

Race for the ring: DOE reacts to Congress's anxieties on SSC

If all had gone according to the plan carefully worked out by the Department of Energy, the last of the applications would have arrived by 2 pm on 3 August at Room 1J-005 of its Forrestal Building, opposite the Smithsonian Institution in Washington. But on 14 July, just three weeks before the deadline, DOE sent out notices by overnight courier services extending the period for submitting proposals by one month, to 2 September. DOE expects to get up to three dozen proposals, each thick with data, reports, testimonials, diagrams, blueprints, maps and photographs, and all with the same purpose: to win the right to become the next world capital of high-energy physics. Since last April, when DOE issued its invitation for site proposals, there has been a scramble in governor's mansions, statehouses and universities from coast to coast to decide whether it's worth putting in the money and effort to land the giant prize—the Superconducting Super Collider.

Despite the odds against winning the SSC, many states and members of Congress are vying for it. Alvin W. Trivelpiece, a plasma physicist whose persistent and persuasive style as DOE's director of energy research until last April had been critical to convincing President Reagan and his Domestic Policy Council to approve the project, claims "there are lots of physicists, politicians and businessmen out there lusting after it."

Locations. In the Pacific Northwest, where the state of Washington expects to propose one site and Oregon two, the SSC is known as "the next Grand Coulee Dam," after the project that generated electricity and employment for the region during the Depression 1930s. California has chosen two sites well away from the earthquake-vulnerable San Andreas Fault, in farmlands near Stockton and Sacramento, which are within easy driving distance of the state's principal universities, high-technology industries and cultural centers. A recent study done for Cali-

fornia's SSC Executive Steering Committee by the graduate management school at UCLA estimates that the state stands to gain as many as 117 000 permanent new jobs and some \$8 billion in new businesses, homes, taxes and other sources in the four years between the completion of the collider and the year 2000.

Another site is to be proposed near DOE's Idaho National Engineering Lab, which would enable the state to take advantage of cheap electricity, Federal land for the huge tunnel and a local legion of some 10 000 scientists and technicians. "If we can save the project \$500 million in construction costs and \$50 million annually in operating expenses," says Richard Tremblay, SSC coordinator for Idaho's Commerce Department, "we would have a good shot at the project."

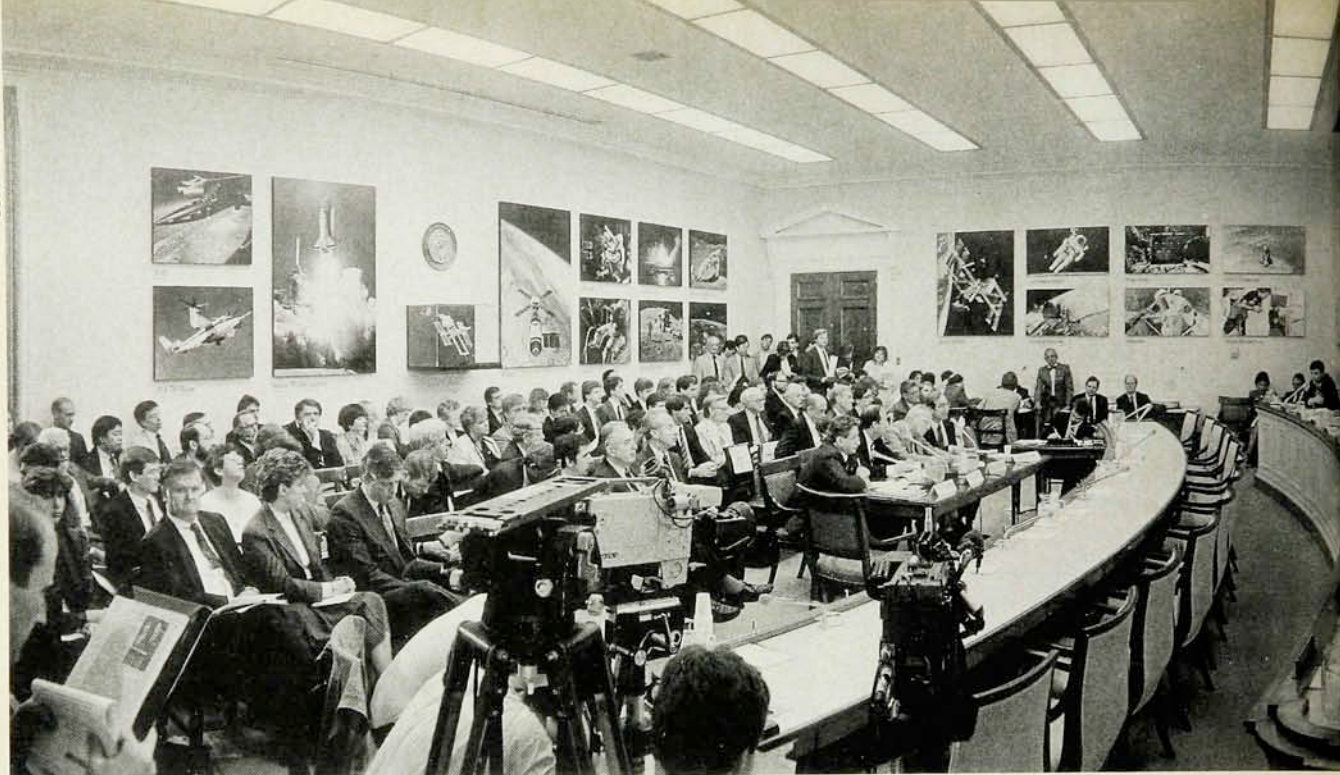
New Mexico is proposing a site in the Estancia Valley, about 35 miles east of Albuquerque, near the Sandia and Kirtland Air Force laboratories, and about 60 miles southeast of Los Alamos. Nevada is still serious about the desert valley west of the Santa Rosa Mountains, near the town of Winnemucca (population 4140). Oregon plans to submit two site proposals: one in the arid flatlands across the Columbia River from Richland, near the Hanford Nuclear Reservation, the second in a river valley between the University of Oregon and Oregon State University.

