



**CALIFORNIA  
ENERGY COMMISSION**



**California Energy Commission  
April 10, 2024 Business Meeting  
Backup Materials for National Technology &  
Engineering Solutions of Sandia, LLC as Management  
and Operating Contractor for the Sandia National  
Laboratories**

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. CRADA Statement of Work
4. Project Task Statement 1
5. Project Task Statement 2

**[PROPOSED]**

**RESOLUTION NO: 24-0410-12**

**STATE OF CALIFORNIA**

**STATE ENERGY RESOURCES  
CONSERVATION AND DEVELOPMENT COMMISSION**

**RESOLUTION: National Technology & Engineering Solutions of Sandia, LLC as Management and Operating Contractor for the Sandia National Laboratories, hereinafter referred to as "Sandia National Laboratories"**

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

**RESOLVED**, that the CEC approves agreement LDS-23-001 with Sandia National Laboratories for a \$2,000,000 federal cost share grant through a Cooperative Research and Development Agreement to perform critical evaluation of energy storage technologies and technoeconomic analysis to assist the CEC in the implementation of LDES demonstration projects; and

**RESOLVED**, the Executive Director, or his or her designee, may approve changes to the CRADA and project task statements consistent with Resolution 20-1812-1a that describes the types of changes and criteria for approving changes. This delegation includes approving new project task statements that are consistent with the CRADA Statement of Work but do not involve additional CEC funds.

**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 April 10, 2024.

AYE:  
NAY:  
ABSENT:  
ABSTAIN:

\_\_\_\_\_  
Kristine Banaag  
Secretariat

Dated:



## GRANT REQUEST FORM (GRF)

### A. New Agreement Number

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

**New Agreement Number:** LDS-23-001

### B. Division Information

1. Division Name: ERDD
2. Agreement Manager: Caitlin Planchard
3. MS-: 51
4. Phone Number: Enter Phone Number

### C. Recipient's Information

1. Recipient's Legal Name: National Technology & Engineering Solutions of Sandia, LLC as Management and Operating Contractor for the Sandia National Laboratories, hereinafter referred to as "Sandia National Laboratories".
2. Federal ID Number: 85-0097942

### D. Title of Project

Title of project: Evaluation of Long Duration Energy Storage Technologies

### E. Term and Amount

1. Start Date: 5/10/2024
2. End Date: 05/10/28
3. Amount: \$2,000,000.00

### F. Business Meeting Information

1. Are the ARFVTP agreements \$75K and under delegated to Executive Director? No
2. The Proposed Business Meeting Date: 4/10/2024 .
3. Consent or Discussion? Discussion
4. Business Meeting Presenter Name: Caitlin Planchard
5. Time Needed for Business Meeting: 5 minutes.
6. The email subscription topic is: Research (Energy RD&D / PIER program).

#### **Agenda Item Subject and Description:**

Sandia National Laboratories

Proposed resolution approving agreement LDS-23-001 with Sandia National Laboratories for a \$2,000,000.00 federal cost share grant through a Cooperative Research and Development Agreement to perform critical evaluation of energy storage technologies and technoeconomic analysis to assist the CEC in the implementation of LDES demonstration projects, and adopting staff's determination that this project is exempt from CEQA. Sandia National Labs will develop tools to quantify the greenhouse gas emissions reductions. Sandia National Labs will also participate in the DOE LDES Consortium to shape policies and share best practices for wider adaptation of LDES in the US. (LDES funding) Contact: Caitlin Planchard



## 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”:

### 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, § 15306 ;

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

Yes

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

Cal. Code Regs., tit. 14, sec. 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. These may be strictly for information gathering purposes, or as part of a study leading to an action which a public agency has not yet approved, adopted, or funded. (Section 21083, Public Resources Code. Reference: Section 21084, Public Resources Code.) This project involves evaluation of energy storage technologies and technoeconomic analysis to support implementation of various LDES demonstration projects and does not include any serious or major disturbance to an environmental resource.

The project activity is also covered by the common sense exemption that CEQA applies only to projects which have the potential for causing a significant effect on the environment. Where it can be seen with certainty that there is no possibility that the activity in question may have a significant effect on the environment, the activity is not subject to CEQA. The work performed under this agreement includes various analysis of energy storage technology, site visits, development of GHG emission



reduction quantification, development of safety reports and web-based tools to support long duration energy storage projects and there is no possibility that these activities may have a significant effect on the environment. Any LDES demonstration projects that may utilize the analysis or other information developed will be approved through separate agreements.

The project will not impact an environmental resource of hazardous or critical concern where designated, precisely mapped, and officially adopted pursuant to law by federal, state, or local agencies; 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 to this project, and this project will not have a significant effect on the environment.

b) Agreement **IS NOT** exempt.

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

No

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

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

## H. 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
No subcontractors to report	\$	\$

## I. 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	\$	\$

**J. 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

**K. 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
GGRF	23-24	303.201	\$ 2,000,000

**TOTAL Amount: \$ 2,000,000**

R&D Program Area: ESTB: ETSI

Explanation for “Other” selection Not applicable

Reimbursement Contract #: Not applicable

Federal Agreement #: DE-LC-000L001

**L. Recipient’s Contact Information**

**1. Recipient’s Administrator/Officer**

Name: Jason Martinez

Address: , P.O.Box 5800

City, State, Zip: Albuquerque, NM 87125

Phone: 505-220-8266

E-Mail: jdmarti@sandia.gov

**3. Recipient’s Project Manager**

Name: Ramesh Koripella

Address: 1515 Eubank Blvd Se

City, State, Zip: Albuquerque, NM 87123-3453

Phone: 505-845-7644



E-Mail: crkorip@sandia.gov

**M. Selection Process Used**

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

Selection Process	Additional Information
Competitive Solicitation #	Not applicable
First Come First Served Solicitation #	Not applicable
Other	This noncompetitive award is authorized under PRC § 25643(d)(2) because the recipient is a national laboratory or an entity contracted by the federal government to operate a national laboratory.

**N. 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:** Caitlin Planchard

**Approval Date:** 02/22/2024

**Branch Manager:** Reynaldo Gonzalez

**Approval Date:** 02/26/2024

**Director:** Delegated to Branch Manager

**Approval Date:** 02/26/2024

## Annex A

### Umbrella Statement of Work

CRADA No. [\[assigned by NTESS CRADA Staff\]](#)

### Implementation of Long Duration Energy Storage (LDES) Systems in CA

#### ACRONYMS

Acronym	Definition
CARB	California Air Resources Board
CEC	California Energy Commission
CRADA	Cooperative Research and Development Agreement
DOE	U.S. Department of Energy
LDES	Long Duration Energy Storage
NNSA	National Nuclear Security Administration
NTESS	National Technology & Engineering Solutions of Sandia, LLC
PTS	Project Task Statement
ReNCAT	Resilient Node Cluster Analysis Tool
ROVI	Rapid Operational Validation Initiative

#### A. PURPOSE

Stationary electrical energy storage has been recognized as a critical need in California to implement the clean energy goals defined in Senate Bill (SB) 100, an enacted California legislation. To assist the California Energy Commission (CEC), NTESS will provide technical assistance by sharing knowledge on various energy storage technologies, applications, and science, assist CEC in the evaluation and implementation of energy storage deployed projects, and collaboratively evaluate available energy analysis tools.

