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FEDERAL RESEARCH

Aging Federal Laboratories Need Repairs and Upgrades

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Mr. Vice Chairman and Members of the Committee:

We are pleased to be here today to discuss the findings of our report to this Committee, which we are releasing today, entitled Federal Research: Aging Federal Laboratories Need Repairs and Upgrades (GAO/RCED-93-203). Citing the importance of federal research and development (R&D) to economic growth and national well-being, Mr. Vice Chairman, you expressed concern that federal research agencies may be underinvesting in maintaining, repairing, and upgrading their laboratories. Accordingly, you requested that we assess the (1) condition of federal laboratory facilities, (2) effect of inadequate laboratory facilities on agencies' scientific productivity and research capabilities, and (3) funding needed to repair or upgrade these facilities.

The information in our report is primarily based on data provided by eight federal agencies for 220 government-owned laboratories that spent about \$18.1 billion of the estimated \$24.9 billion obligated for R&D at federal laboratories in fiscal year 1992. These agencies are the Departments of Commerce, Defense (DOD), and Energy (DOE); the Environmental Protection Agency (EPA); the National Aeronautics and Space Administration (NASA); the Agricultural Research Service (ARS), within the Department of Agriculture (USDA); the National Institutes of Health (NIH), within the Department of Health and Human Services; and the Geological Survey (USGS), within the Department of the Interior. We also interviewed facilities managers for each agency and laboratory management, researchers, and facilities managers at the eight federal laboratories we visited.

In summary, 54 percent of the floor space of the eight federal agencies' laboratories was more than 30 years old. Typical problems among the agencies' laboratories, according to agencies' facilities managers, included leaking roofs and inadequate ventilating systems that do not meet industry standards for circulating air. In addition, many older laboratories are obsolete--they were not designed to meet today's advanced R&D needs and health and safety code requirements.

The federal laboratory facilities managers and researchers we interviewed identified several instances, particularly involving old ventilating systems and power outages, in which aging laboratory facilities substantially reduced scientific productivity. In addition, several agencies cited the need for advanced laboratory facilities that provide greater flexibility to respond to new programs and scientists' research needs.

The eight agencies reported a backlog of more than \$3.8 billion in needed repairs for their laboratories, and facilities managers for four agencies said that funding for repairs was only slightly adequate or inadequate. Furthermore, funding to renovate existing laboratory facilities or construct new ones was either only slightly adequate or inadequate at six agencies.

Four of the eight agencies recently initiated task forces to reexamine their R&D mission and/or improve the effectiveness and efficiency of their laboratory facilities. Reassessing agencies' R&D missions is critical before spending large sums of money on old and often outdated structures. Such task force efforts provide a basis for determining whether to realign, consolidate, or close laboratories and to increase funding for laboratory facilities considered essential for fulfilling agencies' R&D missions.

BACKGROUND

Laboratory facilities, along with scientists and research equipment, provide the basis for conducting advanced R&D at federal laboratories. These facilities include laboratory buildings; heating, ventilating, and air conditioning systems; electrical power supply systems; and water and sewerage systems. Laboratory facilities need to be properly maintained and repaired to continue to work well. In addition, aging laboratory facilities may need to be upgraded--either by renovating existing buildings or constructing new ones--to improve researchers' productivity or enable them to conduct state-of-the-art R&D.

In a June 1990 report, the National Research Council's Building Research Board found that underfunding is a widespread and persistent problem that undermines the maintenance and repair of public buildings.¹ In concluding that procedures and allocations of resources must be changed to recognize the full costs of the ownership of these assets, the Board stated that an appropriate budget allocation for routine maintenance and repair for a substantial inventory of facilities will typically be in the range of 2 to 4 percent of the aggregate current replacement value of those facilities.

AGING FEDERAL LABORATORIES NEED REPAIRS AND UPGRADES

Federal laboratory facilities grew rapidly between 1943 and 1972 as agencies expanded their R&D missions. By the early 1990s, these facilities had aged--31 percent of the eight federal agencies' laboratory space was more than 40 years old, and 54 percent of the space was more than 30 years old. Only 24 percent of the eight agencies' laboratory space was less than 20 years old.

