

Asia Pacific Research Initiative for Sustainable Energy Systems 2012 (APRIS12)

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

Crissy Field Center Wind Power Study Phase II: Interim Operating Report (8 Month)

Task 7

Prepared For
Hawaii Natural Energy Institute

Prepared By
Golden Gate National Parks Conservancy

July 2018



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





July 18, 2018

Crissy Field Center Wind Power Study Phase II, Report 4.2: Interim Operating Report (8 Month)

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 4.2: Interim Operating Report (8 Month)

As outlined in the Deliverables and Payment Schedule, Report 4.2 “Report shall summarize work performed to collect data per Task 2c above during months 5-8 of the project and shall include a log of maintenance work performed and a summary of issues potentially impacting performance of the wind turbine and data acquisition systems.”

During the period covered by this report (October 2017 through January 2018), the wind turbines, associated electronics and Data Acquisition System continued to work as designed, without interruption.

In December of 2017, Luminalt and Loisos & Ubbelohde performed a scheduled inspection and maintenance for the project. As the systems were operating properly, routine maintenance was all that was required. See the attached reports for details.



Crissy Field Center Wind Turbine Maintenance Report

December 7, 2017

System includes two UGE VisionAIR3 turbines and two Omniflow OM1.2 turbines

Inspection date: 12/7/2017

Time readings taken: 6:30 am – 4:30 pm

Name(s): Noel Cotter and Jesse Viana

Weather: Clear Skies

2 UGE turbines

General notes: Both units were in perfect working condition. Units are spinning with no wobble. There is rust present which was sprayed with cold galvanizing compound or protective enamel. Checked torque on bolts.

Inspection performed: Checked for any visual damage such as cracks, rust, etc. Checked all hardware
Visually inspect electrical connections





Rust occurred on hardware on bottom of posts. Cold galvanizing compound was applied

South









North





Rustoleum flat protective enamel was applie to rusted areas on turbine.



2 Omniflow turbines

General notes:

Both spin perfectly. Found rust in bolts but that was about it. Sprayed rust flat protective enamel and cold galvanizing compound on rusted areas. Checked torque on bolts.

Inspections performed:

Checked for any visual damage such as cracks, rust, etc. Checked all hardware. Visually check electrical connection.