Illinois argues that the project rightfully belongs alongside Fermilab, whose proton synchrotron could serve as the injector for the SSC. Proton collisions in the SSC's racetrack-shaped rings would have 20 times the center-of-mass energy of those in the proton-antiproton accelerator at Fermilab, currently the collider with the world's highest energy. The purpose of the SSC is to hurl beams of protons at each other with a collision energy of 40 TeV to better understand the properties of quarks and leptons; to discover new particles, including the elusive Higgs boson, if it exists at all; and possibly to extend the Standard Model

for the structure of matter to include the fundamental forces in a Grand Unified Theory. One of the SSC's most eloquent advocates is Leon M. Lederman, Fermilab's director, who speaks of the Supercollider as "critically important to the 2500-year search for the nature of fundamental matter... to give a coherent account of the world and our place in it." If the SSC is not built at Fermilab, though, Lederman worries that some of his best physicists and technicians will jump ship and go where the action is. To try to prevent this, Illinois Governor James R. Thompson made a preemptive strike last year, convincing the legislature to allot \$15 million to do the necessary geological surveys and to bid on the property near Fermilab.

Campaigns. Brash in its expectation of getting the SSC, Texas anticipated such actions. A year before the Illinois campaign began, Texas's legislature created the National Research Laboratory Commission, consisting of such prominent figures as Peter T. Flawn, president emeritus of the University of Texas; J. Fred Bucy, former chairman of Texas Instruments; and Steven Weinberg, Nobel Prize-winning physicist at the University of Texas at Austin. Despite the state's economic doldrums, the legislature also authorized the sale of \$1 billion in general obligation and special revenue bonds as a sweetener to attract the SSC to the Lone Star State. Employing 80 scientists and engineers to survey 14 different sites, in what amounted to a pilot DOE site selection operation, the commission selected two locations. One, in the plains near Amarillo, would require only "cut and cover" techniques, thereby reducing the cost of tunneling; the other, between Dallas and Fort Worth, would call for conventional hole drilling. Governor William Clements is sending proposals for each site to DOE.

On the principle of better late than never, New York State's Urban Development Corp., led by Lieutenant Governor Stan Lundine, only this year stud-



Hearings on the SSC took place before many empty chairs of the House Science, Space and Technology Committee over three full days last April as physicists, governors, industry scientists and government officials testified.

ied three locations: Malone, near the Canadian border; Palmyra, near Rochester; and the Stewart International Airport, near Newburgh. Last 10 April the state legislature approved \$3 million to advance New York's prospects for the collider. According to Lundine, the strategy is to portray the project as a regional effort by enlisting political support from New Jersey, New England and even the Quebec and Canadian governments.

