



DEPARTMENT OF ENERGY

Major Construction Projects Need a Consistent Approach for Assessing Technology Readiness to Help Avoid Cost Increases and Delays

Highlights of [GAO-07-336](#), a report to the Subcommittee on Energy and Water Development, and Related Agencies, Committee on Appropriations, House of Representatives

Why GAO Did This Study

The Department of Energy (DOE) spends billions of dollars on major construction projects that help maintain the nuclear weapons stockpile, conduct research and development, and process nuclear waste so that it can be disposed of. Because of DOE's long-standing project management problems, GAO determined the extent to which (1) DOE's major construction projects are having cost increases and schedule delays and the major factors contributing to these problems and (2) DOE ensures that project designs are sufficiently complete before construction begins to help avoid cost increases and delays. We examined 12 DOE major projects with total costs of about \$27 billion, spoke with federal and contractor officials, and reviewed project management documents.

What GAO Recommends

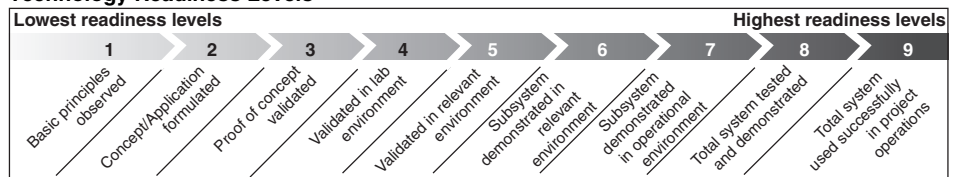
GAO recommends that DOE develop a consistent approach for measuring the readiness of critical project technologies. DOE supports GAO's recommendations but suggested revisions to allow it to first conduct a pilot application on selected projects to better understand the process and evaluate its potential use.

What GAO Found

Of the 12 DOE major projects GAO reviewed, 9 exceeded their original cost or schedule estimates, principally because of ineffective DOE project oversight and poor contractor management. Specifically, 8 of the 12 projects experienced cost increases ranging from \$79.0 million to \$7.9 billion, and 9 of the 12 projects were behind schedule by 9 months to more than 11 years. Project oversight problems included, among other things, inadequate systems for measuring contractor performance, approval of construction activities before final designs were sufficiently complete, ineffective project reviews, and insufficient DOE staffing. Furthermore, contractors poorly managed the development and integration of the technology used in the projects by, among other things, not accurately anticipating the cost and time that would be required to carry out the highly complex tasks involved.

Even though DOE requires final project designs to be sufficiently complete before beginning construction, it has not systematically ensured that the critical technologies reflected in these designs have been demonstrated to work as intended (technology readiness) before committing to construction expenses. Specifically, only one of the five DOE project directors with projects that have recently begun or are nearing construction had systematically assessed technology readiness. The other four directors also told us that they have or will have completed prior to construction, 85 to 100 percent of their projects' final design, but they had not systematically assessed technology readiness. Proceeding into construction without also demonstrating a technology's readiness can lead to cost increases and delays. For example, one technology to be used in DOE's Waste Treatment and Immobilization Plant was not sufficiently demonstrated—that is, shown to be technologically ready for its intended application—before construction began. Consequently, the technology did not perform as expected, which resulted in about \$225 million in redesign costs and schedule delays of more than 1 year. To help avoid these problems, the National Aeronautics and Space Administration (NASA) pioneered and the Department of Defense (DOD) has adopted for its projects a method for measuring and communicating technology readiness levels (TRL). Using a scale from one (basic principles observed) through nine (total system used successfully in project operations), TRLs show the extent to which technologies have been demonstrated to work as intended in the project. DOE project directors agreed that such an approach would help make technology assessments more transparent and improve stakeholder communication prior to making critical project decisions, such as authorizing construction.

Technology Readiness Levels



Source: GAO analysis of DOD data.

www.gao.gov/cgi-bin/getrpt?GAO-07-336.

To view the full product, including the scope and methodology, click on the link above. For more information, contact Gene Aloise at (202) 512-3841 or aloise@gao.gov.