

**Department of Energy (DOE)
FY 2004 Report to Congress**

**Laboratory Directed Research and Development
(LDRD)**

at the

DOE National Laboratories



December 2004

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FY 2004 LDRD Report to Congress

Executive Summary

The Laboratory Directed Research and Development (LDRD) program at the Department of Energy's (DOE's) multi-program National Laboratories, as well as analogous programs at the Department's Plants and at the Nevada Test Site, are Congressionally authorized programs designed to build capability to maintain the vitality of these nationally important institutions. This document fulfills all Congressionally directed LDRD program reporting requirements.

Overall, the multi-program National Laboratories included in this report devoted approximately \$365 million to LDRD, funding projects ranging in size from less than \$5,000 per year to over \$3 million, addressing topics that span the entire range of DOE's broad scientific mandate. An analysis of LDRD investments compared to the sources of laboratory funding indicates the LDRD benefits are commensurate with the funding received from defense, non-defense, and Department of Homeland Security (DHS) sources.

In response to the fiscal year (FY) 2002 Energy and Water Development Appropriations Conference Report, the Secretary issued guidance requiring all LDRD laboratories to notify other Federal agencies concerning LDRD charges. With the creation of the DHS, there are additional provisions for the notification of LDRD charges, as well as requirements for acknowledgements regarding the benefits of LDRD, prior to final approval of all DHS projects (see Section 2.3). Collectively these policies provide the basis for the Secretary's affirmation that all FY 2004 LDRD activities derived from funds of other Federal agencies have been conducted in a manner that supports the science and technology development that benefits the programs of the sponsoring agencies and is consistent with the appropriations acts providing funds to those agencies. That required affirmation is included as Appendix 1.

An important component of the LDRD program's contribution to the laboratories' future is its ability to attract promising young scientists and engineers to the institutions. LDRD-funded post-doctoral appointments, for example, supported 44 percent of all post-doctoral scientists and engineers at the reporting multi-program National Laboratories in FY 2004. In addition, many graduate students participate in LDRD projects, and the LDRD program provides a mechanism for scientists and engineers at the laboratories to keep themselves current in their fields.

The LDRD program is essential to maintaining the vitality of the laboratories that support the Department's missions and national needs. We have carefully reviewed the management and administrative procedures and funding levels at each of the laboratories and will continue to maintain a strong and vital LDRD program at the laboratories. In addition, the Department chartered a Core Team to review the LDRD program policy and guidance in an effort to provide necessary updates and ensure uniformity in interpretation. The team is finalizing its report and the resulting recommendations. Overall, the team feels the Departmental Order governing the LDRD program is effective but should be updated to reflect recent organizational changes and improvements in our management processes, as well as compliance with new reporting and oversight requirements stemming from reviews and Congressional direction.

FY 2004 LDRD Report to Congress

1. Introduction

1.1 Background

Pursuant to Congressional intent, the DOE multi-program National Laboratories and Manufacturing Plants, and the Nevada Test Site, operate research and development programs using a small portion of their overall budgets for the purpose of investing in critical future needs. This document reports on the programs for FY 2004.

LDRD, the first of these programs, was implemented at the DOE multi-program National Laboratories to formalize what had been a long-standing practice, authorized by legislation, to use portions of laboratory overhead for critical research and development efforts.

Within the overall context of maintaining the vitality of the laboratories, the specific purpose of the LDRD program is to provide the DOE laboratories with funds to undertake creative and innovative research and development activities in order to:

- (1) pursue new and innovative scientific and technological ideas;
- (2) enhance the scientific and technological vitality of the institution;
- (3) manage strategic direction; and
- (4) develop and retain new workforce capabilities.

DOE policy provides clear guidance to ensure effective management and oversight of the LDRD program while supporting the laboratories' abilities to pursue innovative projects. The process is consistent with DOE's management philosophy for all research and development activities, and it includes annual planning and reporting documents as well as program and peer reviews. The National Nuclear Security Administration, the Office of Science, and the Office of Nuclear Energy, Science and Technology serve as cognizant Secretarial officers for the multi-program National Laboratories.

1.2 Purpose of the Report

Formally, this report responds to the Conference Report (106-988) accompanying the Energy and Water Development Appropriations Act for FY 2001, which directed DOE's Chief Financial Officer "to develop and execute a financial accounting report of LDRD expenditures by laboratory and weapons production plant." It also responds to the Conference Report (107-258) accompanying the Energy and Water Development Appropriations Act for FY 2002 which directs the Secretary of Energy to include in the annual report to Congress for all LDRD

activities an affirmation that all LDRD activities derived from funds of other agencies have been conducted in a manner that supports science and technology development that benefits the programs of the sponsoring agencies and is consistent with the appropriation acts that provided funds to those agencies. Such an affirmation is included in Appendix 1 of this report.

