant to allow Materials Research LLC to design, construct, and demonstrate a pilot scale geothermal brine treatment and metal recovery system, at the Hell's Kitchen Site in the Salton Sea Known Geothermal Resource Area; and

WHEREAS, Prior to acting on the Agreement EPC-24-043, the Energy Commission desires to make certain findings pursuant to the CEQA Guidelines, title 14, sections 15093 and 15096;

THEREFORE, BE IT RESOLVED,

1. The Energy Commission has reviewed the information contained in the EIR, FOFSOC, MMRP, and resolutions approving the EIR and CUPs relevant to its approval of EPC-24-043, and has reviewed the CEQA findings contained in the County's EIR, FOFSOC, MMRP, and the CUPs, which are adopted to the extent that they are relevant to the Energy Commission's decision to approve EPC-24-043, and has reviewed the Staff Memorandum identified above.
2. The County has already adopted the mitigation measures recommended in the EIR, FOFSOC, MMRP, and the CUPs, and has authority to implement the mitigation measures or to seek any required approvals for the mitigation measures and the Energy Commission has no direct authority to implement the mitigation measures.
3. The Energy Commission has reviewed and considered the EIR, FOFSOC, MMRP, Resolutions approving the CUPs, and the Staff memorandum, and finds that these documents are adequate for its use as the decision-making body for its consideration of EPC-24-043.
4. Approval of EPC-24-043 is within the scope of Conditional Use Permits 21-0020 and 21-0021 approved by the County, and within the activities evaluated in the EIR and CUPs.
5. Because the EIR was finalized and filed on January 24, 2024, and because the CUPs were approved and filed on January 24, 2024, none of the circumstances within CCR, title 14, section 15162 are present and there have been no substantial project changes and no substantial changes in the project circumstances that would require major revisions to the EIR or CUPs, either due to the involvement of new significant environmental effects, or to an increase in the severity of previously identified significant impacts, and there is no new information of substantial importance that would change the conclusions set forth in the EIR.
6. The Energy Commission has not identified any feasible alternative of additional feasible mitigation measures withing its power that would substantially lessen or avoid any significant effect the Project would have on the environment.

FURTHER BE IT RESOLVED, that the Energy Commission finds, on the basis of the entire record before it, that the mitigation measures incorporated in the EIR will prevent EPC-24-043 from having any significant environmental impacts; and

FURTHER BE IT RESOLVED, that the Energy Commission approves EPC-24-043 with Materials Research LLC for \$3,683,950.00.

FURTHER BE IT RESOLVED, that the Executive Director or their designee shall execute the same on behalf of the CEC.

CERTIFICATION

The undersigned Secretariat to the CEC does hereby certify that the foregoing is a full, true, and correct copy of a resolution duly and regularly adopted at a meeting of the CEC held on March 17, 2025.

AYE:

NAY:

ABSENT:

ABSTAIN:

Dated:

Kristine Banaag
Secretariat



GRANT REQUEST FORM (GRF)

A. New Agreement Number

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

New Agreement Number: EPC-24-043

B. Division Information

1. Division Name: ERDD
2. Agreement Manager: Chuck Gentry
3. MS-:43
4. Phone Number: 916-776-0761

C. Recipient's Information

1. Recipient's Legal Name: Materials Research LLC
2. Federal ID Number: 83-1417526

D. Title of Project

Title of project: Geothermal brine pretreatment and metal recovery

E. Term and Amount

1. Start Date: 4/1/2025
2. End Date: 4/1/2029
3. Amount: \$3,683,950.00

F. Business Meeting Information

1. Are the ARFVTP agreements \$75K and under delegated to Executive Director? No
2. The Proposed Business Meeting Date: 3/17/2025 .
3. Consent or Discussion? Consent
4. Business Meeting Presenter Name: Chuck Gentry
5. Time Needed for Business Meeting: N/A.
6. The email subscription topic is: EPIC (Electric Program Investment Charge).

