

# Excerpts from Senate Report 109-084

## **ENERGY AND WATER APPROPRIATIONS BILL, 2006**

June 16, 2005

### **SUMMARY OF ESTIMATES AND RECOMMENDATIONS**

The fiscal year 2006 budget estimates for the bill total \$31,245,000,000 in new budget (obligational) authority. The recommendation of the Committee totals \$31,245,000,000. This is \$1,498,272,000 above the budget estimates and \$1,412,720,000 over the enacted appropriation for the current fiscal year.

### **SCIENCE**

Appropriations, 2005	\$3,599,871,000
Budget estimate, 2006	3,462,718,000
House allowance	3,666,055,000
Committee recommendation	3,702,718,000

The Committee recommendation for the Office of Science is \$3,702,718,000, an increase of \$240,000,000 above the request and \$102,847,000 above the current year level.

The Science account funds investment in basic research critical to the success of the Department's missions in national security, energy security and economic security. Programs funded under this account perform a leadership role in advancing the frontiers of knowledge in the physical sciences and areas of biological, environmental and computational sciences. The Department provides 40 percent of the total Federal spending that supports the research of 15,000 PhDs, post doctorate and graduate students, as well as operating 10 facilities used by over 19,000 researchers each year.

### **HIGH ENERGY PHYSICS**

Appropriations, 2005	\$735,699,000
Budget estimate, 2006	\$713,933,000
House allowance	\$735,933,000
Committee recommendation	\$716,933,000

The Committee recommendation includes \$716,933,000 for high energy physics, an increase of \$3,000,000, to provide operational funding to ensure full utilization of facilities.

The high energy physics program focuses on gaining insights into the fundamental constituents of matter, the fundamental forces in nature, and the transformations between matter and energy at the most elementary level. The program encompasses both experimental and theoretical particle physics research and related advanced accelerator and detector technology R&D. The primary mode of experimental research involves the study of collisions of energetic particles using large particle accelerators or colliding beam facilities.

# Excerpts from Senate Report 109-084

The Committee recognizes the critical importance of the DOE/NASA Joint Dark Energy Mission [JDEM] in answering fundamental questions about the nature and substance of the universe. Consequently, the Committee encourages the Department to move JDEM forward aggressively to ensure the timely accomplishment of this important work.

## NUCLEAR PHYSICS

Appropriations, 2005	\$404,778,000
Budget estimate, 2006	370,741,000
House allowance	408,341,000
Committee recommendation	419,741,000

The Committee recommends \$419,741,000 for nuclear physics, an increase of \$49,000,000 to ensure full utilization of experimental facilities.

The nuclear physics program supports and provides experimental equipment to qualified scientists and research groups conducting experiments at nuclear physics accelerator facilities. These facilities provide new insights and advance our knowledge of the nature of matter and energy and develop the scientific knowledge, technologies and trained manpower needed to underpin the Department's nuclear missions.

*Rare Isotope Accelerator-* The Committee requests the Department to submit a report within 120 days after the enactment of this Act, with information critical to moving forward with the site selection of the Rare Isotope Accelerator. The report shall include, but not be limited to, (1) the status and progress of the conceptual research and development supporting the development of RIA over the past 6 years; (2) the priority research areas the Department will complete prior to site selection for RIA; (3) the process by which the Department selects recipients for its research and development funding; (4) how the results of current and future research and development may affect the design of RIA or the path forward; (5) what technical hurdles remain before RIA site selection can resume; and (6) what funding will be required to clear those hurdles and what is the expected length of time for completion of these activities.

Finally, the Committee requests the Department clarify its plans to move forward with RIA, provide an estimate of when the draft request for proposals will be reissued, and assess whether in a constrained budget environment the Department has any concern that RIA, as it is currently envisioned, will not be built. If the Department anticipates that future budgets will not allow for RIA, the Committee requests the report provide alternatives and explain how the Nation would meet our need for the fundamental physics knowledge and training of scientists applicable to national security and homeland security that RIA would provide.

## BASIC ENERGY SCIENCES

## Excerpts from Senate Report 109-084

Appropriations, 2005	\$1,104,632,000
Budget estimate, 2006	1,146,017,000
House allowance	1,173,149,000
Committee recommendation	1,241,017,000

The Committee recommendation provides \$1,241,017,000, an increase of \$95,000,000.

The basic energy sciences [BES] program funds basic research in the physical, biological and engineering sciences that support the Department's nuclear and non-nuclear technology programs. The BES program is responsible for operating large national user research facilities, including synchrotron light and neutron sources, and a combustion research facility, as well as smaller user facilities such as materials preparation and electron microscopy centers. The BES program supports a substantial basic research budget for materials sciences, chemical sciences, energy biosciences, engineering and geosciences.