#### Reasons for Cooperation

- The proposed work under this Umbrella Cooperative Research and Development Agreement (CRADA) involves performing a critical evaluation of various energy storage technologies, reviewing energy storage analysis, and providing knowledge share and engineering support to CEC on the implementation of energy storage demonstration projects utilizing existing and new technologies as a part of the CA state clean energy initiative. The U.S. Department of Energy (DOE)/ National Nuclear Security Administration (NNSA) share a mission to accelerate the implementation of clean energy initiatives nationwide, including energy storage, to reduce global greenhouse gas emissions and for energy security.



- Energy storage plays a key part in integrating renewable energy sources into the electricity grid. Selection of appropriate technologies, evaluation of the safety aspects, technical risks, and ability of the vendors to scale up newer technologies is needed. Critical review and optimization of the storage analysis for different use case scenarios for various demonstration projects are also important aspects of this process. NTESS - Energy Storage Technologies and Systems group has vast research and development experience in various energy storage technologies for grid scale applications and has developed a public domain software tool called QuEST to help analyze the use case scenarios for the selection of appropriate energy storage technology for capacity (MW) and duration (hours) to maximize the benefits under various use case scenarios. This software tool gathers real input data from utilities and grid operators. The cooperative research effort through these demonstration projects would help optimize the tools for wider adaptation and implementation of energy storage technologies in the U.S. grid to support the U.S. clean energy initiatives. NTESS has also developed the Battery Lifecycle Framework software that is available as an open-source platform. The framework provides tools to visualize, analyze, and share battery data from single cells to systems and is used to power [www.batteryarchive.org](http://www.batteryarchive.org), the largest repository of public Li-ion data. Similar tools for other technologies, such as long duration energy storage (LDES) technologies, could be developed with this cooperative effort.
- CEC, with its Electric Program Investment Charge Program, is the national leader in the implementation of energy storage systems. With its energy storage funding and LDES program under Cal. Pub. Resources Code sections 25640 et. seq, CEC will provide an opportunity for NTESS to conduct analysis, vet existing and new technologies, and remain a leader in the research and analysis of energy storage.

### **Public Abstract**

California Energy Commission (CEC) and National Technology & Engineering Solutions of Sandia, LLC (NTESS) are working under a Collaborative Research and Development Agreement (CRADA) to help in the rapid implementation of energy storage technologies in California to meet the clean energy goals defined in SB-100. Under this CRADA, NTESS will work collaboratively with CEC to assist in the evaluation and implementation of energy storage projects, optimization of the energy storage analysis tools, and assimilate the information in the public domain for nationwide use.

### **B. SCOPE**

- Assessment of various LDES technologies and providers.
- Provide technical and manufacturability assistance to help commercialize promising LDES technologies supported with CEC and/or DOE grants.

- Engineering analysis to optimize power/energy and placement of energy storage systems.
- Evaluation of energy storage analysis and simulation tools.
- Evaluation of energy storage materials, technology, systems, performance, and safety requirements.
- Provide appropriate training on energy storage technologies to CEC staff and other CA agencies.
- Creation of web-based dashboards to visualize and share data from the demonstration programs.

### **Duration of CRADA**

The period of performance of this CRADA is 48 months.

### **Category Descriptions**

**Category 1:** Provide technoeconomic analysis support to the CEC/DOE funded LDES installation projects.

#### Discussion:

- This category is intended for LDES installation projects that will be funded under a DOE grant and will be studied by the NTESS team to determine its performance profile. CEC anticipates providing match funding through a separate agreement to support the DOE grant. The NTESS team will analyze system performance and model, in partnership with CEC and the participating LDES technology party.
- NTESS will perform technoeconomic analysis in all phases of the project, starting with the identification of use cases for the LDES. NTESS will align these with community benefits, such as resilience, environmental, and economic benefits. NTESS will specify field measurements, operational, and manufacturers' data that will be needed for technoeconomic analysis, life cycle assessment, and levelized cost of storage analysis using Rapid Operational Validation Initiative (ROVI) guidelines. NTESS will also perform optimization to contribute to system sizing. NTESS will leverage existing DOE-funded software tools in energy storage analytics and resilience (QuEst, ReNCAT) to quantify the economic and resilience value of the proposed system and potential community benefits.
- QuEst tool will be used to evaluate different energy storage technologies, system configurations, and revenue streams, providing insights into optimal uses of LDES to enhance grid and system reliability and reduce costs. ReNCAT (Resilient Node Cluster Analysis Tool) is a risk and resilience assessment tool that helps evaluate the potential risks and impacts of

disruptive events on energy systems and assess the resilience value of the LDES system through the Social Burden metric.

**Category 2:** Quantification of the reduction of greenhouse gas emissions of energy storage.

Discussion:

- Develop methodology and greenhouse gas reduction metrics for installed and planned CEC-funded energy storage programs.
- Identify direct fossil fuel power replacement options with energy storage, model clean energy renewable power generation enabled with energy storage and quantify the influence of these power generation choices on greenhouse gas emission reductions using California Air Resources Board (CARB) guidelines.
- Develop tools to quantify the effect of energy storage on greenhouse gas emissions reduction.
- Offer web-based visualization tools to display demonstration data.

**Category 3:** Evaluation of the energy storage analysis tools

Discussion:

- Evaluation of energy storage analysis work done by third party vendors for CEC. Review and provide comments as appropriate.
- Provide cost/benefit analysis of CEC-funded demonstration projects.
- Assist in the optimization and validation of the analysis tools with field data where applicable.
- Greenhouse gas emissions reduction quantification tools development.
- Offer web-based visualization tools to display demonstration data.

**Category 4:** Provide technical assistance and knowledge sharing to CEC staff on energy storage technologies and implementation.

Discussion:

- Participate in field trips and factory visits to assess the technologies of interest to CEC.
- Perform detailed technical analysis of the storage technologies. Assist in the evaluation of vendors and their ability to scale up to meet the demonstration goals.
- Provide technical assistance in the installation, codes, and safety aspects for LDES field projects.
- Generate detailed analysis reports.

- Work with CEC staff and knowledge share on various energy storage technologies and field experiences.

**Category 5:** Contribute to energy storage safety and dissemination of energy storage knowledge.

Discussion:

- Participate in California energy storage safety working group and provide expertise in the application of safety codes and standards.
- Work collaboratively with CEC to disseminate energy storage experience and knowledge through the DOE LDES Consortium and other venues to stimulate wider adaptation of energy storage technologies across the country.

**C. ESTIMATED COST**

The estimated contribution by the Participant and the Government for each cooperative research project shall be as set forth in the specific Project Task Statements (PTS's) entered under this CRADA, subject to available funding, and in accordance with conditions set forth in Section E. of each PTS.