Agenda Item Subject and Description:

Materials Research LLC. Proposed resolution adopting California Environmental Quality Act (CEQA) findings for Materials Research LLC's geothermal brine pretreatment and metal recovery project, and approving grant agreement EPC-24-043 with Materials Research LLC. (EPIC Funding) Contact: Chuck Gentry

- i. CEQA Findings. Findings that, based on the lead agency Imperial County's Final Environmental Impact Report (EIR) and Notice of Determination filed for the Hell's Kitchen geothermal power plant and mineral extraction and processing facility, the work under the proposed agreement presents no new significant or substantially more severe environmental impacts beyond those already considered and mitigated by the lead agency.
- ii. Materials Research LLC. Proposed approval of agreement EPC-24-043 with Materials Research LLC for a \$3,683,950 grant to develop a geothermal brine treatment process based on metal sulfide precipitation. This new process will remove interfering minerals to enable direct lithium extraction and allow the recovery of



valuable critical minerals like zinc and manganese from the geothermal brine. This technology has the potential to lower both the capital and operational costs of brine management at geothermal plants.

G. California Environmental Quality Act (CEQA) Compliance

1. Is Agreement considered a “Project” under CEQA?

Yes

If yes, skip to question 2.

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

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

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

a) Agreement **IS** exempt?

No

Statutory Exemption?

Yes or 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:

CCR section number: CCR section number 1, CCR section number 2. Or, None

Categorical Exemption?

Yes or No

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:

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.

b) Agreement **IS NOT** exempt.

IMPORTANT: consult with the legal office to determine next steps.

Yes

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	Yes or No
Negative Declaration	Yes or No



Mitigated Negative Declaration	Yes or No
Environmental Impact Report	Yes
Statement of Overriding Considerations	Yes or No
None	Yes or No

H. Is this project considered “Infrastructure”?

No

I. Subcontractors

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

Subcontractor Legal Company Name	CEC Funds	Match Funds
Suvenco LLC	\$ 250,000	\$62,500
Marc D Hornbostel dba Swift Noble Materials	\$ 250,000	\$62,500
Srinivas Bhamidi dba SS Energy Consulting Services	\$ 312,500	\$78,125
William Olson Consulting & Manufacturing	\$ 312,500	\$78,125
TBD - Chemical Engineer	\$ 25,000	\$0
TBD - Software Developer	\$ 25,000	\$0
Gopala Krishnan	\$ 31,000	\$31,000
Hell's Kitchen Geothermal LLC	\$ 0	\$50,000

J. Vendors and Sellers for Equipment and Materials/Miscellaneous

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

Vendor/Seller Legal Company Name	CEC Funds	Match Funds
Thermo Electron North America LLC	\$ 50,000	\$ 30,000
Hanna Instruments		\$ 9,037
Hammerwood Associates / PG&E	\$ 255,000	\$ 0
Airgas	\$ 10,000	\$ 0

K. Key Partners

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



Key Partner Legal Company Name

No key partners to report

L. Budget Information

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

Funding Source	Funding Year of Appropriation	Budget List Number	Amount
EPIC	23-24	301.001K	\$ 3,683,950

TOTAL Amount: \$ 3,683,950

R&D Program Area: ESB: Renewables

Explanation for "Other" selection Not applicable

Reimbursement Contract #: Not applicable

Federal Agreement #: Not applicable

M. Recipient's Contact Information

1. Recipient's Administrator/Officer

Name: Anoop Nagar

Address: 138 Tennyson Ave

City, State, Zip: Palo Alto, CA 94301-3735

Phone: 650-464-3547

E-Mail: ANOOPNAGAR@GMAIL.COM

3. Recipient's Project Manager

Name: Anoop Nagar

Address: 138 Tennyson Ave

City, State, Zip: Palo Alto, CA 94301-3735

Phone: 650-464-3547

E-Mail: ANOOPNAGAR@GMAIL.COM

N. Selection Process Used

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

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



O. Attached Items

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

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

Approved By

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

Agreement Manager: Chuck Gentry

Approval Date: 1/30/2025

Branch Manager: Kevin Uy

Approval Date: 1/31/2025

Director: Kevin Uy for Jonah Steinbuck

Approval Date: 1/31/2025

**Exhibit A
Scope of Work
Materials Research LLC**

I. TASK ACRONYM/TERM LISTS

A. Task List

Task #	CPR¹	Task Name
1		General Project Tasks
2		Lab Scale Demonstration of Sequential Precipitation
3		Process Design
4	X	Engineering Design
5	X	Pilot Scale System Construction and Commissioning
6		Field Test and Data Collection Plan
7		Field Demonstration of Pilot Skid Operation
8		Evaluation of Project Benefits
9		Technology Transfer Activities

