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Simple-coil optimized stellarator designs for pilot plants.[1] M.C. ZARNSTORFF, S. COWLEY, D. GATES, PPPL, M. LANDREMAN, U. Maryland, C. ZHU, PPPL — Permanent magnets provide a method to produce optimized stellarator configurations using very simple coils. Simple coils should reduce the cost and engineering risk of stellarator experiments and enable large-aperture sector maintenance for fusion systems, resolving a long-standing research need. Commercially available permanent magnets can produce local magnetic fields of ˜1.7T in a background field up to 7.7 T when cooled. Permanent magnets impose different constraint on plasma shape optimization than coils. Analysis of NCSX alternative designs shows that permanent magnets can produce plasma shapes not accessible with physical coils. This flexibility has been used to re-examine stellarator optimization for quasi-axisymmetric plasma confinement. Parametric variation is used to identify promising design approaches and parameters for physics experiments and compact fusion pilot plants, building on earlier studies.

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