Asia Pacific Research Initiative for Sustainable Energy Systems 2012 (APRISES12)

Office of Naval Research
Grant Award Number N00014-13-1-0463

Crissy Field Center Wind Power Study Phase II: Wind Turbine and Data Acquisition System Installation

Task 7

Prepared For
Hawaii Natural Energy Institute

Prepared By
Golden Gate National Parks Conservancy

June 2018

HNEI
Hawai'i Natural Energy Institute
University of Hawai'i at Mānoa

Deliverable 2: Report on Recommendations for Wind Turbine Systems and Data Acquisition System

Crissy Field Center Wind Power Study Phase II, Report 2.2: Wind Turbine and Data Acquisition System Installation

Prime Award No. N00014-13-1-0463, HNEI Subaward No. MA160014

Background

Per the terms of the project contract between the Golden Gate National Parks Conservancy and the Hawaii Natural Energy Institute, dated May 6, 2016,
and as outlined in the Statement of Work, The Golden Gate National Parks Conservancy (GGNPC) will plan, permit, install and operate four new vertical axis wind energy systems at the Crissy Field Center (CFC), an existing modular test platform manufactured by Project Frog. The GGNPC will modify existing infrastructure and the Data Acquisition System (DAS) from the prior wind study project to record wind speed, wind direction, and power generation for each wind energy system. Data from the DAS shall be made available to HNEI sufficient for industry standard analysis.

Report 2.2: Wind Turbine and Data Acquisition System Installation

As outlined in the Deliverables and Payment Schedule, Report 2.2 "shall include documented evidence of completion of installation of turbines, inverters, and data acquisition equipment including photos and statements of installation completion by subrecipient."

Installation Milestones

The construction and installation schedule for the project proceeded as follows:

1. September 21, 2016: On site meeting with Luminalt, Owner, L&U to confirm construction logistics.
2. October 28, 2016: Omniflow equipment and electronics delivered, inspected and prepared for installation.
3. November 23, 2018: Site and single line drawings completed, reviewed and approved.
4. December 05, 2016: Old equipment from Phase 1 removed from site.
5. March 13, 2017: Primary construction starts. Anchor bolt installation commences. Omniflow tower preparation and turbine assembly/installation commences. Trenching and conduit installation commences. Installation of new conductors commences.
6. March 23, 2017: UGE turbines, towers and electronics delivered to site. Preparation of UGE equipment commences.
7. March 29, 2017: Installation of new low voltage conduit complete. Wire pull commences.
8. April 19, 2017: Low voltage installation at mechanical closet completed, prepared for Loisos & Ubbelohde to install new Data Acquisition System (DAS) Equipment.
9. April thru May 22: DAS installation proceeds through to Substantial Completion.
10. May 1 through May 31, 2017: Commissioning, tuning and site commissioning.
11. May 31, 2017: Project Installation complete. Site de-mobilized.

All specified equipment has been furnished installed as of the writing of this report.

Omiflow Assembly and Installation
(March, 2017)

Figure 1: Minor shipping damage was observed on one of the Omniflow cowlings when it was unpacked. Here the unit is shown undergoing repairs with an epoxy compound.

Figure 2: The North Omniflow unit, partially assembled on its lowered tower, which has been fitted with a customized adaptor plate.

Figure 3: North Omniflow unit assembled on tower and ready to raise into place.

Figure 4: Final installation details.

Figure 5: North Omniflow unit installed.

Retrofitting Existing Foundations to Receive New UGE Towers
(March, 2017)