Further, this report addresses Section 3136(b)(1) of the National Defense Authorization Act for FY 1997 (Public Law 104-201), which requires submission by February 1 of each year of “a report on the funds expended during the preceding fiscal year on activities under [the LDRD Program]...to permit an assessment of the extent to which such activities support the national security mission of the Department of Energy.” As defined in its current Strategic Plan, the Department’s national security mission is clearly and comprehensively supported by LDRD activities.

This report addresses how the LDRD program is managed, what research and development activities the funding supports, and why the program is important to DOE and the laboratories. The multi-program National Laboratories organize their respective programs according to their individual needs; however, the LDRD program does have a common administrative approach to Congressional and Departmental guidelines. This report speaks to those commonalities.

This report describes the LDRD program and its implementation at the various DOE multi-program National Laboratories. Newer, analogous programs implemented at the Nevada Test Site and at the manufacturing plants are discussed in detail in Appendices 5 and 6 of this report. They are authorized under separate legislation. The Plant Directed Research, Development and Demonstration (PDRD) program is consistent with Congressional intent as stated in the Energy and Water Development Appropriations Act for FY 2001 (Section 310) and the Defense Authorization Act for FY 2001 (Section 3165) to establish a Plant Directed Research, Development, and Demonstration program at the following sites:

- The Kansas City Plant, Kansas City, Missouri;
- The Y-12 Plant, Oak Ridge, Tennessee;
- The Pantex Plant, Amarillo, Texas; and
- The Savannah River Plant, Aiken, South Carolina.

The conference agreement allows for a maximum of 2 percent of the plants’ National Nuclear Security Administration (NNSA) operating budget to be utilized for the PDRD program.

The Site Directed Research, Development and Demonstration (SDRD) program is consistent with Congressional intent as stated in Section 310 of Energy and Water Development Appropriations Act for FY 2002 (H.R. 2311) which authorizes a program for directed research and development at the Nevada Test Site (NTS). The conference agreement allows for a maximum of 2 percent of NTS’s national security budget to be utilized for the SDRD program.

2. FY 2004 LDRD Program

2.1 Financial Information

2.1.1 LDRD Funding Mechanism

The LDRD program is structured to pursue innovative and creative science and technology, often with an emphasis on projects that will contribute to the needs of multiple programs and Federal agencies. The Department views LDRD as a legitimate cost of doing business for all sponsors at the multi-program laboratories. Therefore, to ensure that all users of the laboratories support their fair share of LDRD, the costs are funded as part of laboratory indirect costs, up to a maximum of 6 percent of operating and capital equipment costs, and are treated as normal costs of doing business. As such, all organizations that fund laboratory programs also fund LDRD activities. The capabilities developed and maintained through LDRD, in turn, benefit all laboratory customers. This combination of equitable treatment of laboratory sponsors and multiple benefits derived from LDRD is achievable only through the indirect cost funding mechanism for LDRD. The combination also underscores the value of the LDRD program to the laboratories and to the Nation.

The pricing policy of DOE is full cost, which includes all direct costs incurred in performing the work, allocable cost incurred in performing the work, allocable cost incurred by DOE and its contractors at any Departmental facility in performing work on behalf of non-DOE entities, and a Federal administrative charge of 3 percent of these costs. LDRD charges and assessments on Work for Others (WFO) agreements are discussed in more detail in Section 2.3. LDRD is considered an allocable cost in accordance with the terms of the laboratory operating contract and is identified in the laboratory's accounting system. Laboratory indirect costs are applied to all funds that come to the laboratories at rates reviewed by the Department. Exemptions from that assessment are uncommon, require the approval of Federal personnel and are reviewed annually. As a general policy, capital construction costs and major "pass-through" costs are exempt from a full indirect cost assessment, including LDRD.

2.1.2 FY 2004 Expenditures

For FY 2004 the multi-program National Laboratories devoted approximately \$365 million to LDRD. The following table shows the LDRD costs by site for FY 2004. For more details on the individual projects conducted at each site, see Note 1. Note 1 provides a project listing by site including project identifier, project name and total FY 2004 project costs. It should be noted that the following table includes all LDRD costs including individual project costs listed in Note 1 and any administrative costs not specifically assigned to individual FY 2004 projects, if applicable.