B. Acronym/Term List

Acronym/Term	Meaning
CAM	Commission Agreement Manager
CAO	Commission Agreement Officer
CEC	California Energy Commission
CPR	Critical Project Review
Salton Sea KGRA	Salton Sea Known Geothermal Resource Area
TAC	Technical Advisory Committee
USGS	US Geological Survey

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

A. Purpose of Agreement

The purpose of this Agreement is to fund the design, construction, and demonstration of a pilot scale geothermal brine treatment and metal recovery system. The process will recover zinc and manganese as saleable products and remove interfering species from geothermal brines to make them suitable for direct lithium extraction. The system will include metal sulfide precipitation as well as a sulfur recycling and reuse process to reduce waste and improve process cost economics, thereby improving cost effectiveness of geothermal energy systems.

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

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B. Problem/ Solution Statement

Problem

The Salton Sea Known Geothermal Resource Area (Salton Sea KGRA), in Imperial County, California, provides a prime location and opportunity to develop new geothermal resources. The Salton Sea KGRA contains a robust, well-mapped, geothermal resource for power generation, with opportunities for concurrent development of lithium and other mineral resources². While geothermal energy is renewable and largely carbon free, it requires a large upfront cost for installation that has a long payback period.

Lithium is a high-value metal used in the production of lithium rechargeable batteries which are a key technology for the clean energy transition. Lithium is found in low but significant concentrations in some geothermal waters (i.e., a few hundred milligrams per liter in the Salton Sea KGRA). Because of the very large volume of brine processed in a geothermal power plant (>22,700 liters per minute), even low-lithium brines represent a valuable resource. A direct lithium extraction process can recover lithium from geothermal brines without the large footprint and negative ecological impact of mining or evaporation ponds that are the two traditional methods of lithium production. However current brine treatment processes result in leftover solid waste products containing silica, iron, and toxic minerals, including lead and arsenic, that require landfill or costly hazardous waste disposal. Reduction of these solid waste products is needed to lower operating costs while improving mineral recovery³.

Solution

The recipient will develop a geothermal brine treatment process based on metal sulfide precipitation. This process will not only remove interfering species and enable direct lithium extraction but will also allow the recovery of valuable critical minerals like zinc and manganese from the geothermal brine. US Geological Survey (USGS) has included zinc and manganese on the 2022 final critical materials list⁴.

A traditional brine treatment process requires a large quantity of additives for pH control and results in hazardous waste streams. Storage and transporting additives to the production site and removal of waste streams add a significant cost as well as reliance on supply chains. The inclusion of sulfur recovery and recycling in the geothermal brine treatment process will significantly improve process economics and reduce waste streams and the need for chemical additives.

² Salton Sea Geothermal Development-Nontechnical Barriers to Entry – Analysis and Perspectives, June 2022 PNNL-32717

³ Paz, Silvia (Chair), Ryan E. Kelley (Vice Chair), Steve Castaneda, Rod Colwell, Roderic Dolega, Miranda Flores, James C. Hanks, Arthur Lopez, Luis Olmedo, Alice Reynolds, Frank Ruiz, Manfred Scott, Tom Soto, Jonathan Weisgall. 2022. Report of the Blue Ribbon Commission on Lithium Extraction in California. California Energy Commission. Publication Number: CEC-300-2022-009

⁴ Federal Register /Vol. 87, No. 37 /Thursday, February 24, 2022 /Notices

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C. Goals and Objectives of the Agreement

Agreement Goals

The goals of this Agreement are to:

- Demonstrate a geothermal brine treatment to remove heavy metals at the lab scale to enable design of pilot scale system.
- Design and build a pilot scale geothermal brine treatment system.
- Demonstrate the pilot scale operation of the brine treatment system at the Salton Sea KGRA using plant process brine flowing at 5-10 liters per minute.

Ratepayer Benefits:⁵ This Agreement will result in the ratepayer benefits of lower costs of geothermal power production and direct lithium extraction. Developers in the Salton Sea KGRA report they can reduce the cost of geothermal power by 35% to be sold at \$50MWhr by integrating lithium recovery with geothermal power production⁶.

Technological Advancement and Breakthroughs:⁷ 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 increasing the share of clean and renewable geothermal power in the California energy mix. This agreement will also help spur a new industry of lithium and other critical minerals production that will provide much needed materials for battery manufacturing with significantly less impact to the environment.

