



## STATEMENT OF PROJECT OBJECTIVES (SOPO)

Enabling High Penetration of  
Renewables with Synchronous  
Condenser Technology (SCCT)  
Concept Paper ID: TA3-050-E

### A. OBJECTIVES

To obtain funds for a synchronous condenser to provide grid voltage regulation for the grid and the island of Kaua'i. Kaua'i Island Utility Cooperative (KIUC) is a stand-alone distribution and transmission system that relies on a large amount of inverter-based renewable generation, often running on 100% renewable on sunny days. This creates grid voltage challenges that are unprecedented given the unique characteristics of the KIUC grid. A synchronous condenser would provide much needed grid stability as more renewables are added. KIUC was over 60% renewable in 2022, has planned projects to achieve approximately 80% renewables in the 2026 timeframe, and has a strategic goal of reaching 100% renewable generation by 2033. The project supports Hawai'i's statutory zero emissions clean economy target in §225P-5 (a) "..., a statewide target is hereby established to sequester more atmospheric carbon and greenhouse gases than emitted within the State as quickly as practicable, but no later than 2045" and positions Kaua'i to achieve a one hundred percent renewable portfolio standard well ahead of the December 31, 2045 statutory target.

The Project is a Combination Systems application that uses assets in one sector to provide services to the other in a manner that reduces upgrade or expansion requirements, improves communications across sectors, and allows for more complete optimization of grid operations. This project involves a technology application and activities to provide grid-forming capability of an existing generator to accommodate the operation of high penetration distributed renewable generation on the island grid.

The objective of the SCCT project on the island of Kaua'i is to enable effective operation of the electric grid when dispatching a variety of electric generation sources and dispatchable loads. On Kaua'i, these include two KIUC-owned fossil fuel power stations, located at Port Allen and Kapaia, two KIUC-owned 12 megawatt (MW) solar farms, a 6.7 MW biomass plant, a number of mostly plantation legacy hydroelectric units, some smaller solar farms, and three large solar/battery sites, ranging in size from 13 MW to 20 MW. To manage the Kaua'i grid effectively, KIUC must not only regulate system frequency, being accomplished by proper MW dispatch, but must manage the grid voltage. A synchronous condenser is proposed to be

located at the Port Allen power station, developed through conversion of an existing, but essentially stand-by steam turbine generator.

SCCT is a high-priority for KIUC. The conversion of an existing, but stand-by, generator to use as a synchronous condenser providing grid voltage regulation service will generate significant community benefit by furthering the capability of the system to accommodate 100% dispatch of renewable generation sources safely, more economically and provide for a more reliable and resilient island grid.

The 12.5 megavolt-amperes (MVA) S1 steam turbine generator was installed at Port Allen in 1968 as part of the 10 MW steam plant installation which included a boiler and other associated equipment. The boiler was taken out of service in 2019. Although the steam turbine can still be fed by a heat recovery steam generator (HRSG) installed in 1977, the HRSG has not been needed to operate in over a year and has not run consistently in over a decade. The steam plant generator was rewound in 2007 and is in excellent condition. The generator would be capable of importing or exporting reactive power as a synchronous condenser.

The project will provide significant regional and community benefits, reducing the likelihood and consequence of disruptive events to the grid. This novel approach to obtaining grid-forming capability is an innovative technology that will demonstrate a conversion that could be replicated for local, regional, and interregional grid enhancement, while advancing electric system decarbonization through improved interconnected operation with renewable power sources.

## **B. SCOPE OF WORK**

Planned activities for this project are expected to last two (2) years, and will be conducted in four broad tasks to achieve the stated objectives:

- **Task 1.0:** Project Management and Planning
- **Task 2.0:** Procurement and Delivery of Materials
- **Task 3.0:** Retrofit of Steam Turbine and Related Site Work
- **Task 4.0:** Testing and Commissioning

Additional details regarding each Task are provided in Section C of this document. Moreover, while the tasks/subtasks are presented sequentially, some work activities will likely be performed concurrently.

Note: This project contains two **Go/No-Go Decision Points**. Subtask 1.2 will require a Go/No-Go decision if the Project fails to complete NEPA compliance. Subtask 2.1 will require a Go/No-Go decision if an amended Project budget exceeds available financial resources.

