



1341 G Street, NW
Eighth Floor
Washington, DC 20005
t: 202.289.7475
f: 202.289.7454
www.lewis-burke.com

Supplement to May 8 Summary and Analysis of the President's FY 2010 Budget Request for Federal Research and Education Programs

The detailed documentation on the National Science Foundation (NSF) budget request for fiscal year (FY) 2010 was not released with the rest of the government's request on May 7, but instead became available late on Friday, May 15. Below is a complete analysis of the NSF request to supplement the report on FY 2010 federal research and education programs you received from Lewis-Burke Associates on May 8.

National Science Foundation

The National Science Foundation (NSF) would receive \$7.045 billion in the fiscal year (FY) 2010 budget request, an increase of \$555 million or 8.5 percent above the FY 2009 appropriated level. (These numbers do not include the one-time infusion of \$3.0 billion to NSF in FY 2009 from the American Recovery and Reinvestment Act [ARRA].)

The proposed increase would build on a 7.6 percent increase NSF received in FY 2009, and the rate of growth is consistent with the Administration's stated goal to double NSF funding. The target is to reach \$11.2 billion for NSF in FY 2016. However, the proposed near-term path is not smooth - documents indicate that the Administration would request a small increase (3 percent) in FY 2011 and then a large "catch-up" increase (17 percent) in FY 2012. This plan likely reflects strong pressure on the Administration to restrain discretionary spending in the immediate future until the economy recovers.

While the planned doubling will affect all of NSF, the programs identified as Presidential priorities for the agency are: the Faculty Early Career Development (CAREER) Program, the Graduate Research Fellowship Program, the Advanced Technology Education Program, and a new Climate Change Education program (further information about these programs are below). NSF is also beginning an agency-wide focus area in climate research.

The budget request offers a first indication of the expected impact of ARRA funds at NSF. Across the government, a significant measure of the impact of these dollars will be the number of jobs created or retained. While NSF has not yet defined how it expects grantees to report on jobs, the budget request does estimate the number of people involved in NSF activities supported by ARRA funds: 39,475, including over 20,000 undergraduates, graduate students, and post-doctoral fellows. (In a regular year, NSF estimates over 200,000 people are involved in NSF activities.)

Another agency-wide impact of ARRA will be in raised success rates in FY 2009. The overall success rate for research grants at NSF was 21 percent in FY 2008, and they hope to raise that to 29 percent in FY 2009 using ARRA funds. The actual impact will vary by directorate; at the low end, the Engineering Directorate research grant success rate is expected to go from 16 percent to 21 percent, while at the high end the Mathematical and Physical Sciences Directorate would go from 27 percent to 39 percent.

Research and Related Activities (R&RA)

The NSF Research and Related Activities (R&RA) account would receive \$5.733 billion in the FY 2010 budget request, an increase of \$550 million or 10.6 percent above the FY 2009 appropriated level. The R&RA account includes funding for research in Biological Sciences; Computer and Information Sciences and Engineering; Engineering; Geosciences; Mathematical and Physical Sciences; and Social, Behavioral and Economic Sciences. It also contains funding for cyberinfrastructure, polar research, international activities, and some agency-wide programs, such as the Major Research Instrumentation program and the Experimental Program to Stimulate Competitive Research (EPSCoR).

Among the research directorates, the proposed increases range from 6.9 percent (for Social, Behavioral and Economic Sciences) up to 12.6 percent (for Geosciences).

Priority Initiatives

Climate Research: The major initiative of the FY 2010 budget is a new NSF-wide investment in climate research. This consists of \$197 million spread across the agency, with the bulk of funding going to the Office of Polar Programs (\$65 million), Geosciences (\$46 million), and Biological Sciences (\$46 million). The purpose of the funding is to improve understanding of and ability to mitigate and adapt to climate change through expanded observing capabilities, modeling and simulation, and fundamental research. Areas of focus would include ecosystems vulnerabilities, the carbon cycle, ocean acidification, abrupt climate change, the dynamics of water in the environment, and weather extremes.

