

## V. Budget Justification

This proposal for the continuation of the Southern California Earthquake Center (SCEC2) is being submitted jointly to the NSF and the USGS. The NSF funding request is \$3M in Year 1 and \$16.665M over 5 years. The USGS funding request is \$1.5M in Year 1 and \$8.335M over 5 years. The combined budget for NSF/USGS funding is listed tables that follow this section. The breakdown of the budget requests for NSF and the USGS for the entire 5 years is also included. The following discussion applies to Year 1 only.

### A. Budget Overview

SCEC2 requests \$3M in FY02 from the NSF Earth Sciences Division and \$1.5M from the USGS NEHRP. With 5% annual increases, the total NSF request for 5 years is \$16,665,000 (\$3.15M in FY03, \$3.32M in FY04, \$3.5M in FY05, and \$3.695M in FY06). The total request for the USGS is \$8,335,000 (\$1.575M in FY03, \$1.66M in FY04, \$1.75M in FY05, and \$1.85M in FY06). Therefore, the total request over 5 years is \$25M. NSF/USGS funding of SCEC2 will trigger \$5.5M in university cost sharing (\$1.1M/yr) over the 5 year period. NSF/USGS funding at this level also will greatly enhance the Center's efforts to acquire additional resources from other federal agencies, the State of California, private foundations, and industry. To address the research proposed here, SCEC2 has assembled a team comprising many of the top earthquake scientists in the U.S.; participants are listed in the table entitled *SCEC2 Institutions* in the Supporting Documents section of this proposal.

### B. Infrastructure Budget

While separate requests are being made to NSF and the USGS, the funding from each agency will be combined for the purposes of building a SCEC2 program each year. Over its lifetime, the Center expects to spend roughly 50% of its base funding on project science and post-earthquake investigations, and 50% on infrastructure and integrative activities including facilities, management, seminars, workshops, outreach, IT infrastructure, and a post-doctoral fellows/visitors program. If both requests are funded, SCEC2 will have \$4.5M to support this core research program in Year 1. This NSF/USGS funding will allow the Center to maintain much of the SCEC1 infrastructure now in place in Southern California.

In Year 1, the Center will allocate the \$800K of USGS funds for science and \$700K for infrastructure. The latter is budgeted as outlined in Table 5.1: \$100K for management, \$50K for science

workshops, \$150K for our Communication, Education, and Outreach (CEO) program, \$100K for supporting geodesy infrastructure (mainly the SCIGN array), \$100K for seismology infrastructure (mainly the maintenance of the Southern California Earthquake Data Center), \$100K for new geology infrastructure (new shores, a backhoe, and database compilation), and \$100K for IT infrastructure.

In Year 1, \$1550K of the NSF budget will be allocated to infrastructure. A Center administration budget of \$100K will provide two months of support each for the Center Director and Deputy Director, who have major, Centerwide leadership responsibilities, as well as other administrative costs. A Vice-Director for Administration will be supported at 75% time. Center administrative office staff support will be paid from the USC cost-sharing funds. SCEC2 will host an annual meeting for Center participants and conduct focused science workshops, for which \$150K is budgeted. Center workshops will be widely advertised and open to all scientists from both the public and private sector. Support will be provided for graduate and undergraduate student and post-doc participation in the workshops. A Centerwide post-doctoral fellows/visitors program will conduct annual competitions to attract young scientists into Center research; this program will be budgeted at \$150K, which will be matched by the institutions hosting the post-doctoral fellows. \$100K will be budgeted to support geodesy infrastructure (mainly the SCIGN array), \$150K for seismology infrastructure (mainly the maintenance of the SCEDC and the Strong Motion Data Base), \$100K for new geology infrastructure (new shores, a backhoe, and database compilation), and \$350K for IT Infrastructure.

SCEC2 will continue the Center's excellent and nationally recognized outreach program, which will be retitled Communication, Education, and Outreach (CEO) and coordinated with the USGS outreach program in Southern California. The program will be staffed by a CEO Vice-Director and one CEO Specialist supported by the Center's base budget of \$450K (\$300K from NSF, \$150K from USGS). Supplemental funding is expected from other sources (for example, SCEC1 Outreach has received \$800K from FEMA for the past 8 years and more than \$100K from sources such as the media and City of Los Angeles). Undergraduate summer internships, partnerships with high-achieving school districts, and research-related educational modules will be a key part of the SCEC2 educational program. A \$50K CEO sub-

**Table 5.1.** SCEC2 Year 1 Funding Request by Agency and Activity

Activity	USGS	NSF	Combined
	Infrastructure	Infrastructure	Infrastructure
Management (Director's Stipends, Management)	100	250	350
Workshops/Meetings	50	150	200
Post-Doctoral Program (cost-shared with core institutions)	0	150	150
Seismology Infrastructure (Data Center, SMBD)	100	150	250
Geodesy Infrastructure (SCIGN)	100	100	200
Geology Infrastructure (Shores, Backhoe, Database)	100	100	200
Education and Outreach	150	300	450
Computer Modeling (IT Infrastructure)	100	350	450
<b>Subtotal</b>	700	1,550	2,250
	<b>Science</b>	<b>Science</b>	<b>Science</b>
Structural Representation	150	300	450
Fault Systems/Kinematics	100	225	325
Fault Systems/Dynamics	100	225	325
Earthquake Physics/Rupture Dynamics	150	225	375
Earthquake Physics/Ground Motions	150	225	375
Seismic Hazard Analysis	150	250	400
<b>Subtotal</b>	800	1,450	2,250
<b>Total Request</b> (\$3.0M from NSF; \$1.5M from USGS)	1,500	3,000	4,500

contract to URS Corporation will support work by Paul Somerville on the Implementation Interface.