Collisions. Though the SSC is still years away from pp collisions, it has already caused bruising collisions within Congress and the physics community. Last April, the battle in the House was joined when two Texas representatives, Jack Brooks, a Democrat, and Joe Barton, a Republican, attempted to insert an amendment to H.R. 1827, the fiscal 1987 Supplemental Appropriations Bill, making \$2.8 million available for high-energy physics research in their state. "It was a sneak attack," recalls Representative J. Dennis Hastert, an Illinois Republican who mobilized a counterattack with a roll-call vote the next morning that crushed the amendment. "They were clearly trying to get the House on record endorsing Texas as the keystone state for physics research."

At stake for the state that gets the SSC is the opportunity of being one of the world's great science centers, with all that the title implies for major universities, cultural institutions, re-

creational spots, hotels and even barber shops and pizza parlors. The vision of economic boom and social prestige that comes with opportunities for another California Silicon Valley or Massachusetts Route 128 high-tech area and possibilities for Nobel Prizes makes the project tantalizing. Not surprisingly, a letter signed by 31 governors on 19 June urged Robert A. Roe, a New Jersey Democrat and chairman of the House Science, Space and Technology Committee, and J. Bennett Johnston, a Louisiana Democrat who heads the Senate Energy and Natural Resources Committee, to back the collider. "The SSC is a symbol of this nation's willingness and commitment to remain at the forefront of scientific research," they wrote. "For this reason we have placed our individual proposals aside for a moment and joined together to demonstrate our collective support for this critical project."

The states are lobbying intensely. "There's never been a competition like this for a major government facility," says Washington lawyer-lobbyist Ed Forgotson, who represents North Carolina. Other lobbyists retained in the race for the ring include former Republican House member Clair W. Burgener of California, representing his home state; former White House legislative liaison M. B. Oglesby, pushing Illinois; and Sam Steiger, another former Congressman, managing Arizona's effort. The appearance of lobbyists at this

early stage, even before a committee of the National Academies of Sciences and Engineering has produced a short list of the best sites, led *The New Republic* to describe the situation as "quark-barrel politics."

Lottery. Representative Dave McCurdy, an Oklahoma Democrat who sits on the House science committee, says, "It's our national lottery." Representative Don Ritter, a Republican of Pennsylvania, prefers to think of the SSC competition as "something like the Publishers' Clearing House Sweepstakes: You can win millions, but you must enter."

This spring the Tennessee Valley Authority attempted an end run around the competitive concept when it suggested that TVA would renegotiate DOE's 1967 power contract if the SSC is placed nearby. Under the current agreement, DOE pays TVA about \$1.4 million per day for 4485 megawatts of electricity it no longer needs for uranium enrichment at Oak Ridge. DOE rejected the offer emphatically.

At least 15 states have decided not to join the race for various reasons: the cost of running and providing financial incentives, the lack of an adequate site for the 53-mile oval ring, and the belief that Congress is not likely to approve spending \$5 billion to \$6 billion to build the SSC in a period of fiscal restraint and economic uncertainty. Minnesota, for instance, decided not to propose a location. But neighboring South Dako-



ta is putting forward a site that extends east from the Sioux Falls area into a piece of Minnesota and would rely on the Minneapolis-St. Paul airport for international flights and the University of Minnesota for broadly based physics programs.

Regionalism. States in New England are generally uninterested in the competition and most do not plan to sign onto a regional association. In other regions, however, joint proposals may be forthcoming, particularly in the Southeast, South and Mountain States. Senator Malcolm Wallop, Republican of Wyoming, tried to put together a proposal backed by his state, Colorado, Montana, New Mexico and possibly Utah, but withdrew his idea when Wyoming began advancing a site of its own in Sweetwater County. States represented in the Southeast Universities Research Association, which is building the Continuous Electron Beam Accelerator Facility at Newport News, Virginia, met in Atlanta recently to discuss joint action. Participants held out hope of offering up to 100 new professorships in physics at universities in most of the member states.

New York State has asked DOE to consider a proposal that would put a portion of the SSC tunnel across the border into Quebec. The Canadian province has offered to put up some construction funds and supply hydroelectric power to the machine at cost. But DOE has refused to accept a collider outside the continental US.

While each state must be prepared under DOE's contest rules to provide 16 000 acres of land for the collider at

no cost to the US government, some states that can afford higher stakes are offering buildings, construction work, water, electricity, discount tuition fees to SSC staff and outright cash—all aimed at influencing the choice of site. Although some states and many Congressmen admit that cost sharing is important, others think that financial incentives, which DOE had listed among the criteria for selection, give an insurmountable advantage to larger states and wealthier regions.

