



PROJECT DELIVERABLE REPORT

INTEL-LINE

Work Package 4

Deliverable 4.1

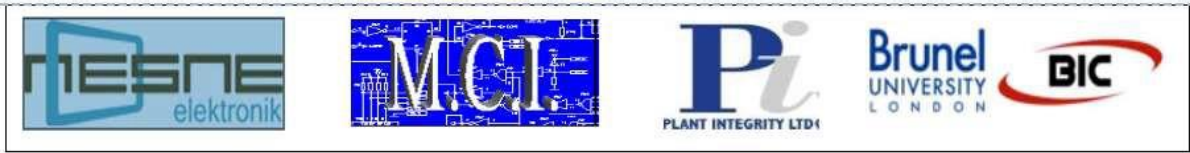
Acceptance Tests in An Operational Environment

Due date of deliverable: 31st March 2019
Actual submission date: 31st March 2019

Authors: Brunel University London and Plant Integrity Ltd

Dissemination Level: Confidential, only for members of the consortium (Including the Commission Services)

Project Call:	Fast Track to Innovation Pilot
Project Number:	720402
Project Start Date:	01 October 2016
Project's coordinator:	Mrs Hilal Tolasa Gundogdu (Nesne electronic)
Tel: 0090232 7659096	
E-mail: hialt@nesne.com	



Contents

Summary.....	3
Offshore Renewable Energy Catapult Report.....	4

Summary

BIC and Pi carried out crucial trials of the Intel-Line system performance for High Voltage (up to 400 kV) and lightning impulse (up to 1200 kV) conditions at the facilities of the Offshore Renewable Energy Catapult (OREC) located in Blyth (UK). The system successfully passed the tests in accordance with the IEC 60060-1:2010 standard.

- The Intel-Line system was tested at four set voltage values: 30kV, 138kV, 220kV and 400kV.
- Each high voltage test lasted for 60 seconds as recommended in section 6.2.1.2 (Tolerances) of the IEC 60060-1:2010 standard.
- A corona discharge camera was used in order to inspect and evaluate the generation of corona discharge in the Intel-Line system encapsulation. Results are shown in Figure 1.

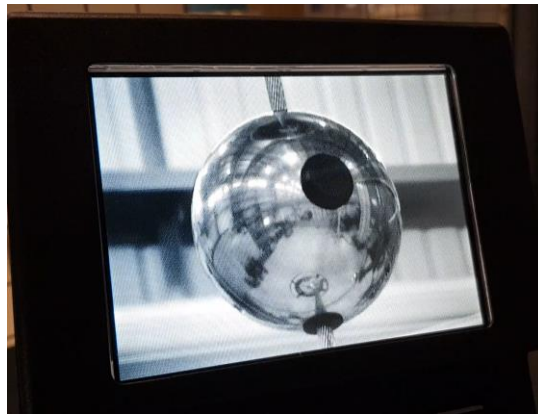


Figure 1 Corona discharge camera results

The report from OREC is provided in the next section of this report.

Offshore Renewable Energy Catapult Report

ORE Catapult Development Services Limited
Charles Parson Technology Centre, High Quay, Blyth, Northumberland, NE24 2AZ
Tel: 01670 35 7770 Fax: 01670 35 7771 <https://ore.catapult.org.uk/>



TEST DATA

Document No. PD/T/18/12247

CLIENT:	Plant Integrity Ltd, Granta Park, Great Abington Cambridge, CB21 6AL.
MANUFACTURER:	Plant Integrity Ltd, Granta Park, Great Abington Cambridge, CB21 6AL.
TEST OBJECT AND RATING:	Test Sphere 1 : Intel Line Prototype System, containing processor board. Test Sphere 2 : Intel Line Prototype System, fully functioning system.
DATE OF TEST	21/01/2019 to 24/01/2019
COMPILED BY	Ian Williamson

Object

To perform H.V. withstand tests and lightning impulse tests in accordance with IEC 60060-1:2010 and Plant Integrity Ltd document LC2535/01/19.

Equipment details

1. Test Sphere 1 contained a working processor board programmed to visually indicate that it was functioning correctly.
2. Test Sphere 2 contained a complete working system comprising of an ultrasonic collar, processor board, power supply and communication system.

The Test Spheres were attached to a 3m section of Bear cable for the withstand test and a 2m section of cable for the lightning impulse tests.

Tests performed

1. AC voltage withstand/PD test for 60 seconds at the following levels:
 - 30 kV rms.
 - 138 kV rms.
 - 220 kV rms.
 - 400 kV rms.
2. 3 positive lightning impulses at 1.2 MV and 3 negative lightning impulses at 1.2 MV.

Test Results

The results of the tests are shown overleaf.

Test 1, Withstand/PD Test: Test Sphere 1

Background PD = 57pC

Voltage Level (kV)	PD (pC)	Test Result	Notes
30	62	Pass	LED flashing after test
138	90	Pass	LED flashing after test
220	1500	Pass	LED flashing after test
400	150000	Pass	LED flashing after test

Test 2, Withstand/PD Test: Test Sphere 2

Background PD = 57pC

Voltage Level (kV)	PD (pC)	Test Result	Notes
30	60	Pass	Comms working
138	62	Pass	Comms working
166	304	Pass	Comms working
220	8000	Pass	Comms working
355	135000	Fail	Comms failed
208	20000	Pass	Comms working
400	150000	Pass	Comms working

Test 3, LI Test: Test Sphere 1

Number/Polarity	Peak Voltage (MV)	T1 (uS)	T2 (uS)	Test Result	Notes
1, Positive	1.187	1.16	52.2	Pass	LED flashing after test
2, Positive	1.196	1.17	52.8	Pass	LED flashing after test
3, Positive	1.201	1.18	52.8	Pass	LED flashing after test
1, Negative	1.192	1.11	51.8	Pass	LED flashing after test
2, Negative	1.206	1.12	52.5	Pass	LED flashing after test
3, Negative	1.206	1.12	52.5	Pass	LED flashing after test

Test 3, LI Test: Test Sphere 2

Number/Polarity	Peak Voltage (MV)	T1 (uS)	T2 (uS)	Test Result	Notes
1, Positive	1.185	1.14	52.2	Pass	Comms working
2, Positive	1.204	1.18	52.8	Pass	Comms working
3, Positive	1.204	1.18	52.8	Pass	Comms working
1, Negative	1.21	1.12	52.4	Pass	Comms working
2, Negative	1.205	1.13	52.4	Pass	Comms working
3, Negative	1.202	1.13	52.5	Pass*	Comms working

* Note: After the 3rd negative impulse communication was lost with the test sphere but was regained after the system was reset.