Table I. FY 2004 LDRD Costs by Laboratory

| Laboratory | LDRD Costs (\$M) |
|-------------------|-------------------------|
| ANL | 24.9 |
| BNL | 7.2 |
| INEEL | 11.8 |
| LANL | 102.1 |
| LBNL | 12.0 |
| LLNL | 69.8 |
| ORNL | 15.3 |
| PNNL | 18.3 |
| SNL | 104.0 |

2.1.3 FY 2004 LDRD Allocation Percentages

Departmental policy states that the maximum funding level established for LDRD must not exceed 6 percent of the laboratory's total operating budget, including non-DOE funded work for the year, plus an amount of capital equipment not to exceed 6 percent of its total capital equipment budget for the year. It is important to note that individual LDRD program estimates at each site are approved based on laboratory estimated budgets for the fiscal year. Initial planning bases are derived from funds anticipated. The final percentage calculation is based upon actual LDRD costs and actual operating and capital equipment costs. Table II below includes the FY 2004 end-of-year information. It is important to note that "laboratory costs" are not the amount of laboratory program funding, but rather what was accumulated as costs. Also shown is the cost of work performed on behalf of other Federal agencies and non-Federal customers' WFO programs. LDRD charges and assessments on WFO agreements are discussed in more detail in Section 2.3.

Table II. Reported FY 2004 overall laboratory costs and LDRD costs at participating DOE laboratories.

| Laboratory | Laboratory WFO Costs (\$M) | Total Laboratory Costs (\$M) | LDRD Costs (\$M) | LDRD Fraction |
|-------------------|-----------------------------------|-------------------------------------|-------------------------|----------------------|
| ANL | 122.0 | 543.5 | 24.9 | 4.58% |
| BNL | 85.6 | 440.7 | 7.2 | 1.63% |
| INEEL | 152.8 | 796.0 | 11.8 | 1.48% |
| LANL | 290.4 | 1859.1 | 102.1 | 5.49% |
| LBNL | 111.7 | 482.2 | 12.0 | 2.49% |
| LLNL | 323.8 | 1418.3 | 69.8 | 4.92% |
| ORNL | 190.0 | 745.3 | 15.3 | 2.05% |
| PNNL | 147.9 | 508.9 | 18.3 | 3.59% |
| SNL | 603.9 | 1941.2 | 104.0 | 5.35% |

In addition, an analysis of the FY 2004 LDRD program was conducted as it relates to funding received from both defense and non-defense sources (including DOE and WFO sponsors) and the return on the dollars invested by those sources in the LDRD program. This analysis now also includes data related to the DHS.

The total FY 2004 funding for the LDRD program conducted at the laboratories was approximately \$365 million, which represents about 4 percent of the total laboratory costs at these laboratories. Of this amount, \$228 million was provided by defense customers, \$126 million by non-defense customers, and \$11 million by DHS. A review of the LDRD program funding shows that about \$278 million supports projects that will be expected to benefit the defense and national security missions, \$306 million supports projects that will be expected to benefit non-defense customer mission areas, and \$102 million supports projects that will be expected to benefit DHS programs.

In assessing the return on the dollars invested in LDRD, it is essential to understand that the vast majority of research and development activities have application to national needs in defense, non-defense and DHS arenas. That is, as the numbers above indicate, many of the LDRD projects are put in more than one category since they support fundamental research and can be expected to benefit defense, non-defense and DHS missions. The clear implication is that the anticipated benefit of LDRD science and technology to defense, non-defense and DHS national needs will always exceed the relative contribution of funds from these sources independently. This leveraging of the research capabilities of the DOE's multi-program laboratories is one of the great benefits of the LDRD program and its focus on the long-term vitality of the laboratories.

2.2 Workforce Development

Maintaining the vitality of the DOE multi-program National Laboratories—the overarching theme of the LDRD program—implies a responsibility not only for future-looking research and development but also for the workforce of the future. For the laboratories to be poised to tackle problems confronting DOE and the Nation it requires more than facilities and infrastructure. Scientists and engineers must also be available to implement the capabilities of the laboratories.

Post-doctoral appointments offer the single largest source of new scientific and engineering talent for the DOE laboratories and are therefore critical to maintaining institutional vitality. The LDRD program plays a central role in the various post-doctoral programs at all of the laboratories, as shown in Table III.

Table III. Postdocs supported by LDRD at the DOE Laboratories in FY 2004.

| Laboratory | Total postdocs | Postdocs supported by LDRD | LDRD-supported fraction |
|-------------------|-----------------------|-----------------------------------|--------------------------------|
| ANL | 229 | 60 | 26% |
| BNL | 119 | 47 | 39% |
| INEEL | 19 | 2 | 11% |
| LANL | 508 | 314 | 62% |
| LBNL | 297 | 55 | 19% |
| LLNL | 147 | 125 | 85% |
| ORNL | 176 | 56 | 32% |
| PNNL | 113 | 32 | 28% |
| SNL | 145 | 80 | 55% |

In addition to this formal participation in post-doctoral programs, the LDRD program also supports a wide range of activities that enhance the laboratories workforce development. These include support for both undergraduate and graduate students working on LDRD projects, reputation building by providing laboratory visibility in a wider range of publication venues than would be the case without the results of LDRD, technical staff retention associated with opportunities to retain and hone scientific skills via LDRD, and a remarkable range of university collaborations stimulated via LDRD projects.