Within available funds, the Committee recommendation includes \$7,280,000 for the Department's Experimental Program to Stimulate Competitive Research. The Committee provides \$5,000,000 to purchase additional fuel for the High Flux Isotope Reactor.

### *Research*

The Committee recommendation includes \$1,062,944,000, the amount of the request, for materials sciences, engineering research, chemical sciences, geosciences, and energy biosciences. The Committee recommendation includes \$4,500,000 for Altair Nanotech for nanotechnology, nanosensors, and nanomaterials research, development, and deployment.

*Energy-Water Supply Technologies-* The Committee recommendation includes an additional \$25,000,000, within the chemical sciences, geosciences, and energy biosciences account, to support a research and demonstration program to study energy-related issues associated with water resources and issues associated with sustainable water supplies for energy production. Within available funds, the Committee recommends \$25,000,000 for energy and water resources management including \$8,000,000 for advanced concept desalination and arsenic treatment research in partnership with American Water Works Research Foundation and WERC; \$12,000,000 for water supply technology development in partnership with other national laboratories to initiate demonstration projects and technology transfer activities; and \$5,000,000 for water management decision support including demonstration programs in partnership with the New Mexico Office of the State Engineer, transboundary applications and support for international energy and water efficiency.

### *Construction*

## Excerpts from Senate Report 109-084

*Spallation Neutron Source-* The Committee recommendation includes the budget request of \$41,744,000 to continue construction at Oak Ridge National Laboratory for the Spallation Neutron Source [SNS] to meet the Nation's neutron scattering needs.

*Nanoscale Science Research Centers-* The Committee recommendation supports the high priority given to nanoscale research and has included the budget request for the nanoscale science research centers at Lawrence Berkeley National Laboratory, Oak Ridge National Laboratory, Argonne National Laboratory, Brookhaven National Laboratory, and the joint effort between Sandia National Laboratories and Los Alamos National Laboratory.

*National Nanotechnology Enterprise Development Center-* The Committee directs \$30,000,000 for the establishment of the National Nanotechnology Enterprise Development Center [NNEDC], to be co-located with the Center for Integrated Nanotechnologies [CINT], a joint facility of Sandia National Laboratory and Los Alamos National Laboratory. The Committee intends that the NNEDC will assist in the technological maturation of nanotechnologies developed at the National Nanoscience Initiative facilities. The mission of the NNEDC will be to identify nanotechnologies developed at the national laboratories and partnered universities that are promising candidates for commercialization and to assist in their transition to the marketplace. The Center will be directed by employees of Sandia National Laboratory and Los Alamos National Laboratory and will emphasize opportunities for industry partnership with the CINT.

## **FUSION ENERGY SCIENCES**

*Fusion Energy-* The Committee provides \$290,550,000, the same as the budget request. The Committee has provided \$28,000,000 in additional funding to ensure the full operations on the DIII-D, Alcator C-Mod, and NSTX fusion research facilities. The current budget reduces operations from 48 weeks to just 17 weeks, which the Committee believes is an irresponsible use of the taxpayer investment in these facilities. The Committee has reduced funding for the International Thermonuclear Experimental Reactor [ITER] by \$28,000,000, equal to the amount domestic research has been increased. The Committee is disappointed that a decision has not been made in selecting a site for the location of this international burning plasma user facility. Without a final decision on a location or allocation, the Committee is skeptical the Department will be able to expend the full budget request for this project in fiscal year 2006. If a site is selected, the Committee will work with the Department to provide an allocation that is consistent with the expected needs for this project. Within available funds, the Committee includes \$1,000,000 for non-defense research activities at the Atlas Pulse Power facility.

## **ADVANCED SCIENTIFIC COMPUTING RESEARCH**

## Excerpts from Senate Report 109-084

The Committee recommendation provides \$207,055,000 for advanced scientific computing research. The Advanced Scientific Computing Research [ASCR] program supports advanced computational research--applied mathematics, computer science, and networking--to enable the analysis, simulation and prediction of complex physical phenomena. The program also supports the operation of large supercomputer user facilities.

The National Leadership Computing Facility at Oak Ridge National Laboratory will provide the scientific community with the computing capability needed to solve problems out of reach of currently available systems and lead to significant advancements in areas such as biology, fusion, and climate change. Unfortunately, the budget request for this effort would halt the next phase of machine acquisitions and provides inadequate funding to operate the system that will be installed during fiscal year 2005.