#### **D. TECHNICAL CONTACTS**

##### **For NTESS:**

(Principal Investigator)

Ramesh Koripella

Org:08811/MS 1108

(505) 845-7644

[crkorip@sandia.gov](mailto:crkorip@sandia.gov)

##### **For Participant:**

CEC (Principal Investigator)

Caitlin Planchard

(916) 637-8128

[caitlin.planchard@energy.ca.gov](mailto:caitlin.planchard@energy.ca.gov)

## PROJECT TASK STATEMENT 1 (PTS 1)

No. [Assigned by NTESS's CRADA Office]

### BETWEEN

**National Technology & Engineering Solutions of Sandia, LLC**  
(hereinafter NTESS)

### AND

**California Energy Commission (CEC),**  
an agency of the State of California  
having a principal office in Sacramento, CA  
(hereinafter "Participant")

### Implementation of Energy Storage Systems in California

This Project Task Statement (PTS 1) is under the authority and subject to all terms and conditions of Cooperative Research and Development Agreement (CRADA) No. SCXX/0XXXX.

### ACRONYMS

Acronym	Definition
CEC	California Energy Commission
CPUC	California Public Utilities Commission
CRADA	Cooperative Research and Development Agreement
DOE	U.S. Department of Energy
EST&S	Energy Storage Technologies and Systems
LDES	Long Duration Energy Storage
NNSA	National Nuclear Security Administration
NTESS	National Technology & Engineering Solutions of Sandia
PTS	Project Task Statement

### A. PURPOSE

Energy storage has been recognized as a critical need in California to meet the clean energy goals defined in Senate Bill (SB) 100 enacted by California legislation. As California continues to conduct research and development in the area, they have asked NTESS to provide technical assistance in evaluating various long duration energy storage (LDES) technologies and quantifying the effect of energy storage in reducing greenhouse gas emissions for CEC

consideration. NTESS will also support CEC energy storage safety group on the safety aspects of lithium-ion battery and various non-lithium-ion energy storage technologies, participate in the U.S. Department of Energy (DOE) LDES Consortium to guide policies for both the rapid integration of LDES technologies in the electricity grid and implementation of field projects, and collaboratively evaluate the energy analysis tools and perform analyses. Of particular interest to both the CEC and NTESS is LDES – the technologies, applications, safety, optimal sizing, and quantification of greenhouse gas emissions reduction.

### **Reasons for Cooperation**

See Annex A, Statement of Work, to CRADA SCXX/0XXXX.

- The proposed work involves performing the critical evaluation of different energy storage technologies to assist CEC in the implementation of demonstration projects as a part of the clean energy initiative. NTESS will develop methodologies and perform analyses to quantify the reduction in greenhouse gas emissions with energy storage for CEC consideration. DOE/National Nuclear Security Administration (NNSA) share a mission to accelerate the implementation of clean energy initiatives in the U.S. to reduce global greenhouse gas emissions and for energy security.
- Energy storage plays a key part in incorporating renewable energy sources into the electricity grid. Selecting appropriate technologies, understanding the technology readiness levels, evaluating the safety aspects, and performing use case analysis is important for implementing the demonstration projects. NTESS Energy Storage Technologies and Systems (EST&S) group has vast R&D experience in various energy storage technologies for grid scale applications and analysis tools to select the appropriate energy storage technology for capacity (MW) and duration (hours) to maximize the benefits under various use case scenarios. In addition, NTESS EST&S has extensive project development and installation experience to help develop the codes and safety aspects of various LDES technologies.
- NTESS developed a public domain analysis software called QuEst. This software tool gathers real input data from utilities and grid operators. The cooperative research effort through these early demonstration projects would help optimize the tools for wider adaptation and implementation of energy storage technologies in the grid to support the U.S. clean energy initiatives. Further development work is needed to add additional modules for the quantification of the reduction of greenhouse gas emissions with energy storage. This CRADA provides an opportunity to evaluate various energy storage technologies and the development of appropriate modeling tools that will help pave the way for technology adaptation in the US, optimization of energy storage analysis tools under various use case scenarios, and quantification of the reduction of greenhouse gas emissions.

- NTESS has developed the Battery Lifecycle Framework software that is available as an open-source platform. The framework provides web tools to visualize, analyze, and share battery data from single cells to systems and is used to power [www.batteryarchive.org](http://www.batteryarchive.org), the largest repository of public lithium-ion battery data. This collaborative effort will help further develop and expand the scope of this framework.
- California has one of the most extensive renewable energy and energy storage programs in the world. The CEC's funding for the LDES program comes from the California Climate Investments (CCI). (Cal. Gov. Code §§ 16428.8 et. seq; Cal. Pub. Resources Code §§ 25640 et. seq. CCI program requires that all funded projects must facilitate the achievement of greenhouse gas emission reductions and further the purposes of AB 32 (AB 32, Nunez, Global Warming Solutions Act of 2006, Chapter 488, 2006), SB 32 (SB 32, Pavley, California Global Warming Solutions Act of 2006, Chapter 249, 2016), and related statutes. This program allows NTESS to be involved with and gain knowledge from technologies and projects they would not have access to otherwise.

### **Public Abstract**

CEC and NTESS are working under a CRADA to help in the rapid implementation of LDES technologies in California to meet the clean energy goals defined in SB-100. Under this CRADA, NTESS will work collaboratively with CEC to help in the evaluation and safety aspects of energy storage projects in California. Additionally, this work will optimize energy storage analysis tools, quantify the effect of LDES in reducing greenhouse gas emissions, and help to assimilate the information in the public domain for nationwide use.

## **B. SCOPE**

### **Duration of PTS**

The period of performance of this PTS is 36 months.

### **Technical Objectives**

- Working collaboratively with CEC staff, assist in the critical evaluation of the various energy storage technologies, their safety aspects, and evaluation of the providers of demonstration projects in CA.
- Develop methodologies and perform analysis to quantify the effect of energy storage on the reduction of greenhouse gas emissions for CEC consideration.
- Review energy storage analysis work and help optimize the analysis tools. Participate in the DOE LDES Consortium to shape policies and share best practices for wider adaptation of LDES in the US.



**Tasks and Division of Responsibilities (this Table is a broad outline. For details on the deliverables and milestones see the sections below)**

<b>Phase No.</b>	<b>Task No.</b>	<b>Subtask No.</b>	<b>Task Title</b>	<b>Duration (Starting &amp; Ending Project Month)</b>	<b>Responsible Parties</b>
1	1	1	Develop methodologies, software tools to quantify greenhouse gas emission reductions from the implementation of LDES projects in CA	01-12	NTESS
1	1	2	Perform simulations and analysis work on greenhouse gas emission reduction quantification. Prepare reports.	01-24	NTESS
1	2	1	Provide technical assistance on the safety aspects of various lithium-ion and non-lithium-ion LDES technologies and implementation of demonstration projects in CA.	01-36	NTESS/CEC
1	2	2	Installation, safety, data analysis of different energy storage technologies under consideration. Prepare reports	01-24	NTESS/CEC
1	3	1	Participation in LDS consortium to shape policies, share best practices, disseminate lessons learned information from CA for wider US adaptation	01-36	NTESS/CEC

Phase No.	Task No.	Subtask No.	Task Title	Duration (Starting & Ending Project Month)	Responsible Parties
1	4	1	Provide LDES site and technology evaluations for new CEC energy storage installations	01-36	NTESS/CEC
	5		Prepare Final Report		NTESS/CEC

### Task Descriptions

#### Task 1: Develop greenhouse gas emission reduction metrics

##### The Parties shall:

- Develop methodology to quantify the greenhouse gas emissions reduction from energy storage for installed and planned energy storage systems funded by the CEC.
- Develop software modules for QuEST using California Air Resources Board (CARB) suggested approaches for quantification as directed by CEC staff.
- Identify direct fossil fuel power replacement options with energy storage, model clean energy renewable power generation enabled with energy storage and quantify the influence of these power generation choices on greenhouse gas emission reductions as directed by CEC staff.
- Perform simulations and analyses on reducing greenhouse gas emissions with energy storage installations past and upcoming in the state of CA as directed by CEC staff.
- Perform similar analyses on the power imported into CA as directed by CEC staff.
- Develop a report to summarize the findings on the greenhouse gas emissions reduction analysis and results of the modified QuEST software.