Agreement Objectives

The objectives of this Agreement are to:

- Design and implement process controls to maintain steady temperature and pH of the geothermal brine to enable sequential precipitation.
- Demonstrate recovery of additional saleable minerals like zinc and manganese from geothermal brine with a target of 60 percent recovery.
- Quantify use of additives for pH control and design methods to recover and recycle the same to the maximum extent possible.
- Demonstrate at least 50 percent recovery and recycling of chemical additives for the geothermal brine treatment process.
- Perform techno-economic analysis of the geothermal brine treatment and mineral recovery process to demonstrate a less than 5 years payback period.

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

⁶ Technical Memorandum (TM) #6.1, 09/27/2021 C Chesney, UC Santa Cruz

⁷ California Public Resources Code, Section 25711.5(a) also requires EPIC-funded projects to lead to technological advancement and breakthroughs to overcome barriers that prevent the achievement of the state's statutory and energy goals.

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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.

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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;

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- 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.

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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.

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The technical and administrative aspects of Agreement closeout will be discussed at the meeting, which may be divided into two separate meetings at the CAM's discretion.

- The technical portion of the meeting will involve the presentation of findings, conclusions, and recommended next steps (if any) for the Agreement. The CAM will determine the appropriate meeting participants.
- The administrative portion of the meeting will involve a discussion with the CAM 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.

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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)

EXHIBIT A

Scope of Work

Materials Research LLC

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

EXHIBIT A

Scope of Work

Materials Research LLC

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*)

EXHIBIT A

Scope of Work

Materials Research LLC

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 Obtain and Execute Subawards and Agreements with Site Hosts

The goals of this subtask are to: (1) procure and execute subrecipients and site host agreements, as applicable, required to carry out the tasks under this Agreement; and (2) ensure that the subrecipients and site host agreements are consistent with the Agreement terms and conditions and the Recipient's own contracting policies and procedures.

The Recipient shall:

- Execute and manage subawards and coordinate subrecipients activities in accordance with the requirements of this Agreement.
- Execute and manage site host agreements and ensure the right to use the project site throughout the term of the Agreement, as applicable. A site host agreement is not required if the Recipient is the site host.

EXHIBIT A

Scope of Work

Materials Research LLC

- Notify the CEC in writing immediately, but no later than five calendar days, if there is a reasonable likelihood the project site cannot be acquired or can no longer be used for the project.
- 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.
- Submit a *Subaward and Site Letter* to the CAM describing the subawards and any site host agreement needed or stating that no subawards or site host agreements are required.
- If requested by the CAM, submit a draft of each *Subaward* and any *Site Host Agreement* required to conduct the work under this Agreement.
- If requested by the CAM, submit a final copy of each executed *Subaward* and any *Site Host Agreement*.
- Notify and receive written approval from the CAM prior to adding any new subrecipient (see the terms regarding subrecipient additions in the terms and conditions).

Products:

- Subaward and Site Letter
- Draft Subawards (*if requested by the CAM*)
- Draft Site Host Agreement (*if requested by the CAM*)
- Final Subawards (*if requested by the CAM*)
- Final Site Host Agreement (*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.

EXHIBIT A

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- 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.

EXHIBIT A

Scope of Work

Materials Research LLC

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.

EXHIBIT A
Scope of Work
Materials Research LLC

- 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

EXHIBIT A

Scope of Work

Materials Research LLC

IV. TECHNICAL TASKS

Products that require a draft version are indicated by marking “(draft and final)” after the product name in the “Products” section of the task/subtask. If “(draft and final)” does not appear after the product name, only a final version of the product is required. Subtask 1.1 (Products) describes the procedure for submitting products to the CAM.

TASK 2 LAB SCALE DEMONSTRATION OF SEQUENTIAL PRECIPITATION

The goal of this task is to perform lab scale experiments suitable for host site geothermal brine composition. Previous lab scale work included batch scale and continuous sulfidation process operation and demonstration of metal sulfide extraction stream with chemical dosing for pH control and temperature control. Precipitation kinetics data was generated from these lab scale experiments. Further lab scale experiments will be carried out based on the geothermal brine composition from the host site. The objective of these experiments is to generate data based on the actual geothermal brine composition. This will help in estimating additive quantities, temperature and pH conditions, as well as settling time. To reduce reliance on the supply chain for chemical additives and minimize waste generation, a recycling process will be developed. The lab scale experiments will help recover and reuse additives. This data will be used in subsequent tasks to design the pilot scale skid.