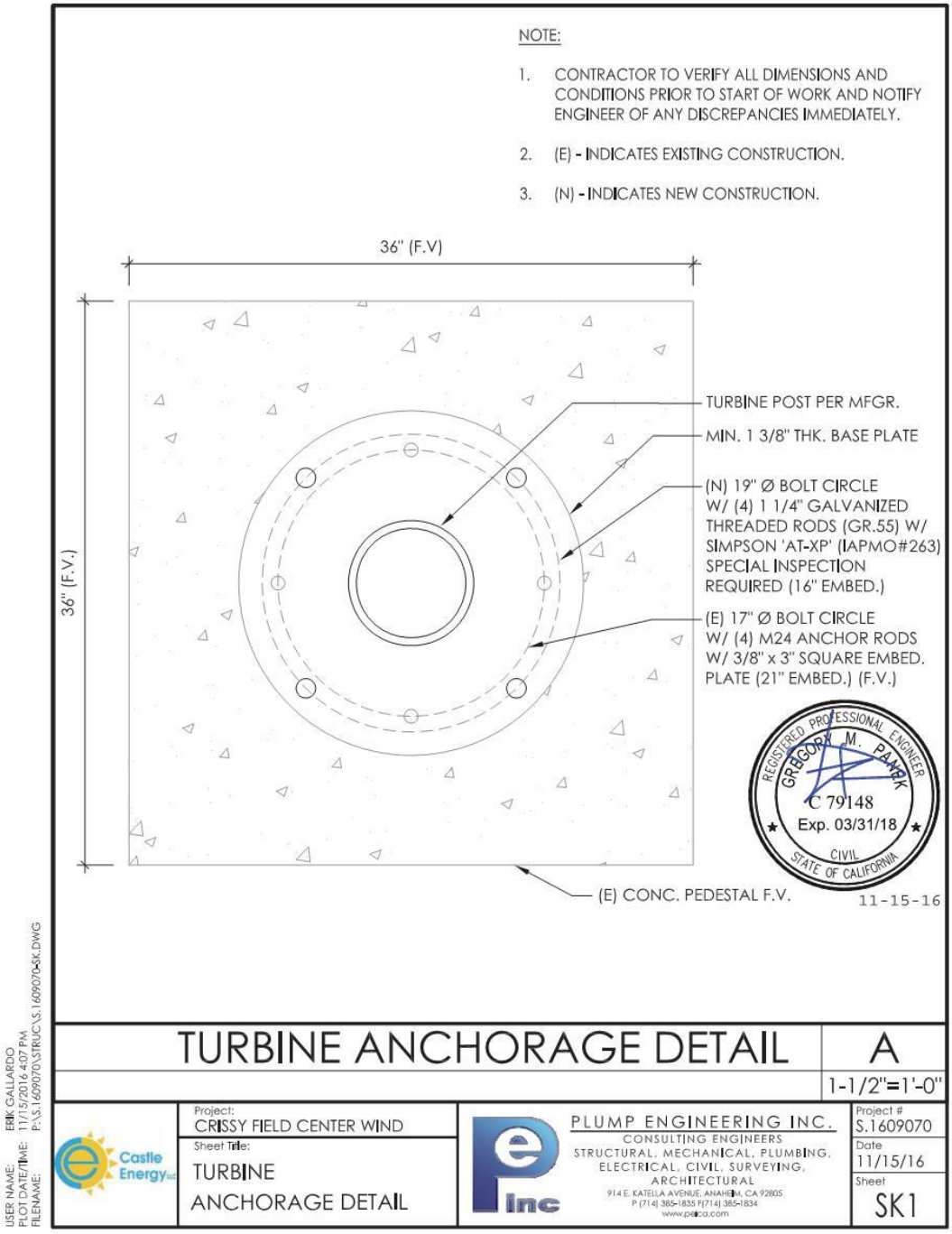

Figure 6: The existing Windspire foundations required additional anchor bolts to receive the new UGE towers and turbine assemblies (see report 1).

Figure 7: Specified epoxy.


Figure 8: Foundation top prepared for drilling.

Figure 8: Drilling holes in the existing Windspire foundations.


Figure 9: Cleaning and prepping new anchor bolt holes.

APPLIED MATERIALS & ENGINEERING, INC.
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June 2, 2017

Presidio Trust
103 Montgomery Street
P. O. Box 29052
San Francisco, CA 94129

Project Number: 1170263T

Subject: Special Inspection Final Report
Luminalt Crissy Field Center

This is to certify that in accordance with Section 1701, 1703, 1704 of the 2013 San Francisco Building Code, we have provided special inspection of the following:

Inspection Code
18A. Bolts Installed in Existing Concrete, report dated 4/3/17

The above inspection was performed by personnel under the direct supervision of the undersigned Registered Civil Engineer in the State of California. Based upon both inspections performed and substantiating reports, it is our professional judgment that the work requiring special inspection was substantially in conformance with the approved plans and specifications and applicable workmanship provisions of this code.

Sincerely,

APPLIED MATERIALS & ENGINEERING, INC.

REGISTERED PROFESSIONAL ENGINEER
MOHAMMED FAIYAZ
No. 84638
Exp. 3/31/18
CIVIL
STATE OF CALIFORNIA

Mohammed Faiyaz, P.E.
Senior Engineer

cc: LUMINALT ENERGY CORPORATION, Aaron Commoms, Noel Cotter

Figure 10: New anchor bolt pull test affidavit.

Installation of UGE Towers

(April, 2017)

Figure 11: Setting UGE South tower on retrofitted foundation.

Figure 12: UGE tower installed and bolted in.