Working closely with CEC, NTESS will gather information on various LDES projects in CA for analysis. NTESS will gather and use information on CARB methodologies for quantifying greenhouse gas emissions for CEC consideration. NTESS will develop quantification methodologies, develop software tools, and perform simulations and analysis for CEC consideration.

##### Deliverables:

- Scope of analysis using CARB approach and selected sites.
- Report and/or presentation on the greenhouse gas emissions quantification methodology.

- Initial QuEST result example report and presentation.
- Report on greenhouse gas emissions reduction and modified QuEST software.

**Milestones:**

6 months	Scope the project. Both parties agree on the LDES projects to be included along with their parameters to be used in analysis. Review CARB guidelines for greenhouse gas quantification.
End of Year 1	Submit report and/or make a presentation to CEC on the greenhouse gas emissions quantification methodology.
End of Year 2	Deliver report on QuEST software module development and simulations results.
End of Year 3	Submit final project report on simulations for selected sites with different storage sizes and technologies.

**Task 2: Support CEC energy storage safety working group**

**The Parties shall:**

- Assist CEC Energy storage safety working group on the safety aspects of lithium-ion battery and non-lithium-ion LDES technologies during installation, operation, and maintenance.
- Actively participate in CEC energy storage safety working group.
- Aid in developing safety guidelines of lithium-ion battery energy storage installations. Develop good work practices for the installation, operation, and maintenance of these energy storage installations for CEC consideration.
- Develop similar procedures for newer non-lithium-ion energy storage technologies, such as Zinc-Bromide, Zinc-air, thermal storage, gravity storage, etc. for CEC consideration.
- Review relevant safety reports and documentation from entities such as the CEC and CPUC.

**Deliverables:**

- Meeting memos from safety working group meetings.
- Critical review of safety reports and documentation.
- Reports on the safety aspects of various lithium-ion and non-lithium-ion LDES technologies.

**Milestones:**

Biweekly or as the meetings occur	Develop the scope of the task and establish NTESS role in the energy storage safety working group. Actively participate in the meeting discussions, review existing safety documents.
End of Year 1	Provide critical review of CEC or CPUC documentation, provide feedback and any suggestions for improvement.
End of Year 2	Deliver report on the safety aspects of various lithium-ion LDES technologies, as determined in agreement with CEC.
End of Year 3	Deliver report on the safety aspects of other non-lithium-ion LDES technologies, as determined in agreement with CEC.

**Task 3: Support the DOE LDES Consortium**

**The Parties shall:**

- Participate in discussions with a group of experts to shape DOE LDES policies and share findings with the CEC.
- Share CEC experiences and best practices with LDES installations, financing, and policies.
- Guide policies to increase LDES deployments nationwide.
- Develop a report on the commercialization of LDES technologies based on discussions about LDES

**Deliverables:**

- LDES Consortium meeting memos reported to the CEC.
- Contribute to the LDES Consortium final reports on LDES policies to be delivered to DOE and shared with the CEC.
- Commercialization report based on the LDES Consortium efforts.

**Task 4: Provide LDES site and technology evaluations**

**The Parties shall:**

- Provide site and technology evaluations for new CEC energy storage installations.
- Participate in field trips and factory visits to assess the technologies of interest to CEC.
- Assess the technology readiness for operational use in California for behind and front of the meter use cases as directed by CEC staff and leadership.

- Assess the scaling potential based on manufacturing capability and supply chain availability as directed by CEC staff and leadership.
- Assess the market potential to determine long-term viability of the technology/product as directed by CEC staff and leadership.
- Evaluate proposed LDES technologies to determine technology readiness for CEC consideration.
- Evaluate vendor capability, especially the ability to scale up for demonstration projects for CEC applications for CEC consideration.

**Deliverables:**

- Technology and commercial assessment report for each technology and vendor evaluated, including briefing notes for each site visit.
- Annual reports on commercialization potential for LDES in California

**Task 5: General Project Tasks and Final Report**

**Discussion:**

The Parties will conduct a kickoff meeting, agreement on the scope of work, schedule, terms and conditions, funding, progress reports, final report, and relevant topics.

Upon completion or termination of this PTS, a final report will be developed by NTESS and CEC, which will include the following information:

- (1) A final abstract
- (2) Technical results/accomplishments
- (3) A list of PTS-generated Intellectual Property (Subject Inventions, Copyrights, Mask Works, and/or Trademarks)
- (4) A description of benefits to the DOE/NNSA
- (5) A description of benefits to the PTS Participant/s, industry, consumers/taxpayers, and/or U.S. economy.

NTESS, as project lead, will have primary responsibility for delivering the final report.

**Deliverables:**

- Kick-off meeting presentation
- Regularly scheduled teleconferences or meetings to report progress on tasks.
- Year-end progress reports
- Final report

**Milestones:**

1 month	Kick-off meeting: Coordinate with CEC for a CRADA kickoff meeting, agreement on the scope and deliverables and schedule.
End of Year 1	Year-end progress report.

End of Year 2	Year-end progress report.
End of Year 3	Final report on the CRADA activity, containing a final abstract, technical accomplishments, description of benefits to DOE/NNSA, CEC, taxpayers, and the US economy.

CRADA Tasks, deliverables					
ID	Task	Year 1	Year 2	Year 3	
1	<b>Quantification of GHG emissions reduction</b>				
	- Scope the project	■			
	- Methodology dev, CEC concurrence	■			
	- QuEst software module dev, simulations		■		
	-Final report with simulation results			■	
2	<b>Energy Storage Safety</b>				
	- Active participation in ES safety working groups	■	■	■	
	- Critical review and feedback on existing safety documents	■			
	- Report on Li LDES safety aspects		■		
	- Report on non-Li LDES safety aspects			■	
3	<b>Participation in LDES Consortium</b>				
	- Active participation in Tiger Teams providing CEC experiences in ES	■	■	■	
	- Contribute to the LDES consortium reports		■		
	- Deliver a report to CEC				◆
4	<b>Due diligence on ES technologies and companies.</b>				
	- Participate in ES installation site and factory visits	■	■	■	
	- ES technology reports	■	■	■	
	- Technical consultation help as needed	■	■	■	
5	<b>General Project Tasks and Final Report</b>				
	- Project management, arrange for regular meetings, periodic reports	■	■	■	