The Recipient shall:

- Develop a *Lab Scale Test Plan* that details the experiments and parameters for the lab scale testing.
- Perform lab scale experiments for sequential precipitation of specific geothermal brine constituents from host site according to the *Lab Scale Test Plan* and summarize the results in a *Lab Scale Test Results Report*.
- Estimate rate of consumption, recovery, and reuse of additives for geothermal brine treatment and include in an *Additives Recovery and Reuse Process Report*.

Products:

- Lab Scale Test Plan
- Lab Scale Test Results Report (draft and final)
- Additive Recovery and Reuse Process Report

TASK 3 PROCESS DESIGN

The goal of this task is to design an integrated pilot scale process that can treat 5-10 liters per minute geothermal brine and recover valuable minerals like zinc and manganese. A process flow diagram will be generated and a heat and mass balance will be calculated. Process parameters and required conditions will be determined and materials of construction will be selected. Process control strategy and data collection basis will also be established.

The Recipient shall:

- Prepare a design for the brine pretreatment and mineral recovery system including equipment sizing to treat 5-10 liters per minute brine.

EXHIBIT A

Scope of Work

Materials Research LLC

- Prepare a process flow diagram and process instrument diagrams with flow, temperature, and pressure data obtained from lab scale experiments.
- Determine rate of addition of chemicals, temperature, and pH range for the sequential precipitation of metals.
- Quantify recovery and recycling of chemical additives used for the precipitation of metals.
- Calculate energy and mass balance using commercially available software to model the brine pretreatment process.
- Specify material of construction for equipment – such as tanks, pumps, piping, instrumentation etc. based on corrosivity, temperature, and species present in the brine.
- Design process control strategy for temperature and flow control and sequential precipitation of various species.
- Prepare a *Process Design Report* that contains process flow and instrument diagrams, materials of construction, and process control strategy.

Products:

- Process Design Report (draft and final)

TASK 4 ENGINEERING DESIGN

The goal of this task is to prepare engineering design of a pilot scale skid for the geothermal brine treatment system. Using the lab scale results, an integrated pilot scale continuous treatment system will be designed. This includes equipment sizing for a flow through system like pumps, mixing and settling vessels, chemical dosing, temperature control, instrumentation, data acquisition and process control system.

The Recipient shall:

- Design pilot scale skid layout including equipment layout such as holding tank, day tank, return tank and associated pumps and piping.
- Prepare equipment specifications and identify suppliers to help with procurement.
- Prepare instrument and data acquisition specifications.
- Design electrical distribution and process control systems.
- Prepare an *Engineering Design Report* that explains the equipment layout, specifications, and instrumentation.
- Prepare *CPR Report #1* and participate in CPR meeting per subtask 1.3.

Products:

- Engineering Design Report (draft and final)
- CPR Report #1

TASK 5 PILOT SCALE SYSTEM CONSTRUCTION AND COMMISSIONING

The goal of this task is to procure equipment and materials to build a portable pilot scale skid and commission it for operation at the host site.

EXHIBIT A

Scope of Work

Materials Research LLC

The Recipient shall:

- Procure equipment and materials as described in the Engineering Design Report.
- Build a portable and modular skid for geothermal brine treatment including process control valves and instrumentation.
- Operate the skid in the lab to the extent possible and test subsystems and commission the pilot scale skid to demonstrate readiness for field operation.
- Prepare a *Construction and Commissioning Report* summarizing the activities in this task.
- Prepare *CPR Report #2* and participate in CPR meeting per subtask 1.3

Products:

- Construction and Commissioning Report
- CPR Report #2

TASK 6 FIELD TEST AND DATA COLLECTION PLAN

The goal of this task is to develop a *Process Test Plan* and identify data needed for process modeling and techno-economic analysis to determine the payback period for the process at a commercial scale installation.

The Recipient shall:

- Identify test parameters.
- Prepare test procedures and safety measures necessary for field tests.
- Identify process parameters required to complete process modeling and perform techno-economic analysis.
- Prepare a *Process Test Plan* that identifies the data needed for modeling and analysis.