### C. Science Program Budget

SCEC2 will spend \$1.45M of NSF funds and \$800K of USGS funds—half of the total budget—on the science programs outlined in the proposal. Most of these funds will support project-oriented, interdisciplinary research, which will be organized into the four focus groups described in §III.B.2: Structural Representation, Fault Systems (Kinematics & Dynamics), Earthquake Physics (Rupture Dynamics & Ground Motions), and Seismic Hazard Analysis. Table 5.1 indicates an approximate split of the research budget among these focus areas, although these amounts will surely change as research results warrant; over time, resources will be directed toward areas showing the most promise. Science grants will average \$40-50K/yr, which translates into support for about 50 projects per year from the core program. Science funding will be allocated in two ways: smaller grants to support individual scientists working in the Center environment, and larger grants to support scientists and scientific teams

collecting integrating, and modeling data for major Center projects.

While there will be many senior scientists involved in the Center, the base science funding will be primarily targeted for young faculty, post-doctoral fellows, and graduate and undergraduate students. Some funds are budgeted within each academic institution to support participation by undergraduates. Priority will be given to students from underrepresented groups to encourage their early involvement in science activities.

The major research effort will be undertaken by scientists from the core institutions, and the USC and subcontracted institutional budgets have been structured accordingly. However, as noted in the management section, the Center Director and Board will make final decisions on funding levels for research projects. Thus, total funding per institution may vary substantially from those projected here. Should this proposal be approved, SCEC2 will establish its Board of Directors as outlined in §IV.A and prepare a science plan for Year 1 funding. Following final selection of research projects for Year 1 by the Center Director, in consultation with the Board, a budget plan will be submitted to both NSF and USGS for approval. USC will

waive overhead on subcontracts issued to other participating institutions—a significant cost share.

#### **D. SCEC2 Cost Sharing**

The cost sharing being provided by academic institutions and the USGS for SCEC2 is truly impressive. The core academic institutions of SCEC2 have committed \$5.5M to the support of the Center in hard funding (\$710K/yr; \$1.1M/yr accounting for overhead). The amount of direct cost sharing per core institution is shown in the supporting documents section on institutions/personnel. The cost-sharing funds at each institution will be spent on SCEC2 research at their institutional discretion and not be controlled by the SCEC2 Director or Board. Institutional representatives will provide a report to the Center Director and funding agencies on how the cost-sharing commitment was expended each year. Indications of how these funds will be expended can be seen in the cost-sharing commitment letters in the Supporting Documents section.

In addition to direct cost sharing, each core institution is providing release time for its faculty to work on Center activities and providing the necessary space and facilities to conduct Center research. The academic release time salary support and salary support of USGS collaborators from Pasadena, Menlo Park, and Golden will each be more than \$1M annually. Additional matching support for the Center can be seen in the cost sharing letters from the deans at the core institutions.

A major cost sharing commitment has been made by University of Southern California, which will provide 11,000 square feet of renovated space in North Science Hall for SCEC2 activities. Triggered by the needs of SCEC2, the university is planning to spend \$32M over the next 2-3 years to completely remodel North Science Hall and upgrade the building's infrastructure (including seismic retrofitting). SCEC2 will be allocated 25% of the space in this building, which translates to an additional commitment by USC of \$8M. The

North Science space will house a media center, conference room, a training center, advanced computing facilities, laboratories, office space for visitors, and the administrative headquarters of SCEC2.

In summary, total cost sharing will be more than \$23M: \$5.5M in academic institution hard funding, at least \$5M in academic institution faculty release time, at least \$5M in USGS collaborator salaries, and \$8M in facilities renovation at USC.

#### **E. Other Funding Sources**

Over 150 Ph.D.-level scientists have already enrolled in SCEC2 (see Supporting Documents), so it will be impossible to fund all eligible participants from this base-funding request. As in SCEC1, many scientists will participate although their primary funding comes from other sources. The ambitious science plan presented in this proposal and the high enrollment by earthquake scientists in this plan argue strongly for expanding the resources for SCEC2 beyond the current request. The Center management will therefore work with the USGS, NSF, and other agencies to increase the SCEC2 funding base.

The Center is already working with the City and County of Los Angeles and other state agencies to acquire California State support (similar to the state's support for PEER). These funds will enhance the basic research and CEO programs outlined in the proposal. Funding can also be anticipated from other sources in California during the life of the Center, primarily from the California Department of Transportation and the utility industry. Most of this ancillary work will be applied research, and, except for a management fee, all funds will go to science programs. This research is more likely to be undertaken by senior Center scientists and will furnish important practical input to such areas as critical facilities and highway retrofit and construction. The Center also plans to seek additional funds from private foundations for Center activities.