**C. ESTIMATED COST**

	PY1	PY2	PY3	Total
	(01-12 months)	(12-24 months)	(24-36 months)	
DOE contribution	\$250,000	\$250,000	\$250,000	\$750,000.00
Other Federal Funds	\$0.00	\$0.00	\$0.00	\$0.00
<b>Total NTESS Funds</b>				\$0.00
Funds-In Contribution	\$667,000	\$667,000	\$666,000	\$2,000,000.00

Paid 0.0% Fed Admin Chg	\$0.00	\$0.00	\$0.00	\$0.00
Total Participant Funds-In	\$667,000.00	\$667,000.00	\$666,000.00	2,000,000.00
In-Kind Contribution				
<i>(*In-Kind is a non-monetary estimation of the salary, equipment, travel, etc. that will be expended to support the collaboration)</i>	\$100,000	\$100,000	\$100,000	\$300,000
<b>Total Participant</b>	767,000	\$767,000	\$766,000	\$2,300,000.00
<b>Total CRADA Value</b>	\$1,017,000	\$1,017,000	\$1016,000	\$3,050,000.00

The CEC agrees to pay in advance for actual allowable expenditures incurred in accordance with the Budget Justification (Attachment 1). The rates in the Budget are rate caps, or the maximum amount allowed to be billed. NTESS can only invoice for actual expenses incurred at the NTESS’s actual rates not to exceed the rates specified in the Budget Justification (e.g., direct labor rates, fringe benefit rates, and indirect rates).

*Detailed project spent reports will be provided to CEC in a timely manner.*

**For NTESS:**

(Principal Investigator) Ramesh Koripella  
 Org 08811/MS 1108  
 (505)845-7644  
 crkorip@sandia.gov

**For Participant:**

(Principal Investigator) Caitlin Planchard  
 (916) 637-8128  
 caitlin.planchard@energy.ca.gov

**D. PAYMENT TERMS**

*NOTE: If the Participant is contributing funds-in to the laboratory, the appropriate payment terms will be inserted here; if no funds-in this section will be labeled as N/A*

The CEC shall provide sufficient funds in advance to reimburse NTESS for costs to be incurred in performance of the work described in this PTS, and the NTESS

shall have no obligation to perform in the absence of adequate advance funds. CEC's payment to NTESS shall be made in accordance with the remittance instructions included on NTESS's Invoice. If the estimated period of performance exceeds 90 days and the estimated cost exceeds \$25,000, the CEC may, with the NTESS's approval, advance funds incrementally. In such a case, the CEC shall provide to the NTESS, prior to any work being performed, an advance payment sufficient to cover anticipated work that will be performed for the first billing cycle. In addition, the CEC shall provide additional advance funding to ensure that funds remain available for work during subsequent billing cycles (collectively the advance payment amount of **\$170,000.00**). Following CEC's remittance of the advance payment, the NTESS will invoice the CEC each billing cycle (or as necessary) to maintain a balance of funding sufficient to cover anticipated work. CEC's payment shall be due no later than thirty (30) days after receipt of NTESS's invoice. Payment shall be made directly to the NTESS who will then notify the DOE as appropriate. Upon termination or completion, any excess funds shall be refunded by the NTESS to the CEC.

This agreement is funded by the Greenhouse Gas Reduction Fund created pursuant to Government Code section 16428.8 et. seq. CEC shall comply with the provisions of the laws enacted for spending of auction proceeds deposited into the Greenhouse Gas Reduction Fund, including without limitation: Health and Safety Code Section 39710 et. seq.; Government Code section 16428.8 – 16428.95, including any amendments to these sections.

**Budget Contingency Clause.**

It is mutually agreed that if the Budget Act of the current year and/or any subsequent years funding the agreement does not appropriate sufficient funds for the program, this agreement shall be of no further force and effect upon written notice by CEC pursuant to the CRADA terms. Participant shall provide NTESS with notice of such a lack of appropriated funds as soon as practicable but, in any event, prior to the time at which funds in NTESS's possession may no longer be spent. In this event, thereafter, the State of California (State) shall have no liability to pay any additional funds whatsoever to NTESS or to furnish any other considerations under this agreement and NTESS shall no longer be obligated to perform any provisions of this agreement. If funding for any fiscal year is reduced or deleted by the Budget Act for purposes of this program, the Participant shall have the option to either terminate this agreement with no liability occurring to the Participant therefrom, or offer an agreement amendment to NTESS to reflect the reduced amount.

**Travel and Per Diem.**

- A. Travel identified in Attachment 1 Budget Justification does not require prior authorization.
- B. Travel that is not included in the NTESS Budget Justification shall require prior written authorization from the CEC.



- C. Origination and destination points for calculating travel expenses shall be the NTESS's office location where the employees performing on the agreement are permanently assigned. NTESS shall be reimbursed for travel and per diem on the same basis as the DOE approved rates in effect during this agreement.
- D. NTESS will document travel expenses as follows:
- expenses must be detailed using the DOE-approved rates.
  - expenses must be documented by trip including dates and times of departure and return. Employee's travel expense report may be used instead.
  - NTESS will retain travel expense documentation and receipts for audit and verification to the extent audits are permitted by DOE policy.

This CRADA is subject to Gov. Code §8546.7.

**DRUG-FREE WORKPLACE REQUIREMENTS:** NTESS will comply with the requirements of the Drug-Free Workplace Act of 1990 and will provide a drug-free workplace by taking the following actions:

- a. Publish a statement notifying employees that unlawful manufacture, distribution, dispensation, possession or use of a controlled substance is prohibited and specifying actions to be taken against employees for violations.
- b. Establish a Drug-Free Awareness Program to inform employees about:
  - 1) the dangers of drug abuse in the workplace;
  - 2) the person's or organization's policy of maintaining a drug-free workplace;
  - 3) any available counseling, rehabilitation and employee assistance programs;and,
  - 4) penalties that may be imposed upon employees for drug abuse violations.
- c. Every employee who works on the proposed CRADA will:
  - 1) receive a copy of the company's drug-free workplace policy statement; and,
  - 2) agree to abide by the terms of the company's statement as a condition of employment on the CRADA.

Failure to comply with these requirements may result in suspension of payments under the CRADA or termination of the CRADA or both and NTESS may be ineligible for award of any future State agreements if the department determines that any of the following has occurred: the NTESS has made false certification, or violated the certification by failing to carry out the requirements as noted above. (Gov. Code § 8350 et seq.)

**E. PERSONAL PROPERTY**

None

**F. LOANED/BORROWED PROPERTY**

None

**G. BACKGROUND INTELLECTUAL PROPERTY**

Section H provides each Party the opportunity, as a matter of goodwill but not legal obligation, to declare its interests in Intellectual Property that has been created in the “background”, i.e., before or outside this PTS. The purpose is to forestall disputes over what is and what is not Generated Information.

Each Party may use another Party's Background Intellectual Property identified in Section G of this PTS solely in performance of research and development under the PTS. This PTS does not grant or promise to grant to a Party any option, grant, or license to commercialize, or otherwise use another Party's Background Intellectual Property. Licensing of Background Intellectual Property, if agreed to by the Parties, shall be the subject of separate licensing agreements between the Parties.