The Committee strongly supports the National Leadership Computing Facility and the Oak Ridge National Laboratory's leadership in this important area. Full operation of the National Leadership Computing Facility at ORNL is necessary to keep domestic researchers and industries competitive with their global counterparts. The Committee will work to ensure that sufficient funding is provided to meet the next phase of machine acquisitions and encourages the Department to focus its efforts on enhancing and expanding activities at the National Leadership Computing Facility.

## **NATIONAL NUCLEAR SECURITY ADMINISTRATION**

### **CAMPAIGNS**

#### *Inertial Confinement Fusion and High Yield*

The Committee recommends \$314,023,000, a reduction of \$4,482,000 from the budget request for the Inertial Confinement Fusion and High Yield Campaign. This allocation restores \$61,000,000 in funding to the Support of Stockpile and Inertial Fusion Technology program that was cut from the budget request.

*National Ignition Facility [NIF]-* The Committee is disappointed in the long-term funding outlook for Weapons Activities contained in the fiscal year 2006 FYNSP. Compared to the budget request in fiscal year 2005, Weapons Activities funding is reduced by \$3,000,000,000 over the next 5 years. This decline is likely to have significant programmatic impacts and drastically curtail NNSA's scientific capabilities. It is difficult to conceive of a single program not being severely impacted, including NIF, as a result of the declining budget. The Committee is cognizant that the modest funding reduction of \$25,000,000 in fiscal year 2005 to the NIF program forced NNSA managers to rebaseline the entire project. As a result of the rebaselining effort, the NNSA has made the decision to support the NIF construction effort at the expense of the Inertial Confinement Fusion and High Yield Campaigns, putting in jeopardy critical high energy stewardship research at Los Alamos, Sandia, and Lawrence Livermore National Laboratories. The fiscal year 2006 budget cuts experimental programs that are essential in obtaining scientific data for ASC

## Excerpts from Senate Report 109-084

codes. The budget proposes the elimination of the Inertial Fusion Technology program that supported research on the Z machine and High Average Power Laser program. Currently, NIF is able to operate four beamlines, making NIF the most powerful laser in the world.

The NNSA has not completed the rebaselining of the NIF program, and the Committee directs that no funds be expended on project 96-D-111 in order to focus on supporting a comprehensive stewardship program.

*Ignition-* The Committee recommends \$68,800,000 to support experiments at Inertial Confinement facilities to demonstrate the principles of thermonuclear fusion. Sufficient funding is provided to support computer simulation, target fabrication, and target design calculation.

*Support for Other Stockpile Programs-* In order to avoid drastic cuts to the ICF program, the Committee recommends restoring funding to \$41,000,000 to perform experiments on the Z-machine to validate computer models as well as experiments on OMEGA at the University of Rochester, NY. This is an increase of \$31,128,000 above the budget request.

*NIF Diagnostics, Cryogenics and Experimental Support-* The Committee provides \$30,000,000. It is clear from recent advances in target research that targets may hold the key to significant increases in efficiency. Targets with cryogenic fuel, composite ablaters, foams, double shells and advanced hohlraum designs can compensate for limitation for both indirect and direct target concepts. The Committee directs the Department to provide \$10,000,000 from within available funds to accelerate development of targets to support experiments on NIF, OMEGA and Z-machine.

*Pulsed Power Inertial Confinement Fusion-* The Committee's recommendation provides \$10,900,000, a \$910,000 increase over the budget request for pulsed power ICF to assess Z pinches as drivers for ignition and high yield fusion.

*University Grants/Other ICF Support-* The Committee provides \$7,700,000 for research assistance in high energy density science, a level consistent with fiscal year 2005.

The Committee recommendation includes \$5,000,000 to Nevada Terawatt Facility. Within the funds provided, \$3,000,000 is for research into strongly magnetized highly density energy matter and \$2,000,000 is for construction of the high energy, short-pulse laser system.

*Facility Operations and Target Production-* The Committee provides \$54,623,000 as requested to support operations on OMEGA and Z-machine. Funds will support target production, engineering support, and maintenance.

*Inertial Fusion Technology-* The Committee is disappointed that the budget completely eliminated funding with this account. As such the Committee has restored the funding to \$41,000,000 and provides \$6,000,000 to prepare Z-machine to support extended operations.

## Excerpts from Senate Report 109-084

*NIF Demonstration-* The Committee recommends \$50,000,000 to support the NIF Demonstration program. The committee directs the NNSA to use this funding to support Stockpile Stewardship responsibilities necessary for closeout costs or other impacts as a result of the halt in construction and installation.

