

Democrat of Arkansas who is the project's most formidable opponent, said he is sometimes accused by SSC advocates of being "a member of the Flat Earth Society, but I think of myself as a member of the flat broke society. The assumption is that anyone who opposes this project is against basic science." He is against the SSC on the grounds that its cost has escalated from \$4.4 billion when it was first approved in 1987 to more than \$10 billion now. "That's absolutely staggering when we are cutting Medicare and Medicaid and kicking Aunt Susie out of a nursing home," said Bumpers.

In support of the SSC were some half-dozen senators, led by Johnston and including Pete Domenici, a New Mexico Republican, and Arlen Specter, a Pennsylvania Republican.

But it was Energy Secretary Hazel R. O'Leary who attracted the most attention at the hearing. She had sharply criticized SSC managers before Representative John D. Dingell's House energy and water oversight and investigations subcommittee on 30 June and promised to review the situation in 30 days. Her testimony to the Senate panels was, in effect, a preliminary report of her findings.

Surprised SSC watchers

O'Leary said she had decided to take the responsibility for building the behemoth accelerator away from Universities Research Association, a consortium of 79 universities, and give the job to an organization more experienced with large construction projects. Her decision surprised veteran SSC watchers because she did not remove those who have received blame for many of the project's management and accounting problems.

Under O'Leary's plan the new "execute-integrate" contractor will be brought in to manage most major subcontracts, oversee the construction work and control the project's business systems. The new contractor, according to O'Leary, will have "world-class experience in managing large construction projects." It also will administer the three largest subcontracts covering conventional construction, such as tunnels and buildings, magnet production and installation of collider components. An aide to O'Leary said that several companies had expressed interest in taking over—namely, Bechtel Corp, Fluor Corp and Martin Marietta Corp.

URA, formed in 1965 to build and operate the Fermilab accelerator, will continue to have an important role, overseeing the design of the SSC and managing its operation as a scientific laboratory. But directing the actual

construction of the 54-mile ring and its 10 000 magnets that are required to keep the beam of colliding protons in precise place will go to the new contractor. O'Leary's plan stopped short of other options she admitted considering—that of dismissing URA outright, firing URA president John Toll and sacking some SSC managers, including Roy Schwitters and Edward Siskin of the SSC Laboratory. "URA is retained to do what it does best: research and development, scientific design, and management and operation of scientific facilities," said O'Leary.

She rejected the advice of Joseph Cipriano, DOE's project manager, who had drafted a memorandum in his personal computer that recommended dismissing Schwitters immediately. Cipriano's memorandum was leaked to the *Washington Post* and made available by a group called Project on Government Oversight, which had earlier circulated a draft of the DOE inspector general's report charging the SSC with mismanagement. Cipriano's memo asserted that Schwitters' removal "may be the only way to keep the lab from falling apart before the Senate vote." It claimed that morale at the lab was low and "confidence in existing management is practically nonexistent and cost and schedule trends are worsening at an alarming rate." He also suggested putting the project on hold for a year to resolve the management problems and to provide time for the preparation of "reduced scope or phased implementation alternatives" for the SSC's construc-

tion. To do this, he proposed that DOE cut its fiscal 1994 budget request for the project from \$640 million to \$400 million—enough to honor existing contracts but not to start new ones.

O'Leary said that her 30-day review confirmed what SSC officials have long insisted—that the project was on time and on budget. But the review also found lapses. Among the most serious were that the approved accounting system to control cost and schedule overruns is more than a year overdue and still deficient, that baseline costs and schedules have been "inconsistent" and that the lab has done a poor job of anticipating labor shortages. Alarmed by the absence of sound accounting procedures to show that the lab is within budget, auditors at Congress's General Accounting Office and staff of the House energy subcommittee on investigations have predicted large cost overruns, amounting to as much as \$2 billion more. But O'Leary said the DOE review had not turned up such problems.

DOE officials plan to select a new contractor this fall if Congress allows the project to go forward. The transition is not expected to take more than a few months—a delay that would be absorbed by the three-year project extension that President Clinton imposed earlier this year to improve the chance of finding foreign partners. The cost of the change, said O'Leary, would be "*de minimus*" compared to the overall project cost and future management savings should recoup it.

—IRWIN GOODWIN

TO REPLACE AT&T AT SANDIA, DOE PICKS MARTIN MARIETTA

After operating Sandia National Laboratories at cost, without fees or profits, since 1949, American Telephone & Telegraph announced in May 1992 that it was eager to leave the labs for others to run (PHYSICS TODAY, November 1992, page 84). The time had come with the end of the cold war, said the company, to get out of nuclear weapons work and to get on with its more traditional pursuit—to dominate the new era of telecommunications.