Policy implications of climate research is often closely tied to the results of energy research, but the NSF FY 2010 budget request does not explicitly identify an agency-wide energy initiative or total funding level. The budget request documents for most of the directorates and programs do refer to energy, especially energy from sustainable or renewable sources, as a topic within their programs. Examples include research (e.g. on biofuels or technologies for energy efficient buildings), education (e.g. a focus on clean energy in the Advanced Technology Education Program), and infrastructure (e.g. plans to improve the use of renewable energy and increase the efficiency of operations at the NSF Arctic and Antarctic research facilities).

CAREER Program: Another priority of the FY 2010 request is support for young faculty and investigators, especially via the cross-NSF Faculty Early Career Development (CAREER) Program. The FY 2010 request for this program would be \$203.8 million, 11.6 percent over the FY 2009 level but basically equal to the FY 2008 funding. The request indicates that the plan in future years is to propose increases proportional to NSF's overall budget growth.

In addition, NSF is dedicating \$165 million in ARRA funding to the CAREER program. This will allow directorates to make many more CAREER awards than originally planned in FY

2009. For example, the Biological Sciences directorate intends to double its planned number of CAREER awards in FY 2009, while the Engineering Directorate will make 87 more, 15 of which will be co-funded with the Office of Cyberinfrastructure and focus on supporting early career researchers in computational science and engineering.

Potentially Transformative Research: NSF is planning to set aside a total of \$92 million across the foundation, at least \$2 million per division for “potentially transformative” research. A major mechanism for expending such funds is the EARly-concept Grants for Exploratory Research (EAGER) awards that program officers may award without external review for untested “high risk-high payoff” research ideas or approaches. The amount of funding set aside varies widely by directorate—\$35 million in Engineering compared to \$8 million in Geosciences. In addition to EAGER, plans call for increased funding of interdisciplinary research, experimental review processes, and large-scale frontier research programs.

Other Programs of Interest

Agency-Wide Programs: NSF has several multidisciplinary and agency-wide programs that receive particular attention from universities and Congress. In addition to the climate research program discussed above, highlighted efforts for FY 2010 include:

- Experimental Program to Stimulate Competitive Research (EPSCoR): EPSCoR would increase 10.6 percent to \$147 million in FY 2010. In addition, the program would receive \$50 million from ARRA funds. NSF indicated that a solicitation is expected soon within the EPSCoR program targeted directly at spending some or all of the stimulus funding to support broadband infrastructure investments.
- Major Research Instrumentation (MRI): The MRI program would receive \$100 million in FY 2010, the same level as in FY 2009. However, the program received \$300 million in ARRA funding which is being distributed to the regular FY 2009 competition and an additional special competition, also in FY 2009. The award cap for MRI, raised to \$6 million for the special competition, will return to \$4 million in FY 2010.
- Academic Research Infrastructure (ARI): NSF does not request any funding to repeat the ongoing ARRA-funded ARI competition in future years.
- Cyber-Enabled Discovery and Innovation (CDI): NSF would continue to increase funding for CDI, a major NSF-wide initiative which began in FY 2008. CDI would receive \$103 million in FY 2010, an increase of \$32 million or 45 percent above the estimated FY 2009 level. The prime supporters continue to be the Computer and Information Sciences and Engineering and Mathematical and Physical Sciences Directorates.
- Science and Engineering Beyond Moore’s Law (SEBML): NSF would sharply ramp up support for the multi-directorate SEBML initiative that was begun in FY 2009. FY 2010 funding would be \$47 million, roughly three times the FY 2009 level.
- Research Experiences for Undergraduates (REU): The REU program would receive \$67.7 million in FY 2010, an increase of \$3.9 million over FY 2009.

Interagency Programs: In addition to NSF-specific programs, NSF investment in interagency research programs, such as climate change science, networking and information technology, and nanotechnology, would continue. Consistent with the new climate research initiative within NSF, a very sizable increase would occur in NSF’s contribution to the climate change science program (up 37 percent over FY 2009). There would also be a significant increase for

networking and information technology (up 11 percent over FY 2009) and relatively smaller growth for nanotechnology (up 6.5 percent over FY 2009). All three programs would benefit from the ARRA funding provided to the NSF research directorates.

