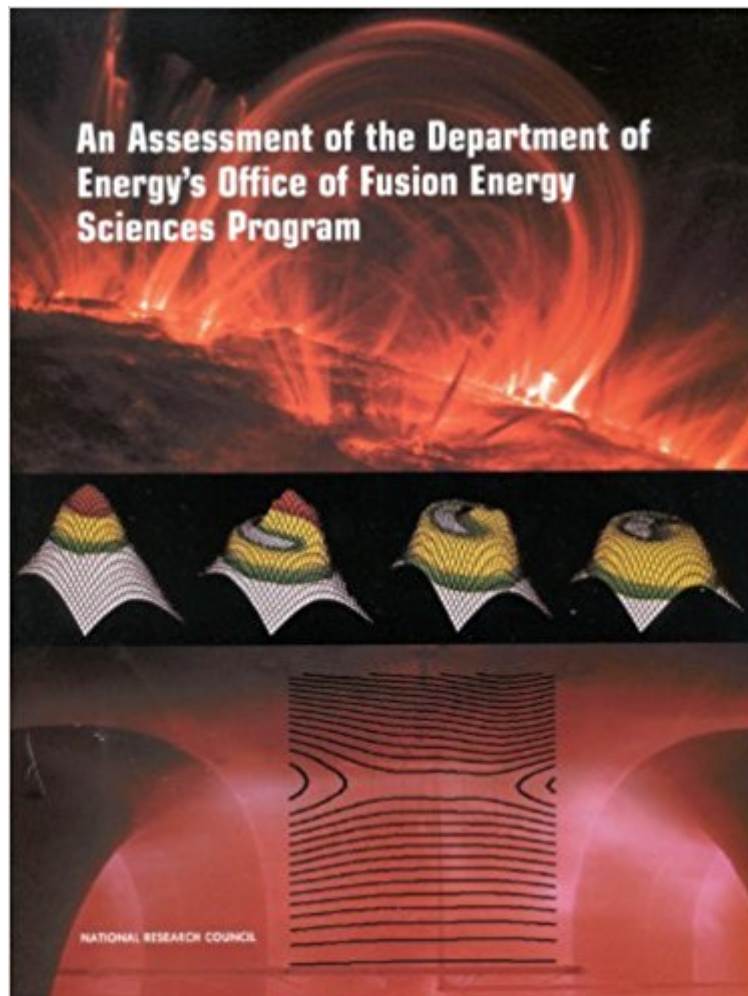




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An Assessment Of The Department Of Energy's Office Of Fusion Energy Sciences Program (Compass Series)



Synopsis

The purpose of this assessment of the fusion energy sciences program of the Department of Energy's (DOE's) Office of Science is to evaluate the quality of the research program and to provide guidance for the future program strategy aimed at strengthening the research component of the program. The committee focused its review of the fusion program on magnetic confinement, or magnetic fusion energy (MFE), and touched only briefly on inertial fusion energy (IFE), because MFE-relevant research accounts for roughly 95 percent of the funding in the Office of Science's fusion program. Unless otherwise noted, all references to fusion in this report should be assumed to refer to magnetic fusion. Fusion research carried out in the United States under the sponsorship of the Office of Fusion Energy Sciences (OFES) has made remarkable strides over the years and recently passed several important milestones. For example, weakly burning plasmas with temperatures greatly exceeding those on the surface of the Sun have been created and diagnosed. Significant progress has been made in understanding and controlling instabilities and turbulence in plasma fusion experiments, thereby facilitating improved plasma confinement-remotely controlling turbulence in a 100-million-degree medium is a premier scientific achievement by any measure. Theory and modeling are now able to provide useful insights into instabilities and to guide experiments. Experiments and associated diagnostics are now able to extract enough information about the processes occurring in high-temperature plasmas to guide further developments in theory and modeling. Many of the major experimental and theoretical tools that have been developed are now converging to produce a qualitative change in the program's approach to scientific discovery. The U.S. program has traditionally been an important source of innovation and discovery for the international fusion energy effort. The goal of understanding at a fundamental level the physical processes governing observed plasma behavior has been a distinguishing feature of the program.

Book Information

Series: Compass Series

Paperback: 116 pages

Publisher: National Academies Press (June 7, 2001)

Language: English

ISBN-10: 0309073456

ISBN-13: 978-0309073455

Product Dimensions: 8.5 x 11 inches

Shipping Weight: 13.6 ounces

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