2.3 LDRD and the Work for Others Program

One of the major benefits the Nation derives from the DOE multi-program National Laboratories is the synergistic application of science and technology to a broad range of critical national security and science missions, through the DOE WFO program.

As mentioned above, the LDRD program is structured to pursue innovative and creative science and technology, often with an emphasis on projects that will contribute to the needs of multiple programs and Federal agencies. All WFO sponsors benefit from the strong science and technology base enhanced by LDRD. The Department views LDRD as a legitimate cost of doing business for all programs at the multi-program laboratories. Therefore, to ensure that all users of the laboratories support their fair share of LDRD innovations, the cost is included as an allocable cost.

WFO programs are possible because the laboratories have developed unique research and development capabilities in a wide range of areas of relevance to organizations besides DOE. WFO customers seek out these capabilities and, in many cases, initiate WFO research and development at the laboratories. WFO research broadens the base of innovation at the DOE laboratories and increases the number of potential solutions to national challenges, including threats to national security. The laboratories' research results are enhanced by the cross-pollination of technologies developed in conjunction with its WFO partners.

In this regard, Congress provided language in the Conference Report accompanying the FY 2002 Energy and Water Development Appropriations Act that requires the Department to notify other Federal agencies that a portion of the funds collected through the WFO program will be used to fund LDRD projects. In addition, with the creation of the DHS, Congress enacted analogous requirements that LDRD funding associated with DHS programs be used to support DHS missions. As noted earlier, the Conference Report also requires the Secretary to affirm that all LDRD activities derived from funds of other agencies have been conducted in a manner that supports science and technology development that benefits the programs of the sponsoring agencies and is consistent with the appropriation acts that provided funds to those agencies.

In response to the FY 2002 Conference Report, the Secretary issued guidance requiring all LDRD laboratories to notify other Federal agencies concerning LDRD charges. These procedures changed the WFO process to ensure proper notification of other Federal agencies as to the LDRD charges prior to funding work at the laboratory. Specifically, each new and/or revised WFO proposal provided to a Federal agency must indicate the amount of LDRD charges that will be collected. Furthermore, the proposal notifies the sponsor that, by providing funding, the agency is acknowledging that LDRD activities are beneficial to their organization and consistent with appropriation acts providing funds to that agency. Subsequently, each WFO funding acceptance document also includes the LDRD estimate acknowledgement.

In February of 2003, the Secretary of Energy and the Secretary of Homeland Security entered into a Memorandum of Agreement to implement key provisions of the Homeland Security Act. In addition, the Deputy Secretary of Energy issued a DOE Notice on *Reimbursable Work for the Department of Homeland Security*. The purpose of that document was to provide information on the process by which the DHS may place orders for reimbursable work activities to be performed at the DOE laboratories. Within that Notice, there are provisions for the notification of LDRD charges in the cost proposal as well as requirements for acknowledgements regarding the benefits of LDRD prior to final approval.

These policies have been implemented and provide a basis for the Secretary to affirm that the LDRD program is managed in accordance with the Congressional direction cited above. The Secretarial affirmation is included as Appendix 1. In December of 2003, the DOE Acting Chief Financial Officer transmitted applicable guidance and policy to reiterate the process to other Federal agency Chief Financial Officers who are customers and sponsors of work at the Department's laboratories.

3. Report Conclusions

The DOE LDRD program offers a crucial mechanism by which the multi-program National Laboratories maintain their vitality and, in the process, prepare themselves to meet the Nation's future scientific and engineering challenges. In FY 2004, the multi-program National Laboratories devoted approximately \$365 million to LDRD, funding projects ranging in size from less than \$5,000 per year to over \$3 million. LDRD projects address topics that span the entire range of DOE's broad scientific mandate. An analysis of LDRD investments compared to the sources of laboratory funding indicates the LDRD benefits are commensurate with the funding received from defense, non-defense and DHS sources. In addition, the Department affirms that all FY 2004 LDRD activities derived from funds of other Federal agencies have been conducted in a manner that supports science and technology development that benefits the programs of the sponsoring agencies and is consistent with the appropriations acts providing funds to those agencies.

An important component of the contribution of the program to the laboratories' future is their ability to attract promising young scientists and engineers to the institutions. LDRD funded post-doctoral appointments, for example, supported 44 percent of all post-doctoral scientists and engineers at the multi-program National Laboratories in FY 2004. In addition, many graduate students participate in LDRD projects, and the programs provide a mechanism for scientists and engineers at the laboratories to keep themselves current in their fields.