Mr. Vice Chairman, we have brought a series of pictures of the facilities' conditions at five federal laboratories we visited. As you can see from the photographs, federal laboratories are experiencing many common problems associated with aging facilities --leaking roofs and gutters, drafty window frames, and inefficient ventilating systems that do not bring sufficient fresh air into

¹Building Research Board, Committing to the Costs of Ownership: Maintenance and Repair of Public Buildings (June 1990).

laboratories. In particular, DOE, EPA, and NASA have cited deteriorating laboratory facilities as a material management weakness in their Financial Integrity Act reports. For example, NASA's 1989-91 reports cited inadequate maintenance funding for its laboratories and other facilities as a material weakness. In response to a growing list of needed repairs and renovations, NASA's Associate Administrator for Aeronautics and Space Technology initiated a 5-year program to augment maintenance and instrumentation funding at three laboratories with \$15 million of R&D funds in fiscal year 1991. This amount rose to \$30 million in fiscal year 1993.

In addition, some federal laboratories are using government facilities not designed for R&D. For example, Commerce's National Oceanic and Atmospheric Administration (NOAA) is using Fort Crockett, an Army post built in the early 1900s in Galveston, Texas, as a sea turtle and shrimp research laboratory. A NOAA facilities manager told us that about \$4 million is needed to repair and renovate this laboratory because the buildings (1) have deteriorated in their advanced age and (2) were designed as barracks for soldiers rather than as laboratories for scientists.

In addition, many older federal laboratories are obsolete-- they were not designed to meet today's health and safety standards and advanced R&D needs. Many laboratory buildings do not have sprinkler and alarm systems and adequate fire walls because they were designed to prior, less stringent requirements. Similarly, computers and other electronic equipment have increased the demand for electrical power and air conditioning, while sensitive scientific instruments that make precise measurements have increased the importance of temperature, humidity, air cleanliness, and vibration controls. Furthermore, potential hazards associated with chemistry and biotechnology R&D have increased air ventilation requirements.

LABORATORY FACILITIES HAVE LIMITED PRODUCTIVITY AND SCIENTIFIC CAPABILITIES

The agency and laboratory officials we interviewed stated that their laboratories generally have avoided a prolonged shutdown of R&D projects by successfully engineering around emergencies. However, they noted that aging laboratory facilities have reduced scientific productivity, citing various instances in which a facility's problems disrupted R&D programs or reduced confidence in the reproducibility of experimental results. These problems have caused researchers to repeat experiments in many instances. Typical problems reported included (1) ventilating systems that do not meet industry standards for circulating air through laboratories--in three laboratory buildings we visited, inadequate ventilating systems have caused respiratory problems among researchers and/or contaminated laboratory samples; (2) electrical power outages and other systems' malfunctions that ruined long-term

experiments; and (3) delays and disruptions in making repairs, limiting researchers' access to equipment or laboratory facilities needed to perform R&D. For example, inadequate ventilation in a 20-year-old laboratory building at ARS' laboratory in Beltsville, Maryland, has caused respiratory problems among researchers and specifically led to the relocation of five researchers from the building. In addition, researchers in one laboratory building at EPA's Gulf Breeze, Florida, facility were relocated to temporary space for 9 months because a newly renovated ventilating system had inadequate air-handling capacity, enabling mold and fungus to grow in the duct work.

NIH has proposed to construct a new \$1.6 billion clinical center to replace its existing 38-year-old clinical center, which is at the end of its useful life and does not meet current fire safety requirements. NIH officials stated that the proposed center, which would provide advanced research hospital facilities, is essential for fulfilling NIH's mission because clinical research is fundamental to its biomedical research program. The U.S. Army Corps of Engineers, in a November 1991 report that validated NIH's need, recommended the construction of a new center because the existing clinical center's physical constraints greatly hinder NIH's ability to provide a modern, flexible facility for biomedical research and patient care.

