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Midsize Facilities: The Infrastructure for Materials Research—*Summary*

BOARD ON PHYSICS AND ASTRONOMY

Background

Most of the instruments now used for materials research are too complex and expensive for individual investigators to own, operate, and maintain them. Consequently, these resources have become increasingly consolidated into multi-user, small to midsized research facilities. These facilities play a critical role in materials research. Their required investment levels are small enough so that they can be located at many sites around the country. The proliferation of these facilities, however, has drawn calls for a careful assessment of best principles for their operation. With support from the Department of Energy (DOE) and the National Science Foundation (NSF), the National Research Council convened a committee to characterize and discuss ways to optimize investments in materials research facility infrastructure with attention to midsize facilities. The study was to identify key features for success and recommend strategies for effective operation and utilization.

Findings

A midsize facility maintains and operates one or more pieces of equipment and has, among others, the following characteristics: multiple users; access to all qualified users; a resident staff; and a replacement cost of about $1 million to $50 million. About 500 such facilities exist nationwide with an aggregate operating budget on the order of several hundred million dollars. These facilities face many challenges including providing and sustaining long-term infrastructure, networking with other facilities, balancing competing purposes, and cooperating with commercial interests. Careful stewardship is necessary.

The analysis of these facilities showed that they are a key component in maintaining national leadership in materials research, education and training; that there is a need for long-term planning and commitment and for systematic program planning; and that the facilities are ripe for optimization as a system in order to expand their contribution to meeting research priorities and to serve even more investigators.

The level of resources currently available for midsize facilities is below that researchers say is needed to keep the facilities successful. A principal option for dealing with this situation—given the revenue-neutral approach taken for this study—is reallocation of existing resources to those facilities that are regionally based, exhibit good management, are sustainable, and can offer professional staff training and career prospects.

Recommendations

Realizing Economies Unlike large user facilities, midsize facilities do not have explicit program agencies responsible for their long-term viability. Rather different programs, agencies, and organizations are involved, usually in an uncoordinated manner. **To maintain national capabilities to perform world-class materials research, DOE, NSF, and other federal agencies should foster cooperative, responsible planning for collective facilities stewardship.**

Such stewardship should also take into account the regional context. A system of regional midsized user facilities can be an effective way to address the diverse needs of individual institutions. **Responsible federal agencies should realize the economies that can be achieved by networking by giving priority for resource allocation to those facilities participating in regional networks**.

Improving Effectiveness Investments in sophisticated instrumentation are taking place without adequate consideration of meeting long-term commitments for its operations and maintenance. Support for long-term infrastructure should be balanced against awards for new facilities. **Host institutions and supporting agencies should give high priority to maintaining the long-term viability of midsize facilities.**

Resident staff that provides education and support to users is vital for the successful operation of midsized facilities. **These facilities require extraordinarily talented staff and their career path should be respected and cultivated.** Ongoing training and career development should also be provided for facility support staff.

Follow-Up Periodic reviews provide opportunities to identify potential facility improvements and to assess funding adequacy. Successful performance should be identified and rewarded. **Midsize facilities should be reviewed periodically by their sponsors to a depth commensurate with the funding level**. Reviews can also be used to evaluate whether a facility should continue in operation, and the federal government should retain title to a regional facility's instrumentation for at least one review cycle.

Since their inception in the 1960s, the nation's midsize facilities have played a pivotal role in materials research and have been a cornerstone of research for a broad cross-section of the community. It is now time to acknowledge the need to move from a system of loosely connected independent facilities to a network of coordinated facilities. This leveraging step will allow the materials research enterprise to offer a transformative and effective path to the future.

For further information

Copies of the complete report*, Midsize Facilities: The Infrastructure for Materials Research,* can be obtained on the National Academy Press Web site <www.nap.edu/catalog/ >**.**

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