Assembly of UGE Turbines

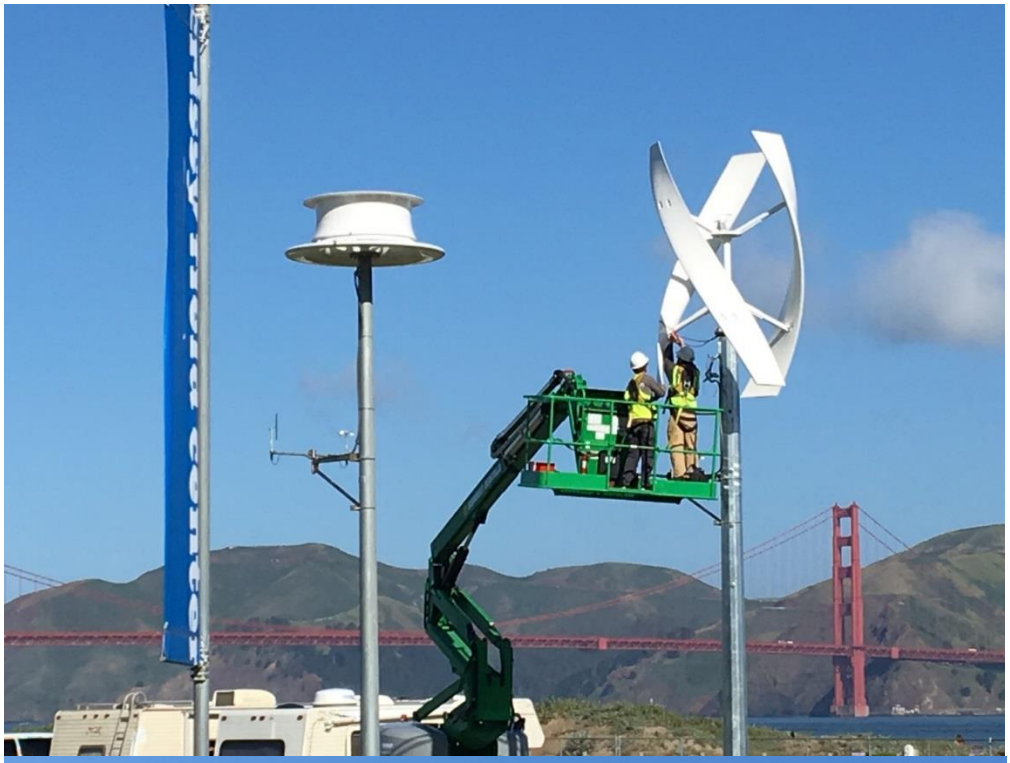
(April, 2017)

Figure 13: Laying out a set of UGE blades.

Figure 14: Preparing UGE generator/shaft for blade installation.

Figure 15: UGE blade assembly.

Figure16: UGE turbine head ready for installation on tower.



Figures 17 & 18: Final installation work on Northern UGE unit.

Figure 19: Safety fencing around project perimeter.

New Conduit and Conductor Installation
(March through April, 2017)

Figures 20 & 21: Trenching for new sensor conduits.

Figure 22: Detection tape.

Figures 23 & 24: Pulling conductors.

Figures 25 & 26: Wiring a turbine and disconnect switch.

Figure 27: Wiring a turbine and disconnect switch.

Figure 28: Completed turbine base installation with disconnect housing.