The LDRD program is essential to maintaining the vitality of the laboratories that support the Department's missions and national needs. We have carefully reviewed the management and administrative procedures and funding levels at each of the laboratories and will continue to maintain a strong and vital LDRD program at the laboratories.

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Project List -- Fiscal Year 2004

ANL - Argonne National Lab

| Project ID | Project Name | FY Total |
|-------------------|--|-----------------|
| P/ANL2002-001 | Laser-Based Ignition System for Natural Gas Reciprocating Engines | \$166600 |
| P/ANL2002-017 | Magnetically Stabilized Metal Clusters | \$25300 |
| P/ANL2002-018 | New Photonic Materials Based on the Self-Assembly of Nano-Structured Metallo-Organic Building Blocks | \$137900 |
| P/ANL2002-099 | Advanced Biological Sensors Based on Fluorescent Conjugated Polymers | \$90000 |
| P/ANL2002-147 | A Calorimeter for the Linear Collider Detector | \$75300 |
| P/ANL2002-149 | Derivatization of Ultrananocrystalline Diamond for Bioassays | \$80600 |
| P/ANL2002-152 | Petascale Experimental Research | \$1305100 |
| P/ANL2002-153 | Prokaryotic Simulation System: Computational Biology and Bioinformatics -- the Science Drivers for PXRf | \$1258200 |
| P/ANL2002-154 | Computational Science for Self-Assembly | \$102900 |
| P/ANL2002-161 | Environmental Decision Making Technology R&D | \$110000 |
| P/ANL2002-163 | Capabilities Development for the Analysis of Complex Adaptive Systems | \$224300 |
| P/ANL2002-185 | Bio-Nano Composite Structures | \$200200 |
| P/ANL2002-186 | Nanophotonics | \$200800 |
| P/ANL2002-187 | Quantum Materials | \$199100 |
| P/ANL2002-188 | Adaptive Nanoscale Self-Assembly | \$271200 |
| P/ANL2002-192 | Development of Nanofabrication Techniques using Advanced Lithography | \$126000 |
| P/ANL2002-194 | Surface Spin Polarization for Spintronics | \$77300 |
| P/ANL2002-195 | Catalytic Destruction of Chemical Threats in Human Occupied Spaces | \$50000 |
| P/ANL2002-196 | Hybrid and Patterned Nanomagnetic Systems | \$298800 |
| P/ANL2002-199 | Nanoscale Multiferroics for Coupled Magnetic and Ferroelectric Functionality | \$76400 |
| P/ANL2002-200 | Nanoscience and Biomineralization | \$51200 |
| P/ANL2002-201 | Synthesis and Physical Properties of Functionalized Diblock Copolymers and Magnetic Nanocrystal Arrays (new title) | \$77100 |
| P/ANL2002-202 | UHV STM for Self-Assembled Magnetic Nanowires | \$49000 |
| P/ANL2002-203 | Fabrication of Nanowires with Anodized Aluminum Oxide | \$50100 |
| P/ANL2002-204 | Imaging of Nanoscale Vortex States in Superconductors by Scanning Tunneling Spectroscopy | \$49500 |
| P/ANL2002-205 | Surface Functionalization of Ultrananocrystalline Diamond Thin Films | \$75700 |
| P/ANL2002-206 | Counter Terrorism Application of Agent Based Simulation | \$79500 |