Leveler. To prevent this, Senator Pete Domenici, a New Mexico Republican, ranking minority member of the Senate Budget Committee and a member of the Energy and Natural Resources Committee, added Amendment 97 to the fiscal 1987 Supplemental Appropriations Bill, preventing DOE from turning the SSC contest into an auction, with the final choice going to the highest bidder. When the \$6.4 billion spending bill was signed by the President on 11 July it contained Domenici's amendment ruling out all financial and other incentives from the selection criteria "to ensure that the Department of Energy bases its final decision on the overall suitability of the site." Domenici's purpose, supported in both houses, is to make sure poorer states are on a more equal footing with wealthier ones.

At about the same time the Domenici amendment was being debated in Congress, 35 members of the House, led by Tim Valentine, a North Carolina Democrat, supported by Marilyn Lloyd, a Tennessee Democrat, and Sid Morrison, a Washington Republican, sent a letter on 26 June to Energy Secretary John S. Herrington seeking an extension for submitting state proposals to the end of the year. This is necessary, they argued, because DOE failed to recognize that many states would be unable to meet the filing deadline of 3 August.

Almost from the day DOE issued the SSC site procedure on 1 April, Valentine and other House members raised questions about the propriety of limiting the proposal preparation period to four months. They argued that some states had been working on proposals for months before the President formally approved the SSC on 30 February. Though Valentine's group originally sought an extension to 31 December, the members were convinced by other Congressmen to ask for 60 days.

'Contributions.' In the end, DOE moved up the deadline a month, to 2 September, citing that the Domenici amendment would require some changes in the way the states documented their claims to the SSC. But though DOE deleted the section on

financial and other incentives the states were willing to put up, the new rules allow proposers to list any "voluntary financial contributions" in a separate document to accompany the main proposal in a sealed envelope. The envelope is to be opened only if the state's proposal is the winning site. All sealed envelopes sent with losing bids will be returned unopened, says the DOE letter, signed by L. Edward Temple Jr, the department's point man on management matters connected with research projects. In effect, the rules have changed only slightly, because, according to Temple's letter, proposers are not precluded from stating what they intend to do to upgrade the site, which is likely to mean improving roads, installing power lines and water mains, and providing sewers. Such "contributions," notes Temple, may well be considered during the technical evaluation of the site proposal.

There is wide support on Capitol Hill for the SSC as an elegant way of advancing scientific research, perhaps winning some international prizes and possibly improving the US technological enterprise and correcting the foreign trade balance. That is a tall order for the SSC. The project does not divide members of Congress on ideological or party lines as do some other scientific issues, such as the Strategic Defense Initiative or research cooperation with the Soviet Union. Last April's Congressional testimony about the SSC, though without the drama or divisiveness of the Iran-contra hearings or the Watergate sessions, also illuminated one of the Republic's fundamental principles—that important government actions need to be thoroughly discussed and considered in reaching a public consensus.

The hearings before the House Science, Space and Technology Committee on 7-9 April enabled politicians, scientists, academics and businessmen to debate the merits of the project. Perhaps the most surprising aspect was that many of the House members and some of the scientists claimed that the high cost of the SSC would absorb much of the funding that would otherwise go into basic research at universities and national labs. When Reagan endorsed the SSC last January, neither he nor DOE suggested how to pay for it. The Administration pledged at the time that the SSC would be built with new funds—not at the expense of ongoing scientific programs already supported by DOE, the National Science Foundation, NASA or other agencies. It did not go unnoticed on Capitol Hill that the Administration's promise to double the current NSF budget by 1992 would mean that the agency's new funds

would total almost exactly the \$4.4 billion (in 1987 dollars, before taking inflation into account) that DOE wants to spend for the SSC.

'Camel's nose.' The SSC's cost in fiscal 1988 would be just \$35 million—all of this coming from reprogramming DOE's high-energy physics budget, with the major losers being Fermilab and SLAC. Not surprisingly, Congressmen in California and Illinois objected to that plan. Members of the budget and appropriations committees in both bodies of Congress are wary of making a commitment to the SSC now because of the massive outlays ahead—rising to between \$600 million and \$700 million each year until 1996, if it proceeds on schedule. As Buddy MacKay, Democrat of Florida, and Ritter stated in their "Dear Colleague" letters last May and June, the 1988 commitment to begin the SSC "is the proverbial camel's nose in the tent."