## C. TASKS TO BE PERFORMED

The tasks/subtasks associated with this project are described below. Moreover, while the tasks/subtasks are presented sequentially, it is expected that work on some of the tasks/subtasks may occur concurrently. Deliverables associated with this project are summarized in Part D.

### **Task 1.0 - Project Management and Planning**

- **Subtask 1.1** - Within 30 days of award, the Recipient shall submit a Project Management Plan (PMP) to the designated Federal Project Officer (FPO). The Recipient shall not proceed beyond Task 1.0 until the PMP has been accepted by the FPO. The PMP shall be revised and resubmitted as often as necessary, during the course of the project, to capture any major/significant changes to the planned approach, budget, key personnel, major resources, etc. The Recipient shall manage and direct the project in accordance with the accepted PMP to meet all technical, schedule and budget objectives and requirements; and will coordinate activities to effectively accomplish the work. The Recipient will ensure that project plans, results, and decisions are appropriately documented, and that project reporting and briefing requirements are satisfied.
- **Subtask 1.2** - As required, the Recipient shall provide the documentation necessary for National Environmental Policy Act (NEPA) compliance via expected approval of a categorical exclusions (CX) as outlined in 7CFR 1970.53 (a) (2) (iii). Based on the CX determination a Go/No-Go briefing will be scheduled with the DOE.
- **Subtask 1.3** - As required, the Recipient will complete planning and design for the Project.
- **Subtask 1.4** –The Recipient will brief DOE on roughly an annual basis to explain the plans, progress and results of the technical effort. The briefing shall also describe the performance relative to project success criteria, milestones, and the Go/No-Go Decision point that are documented in the Project Management Plan (PMP).

### **Task 2.0 – Procurement and Delivery of Materials**

- **Subtask 2.1** –The Recipient will develop and issue competitive Requests for Proposals (RFP) for elements of the Project. Based on the results of procurement a Go/No-Go briefing will be scheduled with the DOE. An amended Project budget will be submitted if appropriate.
- **Subtask 2.2** – Based on the results of the Go/No-Go briefing, contracts will be awarded by the Recipient to successful bidders.

### **Task 3.0 – Retrofit of Steam Turbine and Related Site Work**

- **Subtask 3.1** – Retrofit of Steam Turbine, to include: dismantling of turbine and installation of variable frequency drive motor, installation of clutching mechanism, oil piping modifications, electrical, instrumentation and control work, replacement of exciter.

### **Task 4.0 – Testing and Commissioning**

- **Subtask 4.1** –Conduct inspections and acceptance tests on various elements of the Project.
- **Subtask 4.2** –Place the Project into service as construction is completed.

#### **D. DELIVERABLES**

Subtask 1.1 - Project Management Plan - Due within 30 days after award. Revisions to the PMP shall be submitted as needed or as requested by the FPO.

Subtask 1.2 - National Environmental Policy Act (NEPA) Compliance – Recipient shall provide documentation of NEPA Compliance for the Project.

Subtask 1.5 – Continuation Briefings – The Recipient shall brief DOE annually on performance relative to project success criteria, milestones and the Go/No-Go decision points.

In addition to the deliverables listed above, the Recipient shall submit all periodic, topical, final, and other reports in accordance with the Federal Assistance Reporting Checklist and accompanying instructions.

#### **E. BRIEFINGS/TECHNICAL PRESENTATIONS**

The Recipient shall prepare and present periodic briefings, technical presentations and demonstrations as requested by the FPO, which may be held at a DOE or the Recipient’s facility, other mutually agreeable location or via webinar. Such meetings may include all or a combination of the following:

- **Kickoff Briefing** - Not more than 30 days after submission of the Project Management Plan, the Recipient shall prepare and present a project summary briefing as part of a Project Kickoff Meeting.
- **Pre-Continuation Briefing:** Not less than 90 days prior to the planned start of a new budget period, the Recipient shall brief the DOE on the results to date, and their plans for subsequent periods of work. The DOE will consider the information from

this briefing, as well as the content of deliverables submitted to date, prior to authorizing continuing the project.

- **Final Project Briefing** - Not less than 30 days prior to the end of the project, the Recipient shall prepare and present a Final Project Briefing on the results and accomplishments of the entire project.
- **Other Briefings** - The Recipient shall prepare and present technical, financial, and/or administrative briefings as requested by the DOE. Additionally, the DOE may require the Recipient to make technical presentations at national and/or industry conferences.