

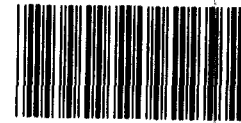
GAO

United States General Accounting Office  
Report to the Honorable  
Dale L. Bumpers, U.S. Senate

July 1992

# FEDERAL RESEARCH

## Implementation of the Super Collider's Cost and Schedule Control System

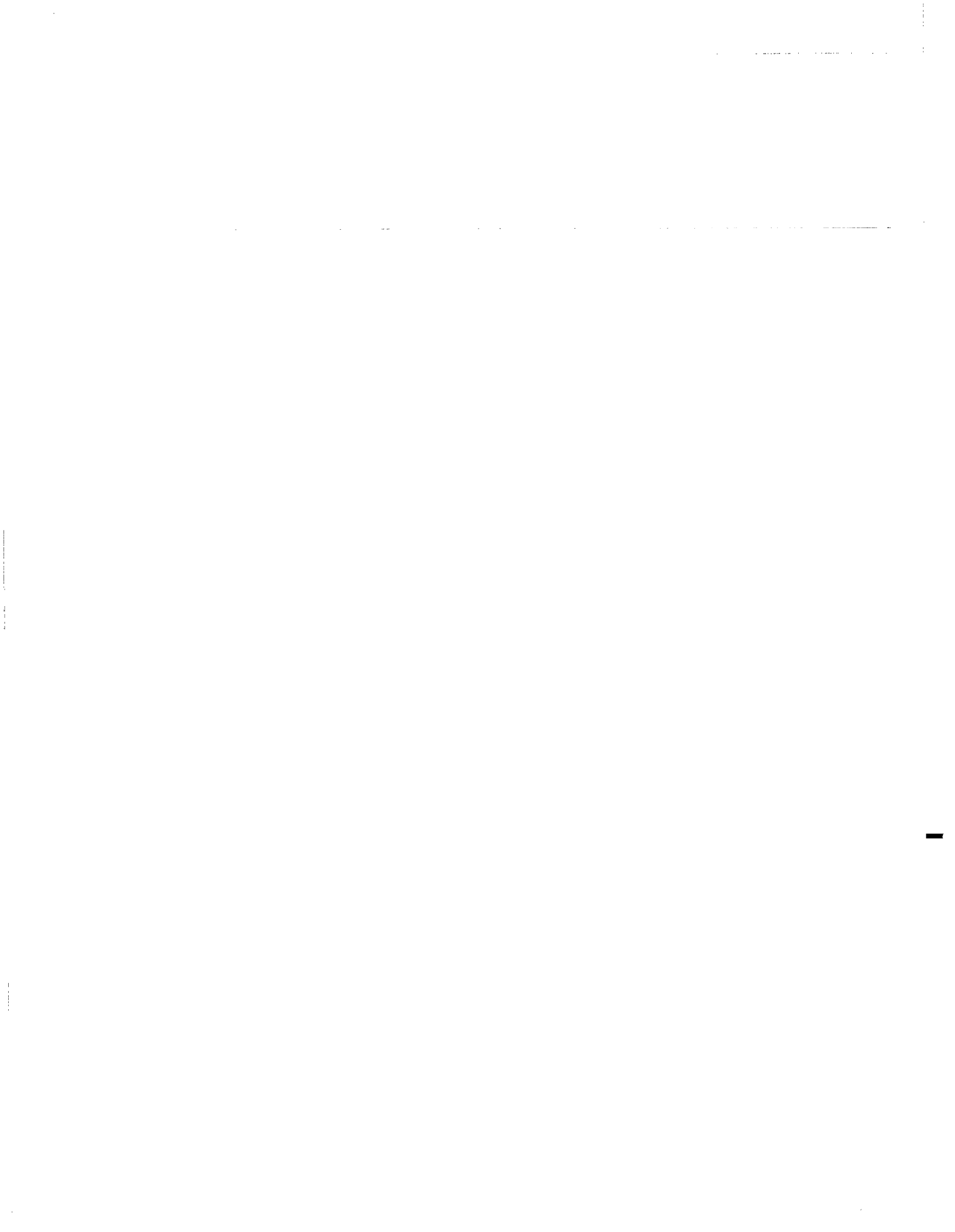


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**Resources, Community, and  
Economic Development Division**

B-227295

July 21, 1992

The Honorable Dale L. Bumpers  
United States Senate

Dear Senator Bumpers:

Your letter recently requested information about our past and ongoing examinations of the cost and schedule for the Department of Energy's (DOE) Superconducting Super Collider (SSC) project. The SSC, estimated to cost \$8.25 billion and to be completed over a 10-year period ending in 1999, is a research tool that will collide two beams of protons at an energy of 40 trillion electron volts. Detectors will record the collisions, which will provide insight into the fundamental components of matter.

