

# **Directly Driven Rare-Earth Permanent-Magnet Electrical Machine Prototype for Wind Energy Applications**

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## **Abstract**

This paper presents finite element design and analysis of two radial-flux high-energy rare-earth permanent magnet electrical machines with new topology. It allows for short endwindings, which contributes to higher efficiency, higher power to weight ratio and low active material cost. Locating the windings in flat slots has further reduced the cost of active material. The permanent magnets are sintered NdFeB with flux concentration arrangement and magnetized tangentially on the rotor support structure. To produce any easy path for the flux penetration and therefore to increase the linkage flux, soft magnetic material is fixed on both poles of the magnets. One of the machines was manufactured and tested as a variable low-speed generator. The relatively high efficiency, the typical 'rule of thumb' value of the leakage flux coefficient and the good agreement between the theoretically predicted and experimentally obtained results, which were achieved, demonstrate the success of this topology in its original design.