*High Energy Petawatt Laser Development-* The Committee strongly supports the OMEGA petawatt laser and provides \$10,000,000 an increase of \$7,000,000 above the request. The funding supports the development and testing of two short pulsed laser beams to support the existing capabilities at OMEGA in Rochester, New York. The Committee recommendation includes an additional \$7,000,000 for university grants and other support. Of this amount, \$3,000,000 is provided for continued development of petawatt laser at the University of Texas at Austin; \$2,000,000 is provided to the University of Nevada, Reno to continue its collaboration with Sandia National Laboratories on highly diagnosed studies of exploding wire arrays and implosion dynamics. The Committee provides \$2,000,000 to Sandia National Laboratories for Z-Petawatt Consortium experiments using the Sandia Z-Beamlet and Z-Petawatt lasers.

*Construction--Project 96-D-111-* The Committee directs that no funds shall be expended for this project.

The Committee directs the NNSA to continue working with the Office of Science and the NSF on interagency coordination and support of high energy density physics and high intensity laser science. The Committee recommends that the Department form a High Energy Density Physics Advisory Committee, drawn from the scientific and technical community, to assist in this effort. The Committee further directs the Department to provide to the Committee a plan for funding and managing non-defense high energy density physics research and facilities development by March 1, 2006.

### *Advanced Simulation and Computing*

The Committee recommends \$735,830,000, an increase of \$75,000,000 above the President's budget request, to support stockpile refurbishments, annual assessment and certification. The Committee acknowledges the important role of the ASC Program in Stockpile Stewardship as affirmed by the JASONS' study directed by Consolidated Appropriations Resolution, 2003, Public Law 108-7. The Committee shares the concerns raised by the JASONS about ensuring both adequate capacity and capability to meet the growing computational demands of the weapons designers and engineers at the laboratories. The Committee urges NNSA to further improve code confidence through more rigorous analysis. The Committee recognizes that without the Advanced Computing program the labs will be unable to certify the life extension program designs in the required timeframes. Codes based in experimental data are critical to validating the calculated changes to a physics package that will be included in the life extension program. As the labs enter a new phase in the life extension program through the RRW program, improved computer modeling will be critical to designing and deploying more reliable and interchangeable parts.

## Excerpts from Senate Report 109-084

The Committee is aware of the enormous management and technical challenge the NNSA has faced in establishing the ASC program over the past 10 years. The Committee is supportive of NNSA's proposed transition to a product-focused initiative that will integrate the experimental data and enhance the predictability to answer challenging questions researchers have yet to solve. In fiscal year 2006, the ASC program is expected to deliver an advanced physics and engineering simulation capability to support the W76 and the W80 life extension certifications. The Committee supports the ASC challenge to complete the modern baseline that reflects the comprehensive physics baseline of our enduring stockpile with ASC codes by fiscal year 2009. In order for the NNSA to meet these milestones and complete its transition to a product based program that serves, the Committee directs the Secretary to withhold funding of earmarks that do not directly support the stockpile stewardship mission within the ASC program until the Secretary certifies in writing to Congress on an annual basis that the ASC program remains on track to meet the annual milestones, as well as goals laid out in the NNSA 5-year plan.

The Committee recognizes that there is a need for much faster computer systems to perform the most complicated weapons systems analyses. The Committee recommends an increase of \$75,000,000 to acquire a 150 teraflop computing system at Los Alamos to decrease the time required for the large weapons related calculations and to increase the productivity of the scientists. Currently, Los Alamos is working on a life extension program for the W76. The Committee has been informed that one calculation to support the LEP has been running for 19 months on a 20 teraflop machine. This is an unacceptable timeframe. The purchase of the new 150 TF machine will reduce the runtime from 19 months to just 3 months for the same calculation. In 2003 the Committee charged JASON and the National Academies to report on the requirements drivers and computer architectural directions chosen by the Advanced Simulation and Computing program. The studies recognized that Stockpile Stewardship simulation demands oversubscribe current resources and that a diversity of supercomputer architectures is needed to meet the demanding obligations of Stewardship. Demands of the Life Extension Programs in particular and Stockpile Stewardship in general do not allow the reallocation of leading systems to single problems for any extended period of time. The Blue Gene/L system at Lawrence Livermore National Laboratory, and its focus on critical nuclear weapons science, only fulfills part of the mission needs. While this system effectively targets weapons aging issues, by design it is not suited to advance the complex full-weapons-systems simulation. The Committee agrees with study recommendations and recognizes the need to support the most demanding requirements.

From within amounts provided, the Committee recommends that no less than \$269,800,000 is provided to Los Alamos National Laboratory; \$243,700,000 for Lawrence Livermore National Laboratory; and \$162,500,000 for Sandia National Laboratory to support the Advanced Simulation and Computing Campaign. In addition, the Committee provides \$55,000,000 for the capacity computing requirements to support the W76-1 LEP.