Products:

- Process Test Plan

TASK 7 FIELD DEMONSTRATION OF PILOT SKID OPERATION

The goal of this task is to transport, install, and operate the pilot scale skid at the host site. A steady state operation of the treatment process will be demonstrated using geothermal brine. Process and analytical data will be collected.

The Recipient shall:

- Transport the pilot scale skid to the host site.
- Install the skid and connect utilities, brine supply, and return.
- Test the system to verify skid operation and safety features.
- Operate pilot scale skid with geothermal brine and collect process data.
- Collect feed, return, and in-process samples for analysis.
- Prepare an *Operations Report* summarizing the demonstration activities and the data collected.
- Develop process model and prepare a *Techno-Economic Analysis Report*

Products:

- Operations Report (draft and final)
- Techno-Economic Analysis Report (draft and final)

EXHIBIT A

Scope of Work

Materials Research LLC

TASK 8: EVALUATION OF PROJECT BENEFITS

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

The Recipient shall:

- Complete the *Initial Project Benefits Questionnaire*. The Initial Project Benefits Questionnaire shall be initially completed by the Recipient with 'Kick-off' selected for the 'Relevant data collection period' and submitted to the CAM for review and approval.
- Complete the *Annual Survey* by January 31st of each year. The Annual Survey includes but is not limited to the following information:
 - Technology commercialization progress
 - New media and publications
 - Company growth
 - Follow-on funding and awards received
- Complete the *Final Project Benefits Questionnaire*. The Final Project Benefits Questionnaire shall be completed by the Recipient with 'Final' selected for the 'Relevant data collection period' and submitted to the CAM for review and approval.
- Respond to CAM questions regarding the questionnaire drafts.
- Complete and update the project profile on the CEC's public online project and recipient directory on the [Energize Innovation website \(www.energizeinnovation.fund\)](http://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 \(www.energizeinnovation.fund\)](http://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 9 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.

EXHIBIT A

Scope of Work

Materials Research LLC

The Recipient Shall:

- 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

V. PROJECT SCHEDULE

Please see the attached Excel spreadsheet.



MEMORANDUM

TO: David Hochschild
Andrew McAllister
Siva Gunda
Noemí Gallardo
Nancy Skinner

FROM: Chuck Gentry
Mechanical Engineer, Energy Research and Development Division

SUBJECT: California Environmental Quality Act Analysis for EPC-24-043, Materials Research LLC's Geothermal Brine pretreatment and Metal Recovery

DATE: March, 5, 2025

I am a Mechanical Engineer in the Research and Development Division, California Energy Commission (CEC), and the CEC's Agreement Manager for proposed Agreement EPC-24-043 (Agreement).

This memo analyzes the environmental impacts of the proposed grant Agreement, which is part of a separate, but overlapping Project, considered and approved by the lead agency, Imperial County (County). The County evaluated Conditional Use Permit Application No. 21-0020 and 21-0021, for the Hell's Kitchen PowerCo 1 and LithiumCo 1 Project (Project), proposed by Controlled Thermal Resources (US) Inc. via its subsidiaries, which is described in the County's California Environmental Quality Act (CEQA) documentation as a project to develop and operate a 49.9 MW geothermal power plant and a mineral extraction and processing facility on land currently owned by the Imperial Irrigation District in the unincorporated area of Imperial County. The approximately 1881.72 acre geothermal leasing area borders the Salton Sea, and is within the area known as the Salton Sea Known Geothermal Resource Area. The Project involves construction and operation of a geothermal power plant, a mineral-extraction facility, well pads with geothermal production and injection wells, pipelines between facilities, mineral handling and packaging facilities, and a 230-kV gen-tie line. The Project also includes the construction of shared administrative facilities, offices, repair facilities, shipping and receiving facilities, ingress and egress to the Project site from Davis Road, and the paving of Davis Road from McDonald Road to Noffsinger Road. The estimated area of disturbance for the Project is approximately 68 acres.

The proposed Agreement will allow the grantee, Materials Research LLC, to design, construct, and demonstrate a pilot scale geothermal brine treatment and metal recovery system at the Salton Sea Known Geothermal Resource Area, which relates to the Hell's Kitchen LithiumCo1 portion of the Project.

