Appendix 1 – Glossary of Terms

Anemometer	The anemometer is a device used for measuring the instantaneous wind speed.
Bearing	In the wind turbine the function of the bearing is to allow the shaft to rotate freely.
Cut-In Speed	This is the wind speed at which the turbine will start to deliver electrical power. Cut-in will occur when the speed of the generator achieves its synchronous speed.
Cut–Out Speed	The maximum wind speed at which the turbine is permitted to deliver power. The operating range of a turbine is limited due to engineering design and safety constraints. The cut-out speed for the turbine is 25 m/s, although wind speeds this high are rare.
Distribution Network	This is the low and medium voltage (under 33 kV) that typically connects into homes and businesses.

537	(G) peak power	Production from the generator exceeds the peak value of 18 kW.	A	50	10m	The error will be automatically reset when the wind speed is below an average of 18 m/s over a 10 minutes period.
601	Current asymmetry	The power from one phase deviates by more than 25% compared with the other phases.	M	50	0s	Contact Gaia-Wind or your turbine servicing company.
607	Auto. motorstart	The turbine motor start has been activated more than 20 times.	M	50	30s	Reset error. If error persists, then contact Gaia-wind or your turbine servicing company.
609	Thyrister Block hot	Thyristor block temperature > *Set stat. 609 xx°C.	A	50	0s	Automatic reset when thyristor block temperature < Clr stat. 609 °C.
651	Cut in 0>G1	Cut in time of G1 via WP4060 increases *0>G1 xxS (30 sec.).	A	50	30s	No Action required.
662	WP4060 error	Cut in error. The status code is not tested when output 524 (G1 contactor) is low, or when output 525 (generator bypass) is high.	A	50	10s	Automatic reset when the turbine is not moving (rpm = 0).
772	Cable twisted	The cable twist sensor has been activated.	M	50	0s	Contact Gaia-wind or your turbine servicing company.
1311	Coupling (G) gearbox	Ratio between the RPM of the generator and rotor does not match the gear ratio (+/- 2).	A	50	0s	Reset error. If error persists, then contact Gaia-wind or your turbine servicing company.
1544	PT100 defective	A connection to one of the PT100 sensors is defect.	A	50	0s	Contact Gaia-wind or your turbine servicing company.
2812	ROCOF!	A loss of mains power event.	A	99	190s	No Action required.

Status Code	Error Message	Description	Error Reset Type	Required password level	Reset Delay	Instructions
2925	Freq. Fall too fast!	The grid frequency is falling too fast.	A	99	190s	No Action required
2926	Freq. Fall too fast!	The Grid frequency is raising too fast.	A	99	190s	No Action required
3041	Islanding	Occurs when there has been no power to controller.	A	50	180s	No Action required

Distribution Network Operator	The companies which operate the Distribution Network in the UK.
Downwind	This refers to a wind turbine in which the hub and blades point away from the wind direction. The opposite of an upwind turbine.
Freewheeling	The wind turbine is said to 'freewheel' when it is not connected to a load but continues to rotate.
Gearbox	A mechanical system used to match the slow rotational speed of the rotor to the high rotational speed of the generator.
Horizontal Axis Wind Turbine	This is a standard in wind turbine design. The shaft is parallel to the ground and the rotor area is perpendicular to the ground.
Hub	The centre of the rotor of the wind turbine. The purpose of the hub is to hold the blades in place and attached to the turbine shaft.
Induction Motor	An AC motor in which the rotating part has no windings and brushes on it.
Kilowatt Hour (kWh)	The kilo-watt-hour is the standard unit for measuring electric energy in the UK. 1kWh is equivalent to the energy consumed by a 1kW device operating for 1 hour. Note that this is equivalent to a 3 kW device operating for 20 minutes.
Leading Edge	The edge of the blade that faces towards the direction of rotation.
Nacelle	Housing that contains all of the components necessary for the conversion of wind energy to electrical energy. The important components include the bearings, shafts, gear box, brake, and generator.