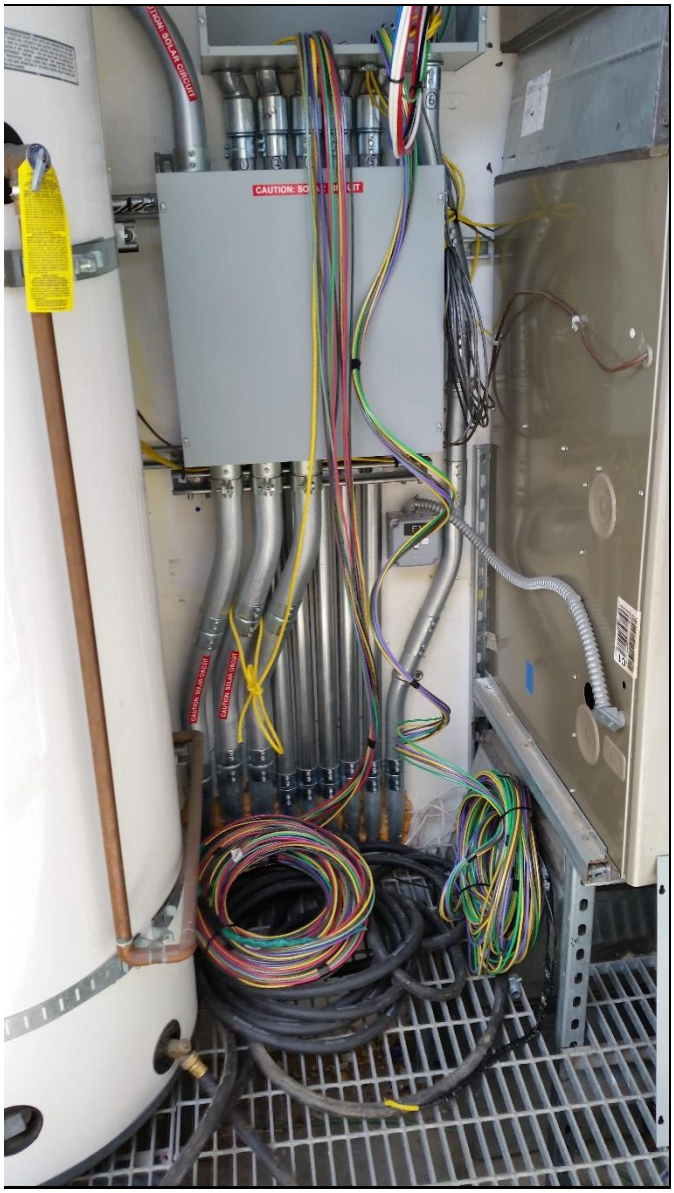


Figure 29: Wire pulled from turbines/sensors to mechanical closet.

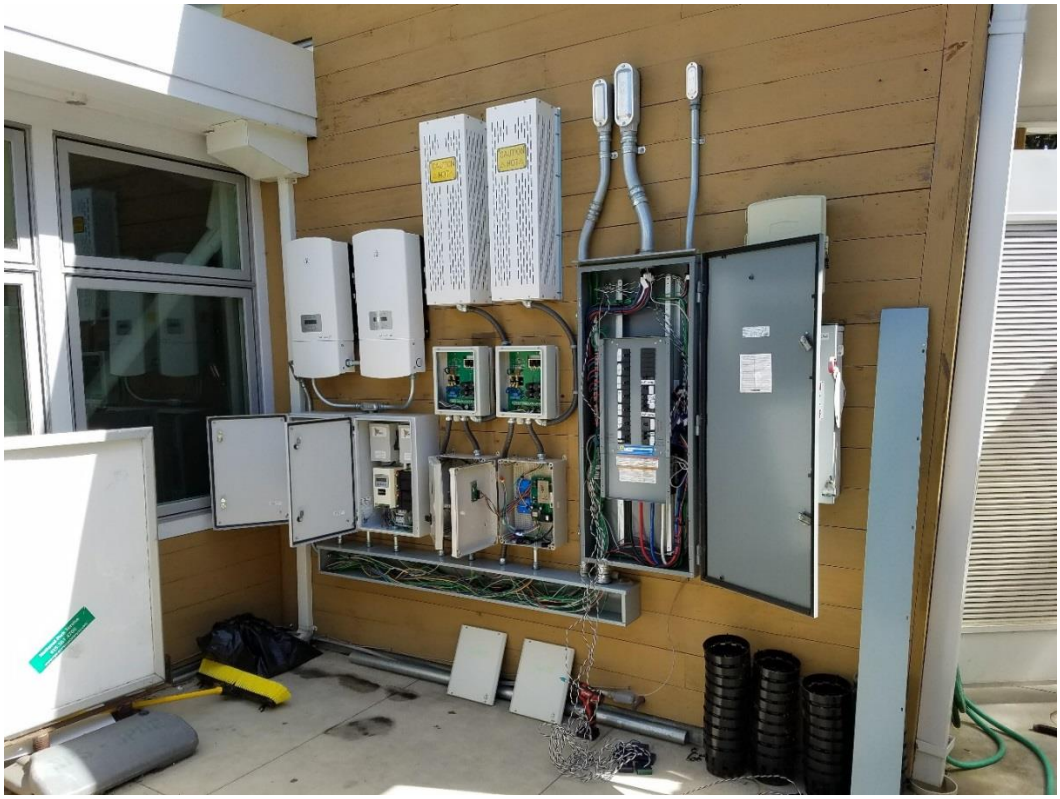


Figure 30: Wiring the inverters and associated electrical equipment.

Figure 31: Completed inverter array.

