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The QUASAR facility[1] DAVID GATES, Princeton Plasma Physics Laboratory — The QUAsi-Axisymmetric Research (QUASAR) stellarator is a new facility which can solve two critical problems for fusion, disruptions and steady-state, and which provides new insights into the role of magnetic symmetry in plasma confinement. If constructed it will be the only quasi-axisymmetric stellarator in the world. The innovative principle of quasi-axisymmetry (QA) will be used in QUASAR to study how "tokamak-like" systems can be made: 1) Disruption-free, 2) Steady-state with low recirculating power, while preserving or improving upon features of axisymmetric tokamaks, such as 1) Stable at high pressure simultaneous with 2) High confinement (similar to tokamaks), and 3) Scalable to a compact reactor Stellarator research is critical to fusion research in order to establish the physics basis for a magnetic confinement device that can operate efficiently in steady-state, without disruptions at reactor-relevant parameters. The two large stellarator experiments – LHD in Japan and W7-X under construction in Germany are pioneering facilities capable of developing 3D physics understanding at large scale and for very long pulses. The QUASAR design is unique in being QA and optimized for confinement, stability, and moderate aspect ratio (4.5). It projects to a reactor with a major radius of ∼8m similar to advanced tokamak concepts. It is striking that (a) the EU DEMO is a pulsed (∼2.5 hour) tokamak with major R ∼ 9 m and (b) the ITER physics scenarios do not presume steady-state behavior. Accordingly, QUASAR fills a critical gap in the world stellarator program.

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