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Appendix 2 – Technical Data

General	
Type	Gaia-Wind 133-11kW
Hub Height	18.3 m
Yaw System	Free Yaw
Cut-In Wind Speed	3.5 m/s
Rated Wind Speed	9.5 m/s
Cut-out Wind Speed	25 m/s
Rated Power	11kW
Nacelle Weight	900 kg
Operating Temperature	-20°C > 50°C

Rotor	
Diameter	13.0 m
Blade Material	Glass Fibre Reinforced Polyester (GRP)
Nominal Speed	56 rpm
Weight	200 kg
Power Regulation	Stall Regulated
Air Brake	Tip brakes, centripetal activation

Generator	
Type	3-phase induction generator, 400 V, 50Hz, Marine Grade
Nominal Power	11kW
Weight	138 kg

Gear	
Transmission Ratio	1 : 18
Lubrication	Centrifugal
Weight	143 kg

Mechanical Brake	
System	18.0 m

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Appendix 3 – Error Message Status Codes

Error Reset Types; A denotes Auto, M denotes Manual & R denotes Remote

Status Code	Error Message	Description	Error Reset Type	Required password level	Reset Delay	Instructions
0	System OK	No errors. Turbine operational.	A	50	0s	No Action required.
5	Vibration	Vibrations detected within the nacelle.	M	50	0s	Contact Gaia-Wind or your turbine servicing company.
7	Turbine is Serviced	Turbine is in service mode.	M	80	0s	Contact Gaia-Wind or your turbine servicing company.
9	Remote Stop	A special function not used.	A	50	1s	Contact Gaia-Wind or your turbine servicing company.
11	Stop via communica-tion	Stop command received via modem or direct link.	R	50	0s	Contact Gaia-Wind or your turbine servicing company.
13	Manual Stop	The turbine has been stopped manually via the STOP button on the turbine operating panel.	M	50	0s	Reset error and restart turbine.
18	Emergency stop	Emergency stop button has been activated.	M	50	0s	First check for good reason for Emergency Stop activation. Once satisfied, release emer-gency stop and reset.
23	Repeating error	An error code has been recorded too many times.	M	50	0s	Contact Gaia-wind or your turbine servicing company.
29	New Program	The program firmware has been updated.	M	50	0s	Contact Gaia-wind or your turbine servicing company.
38	Alarm Call Test	Alarm call test in the Service Menu is set to ON.	R	50	0s	Contact Gaia-wind or your turbine servicing company.
39	Division by zero	Parameter error value.	M	50	0s	Contact Gaia-wind or your turbine servicing company.

40	Parameter Crash	Parameter crash due to flat battery. Battery must be replaced and all parameters set to default values.	M	50	0s	Contact Gaia-wind or your turbine servicing company.
42	Internal Battery Low	Battery needs replaced.	M	50	0s	Contact Gaia-wind or your turbine servicing company.
45	Main ctrl. Supply	There has been a power failure in the mains supply and the turbine controller has reboot.	A	50	10s	Error will be reset automatically when mains supply is detected after a delay of 3 minutes.
51	DSP Watchdog	DSP processor is rebooting.	A	50	0s	No Action required.
53	Main ctrl. Watchdog	The main controller is rebooting.	A	50	10s	No Action required.
55	Main ctrl. Watchdog	The controller has been reset manually by the user.	A	50	10s	No Action required.