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ANL - Argonne National Lab

| Project ID | Project Name | FY Total |
|-------------------|---|-----------------|
| P/ANL2002-211 | Interacting Laterally Patterned Magnetic Structures | \$199400 |
| P/ANL2002-212 | Thermal Transport in Nanostructures and Nanocomposites | \$25600 |
| P/ANL2002-213 | Self-Assembly and Self-Organization of Nanostructures by Multiscale Materials Simulation | \$75300 |
| P/ANL2003-010 | Preparation and Crystallization of Membrane Proteins, MerC and MerT Involved in Bacterial Mercuric Ion Detoxification | \$84000 |
| P/ANL2003-040 | Vortex Cellular Automata: Computing with Superconducting Vortices in Nanoscale Devices | \$86400 |
| P/ANL2003-064 | Bio/Inorganic Hybrid Arrays for Photovoltaic Cells and Biological Sensors | \$139700 |
| P/ANL2003-073 | The Control of Shape, Size, and Reactivity of Metal Oxide Nanoparticles | \$126500 |
| P/ANL2003-080 | Laser Trapping and Cooling of Radium-225 | \$84500 |
| P/ANL2003-087 | Development of Surface Treatments for Ultra High Gradient Accelerator Cavities | \$134700 |
| P/ANL2003-103 | Fluxoid Manipulation by Josephson Vortices: New Opportunity for Vortex Logic | \$86500 |
| P/ANL2003-105 | Ultrafast Spectroscopy, Combining Lasers and X-Rays | \$138900 |
| P/ANL2003-106 | Metabolome Analysis from Aptamer Biochips | \$146200 |
| P/ANL2003-117 | Quantized Magneto-Catalysis of Electron Transfer Reactions | \$90200 |
| P/ANL2003-119 | Tunable Terahertz Sources | \$146700 |
| P/ANL2003-124 | Development of Polysiloxane-Based Solid Electrolytes for Lithium Batteries | \$135200 |
| P/ANL2003-128 | Novel Thin-Film Diamond Electronics | \$96900 |
| P/ANL2003-146 | Synthesis of High Temperature Superconductor Wires using Novel Atomic Layer Deposition Synthesis | \$147600 |
| P/ANL2003-151 | Time-Resolved X-Tomography of Highly Transient Fuel Sprays | \$134300 |
| P/ANL2003-158 | High-Sensitivity Infrared Imagers for Environmental and Energy Security/Safety Monitoring | \$129600 |
| P/ANL2003-172 | Mass Spectral Detection of Biomolecular Interactions on a Functional Proteomic Biochip | \$192800 |
| P/ANL2003-173 | Functional Genomics of Endothelial Cell Tube Formation | \$273300 |
| P/ANL2003-176 | Designer Antibodies and Interaction Mapping | \$715700 |
| P/ANL2003-177 | Nano-Architecture from the Bio-System: Fabrication, Assembly and Function | \$184200 |
| P/ANL2003-185 | High-Power Beam Dump for a Large Acceptance RIA Fragment Separator | \$525900 |

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ANL - Argonne National Lab

| Project ID | Project Name | FY Total |
|-------------------|--|-----------------|
| P/ANL2003-188 | Development of a Model 3-Spoke Superconducting Resonator for RIA | \$720100 |
| P/ANL2003-204 | Lightweight and Robust Hydrogen Storage Materials for Automotive Fuel Cells | \$160300 |
| P/ANL2003-216 | Linear Collider R&D: High Gradient Accelerating Structures | \$283500 |
| P/ANL2003-217 | High-Brightness Beams Electron Sources | \$143200 |
| P/ANL2003-218 | Damping Rings for Linear Colliders | \$26800 |
| P/ANL2003-219 | Investigations of the Effect of the Biogeochemical Cycling of Iron on the Fate and Transport of Heavy Metal, Radionuclide, and Organic Contaminants | \$420800 |
| P/ANL2003-224 | Separative Bioreactor Model: Using pH-Controlled Electrodeionization | \$87300 |
| P/ANL2003-230 | Demonstrate the Two-Charge State Injector Concept for the RIA Driver Linac | \$300500 |
| P/ANL2003-237 | Study of Beam Halo Formation in Longitudinal Phase Space in the RIA Driver Linac | \$206500 |
| P/ANL2003-242 | Transmission Multilayer Optics for Sub-Ten-Nanometer Focusing of Hard X-Rays | \$175600 |
| P/ANL2003-256 | Vacuum-Ultraviolet Free-Electron Laser Studies | \$250800 |
| P/ANL2003-288 | Thin-Film Liquid Lithium Stripper for the RIA Driver Linac | \$700800 |
| P/ANL2003-329 | Hydrogen Production from Low Temperature Thermochemical Cycles Compatible with Heat from a Na-Cooled Nuclear Reactor | \$230100 |
| P/ANL2003-331 | Process and Equipment Integration for a Recycling Capability | \$225500 |
| P/ANL2003-332 | Integration of Automated Systems and Robotics for a Recycling Operation | \$69800 |
| P/ANL2003-335 | Experimental Testing of Pyroprocessing Structural Materials | \$206200 |
| P/ANL2003-336 | Multidisciplinary Theory | \$297600 |
| P/ANL2003-337 | The Use of Synchrotron Radiation Sources for Homeland Security | \$99600 |
| P/ANL2003-338 | Modeling Near-Field Atmospheric Dispersion and the Potential Health and Economic Impacts from Terrorism Scenarios Involving "Dirty Bombs" or Similar Devices | \$134400 |
| P/ANL2003-340 | Core-Shell Nanocrystal Spring Magnets | \$80100 |
| P/ANL2003-341 | Simulation and Modeling of Reactivity in Nanoporous Materials | \$73500 |
| P/ANL2004-002 | Development of Germanium Double Sided Strip Detectors for Nuclear Imaging Applications | \$122900 |
| P/ANL2004-009 | Ultrafast Laser/X-Ray Interactions | \$75000 |
| P/ANL2004-014 | Development of Cross-Polarization Confocal Microscopy for Measurement of Subsurface Microstructure | \$106100 |