Each Party has used reasonable efforts to list all relevant Background Intellectual Property, but Intellectual Property may exist that is not identified. No Party shall be liable to another Party because of any failure to list Background Intellectual Property.

NTESS elects to declare an interest in the following Background Intellectual Property: *[State NONE, if appropriate.]*

**None**

NTESS elects to declare an interest in the following Background Intellectual Property: *[State NONE, if appropriate.]*

**None**

**APPROVAL**

**For NTESS:**

BY:

\_\_\_\_\_  
Mary Monson

TITLE: Senior Manager, Technology Partnerships & Business Development

DATE: \_\_\_\_\_

**For Participant:**

BY: \_\_\_\_\_

TITLE: \_\_\_\_\_

DATE: \_\_\_\_\_

**PROJECT TASK STATEMENT 2 (PTS 2)**

No. **[Assigned by NTESS's CRADA Office]**

**BETWEEN**

**National Technology & Engineering Solutions of Sandia, LLC  
(hereinafter NTESS)**

**AND**

**California Energy Commission (CEC),  
an agency of the State of California  
having a principal office in Sacramento, CA  
(hereinafter "Participant")**

**Implementation of Energy Storage System in California**

This Project Task Statement (PTS 2) is under the authority and subject to all terms and conditions of Cooperative Research and Development Agreement (CRADA) No. SCXX/0XXXX.

**ACRONYMS**

<b>Acronym</b>	<b>Definition</b>
CA	California
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CRADA	Cooperative Research and Development Agreement
DOE	U.S. Department of Energy
DVT	Design Validation Test
DWP	Demonstration Work Plan
EVT	Engineering Validation Test
FAT	Factory Acceptance test
LCOS	Levelized Cost of Storage
LDES	Long Duration Energy Storage
NEPA	National Environmental Policy Act
NTESS	National Technology & Engineering Solutions of Sandia
PTS	Project Task Statement
ROVI	Rapid Operational Validation Initiative
SAT	Site Acceptance Test

SNL	Sandia National Labs
TEA	Technoeconomic Analysis

## A. PURPOSE

Energy storage has been recognized as a critical need in California (CA) to implement the clean energy goals defined in Senate Bill (SB) 100 enacted by California legislation. As California continues to conduct research and development in the area, they have asked NTESS to provide technical assistance in the implementation of field projects and collaboratively evaluate the energy analysis tools and perform analysis. Recently, the U.S. Department of Energy (DOE) awarded a \$10M award to the National Labs team led by Sandia National Labs, to implement a 500kW, 24 hour long duration energy storage (LDES) system to demonstrate a resiliency application at a U.S. DOE National Laboratory Site. CEC desires to support this effort with a \$8M cost share towards the deployment of a promising non-lithium-ion LDES for installation at Sandia National Labs, Livermore, CA facility. Currently there are few electrochemical energy storage system demonstration deployments with 24hr duration in the US. Both DOE and CEC are interested in evaluating a promising, safe, potentially lower cost non-lithium-ion technology for this application. After careful consideration of various LDES technologies, the zinc-air battery with low-cost raw materials being developed by e-Zinc was selected by DOE for this application. This LDES deployment would allow both CEC and DOE to evaluate the feasibility of using zinc-air battery technology for 24 hour duration resiliency application. NTESS will develop a DOE approved Demonstration Work Plan (DWP) that describes all project milestones, go/no-go points, and schedule requirements that will determine the lifecycle of the project.

NTESS & CEC will monitor the cell, string, and system manufacturing progress of e-Zinc with relevant milestones and evaluate e-Zinc engineering progress at various stages of manufacturing until delivery for installation. The collaborative demonstration deployment with NTESS and CEC aims to enhance the understanding of zinc-air battery technology for LDES, assessing its manufacturing readiness and applications through technoeconomic analysis. This effort will inform potential larger deployments in California and across the broader U.S. electricity grid, supporting the nation's clean energy goals. NTESS will work through the CEC in the procurement and deployment of the e-Zinc system.

### Reasons for Cooperation

See Annex A, Statement of Work, to CRADA SCXX/0XXXX.

- Currently most grid scale energy storage systems are 4 hours or less in duration. However, with increased penetration of renewables on the grid, there is a need for cost competitive, safe, longer duration energy storage technology. The current collaborative demonstration deployment project

- would allow thorough evaluation of the e-Zinc technology for LDES applications in CA and the U.S. electric grid to meet the state and national clean energy goals.
- Under the Electric Program Investment Charge (EPIC) program, the CEC awarded a grant to e-Zinc for the deployment of a 10kW/24 hour system in San Diego CA to evaluate the feasibility of the Zinc-air technology. The deployment at the Livermore site will be a larger scale version of this technology with 12 MWh capacity. The proposed work involves thorough evaluation of the e-Zinc technology for commercial readiness, evaluation of the EPIC e-Zinc project (EPC-19-034) demonstration system at the Rapid Integration and Commercialization Unit (RICU) facility at Miramar, and performing technoeconomic analysis to understand its application for LDES and its ability to meet cost targets for future LDES deployments.
  - After the environmental review is complete for the e-Zinc demonstration project, CEC will consider awarding a cost share grant directly to e-Zinc for battery manufacturing and delivery of fully integrated systems to Sandia National Labs, Livermore, CA deployment site. CEC and NTESS will jointly collaborate in monitoring the battery manufacturing progress with milestones as outlined in the DWP. The NTESS team would apply the DOE share of the funding for site preparation, purchasing and installation of power electronics, and constructing connections between the energy storage system and the electric grid. In addition, under the DOE funding, NTESS will perform technoeconomic analysis and evaluate the performance of the energy storage system for LDES applications to support critical laboratory infrastructure at Sandia, Livermore.
  - There is no exchange of funds between CEC and NTESS under this PTS; only formalizing the collaborative efforts in this area.
  - Understanding the technology readiness levels, evaluating the safety aspects, and performing use case analysis is important for implementing the demonstration projects. NTESS Energy Storage Technology and Systems (ESTS) Department has significant research and development experience in various energy storage technologies for grid scale applications. This group has the capabilities and analysis tools to select the appropriate energy storage technology for capacity (MW) and duration (hours) to maximize the benefits under various use case scenarios. In addition, NTESS, through its roles as the lead laboratory for DOE's energy storage demonstration projects, has extensive experience in energy storage system project development and installation and commissioning of energy storage systems. NTESS has also been leading the development of codes and standards for storage system safety and this project will help to develop a greater understanding of the safety aspects of LDES technologies to support the development of appropriate safety codes and standards.
  - CA requires California Environmental Quality Act (CEQA) analysis for all energy storage installation projects. CEC will complete the CEQA analysis

- for the deployment before the CEC considers awarding the cost share grant funds.
- NTESS developed a public domain analysis software called QuEst. This software tool gathers real input data from utilities and grid operators. The cooperative research effort through these early demonstration projects would help optimize the tools for wider adaptation and implementation of energy storage technologies in the grid to support California and national clean energy initiatives. This CRADA provides an opportunity to evaluate energy storage technology, develop modeling tools that will help pave the way for LDES adaptation in the U.S., and optimize energy storage analysis tools under various use case scenarios.
  - The DOE award requires the recipients to follow Rapid Operational Validation Initiative (ROVI) guidelines to gather and analyze the data to make predictions on the operational lifetime performance. The DOE grant also requires the recipient to perform Levelized Cost of Storage (LCOS) analysis. The ROVI guidelines are still in the early stages of development, and the CRADA will help guide this development to make better predictions of long duration energy storage performance and expected lifetime.
  - NTESS has developed the Battery Lifecycle Framework software that is available as an open-source platform. The framework provides web tools to visualize, analyze, and share battery data from single cells to systems and is used to power [www.batteryarchive.org](http://www.batteryarchive.org), the largest repository of publicly available data on lithium-ion battery performance. This collaborative effort would help further develop and expand the scope of this framework for non-lithium-ion battery data.
  - California has one of the most extensive renewable energy programs in the world. This program allows NTESS to be involved with and gain knowledge from technologies and projects that they would not have access to otherwise.