Computational Science: The Office of Cyberinfrastructure was established in 2005 and has since then spent a majority of its funding on investments in networking and computational resources infrastructure and services. This year, the office plans to take on an active role as a national steward of computational science activities, as seen in significant proposed increases in the research and education side of the office's portfolio. The office would start or increase participation in NSF-wide programs such as CAREER, Research Experiences for Undergraduates, and the Graduate Research Fellowships, to provide targeted support for researchers who prototype and develop the next generation cyberinfrastructure, and/or apply it to advance their basic science disciplines.

Centers: NSF provides large-scale multidisciplinary awards through a variety of center programs which, in most cases, do not run competitions every year. The plans for some of these center programs are:

- Engineering Research Centers (ERCs): ERC funding would increase \$6 million in FY 2010, on top of \$18.5 million received for the program from ARRA funding. Three new center awards will be made in FY 2010 (from the ERC competition currently in progress), and in the future NSF is planning to award grants for two additional centers in early 2011.
- Centers for Chemical Innovation (CCI): An increase of \$8.5 million for the CCI program in FY 2009 would allow NSF to fund a competition for four new center development (Phase I) grants and two new full-scale center (Phase II) grants.
- Science and Technology Centers (STCs): Up to five new STC awards will be made in FY 2010 (from the STC competition currently in progress to replace sunsetting centers).
- Materials Research Science and Engineering Centers (MRSECs): The next MRSEC competition is planned for FY 2011.

Education and Human Resources (EHR)

The NSF Education and Human Resources (EHR) account would receive \$857.8 million in the FY 2010 budget request, an increase of \$12.5 million or 1.5 percent above the FY 2009 appropriated level, excluding FY 2009 ARRA funds of \$100 million.

In past years, proposed EHR increases have usually been lower than the increases proposed for the R&RA account (comparing percentages), but Congress often increases the EHR funding levels during the appropriations process. Already, concern has been expressed by Members of Congress and the education community about the relatively flat funding for EHR, especially in light of the President's overarching emphasis on education in general and K-12 math and science education in particular. In response, NSF and White House Office of Science and Technology Policy personnel have stressed that education programs at NSF do not occur or are funded solely through the EHR Directorate, but throughout the research directorates and offices, and that these programs would receive robust funding.

Documents from the White House Office of Science and Technology Policy state that science, technology, engineering, and mathematics education funding NSF-wide would increase by \$43 million, or 4.0 percent from FY 2009 to \$1.109 billion FY 2010. Examples of where this non-

EHR education funding would be spent include the proposed ramping up of the R&RA support for Graduate Research Fellowships (up \$11 million), the proposed activities to improve undergraduate biology education (up \$10 million), and an effort to broaden participation in and increase public awareness of geosciences (up \$6 million).

The FY 2010 budget request seems to indicate that, for NSF education, the priority is being placed on undergraduate and graduate education, not K-12. The Research on Learning in Formal and Informal Settings (DRL) division, which contains most of EHR's K-12 programs, would increase only \$3 million to \$230 million, with the increases going to programs focused on evaluation. The non-K-12 emphasis is reflected in the three education programs that have been identified as Presidential priorities. One priority is the Advanced Technology Education (ATE) Program, which would increase by 24 percent to \$64 million; this program supports community college programs focused on training a workforce for high-technology sectors. A focus in FY 2010 would be expanded funding for clean energy-related projects.

The other two priorities for EHR are actually proposed to be carried out in concert with the research directorates, with the new funding going to the R&RA account. First is a climate change education program (with was begun with \$10 million in EHR in FY 2009) that would support programs for K-12 up to graduate level and efforts to increase public understanding of climate change and its consequences. In FY 2010, this effort is proposed to have the same level of funding, but with \$4.5 million allocated to the Geosciences, Biological Sciences, and Office of Polar Programs.

The final priority is the President's plan to triple the number of new Graduate Research Fellowships (GRFs) given each year, bringing the level to 3,000 by 2013. In FY 2010, overall funding for GRFs would increase 6.0 percent to \$122.0 million, but this growth includes an increased role for R&RA (building on \$45.6 million in R&RA ARRA funding in FY 2009) and a decrease of \$4.4 million in the EHR funding for this program.

