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Investigation of Anisotropic Bonded Magnets in Permanent Magnet Machine Applications[1] H.A. KHAZDOZIAN, Ames Laboratory, S.K. MCCALL, Lawrence Livermore National Laboratory, M.J. KRAMER, Ames Laboratory, M.P. PARANTHAMAN, Oak Ridge National Laboratory, I.C. NLEBEDIM, Ames Laboratory — Rare earth elements (REE) provide the high energy product necessary for permanent magnets, such as sintered $Nd_2Fe_{14}B$, in many applications like wind energy generators. However, REEs are considered critical materials due to risk in their supply. To reduce the use of critical materials in permanent magnet machines, the performance of anisotropic bonded NdFeB magnets, aligned under varying magnetic field strength, was simulated using 3D finite element analysis in a 3MW direct-drive permanent magnet generator (DDPMG), with sintered N42 magnets used as a baseline for comparison. For direct substitution of the anisotropic bonded magnets, approximately 85% of the efficiency of the baseline model was achieved, irrespective of the alignment field. The torque and power generation of the DDPMG was not found to vary significantly with increase in the alignment field. Finally, design changes were studied to allow for the achievement of rated torque and power with the use of anisotropic bonded magnets, demonstrating the potential for reduction of critical materials in permanent magnets for renewable energy applications.

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