LARGE CAPACITY ENERGY STORAGE

Statement of Objectives

1.0 Background: The AFRL Energy Office has a need to improve the Department of the Air Force's (DAF) ability to provide reliable power for critical infrastructure. This effort is needed to maximize the ability of DAF installations to achieve mission assurance through energy assurance by adding Large Capacity Energy Storage. The focus of this program is to research and demonstrate the integration of new installation energy technologies that can be demonstrated at a DAF location to provide increased operational resilience. Due to the austere location of the installation, new technology would need to operate in extreme low temperatures of -60°F. Large Capacity Energy Storage offers many economic and operational benefits, such as improved power quality and stability, and reduced dependence on generators, and reduce the logistics required to bring in fuel for generators. More background information is available in the restricted distribution document available to qualified contractors.

2.0 Scope: This program shall demonstrate new and emerging advanced energy storage and energy efficiency technologies that can be further developed and transitioned to meet military needs. The focus of this program is to demonstrate a prototype large capacity 3 Mega Watt (MW) 9 Mega Watt Hour (MWH) (3MW/9MWh) energy storage technology in an operational environment, supporting the Clear SFS mission(s). The demonstrated stored energy will be used as a source of back-up power and will provide a means to improve power quality by acting as a buffer against power surges and demand spikes. This system design may allow peak shaving capability/functionality.

The scope of this project includes the following tasks:

- Assembly of the energy storage system, including the construction of an energy storage structure, installation of all necessary components, such as electrical infrastructure and control systems, and integration of the energy storage technology, in accordance with all manufacturer and other applicable assembly instructions.
    - Contractor shall investigate and comply with all assembly instructions for the following:
        - Construction of the energy storage structure, including site preparation, foundation work, and installation of the facility's structural, mechanical, and electrical systems as needed.
        - Installation of the energy storage system components, including the energy storage technology, electrical infrastructure, and control systems as needed.

- Integration of the energy storage system with the energy storage housing facility, including connection to the facility's electrical and mechanical systems as needed.
- Testing and commissioning of the energy storage system, including verification of its performance, efficiency, and reliability as needed.

- Demonstration of the energy storage system, including testing and validation of its performance, efficiency, and reliability. Testing and validation shall be for at least one year to ensure all seasonal weather conditions are evaluated.
  - The demonstration shall include detailed procedures for the testing and validation of the energy storage system, to include metrics used for performance, efficiency, and reliability.
- Development of specifications for the energy storage system, including technical requirements, safety protocols, and maintenance procedures.
- Transfer of the energy storage system to base tenant at the end of the project, to include all necessary documentation, training, and support.

The installed large capacity energy storage will be able to synchronize (e.g. match voltage, frequency, etc.) with utility-provided station power and allow Clear SFS to shed critical loads to Large Capacity Energy Storage system in times of grid stress and/or unavailability. This demonstration will help the critical missions at Clear SFS meet the OSD goals for energy availability.

The successful completion of this program will provide a functional energy storage system that can be used to support the critical missions at Clear SFS and will demonstrate the feasibility of using advanced energy storage technology to meet military energy storage needs.

2.1 Anticipated Funding:

Anticipated Budget (Notional) Note**:** Each FY's sub totals, and each line's totals may vary from the notional values and will be considered with the total cost anticipated between $14M - $25M

	FY25	FY26	FY27	FY28	FY29	Sub Total
Base Contract	$3.0M	$5.0M	$2.5M	$1.0M	$2.5M	$14M
Additional Storage System Capacity				$4.0M	$1.0M	$5.0M
Capacitance for Load Leveling	$0.5M	$0.5M	$3M			$4.0 M
Disposition/Transition					$2.0M	$2.0M

Total	$3.5M	$5.5M	$5.5M	$5.0M	$5.5M	$25M

This project will be incrementally funded, with a ceiling of $25M. The baseline deliverable is a 3MW/9MWh energy storage system. FY29 funding is intended for either transition of real property or system decommissioning and completion of the contract. For each increment, work should be broken down into severable tasks. Additional capability in one facet may require additional capability in another facet. The Contractor must consider all system interdependencies when scaling, improving, or otherwise modifying the system design. For example, increasing the capability on Task X requires that Task Y be scalable to allow an increase in capability. For a contract awardee, the government reserves the right to award any or all the optional work. Anticipated funding could vary pending funding availability

The proposer shall discuss any flexibility on expenditure rate, the ability to more tasks form one year to another. Additionally, address any variations for the notional FY sub totals. As well as any dependance of the optional work of Additional Storage, Capacitance, or Disposition/Transition and other tasks.