NSF would also participate in the President's Regaining our Energy Science and Engineering Edge (RE-ENERGYSE) initiative, which aims to inspire and enable students to pursue careers in science, engineering, and entrepreneurship related to clean energy. The Department of Energy has significant new funds and activities proposed in this area, but for FY 2010, NSF's focus appears to be on using the planned expansion of existing programs (such as the Graduate Research Fellowship Program, the Integrative Graduate Education and Research Traineeship Program, Research Experiences for Undergraduates, and the Advanced Technological Education Program) to support activities relevant to the Administration's clean energy goals.

At NSF, the bulk of ARRA funding went to research and facilities programs. While Congress did provide \$100 million to EHR in ARRA, they directed it to three specific education programs; these programs would be flat or decline in the FY 2010 budget request. The Robert Noyce Teacher Scholarship Program would receive \$55 million in FY 2010, the same as its FY 2009 level, but it did also receive \$60 million from ARRA. Similarly, the Math and Science Partnership Program would receive \$58 million in FY 2010, \$2.8 million below FY 2009, and \$25 million from ARRA. Finally, no funding at all would be provided in FY 2010 to the Professional Science Masters program, established with \$15 million from ARRA in FY 2009.

Other programs of interest include:

- Integrative Graduate Education and Research Traineeships (IGERT) program: The IGERT program would receive \$68.9 million in FY 2010 (from EHR and R&RA), an increase of \$5.7 million over FY 2009 to allow up to three new IGERT awards in areas such as water, climate change, and renewable energy. The program would also receive \$14 million in ARRA funding.
- Discovery Research K-12 (DRK-12): The DRK-12 program would receive \$108.5 million in FY 2010, the same amount it received in FY 2009.
- Research and Evaluation on Education in Science and Engineering (REESE): The REESE program would receive \$43.0 million in FY 2010, an increase of \$1.0 million over FY 2009.
- STEM Talent Expansion Program (STEP): The STEP program would receive \$31.5 million in FY 2010, an increase of \$1.8 million over FY 2009.
- Louis Stokes Alliances for Minority Participation (LSAMP): The LSAMP program would receive \$44.8 million in FY 2010, an increase of \$2.3 million over FY 2009.

As noted above, Congress may provide funding over the request level for favored EHR programs during the appropriations process; this funding could come out of other EHR programs or elsewhere in NSF.

Major Research Equipment and Facilities Construction (MREFC)

The NSF Major Research Equipment and Facilities Construction (MREFC) account would receive \$117.3 million in the FY 2010 budget request, a decrease of \$34.7 million or 22.8 percent below the FY 2009 appropriated level. The lower total reflects that NSF used \$400 million in ARRA funds for three MREFC projects, the Alaska Region Research Vessel (ARRV), the Advanced Technology Solar Telescope (ATST), and the Ocean Observatories Initiative (OOI). This expenditure reduced the amount of MREFC spending that would be needed in regular FY 2010 appropriations.

In FY 2010, funds are requested for five ongoing MREFC projects: Advanced LIGO (AdvLIGO), ATST, the Atacama Large Millimeter Array (ALMA), the IceCube Neutrino Observatory (IceCube), and OOI. (ARRV is not included on this list because the ARRA funding completed the necessary appropriations.)

The budget request contains information on two projects that could in the future be supported in the MREFC account: the National Ecological Observatory Network (NEON) and the Deep Underground Science and Engineering Laboratory (DUSEL). For NEON, funding is not requested in the MREFC account this year, although \$13.5 million is included in the Biological Sciences Directorate to support planning and design work to inform the FY 2011 budget request. (A final review of the design and baseline, scope, schedule, and cost is planned for early FY 2010.) The DUSEL project is receiving funds from the Mathematical and Physical Sciences Directorate for design activities and support of a competition to define experiments that would be placed within the laboratory.

The FY 2010 NSF budget request is available online at:

<http://nsf.gov/about/budget/fy2010/toc.jsp>.