South







North





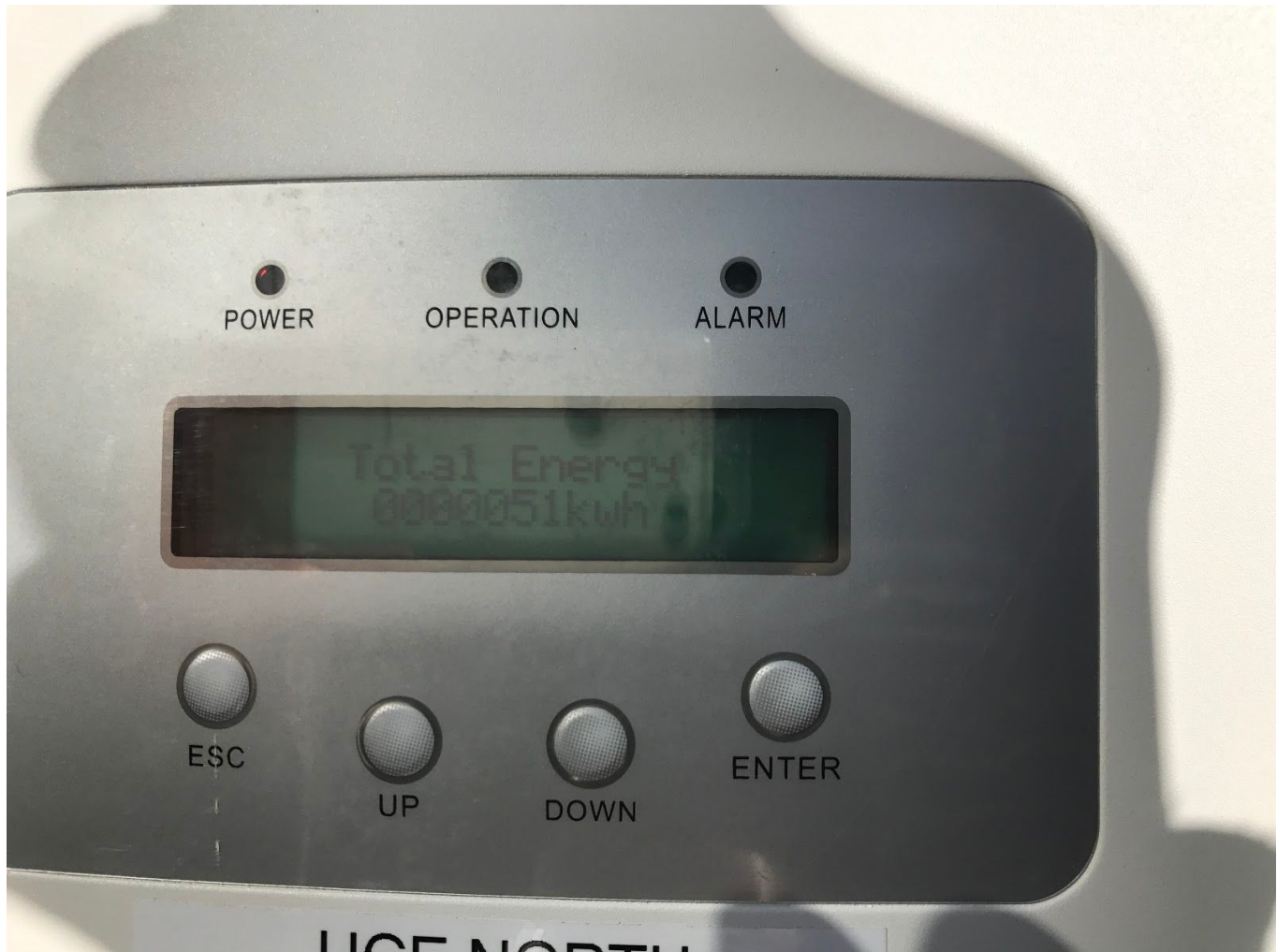




Inverters are in perfect working condition









Report 4.2: Interim Operating Report (8 Month)
Attachment 2

Dec 7, 2017 Maintenance Inspection

North UGE Tower	PASS	PASS W/ADJ	FAIL	NOTES
WIND SPEED SENSOR				
Visually inspect the anemometer cups for cracks and breaks	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Make sure that each arm is securely attached to the cup assembly hub	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Check to see that the vent hole, located at the base of the sensor, is unobstructed	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	rotated sensor as other
Look for abrupt stopping of the cup assembly with slow cup rotation.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<i>If this occurs, the bearings may need to be replaced.</i>				
WIND DIRECTION SENSOR				
Inspect for physical damage	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Verify that the vane assembly rotates freely.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

also: desiccant retrieved from electronics enclosure for recharge

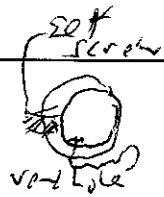
Report 4.2: Interim Operating Report (8 Month)
Attachment 2

Dec 7, 2017 Maintenance Inspection

North Omniflow Tower	PASS	PASS W/ADJ	FAIL	NOTES
WIND SPEED SENSOR				
Visually inspect the anemometer cups for cracks and breaks	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Make sure that each arm is securely attached to the cup assembly hub	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Check to see that the vent hole, located at the base of the sensor, is unobstructed	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	rotated sensor (same as o/lers)
Look for abrupt stopping of the cup assembly with slow cup rotation.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<i>If this occurs, the bearings may need to be replaced.</i>				
WIND DIRECTION SENSOR				
Inspect for physical damage	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Verify that the vane assembly rotates freely.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Report 4.2: Interim Operating Report (8 Month)
Attachment 2

Dec 7, 2017 Maintenance Inspection

South Omniflow Tower	PASS	W/ADJ	FAIL	NOTES
WIND SPEED SENSOR				
Visually inspect the anemometer cups for cracks and breaks	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Make sure that each arm is securely attached to the cup assembly hub	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Check to see that the vent hole, located at the base of the sensor, is unobstructed	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	rotated so vent hole is near set screw, 
Look for abrupt stopping of the cup assembly with slow cup rotation.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

If this occurs, the bearings may need to be replaced.

