## EXECUTIVE SUMMARY

In November 1994, Dr. Martha Krebs, Director of the U.S. Department of Energy (DOE) Office of Energy Research (OER), initiated a broad assessment of the current status and promise of the field of accelerator physics and technology with respect to five OER programs—High Energy Physics, Nuclear Physics, Basic Energy Sciences, Fusion Energy, and Health and Environmental Research. Dr. Krebs asked the High Energy Physics Advisory Panel (HEPAP) to establish a composite subpanel with representation from the five OER advisory committees (HEPAP, Nuclear Science Advisory Committee [NSAC], Basic Energy Sciences Advisory Committee [BESAC], Fusion Energy Advisory Committee [FEAC], and Health and Environmental Research Advisory Committee [HERAC]) and with a balance of membership drawn broadly from both the accelerator community and from those scientific disciplines associated with the OER programs. The Subpanel was also charged to provide recommendations and guidance on appropriate future research and development needs, management issues, and funding requirements.

The Composite Subpanel for the Assessment of the Status of Accelerator Physics and Technology has sought information and advice using an open and participatory process. At three of its meetings, it heard presentations by OER program managers, by members of the accelerator physics community, and by leading scientists representing the major scientific fields that use accelerators. The Subpanel gathered information on accelerator R&D efforts from the national laboratories, university facilities supported by DOE and National Science Foundation (NSF), and DOE program managers.

The Subpanel finds that accelerator science and technology is a vital and intellectually exciting field. It has provided essential capabilities for the DOE/OER research programs with an enormous impact on the nation's scientific research, and it has significantly enhanced the nation's biomedical and industrial capabilities. Further

progress in this field promises to open new possibilities for the scientific goals of the OER programs and to further benefit the nation.

Sustained support of forefront accelerator research and development by the DOE's OER programs and the DOE's predecessor agencies—the Atomic Energy Commission (AEC) and the Energy Research and Development Agency (ERDA)—has been responsible for much of this impact on research. This report documents these contributions to the DOE energy research mission and to the nation.

This Subpanel believes that the DOE and its predecessor agencies—primarily through their long-standing and sustained investments in accelerator science and technology development—have *de facto* held a national trust for the stewardship of accelerator science and accelerator-based technology development. This has provided the foundation for essential capabilities needed both for the DOE mission and for addressing broader national interests. This Subpanel has concluded that it is vital that the DOE and its OER programs continue to hold this national trust and thus recommends that:

**A. Stewardship of accelerator science and technology should be acknowledged as an explicit part of the overall DOE Energy Research mission.**

These stewardship responsibilities are elaborated in Chapters 2 and 7.

The Subpanel examined the approach used by the five OER programs in managing and funding their R&D activities in accelerator science and technology to determine if each is carried out in a manner appropriate to the overall needs of that program. We identified three broad categories of accelerator R&D (short, medium, and long-term) that are useful for assessing the management of these activities. A principal focus of the Subpanel was long-term R&D that provides the scientific basis for the concepts and technologies that drive the development of important future

accelerator-based capabilities. Our assessment of long-term accelerator R&D led us to recommend that:

**B. Each OER program should have proposal-driven, peer-reviewed long-term accelerator R&D as part of its research portfolio.**

**C. The Director of Energy Research should charge the appropriate OER advisory committees with recommending the level of long-term accelerator R&D funding for each program.**

A more detailed discussion of these recommendations appears in Chapters 6 and 7.

The Subpanel found that the management of short-term (design, construction, operation, and improvement of existing or approved facilities) and medium-term (future capabilities of interest to a specific laboratory or facility) accelerator R&D is generally effective. Both types are conducted at a national laboratory or accelerator facility, where the management determines the scope of this R&D. We recommend that:

**D. The current approach to short-term, facility-directed accelerator R&D should be continued.**

The Subpanel endorses the present funding of medium-term accelerator R&D by facility budgets and Laboratory Directed R&D (LDRD) funds. However, additional benefits would be gained by each program office explicitly recognizing the value of such investments and evaluating the performance of its accelerator-based facilities accordingly. We recommend that:

**E. The present system of medium-term R&D directed at future capabilities of interest to laboratories, facilities or users of facilities should be strengthened.**

Associated with OER's stewardship of accelerator science and technology is a responsibility to encourage the timely dissemination of this knowledge and technology. To be effective this requires an environment that fosters communication and cooperation between the OER laboratories and grantees on one hand, and the industrial and commercial sectors on the other. We recommend that:

**F. OER program officers and laboratory managers who are responsible for the stewardship of accelerator science and technology should make a special effort to nurture societal applications.**