2.2 Large Capacity Energy Storage System Specifications and Goals:

- May include a structure to house the energy storage system
  - Not Intended to be mobile
  - System must operate in a wide range of ambient temperatures, to include sub-freezing temperatures associated with subarctic (near arctic) climates
- Materials must be from readily available domestic suppliers (i.e., Buy America Act compliant)
- System shall be capable of tolerating fully charged/discharged states to maintain system stability
- System shall be capable of handling a significant amount of charge/discharge cycles (dependent on technical capabilities of storage solution)
- Weight and Density are not significant factors

2.3 Prohibited Materials:

- Hazardous materials, such as, but not limited to, lithium and lead in any significant quantity
- Flammable, explosive, or highly reactive substances
- Materials that produce toxic or flammable off-gassing
- Significant rare Earth elements
- Unstable compounds that could lead to spontaneous combustion
- Materials prone to thermal runaway

3.0 Objectives: There are four major objectives for this research and development project:

3.1 The first objective is to **design and fabricate** a large capacity energy storage system to be used in the demonstration on a military installation.

3.2 The second major objective is to **perform a demonstration** to evaluate the system for technical maturity, develop potential Concepts of Operations (CONOPS), and identify life-cycle factors, including sustainment costs.

3.3 The third major objective is to synthesize and integrate the lessons learned from the design, fabrication, and demonstration objectives to **develop standard technical specifications, recommended CONOPS, and training material for large capacity energy storage systems**.

3.4 The work performed in this contract shall be documented in a **final report** that shall be non-proprietary in nature and available for distribution within Government and Government contractors. It is expected that many sub-components will have proprietary elements and proprietary sub-component information that will not be required in the final report.

4.0 Description of Work:

4.1 The Contractor shall **design** a large capacity energy storage system that is capable of producing approximately 3 MW at a capacity of 9 MWh. Design may incorporate an environmentally controlled structure that supports system and substation interface requirements to allow for the operation in an arctic environment.

Figure 1. Clear SFS

4.2 The Contractor shall **install and integrate** a high-capacity energy storage system (3MW/9MWh) with the existing 4160V substation or medium voltage grid. Work shall be in compliance with all applicable local policies, permits, guidelines, and regulations.

4.2.1 The Unified Facility Criteria (UFC) does not apply during the demonstration, Although UFC compliance may be required for transition to Clear SFS.

4.2.2 The demonstration projects may require approval from the Alaska Department of Environmental Conservation (ADEC) and Tribal authorities for actives such as digging or placement of a structures.

4.2.3 Contractor will need to ensure that the project complies with base access and security regulations.

4.2.4 Contractor will be responsible to address Environmental, Safety and Occupational Health concerns specific to the base, such as permafrost and Arctic climate conditions.

4.3 The Contractor shall **develop a** demonstration/test plan. This plan will require approval from the government and must be submitted at least six months prior to planned execution. A notice to proceed (NTP) decision will be made by the 460 CES Buckley SFB and the AFRL Energy Office following review of the demonstration/test plan. Any requests for information (RFIs) and/or requests for action (RFAs) coming out of the demonstration/test plan will be recorded on a Notice to Proceed comment workbook with Environmental, Safety, Mechanical, Electrical, Architectural, Communications, Civil, Structural, and General sections to cover all applicable disciplines. All comments shall be documented by Commentor, Date, Reference (to a section and/or drawing #), Comment/Question, Response, Back Check Confirmation/ Non-Concur Response #1, Back Check Confirmation/ Non-Concur Response #2, and Government Evaluation. Any comments that are not resolved or do not have a contingency plan in place will put the demonstration/test on hold unless otherwise noted (i.e., “non-critical” or “confirm during test” noted in Government Evaluation). Any condition that poses a significant risk to personnel and/or property will automatically be deemed “critical” until sufficient mitigations are in place, or the matter is resolved before moving forward with the demonstration/test plan. Operating conditions for the demonstration/test shall consider: Routine Operations, Surge Operations, Power-out Operations, Subarctic/Arctic Environmental Constraints, and Long-term Maintenance Operations.