In April 1992, we testified before the Subcommittee on Investigations and Oversight, House Committee on Science, Space, and Technology, that DOE does not have in place an integrated system for monitoring cost and schedule performance to objectively determine the SSC project's progress.<sup>1</sup> During June 1992 Senate hearings, DOE's Assistant Director of the Office of the SSC asserted that our testimony was based on 1990 audit work and did not accurately reflect the present situation.<sup>2</sup> In regard to this assertion, you asked us to provide information on (1) the time frame and basis of our data that supported this statement in our April 1992 testimony and (2) the status of our review and the present implementation status of DOE's system for managing the SSC project's cost and schedule.

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**Results in Brief**

DOE and its prime contractor have not yet fully implemented the cost and schedule system for managing the SSC project. This statement was valid in April 1992 and is still valid today. Our audit work supporting our April 9, 1992, testimony on the SSC cost and schedule was started in December 1991 and was ongoing at the time. The testimony was not based on 1990 audit work. Our ongoing work continues as of July 21, 1992, to assess DOE and its prime contractor's implementation of the SSC project's cost and schedule system. Without a cost and schedule system, DOE cannot assess on a timely basis whether the SSC project has encountered problems affecting the cost and schedule. It might be June 1993 before DOE's prime

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<sup>1</sup>Federal Research: Concerns About the Superconducting Super Collider (GAO/T-RCED-92-48, Apr. 9, 1992).

<sup>2</sup>June 30, 1992, hearings before the Senate Committee on Energy and Natural Resources and the Subcommittee on Energy and Water Development, Senate Committee on Appropriations.

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contractor will be able to provide a meaningful trend analysis of the SSC project's cost and schedule.

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## Background

DOE's Cost and Schedule Control System is intended to be an early warning system for identifying problems affecting the SSC project's cost and schedule. When fully implemented, the system will provide DOE and its prime contractor, Universities Research Association, Inc., (URA) with information essential for managing the SSC project and will form the data base for reporting on the project's progress. URA is required by its January 1989 management contract with DOE, the agency's acquisition regulations, and the SSC project management plan to implement a Cost and Schedule Control System as soon as possible. Two key products of such a system are a monthly cost performance report and an integrated project schedule. These products, in turn, are used by contract administrators and project managers to further assess the project's progress and to perform trend analyses of the total cost and schedule for completing the project.

Cost performance reports periodically compare, in terms of budget and schedule, work planned over the project's entire 10-year construction period with actual work performed. A critical part of the reports shows the amount of work completed as it relates to the SSC project's cost estimate. Knowing this amount, which is called the earned value, is essential to monitoring the project's progress.

An integrated project schedule shows the relationship of the key milestones and cost for each major project component to the milestones and cost of the other major components. A completed integrated project schedule shows the interrelationships of the scheduled dates for the various components and enables managers to evaluate the adequacy of planned schedules and to determine critical path items.

Complete cost performance reports and an integrated project schedule are therefore needed to enable contract administrators and project managers to properly evaluate factors associated with cost and schedule. This information can ultimately be used to predict trends in work performance, identify critical areas that may be behind schedule or over budget, and monitor the overall status of the project.

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## **Time Frame and Basis of Our Work Supporting April 1992 Testimony**

Our April 9, 1992, testimony on the SSC's cost and schedule was based on audit work started in December 1991 that was ongoing at the time. It was not based on 1990 audit work. As of April 9, 1992, our audit work disclosed that URA had not implemented a functioning Cost and Schedule Control System. Until March 1992, URA's cost performance reports for the SSC project showed only the expenditures, but not the budgeted amounts nor the earned value. The March cost performance report showed budgeted amounts for the current fiscal year, but was still incomplete. The report did not show how expenditures related to the earned value.

As of April 9, 1992, URA had not prepared an integrated project schedule because URA management gave low priority to implementing the Cost and Schedule Control System. According to a URA official, the low priority resulted in insufficient staff being committed to implementing the system. The system had low priority in part because URA was in the midst of revising the work breakdown structure, which outlines the work to be done. If the integrated project schedule were completed before the work breakdown structure was revised, then the integrated project schedule would need to be revised to reflect the new work breakdown structure.