Status Code	Error Message	Description	Error Reset Type	Required password level	Reset Delay	Instructions
99	Park master stop	The park control has sent a command to stop the turbine. The status code is reset when the park control sends a start command.	R	50	0s	No Action required.
100	Repeated grid error	Errors relating to the voltage and frequency of the mains supply have been occurring too often.	M	50	0s	Contact Gaia-Wind or your turbine servicing company.
102	Phase drop	No voltage in one or more.	A	50	3m	Error will be reset when the voltage is detected
103	Vector surge	The phase angle has changed by more than 3°.	A	50	10s	Automatic reset when phase angle is smaller than 3°.
110	Vector surge	The grid voltage has exceeded the maximum limit.	A	50	3m	The error will be reset when the grid voltage is OK.
111	Vector surge	The grid voltage has exceeded the maximum limit.	A	50	3m	The error will be reset when the grid voltage is OK.
120	Frequency high	The grid frequency has exceeded the maximum limit.	A	50	3m	The error will be reset when the grid voltage is OK.
121	Frequency low	The grid frequency has exceeded the maximum limit.	A	50	3m	The error will be reset when the grid voltage is OK.
130	L1-L2-L3 120°	The phase angle between the L1, L2, and L3, is larger than 6°.	A	50	10s	The error will be reset when the grid voltage is OK.
138	Grid Param. Warning	Internal Calculations.	M	50	0s	Contact Gaia-wind or your turbine servicing company.

139	Grid Param Stop	Internal Calculations.	M	50	0s	Contact Gaia-wind or your turbine servicing company.
158	Voltage high 2	Back up - The grid voltage has dropped below the minimum limit.	A	99	190s	No Action required.
159	Voltage low 2	Back up - The grid voltage has dropped below the minimum limit.	A	99	190s	No Action required.
227	Anemometer defect	Anemometer recording wind speed below 2 m/s, with turbine output power over 1 kW.	A	50	1m	The error will be reset automatically when the wind speed recorded over 30 seconds averages the start wind speed (3 m/s).
233	Wind < start cond.	The wind speed is less than starting conditions.	A	50	0s	No Action required.
240	Awaiting Wind	The wind speed is too low and freewheeling is disabled.	M	50	0s	No Action required.
250	Wind > max	The recorded wind speed averages 20 m/s over a 10 minute period or the wind speed is higher than 25 m/s.	A	50	*600s	The error will be automatically reset when the wind speed is below an average of 18 m/s over a 10 minutes period.
300	(G) tacho defect	The generator speed is below 100 RPM, when the rotor speed is above 8 RPM.	A	50	0s	Reset error. If error persists, then contact Gaia-wind or your turbine servicing company.
302	(R) tacho defect	Rotor speed is below 2 RPM while the generator speed is greater then 600 RPM.	A	50	0s	Reset error. If error persists, then contact Gaia-wind or your turbine servicing company.
311	Rotor overspeed	The rotor speed exceeds the maximum rotor speed (62 RPM)	M	50	0s	Contact Gaia-wind or your turbine servicing company.

Status Code	Error Message	Description	Error Reset Type	Required password level	Reset Delay	Instructions
312	(G) overspeed	The generator speed exceeds the maximum generator speed.	M	50	0s	Contact Gaia-wind or your turbine servicing company.
314	Free wheeling oversp	The rotor speed exceeds the maximum rotor speed (62 RPM) before the generator has 'cut-in'. Most commonly the result of a large gust of wind.	M	50	0s	Reset error. If error persists, then contact Gaia-wind or your turbine servicing company.
415	Brake pads worn	Warning that the brake pads are worn out and should be replaced.	M	50	0s	Contact Gaia-wind or your turbine servicing company.
416	Replace brake pads	The brake pads worn error has occurred four times.	M	50	0s	Contact Gaia-wind or your turbine servicing company.
421	Brake not released	The brake has not released.	M	50	0s	Reset error. If error persists, then contact Gaia-wind or your turbine servicing company.
434	B200 brake time>max	The turbine braking procedure took longer than 10 seconds.	M	50	0s	Contact Gaia-wind or your turbine servicing company.
501	Power consumption	The turbine consumes more than limit of 5 kW of power.	M	50	0s	Reset error. If error persists, then contact Gaia-wind or your turbine servicing company.
521	(G) hot	The generator temperature is too high.	A	50	1h	Reset when generator temperature decreases.
530	(G) power too high	Production from the generator exceeds a value of 15 kW, averaged over a period of 10 minutes.	A	50	10m	The error will be automatically reset when the wind speed is below an average of 18 m/s over a 10 minutes period.