Pursuant to my work on the Agreement, including the scope of work for the Agreement, I have reviewed the County's CEQA documents relevant to the Agreement. These CEQA documents include: (1) the Final Environmental Impact Report (FEIR) for the Hell's Kitchen PowerCo 1 and LithiumCo 1 Project; (2) the Findings of Fact and Statement of Overriding Consideration for the FEIR; (3) Board of Supervisors Resolution certifying the FEIR and CEQA Findings; (4) Mitigation Monitoring and Reporting Program; (5) Board of Supervisors Resolution approving the Mitigation, Monitoring, and Reporting Program; (6) Board of Supervisors Resolution approving the Conditional Use Permit #21-0020; (7) Board of Supervisors Resolution approving the Conditional Use Permit #21-0021; (8) Board of Supervisors Resolution approving the Variance #21-0004; (9) Board of Supervisors Resolution approving the Variance #21-0005; (10) the Notice of Determination for the FEIR; (11) Judgment for Case No. ECU003425.

The County's Findings of Fact and Statement of Overriding Considerations, states that the inclusion of mitigation measures will reduce most potential significant effects to a less than significant level, and no impacts will remain Significant and Unavoidable.

Following the County's approval of Hell's Kitchen's geothermal power plant and lithium extraction plant, Comitè Civico Del Valle (Petitioners) challenged the Project's approvals on various violations of the California Environmental Quality Act. A hearing was held and a judgment was issued denying the Petition for Writ of Mandate.

Based on my review and consideration of the above documents, it is my independent and professional opinion that, there have been no new Project changes since the above CEQA documents have been finalized, and no new, additional, or increased significant environmental impacts have occurred. There are no substantial changes in the proposed project, or with respect to the circumstances under which the project will be undertaken, which would have required a subsequent EIR. Furthermore, I have not identified any new information which would change the conclusions of the County's CEQA documents, or render those conclusions inadequate.

It is also my independent and professional opinion that the work to be performed under the proposed Agreement falls within the scope of the County's CEQA documents, and that the Agreement will not result in any new significant environmental impacts beyond those already considered. Finally, I have not identified any new mitigation measures, within the CEC's authority, that would lessen or further mitigate the impacts of the Project.

The reasons for my conclusions are as follows:

The proposed agreement includes developing and demonstrating a new brine treatment process based on metal sulfide precipitation. This process will not only remove interfering minerals to enable direct lithium extraction but will also allow the recovery of valuable critical minerals like zinc and manganese from the geothermal brine. The prototype will be demonstrated at the site using brine from the Hell's Kitchen Project under Conditional Use Permits #21-0020 and #21-0021. A slip stream of brine (about 5-10 liters per minute) will be provided to the prototype and remaining brine will be returned to the facility.

All of the construction, operation, and other activities described in the scope of work of the proposed Agreement fall within the activities evaluated by the County's CEQA documents identified above. The scope of work of the proposed Agreement has no conflicts of information with the County's FEIR.

Aesthetics

The EIR found that the Project is located in a vacant, non-urbanized area characterized by agricultural and open space uses, near the Salton Sea. The EIR found the Project's impacts on Aesthetics would be less than significant. The proposed Agreement will not have any impact on aesthetics, and will not change the impacts identified in the County's CEQA documents.

Agriculture and Forest Resources

The EIR found that the Project would have no impact on Agriculture and Forest Resources. The proposed Agreement will not have any impact on agricultural resources, and will not change the impacts identified in the County's CEQA documents.

Air Quality

The EIR found that with the implementation of the mitigation measures, the Project's impacts to air quality would be reduced to a level less than significant. The proposed Agreement will not have any impact on air quality, and will not change the impacts identified in the County's CEQA documents.

Biological Resources

The EIR found that with the implementation of the mitigation measures, the Project's impacts to biological resources would be reduced to a less than significant level. The proposed Agreement will not have any impact on biological resources, and will not change the impacts identified in the County's CEQA documents.

Cultural Resources

The EIR found that with the implementation of the mitigation measures the Project's potential impacts related to cultural resources would remain less than significant. The proposed Agreement will not have any impact on cultural resources, and will not change the impacts identified in the County's CEQA documents.

Energy

The EIR found the Project's impacts related to energy are less than significant. The proposed Agreement will not have any impact on energy, and will not change the impacts identified in the County's CEQA documents.

