C-GEN Direct Drive

The PTO solution with high reliability, survivability, availability & affordability.

WES STAGE 3 OBJECTIVES

- Demonstrate C-GEN in a real environment, at a relevant scale and under realistic load profiles.
- Industrialise the design and manufacture of C-GEN for marine renewable applications.
- Obtain certification/qualification from an independent body.
- Align the commercial strategy with device developers for a full scale Stage 4 demonstrator.

TOPOLOGY

LINEAR

ROTARY

APPLICABLE TO ALL OFFSHORE RENEWABLEs

WAVE

TIDAL

WIND

SCALABILITY:

25kW to 1MW in one step

AFFORDABILITY:

CAPEX Target - £400k/MW
LCoE Target - £150/MWh

AVAILABILITY, RELIABILITY AND SURVIVABILITY

MTBF – target 5 years
5 x electrical & mechanical overload capability
Modularity provides redundancy
Maintenance on vessel – low MTTR
Flooded operation provides inherent overload capability

Modularity - offshore O&M

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C-GEN Technology

C-GEN is an advanced proven multi-stage air-cored direct drive PM generator technology providing high reliability and availability in renewable energy converters.

The differentiating design features of the patented C-GEN design include:

- an axial flux topology with C-shaped rotor core
- an air-cored stator arrangement
- generator divided into several axial generator stages that are electrically independent
- generator rotor and stator divided into low weight standardised modules around the circumference

C-GEN PMG technology has the following USPs over existing generator technologies used for direct drive:

1. **No Magnetic Attraction Forces closing the airgap** - simplifies the support structure required, and simplifies final assembly.

2. **No cogging torque** - more of the input mechanical energy will be converted to electrical energy, and noise and vibration will be reduced.

3. **High Degree of Modularity** - the use of air-cored coils allows a high degree of modularity in both the stator and rotor construction.

4. **Higher availability** – C-GEN is a multi-stage machine, eg a 4 stage 1MW generator consists of 4 separate 250kW machines, all of which can be isolated. A fault in one stage can be isolated and the remaining 3 stages can generate increasing availability, annual energy yield and hence reducing LCOE.

5. **Ease of O&M** - the high degree of modularity enables replacement of single faulty modules rather than the complete machine. This reduces O&M costs and increases the turnaround of any O&M procedures. Depending upon the size of the device, the O&M procedure could be done on board a ship using an on-board crane or using a crane in a nacelle of a wind turbine.

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