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ANL - Argonne National Lab

| Project ID | Project Name | FY Total |
|-------------------|---|-----------------|
| P/ANL2004-018 | Fundamental and Applied Studies of Novel Intermetallic Thin Films for Lithium Ion Battery Anodes | \$150200 |
| P/ANL2004-019 | Multiphase CFD Analysis of Vascular Lesion Formation | \$146700 |
| P/ANL2004-026 | Science and Technology of a New TiAlOx Alloy Oxide and TiO2/Al2O3 Superlattice Oxide Layers and Their Application to a New Generation of Integrated Circuit Gate Dielectric | \$94700 |
| P/ANL2004-036 | Direct Conversion of Sequestered CO2 to Feedstocks for Large Commodity Chemicals | \$52000 |
| P/ANL2004-038 | Time-Resolved Studies of Magnetization Dynamics in Nanostructured Materials | \$109700 |
| P/ANL2004-041 | Site-Specific Magnetism in Crystals | \$110100 |
| P/ANL2004-044 | Palladium/Semiconductor Nanohybrids as Hydrogen Sensors for Fuel Cell Applications | \$149400 |
| P/ANL2004-046 | Superconducting Magnetic Control System for Manipulation of Magnetic Particles and Nano-Particles for Medical Applications | \$149000 |
| P/ANL2004-057 | Novel Integrated (On-Chip) Magnetic Field Sensors | \$69600 |
| P/ANL2004-063 | Ferromagnetic Micro-Disks with Superior Properties for Biomedical Applications | \$119400 |
| P/ANL2004-069 | Design and Fabrication of Two Novel High-Gradient Accelerating Structures: The Metallic Photonic Bandgap Accelerator and the SiC Surface Wave Accelerator | \$95000 |
| P/ANL2004-086 | A New Low Temperature Thermochemical Hydrogen Production Cycle Based on Heavy Element Halides | \$105700 |
| P/ANL2004-095 | Nanoporous Separation Membranes | \$172700 |
| P/ANL2004-103 | Direct Regeneration of Cofactors with an Electron/Ion Mixed Conductive Matrix | \$128500 |
| P/ANL2004-115 | Photosynthetic Reaction Center as a Novel Quantum Electronic Circuit Element | \$148500 |
| P/ANL2004-126 | Novel Hydrogen Storage Media through Nano-Structured Polymer and Carbon Layer Materials | \$135100 |
| P/ANL2004-127 | Hydrogen Storage through Organic Hydride | \$118000 |
| P/ANL2004-133 | Ultra-High-Sensitive Miniature Calorimeter for Studies of Confinement Effects of Bio-Organic Structures | \$129800 |
| P/ANL2004-141 | Environment for a Nanoscale Materials Virtual Fab Lab | \$138300 |
| P/ANL2004-142 | Simulations of Spin Wave Excitations in Magnetic Nanoparticles | \$64800 |