WIND DIRECTION SENSOR				
Inspect for physical damage	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Verify that the vane assembly rotates freely.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Report 4.2: Interim Operating Report (8 Month)
Attachment 2

Dec 7, 2017 Maintenance Inspection

South UGE Tower	PASS	PASS W/ADJ	FAIL	NOTES
WIND SPEED SENSOR				
Visually inspect the anemometer cups for cracks and breaks	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Make sure that each arm is securely attached to the cup assembly hub	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Check to see that the vent hole, located at the base of the sensor, is unobstructed	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	rotated sensor so vent hole is oriented near set-screw
Look for abrupt stopping of the cup assembly with slow cup rotation.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

If this occurs, the bearings may need to be replaced.

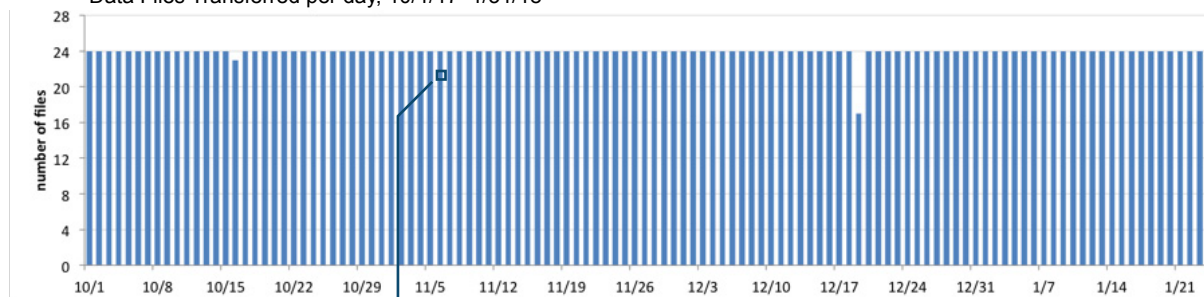
WIND DIRECTION SENSOR				
Inspect for physical damage	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Verify that the vane assembly rotates freely.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

High Resolution Monitoring System Activity, October 2017 – January 2018

Total Lines of
Data Transferred: **169,113,600**

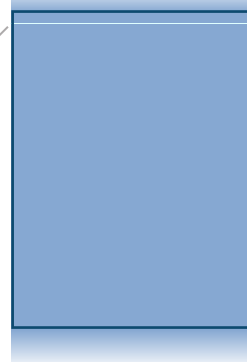
Data Files
Transferred:
2936

Data Files Transferred per day, 10/1/17–1/31/18



Example of Single Data File
(see attached for the first 1%
of this file)

Timesteps
per File:
3600



Snapshot of Single Timestep in
Raw Data File

Lines of Data
per Timestep:
16

```
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1510002015,1,5,26739,16489~
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1510002015,1,11,2117,17306~
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1510002015,11,6002,0~
1510002015,11,7002,23~
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1510002016,1,9,26739,16489~
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1510002017,1,1,13632,16438~
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Snapshot of Single Timestep in
Converted Data File

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2017/11/06 21:00:15,1,9,2.84700012207~
2017/11/06 21:00:15,1,11,308.064605713~
2017/11/06 21:00:15,1,13,2.04699993134~
2017/11/06 21:00:15,1,15,310.190887451~
2017/11/06 21:00:15,10,7002,0~
2017/11/06 21:00:15,11,6002,0~
2017/11/06 21:00:15,11,7002,23~
2017/11/06 21:00:15,12,6002,0~
2017/11/06 21:00:15,12,7002,11~
2017/11/06 21:00:15,13,6002,7~
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2017/11/06 21:00:17,1,1,2.84700012207~
2017/11/06 21:00:17,1,3,306.284454346~
```

wind speed and direction at tower 1
wind speed and direction at tower 2
wind speed and direction at tower 3
wind speed and direction at tower 4
power (pos. and neg.), turbine 1
power (pos. and neg.), turbine 2
power (pos. and neg.), turbine 3
power (pos. and neg.), turbine 4

Converted Data File for November 6, 2017, 9:00 PM - 10:00 PM
(only the first 40 seconds—about 1%—of the file is shown here)

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