Thus, on 17 June the House agreed to the 1988 Energy and Water Development Appropriation Bill that excluded the DOE request for \$10 million to begin construction of long-lead-time items for the SSC. It approved \$25 million for continued R&D on the collider. The House Appropriations Committee report expresses concern

that DOE has not come forth with a plan for paying for the machine in a period when deficit reduction is a singular goal on Capitol Hill. The report calls on DOE to "continue to explore cost participation in this project by foreign countries. The committee believes that progress in identifying foreign financial participation will be very beneficial in firming up the overall fiscal picture for this project."

DOE officials and some physicists acting at the behest of the department have discussed participation with government and scientific leaders in Japan, Canada and the European Community, but no formal agreements have been reached. Canada has shown interest in a cross-border tunnel located principally in the state of New York. The rules of the competition require the SSC to be built entirely within the continental US, however.

European rival. Officials from 17 states appeared before the House Science, Space and Technology Committee last April to argue for full funding of the SSC. The committee also heard Herwig Schopper, director-general of the European Organization for Nuclear Research, describe the Large Hadron Collider that CERN physicists want to construct in the 17-

mile circular tunnel that is now being completed for the 110-GeV Large Electron Positron collider. A special committee under Carlo Rubbia reported in June that the proposed LHC could produce particle collisions at five times the rate of the SSC for less than 20% the cost. In its current design, the LHC would have about 16 TeV compared with the SSC's 40 TeV. Under questioning, Schopper admitted that in the community's current financial straits, neither Europe's leading ministers nor its parliamentarians were keen on spending additional sums for scientific research.

It has not been overlooked by some on Capitol Hill that DOE created a timetable that allows the Administration to choose the winning site in January 1989 as one of its last official acts. And some are already saying it's unlikely that Reagan can bear to pass over his beloved California for such a plum. Few in Washington would be shocked if the final decision is based on political considerations, says New York's Lundine. "Believe me," he says, "there are science politics every bit as intriguing as welfare politics or military politics that we know so well in Washington."

—IRWIN GOODWIN

Will high- T_c superconductivity affect the SSC's design?

Because superconducting magnets are so central to the design and engineering of the SSC, the progress and promise of a new group of superconducting materials known as layered perovskites have excited some physicists to claim the giant machine could be built cheaper and smaller. Relatively soon, perhaps in a few years, these physicists say, high-temperature superconducting materials are likely to make possible, among an astonishing array of applications, particle accelerators whose magnets would no longer need to be cooled by costly liquid helium to 4.2 K above absolute zero but would operate at or near room temperature. Indeed, they seem confident that those materials will generate magnetic fields much higher than now known, with virtually no loss of current.

But predictions are no guarantee such things will come about, let alone in a few more years. Still, the assertions, coming from several prominent physicists, trouble and tantalize many members of Congress just when they are deciding whether to approve the fiscal 1988 budget to begin work on construction items for the SSC. Politicians abhor uncertainties. What they read and hear about the superconduc-

tivity phenomenon leaves them agog, puzzled by speculations that the new materials should enable physicists to redesign the accelerator so that it will require a lot fewer than 10 000 magnets, a tunnel much smaller than 53 miles in circumference and a total price tag well under the advertised \$4.4 billion (in 1987 dollars).

Speculations. This belief was apparent in several "Dear Colleague" circulars issued in May and June in the House of Representatives. In these, four members of the Science, Space and Technology Committee identify such respected solid-state physicists as Philip Anderson and James A. Krumhansl as opposing construction of the SSC now. A quotation from Anderson, taken from an article in *The New York Times* (14 April 1987), has him saying: "It is important to wait awhile on the SSC. [I had thought that superconducting] technology was not going to move fast enough to make a difference to the Supercollider, and I've changed my mind. Things are moving faster than I ever thought."

The House letter contains a portion of the testimony presented by John M. Rowell of Bell Communications Research at the April hearing of the

House Science, Space and Technology Committee. On that occasion, he observed that much more should be known about the current-carrying capability of new superconductors by the end of this year and that he would be "very surprised" if a lot more isn't also known by early next year about fabricating the materials into magnets and wires for the SSC. In an earlier version of the "Dear Colleague" statement, Krumhansl's letter of 19 February to Energy Secretary John S. Herrington is quoted: "The implications [of high- T_c superconductivity] are vast! These materials are inexpensive, they can be easily made, and can be refrigerated by a variety of widely available cheap methods. They unquestionably have the potential to save billions of dollars in construction and operation of particle accelerators like the SSC. Because they are easily fabricated, I have little hesitation in predicting that they will be brought to technological usability in three to five years, if materials research is supported adequately. By contrast with particle physics, I can assure you that this discovery is so important that it will find its way into almost every area of materials, energy, electronic and military technologies. A