Geology and Soils

The EIR found that with the implementation of the mitigation measures, the Project's potential impacts related to geology and soils would be reduced to less than significant. The proposed Agreement will not have any impact on geology and soils, and will not change the impacts identified in the County's CEQA documents.

Greenhouse Gases

The EIR found that the Project would result in less than significant impacts related to Greenhouse Gas issues. The proposed Agreement will not have any impact on greenhouse gases, and will not change the impacts identified in the County's CEQA documents.

Hazards and Hazardous Materials

The EIR found that with the implementation of mitigation measures, the Project's impacts related to hazards and hazardous materials would be less than significant. The proposed Agreement will not have any impact

on hazards and hazardous materials, and will not change the impacts identified in the County's CEQA documents.

Hydrology and Water Quality

The EIR found that with the implementation of mitigation measures and best management practices that the Project's impacts on the surface water quality would be reduced to less than significant and potential water quality impact from discharges would be reduced to less than significant. The proposed Agreement will not have any impact on hydrology and water quality, and will not change the impacts identified in the County's CEQA documents.

Land Use and Planning

The EIR found that the Project would result in less than significant impacts relating to land use and planning. The proposed Agreement will not have any impact on land use and planning, and will not change the impacts identified in the County's CEQA documents.

Mineral Resources

The EIR found the Project would have no impact on mineral resources. The proposed Agreement will not have any impact on mineral resources, and will not change the impacts identified in the County's CEQA documents.

Noise

The EIR found the Project impacts would have no impact on noise. The proposed Agreement will not have any impact on noise, and will not change the impacts identified in the County's CEQA documents.

Population and Housing

The EIR found the Project 's impacts on population and housing would be less than significant. The proposed Agreement will not have any impact on population and housing, and will not change the impacts identified in the County's CEQA documents.

Public Services

The EIR found the Project would have less than significant impacts relating to Public Services. The proposed Agreement will not have any impact on public services, and will not change the impacts identified in the County's CEQA documents.

Recreation

The EIR found the Project would have no impact on recreation. The proposed Agreement will not have any impact on recreation, and will not change the impacts identified in the County's CEQA documents.

Transportation

The EIR found that the Project's impacts on transportation would be less than significant. The proposed Agreement will not have any impact on transportation, and will not change the impacts identified in the County's CEQA documents.

Tribal Cultural resources

The EIR found that with the implementation of mitigation measures, the Project's impacts would be less than significant. The proposed Agreement will not have any impact on tribal cultural resources, and will not change the impacts identified in the County's CEQA documents.

Utilities and Service Systems

The EIR found that with the implementation of mitigation measures, the Project's impacts would be less than significant. The proposed Agreement will not have any impact on utilities and service systems, and will not change the impacts identified in the County's CEQA documents.

Wildfire

The EIR found that the Project's impact on wildfires are less than significant. The proposed Agreement will not have any impact on wildfire, and will not change the impacts identified in the County's CEQA documents.

The full California Environmental Quality Act (CEQA) supporting documentation for EPC-24-043 can be obtained at:

Draft EIR, State Clearinghouse No. 2022030704:

<https://ceqanet.opr.ca.gov/2022030704/3>

Final EIR:

<https://www.icpds.com/planning/environmental-impact-reports/final-eirs/cup21-0020-21-hell-s-kitchen-power-and-lithium-feir>

Findings of Fact and Statement of Overriding Consideration:

<https://www.icpds.com/assets/hearings/APP23-0004-Hell's-Kitchen-Complete-Board-PKG--01-23-24.pdf>

Resolution certifying the FEIR and CEQA Findings:

<https://www.icpds.com/assets/hearings/APP23-0004-Hell's-Kitchen-Complete-Board-PKG--01-23-24.pdf>

Mitigation Monitoring and Reporting Program (MMRP):

<https://www.icpds.com/assets/hearings/APP23-0004-Hell's-Kitchen-Complete-Board-PKG--01-23-24.pdf>

Resolutions approving MMRP, CUP #21-0020, CUP #21-0021, Variance #21-0004, Variance #21-0005:

<https://www.icpds.com/assets/hearings/APP23-0004-Hell's-Kitchen-Complete-Board-PKG--01-23-24.pdf>

Notice of Determination available at:

<https://ceqanet.opr.ca.gov/2022030704/5>