A NEW GENERATOR THAT CAN DRIVE DOWN LCOE

INNOVATION

GreenSpur Renewables has developed a new low cost direct drive (DD) permanent magnet generator (PMG) for the wind turbine market. The company's USP is that its generator uses ferrites to create the magnetic field, which is a significant source of cost reduction. The use of ferrite could also eliminate an industry wide reliance on Neodymium Iron Boron (NdFeB), the scarce and expensive rare magnet used in existing designs.

RARE EARTH MAGNETS INTRODUCE SUPPLY AND PRICE RISKS

Security of supply of NdFeB is a major risk issue. Almost 95% of global rare earth market production originates from China and is in high demand from other powerful industries, including defence, aerospace, electrical vehicles, medical, computing and mobile phones. The 2015 annual production of neodymium amounted to 35,900 tonnes.

By contrast ferrite magnets are made from iron ore, an abundant material with worldwide reserves estimated at 800 billion tonnes. NdFeB is also expensive. Although ferrite magnets are 1/3rd less powerful they are 1/30th of the cost by mass of rare earth magnets. In simple terms magnet costs could fall to 1/10th of current levels and simultaneously eliminate supply risk.

WHAT'S DIFFERENT?

The Greenspur DD PMG is a patented novel axial flux design. It embodies a number of innovations that make it possible to assemble a ferrite only DD PMG with a similar mass and space envelope to current offerings. It is also less sensitive to the cooling problems that face existing DD PMGs, as ferrite has a Curie point of 460°C as compared to 180°C for NdFEB magnets.

COST ADVANTAGES

LCOE savings of about 0.5% have been estimated by BVG Associates and there is potential to go much further as the design is optimised.

DEVELOPMENT PATH

The Greenspur DD PMG has been proven at prototype scale. A Finite Element Analysis model has been built by the University of Cambridge, which can accurately model output and costs of multi-MW units. A 50kW unit will be in test by the end of the year. The company then plans to build an optimised 250kW unit, which will be quickly followed by a fully optimised 1MW unit.

This will provide the stepping stone to much larger units in the 6MW to 15MW range suitable for deployment from the early 2020s onwards. The company is looking to establish relationships with leading suppliers that will guide designs suitable for volume manufacture.

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