Because URA had not yet implemented a complete Cost and Schedule Control System, the contractor lacked the information to make a meaningful trend analysis of the project's overall cost and schedule. As a result, we concluded in our April 1992 testimony that DOE lacked objective information to assess on a timely basis whether the project had encountered problems affecting its cost and schedule.

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## **Status of GAO Review and Implementation of DOE's Cost and Schedule Control System**

Since our testimony, we have continued to monitor DOE's and URA's efforts to implement a Cost and Schedule Control System. URA has made progress in implementing the system, but some critical aspects of the system are still not in place.

In May 1992, URA began training its managers on the importance and use of the system. However, none of the monthly cost performance reports issued as of July 1992 for fiscal year 1992 has shown the earned value of the work performed. According to a DOE official, URA is still deciding on the best methodology to use for determining the amount of work completed. URA expects that this issue will be resolved shortly and that the September 1992 cost performance report will show the earned value.

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URA made a preliminary integrated project schedule in May 1992. That preliminary schedule disclosed that the SSC project's cost exceeded planned funding. For example, fiscal year 1995 funding requirements would be about \$200 million more than the approximately \$900 million planned. Such increases would be offset by reduced amounts in fiscal years 1998 and 1999, according to URA officials. Also, major program elements were missing from the integrated project schedule. The system's integrated project schedule did not incorporate the detailed construction schedules for the large detectors that are to be used by physicists to study the results of the collisions. A URA official advised us that without detailed schedules for the detectors, the work schedule for the detectors cannot be fully coordinated with the construction schedules for the experimental halls in which the detectors are to be built. URA officials advised us that they plan to have a more refined integrated project schedule by August 1992.

On the basis of the September 1992 cost performance report, DOE and URA will not be able to perform a complete and meaningful trend analysis of the SSC project's cost and schedule. According to a DOE official responsible for making the trend analysis, once complete cost performance reports are produced in September, 3 to 6 months will be needed to work the "bugs" out of the system. Then, about 6 months of data will be needed to produce a meaningful trend analysis. Therefore, the first meaningful trend analysis based on the cost performance report showing the estimated cost and schedule for completing the project may not be available until June 1993—nearly 4-1/2 years after DOE awarded URA the prime contract that required the Cost and Schedule Control System to be implemented.

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## Conclusion

A system is not in place that would allow DOE or its prime contractor to objectively monitor the SSC project's progress. This statement was true in April 1992 and is still true today. Without such a system, DOE lacks information to assess on a timely basis whether the project has encountered problems affecting its cost and schedule. Potential problems need to be systematically identified as early as possible so that corrective actions can be initiated before problems greatly increase the project's cost, extend the schedule, or reduce potential benefits.

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## Agency Comments

We met with the DOE Project Office Chief of Staff and discussed with him the facts presented in this report. He acknowledged that the Cost and Schedule Control System for the SSC was not fully operational as of

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July 16, 1992. He said that SSC project officials use alternative means—including reports of money and time spent on various tasks and frequent face-to-face discussions with individual task leaders concerning the status of their tasks—to assess the progress and expected costs and schedule. However, in our opinion, these alternative means still do not provide DOE or its prime contractor, URA, with an analytically based system for determining the SSC project's cost and schedule. As requested by your office, we did not obtain written agency comments.

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## Scope and Methodology

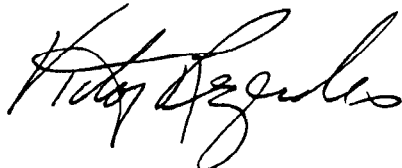
To respond to this request, we examined documents supporting our April 9, 1992, testimony before the Subcommittee on Investigations and Oversight, House Committee on Science, Space, and Technology, and the information from our ongoing work examining the status of DOE's implementation of the Cost and Schedule Control System for managing the SSC project. We performed our work between July 13 and 17, 1992.

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As arranged with your office, copies of this report are being sent today to the Chairman and Ranking Minority Member, Subcommittee on Oversight and Investigations, House Committee on Science, Space, and Technology. Unless you publicly announce its contents earlier, we plan no further distribution of this report until 30 days after the date of this letter. At that time, we will send copies to the Secretary of Energy. We will also make copies available to others on request.

Please contact me at (202) 275-1441 if you or your staff have any questions. Major contributors to this report are listed in appendix I.

Sincerely yours,



Victor S. Rezendes  
Director, Energy Issues

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# Major Contributors to This Report

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