SEVERAL AGENCIES ARE ASSESSING R&D FACILITY FUNDING NEEDS AND MISSIONS

Each of the eight federal agencies has taken actions to better identify its laboratories' needs for maintenance, repairs, and upgrades. For example, ARS (in 1985) and NOAA (in 1991) initiated surveys on the condition of their laboratory facilities to identify maintenance and repair needs at their primary laboratories. Similarly, NIH and EPA are updating their laboratories' master site plans for the first time since about 1972 and 1985, respectively.

Funding to maintain laboratory facilities was moderately adequate, according to facilities managers at most of the eight agencies. However, funding constraints limit some agencies' ability to repair and upgrade their laboratory facilities. In fiscal year 1992, only ARS and NASA met the Building Research Board's minimum guideline that 2 percent of a facility's current replacement value be spent for routine maintenance and repair. The eight agencies also reported a total backlog of more than \$3.8 billion in needed repairs at their laboratories; some agency and laboratory facilities managers noted that their backlog is growing. In addition, facilities managers at DOD, DOE, EPA, NASA, NIH, and USGS told us that funding to renovate existing laboratory facilities or construct new ones is either inadequate or only slightly adequate. According to the facilities managers, the process for funding and making a major repair, such as replacing the roof of a large laboratory building, typically takes about 3 to

5 years from proposal to completion, while the process for renovating existing facilities or constructing new ones takes about 7 to 10 years from proposal to completion. During either process, a number of lower-priority laboratory projects will be dropped, and the amount of funding made available may be reduced because of competing priorities.

The Congress is funding some major projects to modernize existing research facilities and construct new ones needed to perform advanced R&D. In particular, in fiscal year 1993, the Congress appropriated \$110 million of \$540 million requested by Commerce's National Institute of Standards and Technology to renovate seven existing laboratory buildings and construct the equivalent of two new laboratory buildings with advanced systems to control temperature, humidity, air cleanliness, and vibrations. In addition, ARS officials stated that the Congress has made available about \$70 million of \$205 million that ARS proposed in 1988 to modernize its Beltsville laboratory.

In response to budget constraints and/or changing R&D missions, several federal agencies have considered alternatives to realign or consolidate their laboratory facilities. For example, within DOD, the Army, Navy, Air Force, and the Armed Forces Radiobiology Research Institute are reducing their combined number of laboratories from 76 to 31, according to DOD research managers. Similarly, USDA is studying whether to close or consolidate some of ARS' 111 laboratories, DOE is considering how to realign its nuclear weapons laboratories in response to the end of the Cold War, and NASA is developing a national facility plan for world-class aeronautics and space facilities. House bill 1432 proposes to establish the Federal Laboratory Mission Evaluation and Coordination Committee, which in part would make recommendations on the advisability of establishing a commission to determine whether specific federal laboratories should be realigned, consolidated, or closed. One criterion that the Laboratory Committee would be directed to consider is improving the efficiency and effectiveness of the overall federal laboratory system.

CONCLUSIONS

Most of the eight federal agencies' laboratory facilities are at least 30 years old, requiring increased maintenance and repair funding. In fiscal year 1992, six of the eight agencies did not spend the Building Research Board's minimum guideline for funding routine maintenance and repair, and many agencies currently have a substantial backlog of needed repairs. In addition, inadequate facilities are limiting research capabilities at some federal laboratories. Substantial funding would be needed to provide the proposed new laboratory facilities.

In recent years, DOD, DOE, NASA, and USDA have initiated task forces to reexamine their R&D mission and/or improve the

effectiveness and efficiency of their laboratory facilities. An important consideration in such reviews is to ensure adequate funding to support laboratory facilities, which may involve (1) reducing expenses by realigning, closing, or consolidating laboratories not essential for fulfilling an agency's R&D mission as well as (2) increasing funding to maintain, repair, and upgrade those laboratory facilities considered essential to fulfilling an agency's R&D mission.

Mr. Vice Chairman, this concludes my statement. I would be happy to respond to any questions that you or members of the Committee may have.

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