In replacing AT&T, the Energy Department issued requests for proposals to 140 organizations, including four universities, and received bids from fewer than 30. On 26 July DOE selected Martin Marietta Corp, headquartered in Bethesda, Mary-

land, to manage and operate Sandia, the department's largest research facility, with 8700 employees and an annual budget of \$1.3 billion. Sandia has two labs, in Albuquerque, New Mexico, and Livermore, California, and two missile test sites, in Tonopah, Nevada, and Kauai, Hawaii. Sandia's principal responsibility is engineering and testing nuclear weapons. It also produces Patriot missiles, which attained notoriety in the Persian Gulf War. In addition, Sandia performs light-ion inertial confinement fusion research and materials research for the magnetic fusion energy program. It also conducts energy and environmental research on a budget of \$250 million per year. In fact, 29% of Martin



A great transformation is in store for the sprawling Sandia Lab near Albuquerque, shown here in its picturesque setting with the Sandia Mountains in the background, as Martin Marietta takes over its management from AT&T. Sandia's director, Albert Narath (inset), will stay in charge.



Marietta's income in 1991 came from DOE contracts.

DOE figures that Sandia's budget for the next five years—the term of the new contract with Martin Marietta—will be about \$9 billion. The company will receive \$10.3 million in fees the first year, which begins on 1 October. Fees in subsequent years will be determined on the basis of performance reviews.

In the bidding process this summer, DOE chose Martin Marietta over Battelle Memorial Institute, the other finalist, not only because the company is one of the country's largest defense contractors, but also because it already operates Oak Ridge National Laboratory. The principal factor in DOE's decision, though, was Martin Marietta's pledge to put up \$9.5 million of its own money in a nonprofit venture capital corporation that would help commercialize Sandia's discoveries and developments. The new corporation, to be housed at a research park adjacent to the University of New Mexico, is expected to attract commitments of some \$30 million from venture capi-

tal firms and other companies, Martin Marietta officials estimate. They have invited other labs in the area, including Los Alamos and the Air Force's Phillips Laboratory, to join the technology transfer scheme.

In its first nine years of managing Oak Ridge, according to Martin Marietta, \$180 million in additional capital flowed into 73 start-up firms based on Oak Ridge technologies, generating 6000 new jobs. "An essential element of our management plan for Sandia is an aggressive technology transfer program," says Norman R. Augustine, Martin Marietta's chairman and CEO.

In October, when Sandia becomes a wholly owned subsidiary of Martin Marietta, it will have its own board of directors under the chairmanship of A. Thomas Young, who is president of the parent company. Other directors will include George Keyworth II, President Reagan's first science adviser, and Lew Allen, a retired Air Force general who headed Caltech's Jet Propulsion Laboratory. Sandia's management will remain in familiar hands: Martin Marietta insisted

that Albert Narath, who has worked at Sandia for 34 years, the last four as lab director, will stay in the top job. Even so, Martin Marietta's executive vice president, James A. Tegnalia, who led the company's bid, will become deputy director. He was once deputy director of the Defense Advanced Research Projects Agency.

Sandia had its origin in the Z Division at wartime Los Alamos. The division derived its name from its leader, Jerrold Zacharias, who returned to MIT after the war. At Los Alamos Z Division was responsible for production engineering, procurement and assembly of nuclear bomb components. After the war, Los Alamos established a mechanical test laboratory at a site that took its name from the Sandia Mountains near Albuquerque, and in 1948 a separate lab was formed. It was then that President Truman asked AT&T to run Sandia "in the nation's service." In 1959 Sandia branched out to Livermore.

Martin Marietta experienced a major expansion last November when, to the surprise of many in the corporate world, it purchased General Electric's aerospace unit and three other GE businesses for a total of \$3.05 billion. With those acquisitions, which include GE's naval nuclear propulsion systems and RCA Aerospace and Defense Systems, which was acquired by GE in 1986, Martin Marietta became a military aerospace and electronics powerhouse with annual revenue of about \$11 billion and a payroll of 97 000 employees. The company's own product line includes Titan launch vehicles, external fuel tanks for NASA's space shuttles, sonar arrays, the Lantirn navigation and targeting system for combat aircraft and commercial air traffic control systems. The company also has been involved in the Strategic Defense Initiative, designing a chemical laser for the dimly remembered Zenith Star space experiment and producing sensors and lasers for the still-untested "Brilliant Eyes" system.

The deal with GE also gave Martin Marietta the DOE contract to operate Knolls Atomic Power Laboratory, which designs naval propulsion systems and trains people to operate them, and enabled Martin Marietta scientists and engineers to work at GE's corporate research and development center in Schenectady, New York. Under the terms of the sale, GE, which owns and operates the center, provides R&D support for aerospace technologies to Martin Marietta for the price of the work.

—IRWIN GOODWIN