### **Public Abstract**

CEC and NTESS are working under a CRADA to help in the rapid implementation of LDES technologies in California to meet the clean energy goals defined in SB-100. Under this CRADA, NTESS will work collaboratively with CEC on preliminary and technical work to support the DOE long duration energy storage demonstration project for resiliency application at Sandia National Labs, Livermore, CA facility. A non-lithium-ion, zinc-air 500W/24 hour battery, manufactured by e-Zinc will be evaluated for this application.

## **B. SCOPE**

### **Duration of PTS**

The period of performance of this PTS is 48 months.

### Technical Objectives

- The objectives for NTESS are to evaluate technology, validate the energy storage system at 500W/24hr scale, evaluate the ability of e-Zinc to scale up for future LDES deployments. This PTS will support the installation and deployment of an e-Zinc 500W, 24hr zinc-air battery energy storage system at Sandia National Labs, Livermore, CA facility for resiliency application performance evaluation.
- Other objectives for NTESS are to specify field measurements and data gathering needs for ROVI analysis, perform techno-economic analysis to optimize sizing, use cases, community benefits, resilience, environmental and economic analysis.

### Tasks and Division of Responsibilities

Phase No.	Task No.	Subtask No.	Task Title	Duration (Starting & Ending Project Month)	Responsible Parties
1	1	1	Agreement management and general project tasks.  Project kickoff meetings with CEC, and e-Zinc, agree on tasks, deliverables	01-02	NTESS/CEC/e-Zinc
1	2	1	CEQA and NEPA analysis for the installation	01-02	NTESS/CEC/Aspen Consulting
1	3	1	e-Zinc single cell testing at Sandia and validation of e-Zinc test data.	01-18	NTESS/CEC
1	4	2	Specify field measurements, use operational and manufacturers data to analyze TEA and LCOS using ROVI guidelines	01-36	NTESS/CEC
2	5	1	Quantify the economic and resilience value of the proposed system and	01-36	NTESS/CEC



Phase No.	Task No.	Subtask No.	Task Title	Duration (Starting & Ending Project Month)	Responsible Parties
			potential community benefits		
2	6	1	String level battery test data validation. Evaluate e-Zinc EPIC deployment at Miramar	01-24	NTESS/CEC
3	7	1	Factory acceptance testing of NTESS CA battery system.	01-36	NTESS/CEC
4	8	1	ES system deployment demonstration at NTESS-CA site.	01-48	NTESS/CEC
	9	1	Prepare Final Report	01-48	NTESS/CEC

### Task Descriptions

**Task 1: Project Phase 1. Kickoff meeting with CEC, e-Zinc and NTESS project team. Agree on tasks and deliverables.**

- Discussion: The Parties will participate in the project team kick off meeting and will seek to understand the project details, milestones and project deliverables and schedule.

Deliverable: DWP with project plan details.

**Task 2: Project Phase 1. CEQA and National Environmental Policy Act (NEPA) analysis for the installation in collaboration with CEC and Aspen Consulting.**

- Discussion: CEQA analysis is needed for ES installations in CA. NTESS completed the NEPA analysis. NTESS will share NEPA analysis and other project relevant information to support the CEC’s CEQA analysis of the proposed e-Zinc battery installation.

Deliverable: Completion of CEQA and NEPA analysis and submission for project installation approvals.

### **Task 3: Project Phase 1. Single cell battery testing at NTESS.**

- Discussion: e-Zinc will deliver two e-Zinc battery cells under agreement with CEC for testing at NTESS site. NTESS will gather test data for validation of the e-Zinc technology and perform safety abuse tests on the battery.

Deliverable: Single cell battery testing data report.

### **Task 4: Project Phase 1. Specify field measurements following ROVI guidelines. Evaluation of the EPIC e-Zinc demonstration deployment at the RICU at Miramar.**

- Discussion: The Parties will specify field measurements, use operational and manufacturers data to analyze TEA and LCOS using ROVI guidelines and evaluate the e-Zinc CEC-EPIC project deployment unit at the RICU facility at Miramar.

Deliverable: Report on guideline specifications and the performance of the e-Zinc demonstration unit at Miramar, presented to e-Zinc and CEC.

### **Task 5: Project Phase 2. Quantification of economic and resilience value of the proposed system and community benefits**

- Discussion: NTESS team will perform technoeconomic analysis and develop tools for quantification of economic and resiliency value, and community benefits.

Deliverable: Technoeconomic analysis report to CEC.

### **Task 6: Project Phase 2. String level battery testing at e-Zinc.**

- Discussion: The Parties will witness the battery string test data at e-Zinc facility. A battery string consisting of 36 and 72 cells as part of the energy storage system that is being prepared for CEC and will be tested. Another purpose of this milestone is to evaluate the performance of e-Zinc engineering validation test (EVT) prototypes.

Deliverable: String level battery testing data report to CEC.

### **Task 7: Project Phase 3. Factory acceptance test (FAT) of e-Zinc battery for Sandia, Livermore, CA deployment.**

- Discussion: After the deployment of 10kW/24hr ES system in CA under the CEC-EPIC award, the Parties will perform design validation tests (DVT) on their prototype, tool up for larger scale manufacturing and start making

batteries for DOE deployment. NTESS will witness the FAT of the full containerized system.

Deliverable: Report on the factory visit by NTESS, showcasing the prototype and containerized system, presented to CEC.

#### **Task 8: Project Phase 4. Showcase of e-Zinc battery ES system at CA deployment.**

- Discussion: Under DOE funding, NTESS will perform the delivery, installation, and commissioning/site acceptance testing (SAT) of the energy storage system at Sandia National Labs, Livermore, CA.

Deliverable: Demonstration of the operating installed system to CEC and DOE. Arrange demo day with site visits.

#### **Task 9: Final Report**

- Discussion: Perform evaluation tests on the installed ES system and prepare a final report with the data. Leave the ES system operating for durability tests.

Upon completion or termination of this PTS, a final report will be developed by NTESS, which will include the following information:

- 1) A final abstract
- 2) Technical results/accomplishments
- 3) A list of PTS-generated Intellectual Property (Subject Inventions, Copyrights, Mask Works, and/or Trademarks)
- 4) A description of benefits to the DOE
- 5) A description of benefits to the PTS Participant/s, industry, consumers/taxpayers, and/or U.S. economy.