4.4 The Contractor shall **execute** the demonstration/test plan outlined in paragraph 4.3. The contractor will be responsible for shipping materials, as required. The contractor will be responsible for maintaining the large capacity energy storage system for the duration of the contract. The contractor shall provide the requisite personnel to operate the equipment and provide technical support during the demonstration/test. In addition to a demonstration, CONOPS proof of concept testing is required. The contractor shall provide the programmatic and technical support to coordinate the demonstration/test with the selected

test agent (if needed). The contractor shall provide technical resources to travel to the demonstration location and provide on-site training.

4.5 The Contractor shall **develop standard technical specifications, recommend CONOPS, and training** on how to operate the large capacity energy storage system. The contractor shall provide Clear SFS sustainment cost estimation figures. The estimation of sustainment cost will be used as part of a transition plan to allow the installation to plan for Operations and Maintenance (O&M) funding.

4.6 The Contractor shall produce a **final report** and companion briefing which aggregates and synthesizes the lessons learned from the design, fabrication, compliance/compatibility testing, and demonstration. Schematics, pictures and illustrations of the developed system, a summary of the demonstration performance, and lessons learned shall also be included in the final report and presentation. The final report shall also have appendices for warranties, manufacturer maintenance manuals, specifications, and schematics/drawings. The final report and presentation shall not include any proprietary information or markings that would prohibit public release.

4.6.1 The Contractor shall provide Clear SFS with as-built drawings compilate with Clear SFS CE

4.7 Supplemental information (Unclassified Distribution D Supplemental Package) can be requested by contacting the RXMZ Technical Advisor(s) outlined in the call. The request should include your company name, a company Point of Contact, address, and a copy of current/valid DD Form 2345 “Military Critical Technology Data Agreement.” This Supplemental Package may help to understand the effort and provide more accurate technical and cost proposals.

5.0 Deliverables:

5.1 Deliverables as listed below:

Deliverable #1	Scientific & Technical Reports (Final Report)
Deliverable #2	Funds & Man-hour Expenditure Report
Deliverable #3	Contract Funds Status Report
Deliverable #4	Status Report (Monthly)
Deliverable #5	Presentation Material
Deliverable #6	Test Plan(s)
Deliverable #7	Material and Processing Digital Data Package (MPDDP)
Deliverable #8	Data Management Plan (as required)
Deliverable #9	Software (as required)

5.2 Test Samples, Prototypes and Residual Materials; The contractor shall return to the Government all test samples, prototypes and residual materials not consumed in testing at the conclusion of the technical effort as directed by the Government. Material and Processing Digital Data Package (MPDDP) shall be non-proprietary and in a format such as CAD/BIM/Digital Model.

6.0 Government Furnished Equipment: No additional GFE required.

7.0 Security Requirements:

Operations Security (OPSEC)

The contractor shall participate in all activities associated with the disciplines of the organization's Industrial Security, Information Security, Personnel Security, Operations Security (OPSEC), and Antiterrorism programs, following appropriate measures in each program as required for this particular contract. Security measures are required to reduce program vulnerability from successful adversary collection, exploitation of critical information, and violations of export control requirements. The prime contractor shall ensure all subcontractors, if applicable, conform to these requirements as required by the prime contractor.

Program Protection Plan (PPP) Requirements

Any potential critical program information (CPI) generated as part of this effort will be reviewed to determine the need for a PPP or to be included as part of an existing PPP.

8.0 Government Furnished Facilities and Information: Not applicable for this proposal

9.0 Start Date: Commensurate with Contract Award

10.0 Place of Review, Inspection, and Acceptance: TBD

11.0 Period of Performance: Fifty-seven (57) months Technical, plus three (3) months for Final Report, totaling sixty (60) months. Period of performance may increase as future funding is added to the contract.

12.0 Special Instructions: The contractor will be responsible for insurance covering equipment, materials, and components throughout contract execution.