Data Acquisition System Installation
(April through May, 2017)

LOISOS + UBBELOHDE
ARCHITECTURE . ENERGY

1917 Clement Ave Building 10A • Alameda, CA 94501-1315
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MEMORANDUM

DATE 24 May, 2017

TO **Tom Odgers**
Golden Gate National Parks Conservancy

Jim Maskrey
Hawaii Natural Energy Institute

FROM Nathan Brown, Associate

RE Crissy Monitoring Installation Report

This memo describes the completed installation of hardware components in the high frequency monitoring system used to collect wind and power data for the updated Crissy Field Center wind turbine project. This report constitutes the final deliverable for Task 2 from the Consulting Services Agreement dated June 15, 2016. Site work for installation of the monitoring system concluded May 22, 2017.

Monitoring System

The updated wind turbine project includes wind turbine models by Omniflow and UGE. We refer to these by their location from the north:

- Wind turbine 1 : UGE North
- Wind turbine 2 : Omniflow North
- Wind turbine 3 : Omniflow South
- Wind turbine 4 : UGE South

The monitoring system includes the following for each turbine:

- Wind speed and direction sensors mounted on the turbine tower

Sensors: Met One wind sensor models 014A (speed) and 024A (direction)

- Power monitoring at the panel between the turbine inverter and power grid

  Sensors: Dent Powerscout 24 with Continential Control Systems AccuCTs

The measurements from the Omniflow turbines include solar power. Wind data will have to be disaggregated using data analysis (see memo titled 161025_omniflow_monitoring for further discussion).

As-Built Installation Plans

Attached are installation diagrams that represent as-built conditions[1].

[1] Source: 170524_install_plan_final.pdf

Figure 32: Completing the anemometer installation

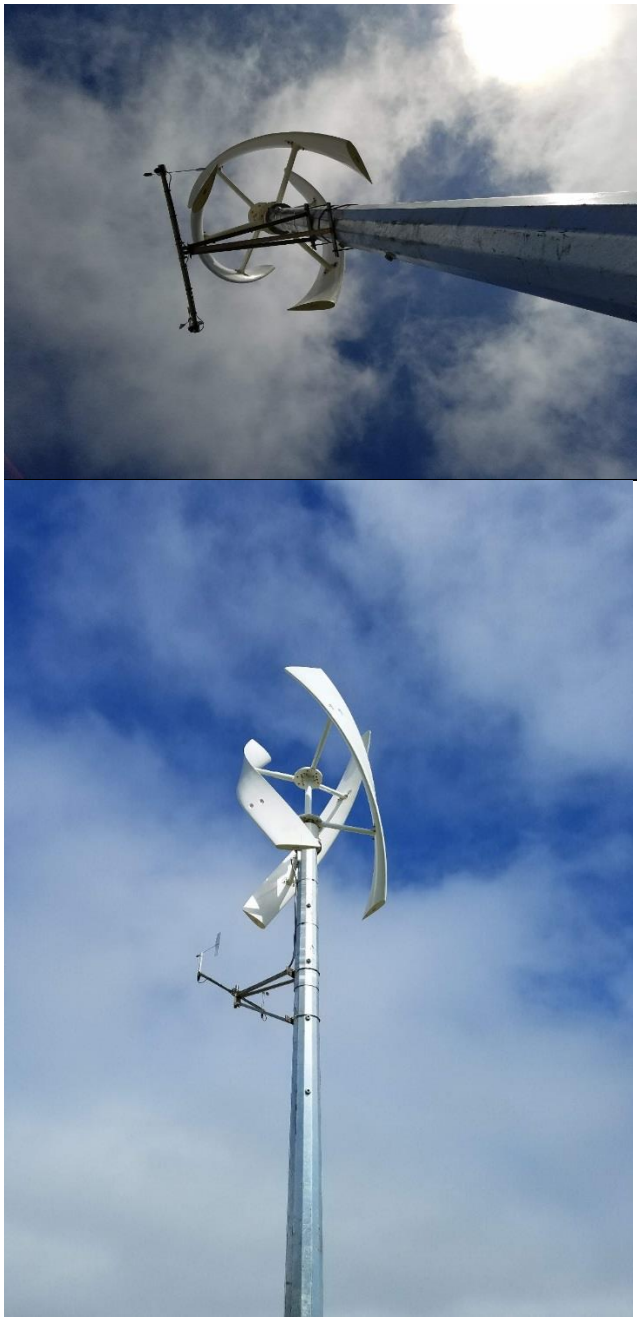

Figure 33 & 34: UGE unit with anemometer installed and operational.

Project Substantially Complete and Operational

(May 31, 2017)