Deliverable:

Final project report delivered to CEC and DOE and published.

e-Zinc ES system (500 kW, 24hr) at Livermore, CA project, tasks and deliverables							
ID	Task	Year 1	Year 2	Year 3	Year 4		
1	<b>Phase 1 kick off meeting.</b>						
	- Scope the project	■					
	- Final SOW and Schedule	■					
2	<b>Phase 1 Codes, standards and safety review.</b>						
	- Complete CEQA and NEPA analysis	■					
	- Review installation codes, regulations and safety aspects.	■					
3	<b>Project Phase 1. Single Cell testing</b>						
	- e-Zinc to deliver two single cells to SNL for testing		■				
	- performance testing validation of technology		■				
	- Battery safety testing		■				
4	<b>Project Phase 1. Specify field measurements following ROVI guidelines. Evaluation of the EPIC e-Zinc demonstration deployment at the RICU at Miramar.</b>						
	- Provide ROVI requirements for data collection to the team	■	■				
	- Analysis report on LCOS, expected life			■	■		
	- Evaluation of EPIC e-Zinc deployment at Miramar		■	■			
5	<b>Project Phase 2. Energy Storage Technoeconomic analysis.</b>						
	- Quantify the economic and resilience value of the proposed system and potential community benefits	■	■	■	■		
	- Recommendations to the team on optimum use profile of the energy storage system to maximize the economic value					■	■
6	<b>Project Phase 2. String level battery testing at e-Zinc</b>						
	- Witness the 36 and 72 cells string level testing at E-Zinc facility		■				
	!- Prepare a report on the string level testing.			■			
7	<b>Project Phase 3. Factory Acceptance test of e-Zinc battery</b>						
	- Witness the assembly of batteries and final testing at E-Zinc facility ready for shipment to CA			■			
	!- Prepare a report on the factory visit				■		
8	<b>Project Phase 3. Installation of e-Zinc ES system at SNL, Livermore</b>						
	- delivery, installation and site acceptance testing.					■	■
	- Demonstration of system operation						■
	-Arrange demo day to DOE and CEC						■
9	<b>General Project Tasks and Final Report.</b>						
	- Project management, arrange regular progress review meetings, periodic reports	■	■	■	■	■	■
	- Prepare final project report						■

**C. ESTIMATED COST**

	PY1	PY2	PY3	PY4	Total
	(01-12 months)	(12-24 months)	(24-36 months)	(36-48 months)	
DOE contribution	\$2,260,000	\$3,165,000	\$3,270,000	\$1,305,000	\$10,000,000
Other Federal Funds	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
<b>Total NTESS Funds</b>					\$0.00
Funds-In Contribution**	\$0.00	\$ 0.00	\$ 0.00	\$ 0.00	\$ 0.00
Paid 0.0% Fed Admin Chg	\$0.00	\$0.00	\$0.00		\$0.00
Total Participant Funds-In	\$ 0.00	\$ 0.00	\$ 0.00	\$ 0.00	\$ 0.00
In-Kind Contribution					
<i>(*In-Kind is a non-monetary estimation of the salary, equipment, travel, etc. that will be expended to support the collaboration)</i>	\$100,000.00	\$100,000.00	\$100,000.00	\$100,000.00	\$400,000.00
<b>Total Participant**</b>	\$100,000.00	\$100,000.00	\$100,000.00	\$100,000.00	\$400,000.00
<b>Total CRADA Value</b>	\$2,360,000	\$3,265,000	\$3,370,000	\$1,405,000	\$10,400,000

- **\*\* CEC anticipated funding on the demonstration project would be provided directly to the battery manufacturer e-Zinc through a separate cost share grant agreement.**

**For NTESS:**

(Principal Investigator) Babu Chalamala  
 Org 08811/MS 1108  
 (505)845-7185  
 bchalam@sandia.gov

**For Participant:**

(Principal Investigator) Caitlin Planchard  
 (916) 637-8128  
 caitlin.planchard@energy.ca.gov

## D. PAYMENT TERMS

*NOTE: If the Participant is contributing funds-in to the laboratory, the appropriate payment terms will be inserted here; if no funds-in this section will be labeled as N/A*

There is no money exchange between CEC and NTESS under this CRADA task. Funding for the e-Zinc demonstration project will be provided by a DOE grant and other matching funding contributions through separate agreements.

This CRADA is subject to Gov. Code §8546.7.

DRUG-FREE WORKPLACE REQUIREMENTS: NTESS will comply with the requirements of the Drug-Free Workplace Act of 1990 and will provide a drug-free workplace by taking the following actions:

- a. Publish a statement notifying employees that unlawful manufacture, distribution, dispensation, possession or use of a controlled substance is prohibited and specifying actions to be taken against employees for violations.
- b. Establish a Drug-Free Awareness Program to inform employees about:
  - 1) the dangers of drug abuse in the workplace;
  - 2) the person's or organization's policy of maintaining a drug-free workplace;
  - 3) any available counseling, rehabilitation and employee assistance programs; and,
  - 4) penalties that may be imposed upon employees for drug abuse violations.
- c. Every employee who works on the proposed CRADA will:
  - 5) receive a copy of the company's drug-free workplace policy statement; and,
  - 6) agree to abide by the terms of the company's statement as a condition of employment on the CRADA.

Failure to comply with these requirements may result in suspension of payments under the CRADA or termination of the CRADA or both and NTESS may be ineligible for award of any future State agreements if the department determines that any of the following has occurred: the NTESS has made false certification, or violated the certification by failing to carry out the requirements as noted above. (Gov. Code § 8350 et seq.)

## E. PERSONAL PROPERTY

None

## F. LOANED/BORROWED PROPERTY

None

## G. BACKGROUND INTELLECTUAL PROPERTY

Section G provides each Party the opportunity, as a matter of goodwill but not legal obligation, to declare its interests in Intellectual Property that has been created in the “background”, i.e., before or outside this PTS. The purpose is to forestall disputes over what is and what is not Generated Information.

Each Party may use another Party's Background Intellectual Property identified in Section H of this PTS solely in performance of research and development under the PTS. This PTS does not grant or promise to grant to a Party any option, grant, or license to commercialize, or otherwise use another Party's Background Intellectual Property. Licensing of Background Intellectual Property, if agreed to by the Parties, shall be the subject of separate licensing agreements between the Parties.

Each Party has used reasonable efforts to list all relevant Background Intellectual Property, but Intellectual Property may exist that is not identified. No Party shall be liable to another Party because of any failure to list Background Intellectual Property.

NTESS elects to declare an interest in the following Background Intellectual Property: *[State NONE, if appropriate.]*

**None**

NTESS elects to declare an interest in the following Background Intellectual Property: *[State NONE, if appropriate.]*

**None**

**APPROVAL**

**For NTESS:**

BY:

\_\_\_\_\_  
Mary Monson

TITLE: Senior Manager, Technology Partnerships & Business Development

DATE: \_\_\_\_\_

**For Participant:**

BY: \_\_\_\_\_

TITLE: \_\_\_\_\_

DATE: \_\_\_\_\_