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ANL - Argonne National Lab

| Project ID | Project Name | FY Total |
|-------------------|--|-----------------|
| P/ANL2004-143 | Hydrogen Storage using Novel Nanoporous Materials Coated via Atomic Layer Deposition | \$64900 |
| P/ANL2004-144 | Near-Field Optical Investigations of Nanoscale Photochemistry and Photophysics | \$176300 |
| P/ANL2004-145 | Ultrasensitive Hydrogen Sensors | \$138200 |
| P/ANL2004-147 | Large Scale Manufacturing of Hydrogen in Gas-Fluidized Bed Reactors with Nanostructured Support Catalysts and Modulated Air Flow | \$80000 |
| P/ANL2004-148 | Discovery of Protein Space | \$80100 |
| P/ANL2004-149 | Nano IR Spectroscopy and Imaging | \$103600 |
| P/ANL2004-150 | Aerosol Characterization and Modeling: Morphology and Surface Reactions | \$74200 |
| P/ANL2004-152 | Fundamental Aspects of Hydrogen Storage in Novel Nanocomposite Materials | \$93900 |
| P/ANL2004-154 | Nanoscale Confinement of Highly Spin-Polarized Oxides | \$49800 |
| P/ANL2004-156 | Functional Metalloproteomics | \$149900 |
| P/ANL2004-157 | High-Throughput Analysis of Low Abundance Protein Constituents in Complex Biological Mixtures | \$566100 |
| P/ANL2004-158 | Development of Peptide Biochips for a Whole-Proteome Analysis of Protein Interactions with Peptide Recognition Modules | \$243900 |
| P/ANL2004-159 | Molecular Recognition: Protein-Small Molecule Interactions | \$79500 |
| P/ANL2004-160 | Characterizing and Unveiling the Mechanism of Protein-Ligand Interactions | \$199200 |
| P/ANL2004-161 | Evolution of the Hydrogen Infrastructure as a Complex Adaptive System | \$144900 |
| P/ANL2004-162 | The Biogeochemical Cycle of Nitrogen: Effects on Climate Change | \$70600 |
| P/ANL2004-164 | Challenge and Opportunity in Megaproteins | \$194600 |
| P/ANL2004-165 | Core Physics Conceptualization of an Inert Matrix Fuel Assembly | \$90100 |
| P/ANL2004-166 | Inert Metal Matrix LWR Dispersion Fuel Fabrication | \$196600 |
| P/ANL2004-167 | Evaluation of Fuel-Cladding Interaction in a Lined, ODS-Clad, SFR Fuel for Hydrogen Production Applications | \$68700 |
| P/ANL2004-169 | Compact Heat Exchanger Studies for Supercritical CO ₂ Power Conversion System | \$175400 |
| P/ANL2004-173 | Modeling Nuclear Energy Market Penetration in the U.S. Energy Sector | \$120800 |
| P/ANL2004-174 | Life Cycle Analysis for the DANESS System Dynamics Code | \$89900 |
| P/ANL2004-175 | Economic Impacts of a Transmutation Enterprise | \$125600 |
| P/ANL2004-177 | Recovering Actinides from UO ₂ -Carbide Fuels | \$49100 |

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ANL - Argonne National Lab

| Project ID | Project Name | FY Total |
|-------------------|---|-----------------|
| P/ANL2004-178 | Incorporating Advanced Methods and Instrumentation into an Analytical Chemistry Laboratory to Support Advanced Fuel Cycle Needs | \$45800 |
| P/ANL2004-179 | ICP-OES and ICP-MS Methods for Actinide Accountancy Measurements and Process Control in Spent Fuel Processing | \$54900 |
| P/ANL2004-180 | AMUSE Development, Beyond Solvent Extraction and Into Hybrid Processing | \$175900 |
| P/ANL2004-181 | Evaluation and Development of a Supercritical Carbon Dioxide Based Dry Processing Technology and Related Closed Fuel Cycle Applications | \$50000 |
| P/ANL2004-182 | High Strength and Heat Resistant Chromium Steels - Promising Structural Materials for Sodium-Cooled Fast-Reactor Heat Exchangers | \$83000 |
| P/ANL2004-185 | Investigation of Passive Safety Performance of the Very High Temperature Reactor (VHTR) in Hydrogen Production Applications | \$100000 |
| P/ANL2004-186 | Design of a Helium Loop with Controlled Impurity Control for Research on Materials with Application in VHTR | \$29900 |
| P/ANL2004-187 | Passive Decay Heat Removal in the Very High Temperature Reactor | \$100000 |
| P/ANL2004-188 | Development of Advanced Computational Procedure for VHTR Physics Analyses | \$200000 |
| P/ANL2004-191 | Multidimensional Flow and Heat Transport Natural Convection Test Capability | \$100000 |
| P/ANL2004-194 | Hydrogen and Oxygen Production from Low Temperature Hybrid Cycles | \$142800 |
| P/ANL2004-195 | Single Step Hydrogen Production from Water using Catalytic Dense Mixed-Conducting Membranes | \$77100 |
| P/ANL2004-198 | The Electrochemical Storage of Hydrogen in a Zintl Matrix | \$76500 |
| P/ANL2004-201 | Microfluidic Study of Nanofluids | \$76600 |
| P/ANL2004-202 | Integrating Sensor Networks and Radiation Detectors to Protect Urban Areas from Radiological Terrorism | \$179800 |
| P/ANL2004-212 | Novel Superhard Coatings for Wear Reduction and Energy Saving Applications in Diesel Engines | \$114300 |
| P/ANL2004-213 | Pressure Rate Controlled Compression Ignition Engine | \$159100 |
| P/ANL2004-214 | Homogeneous Charge Compression Ignition (HCCI) Engine Research: An Advanced Concept for IC Engines | \$91600 |
| P/ANL2004-215 | Investigation into Nano-Particulate Production from Homogeneous Charge Compression Ignition (HCCI) Combustion | \$154800 |
| P/ANL2004-216 | Optimization of Electromagnetic Pumps for Liquid Lithium Applications | \$100000 |
| P/ANL2004-221 | T Lymphocyte Differentiation of Human Blood Progenitor Cells | \$276700 |

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ANL - Argonne National Lab

| Project ID | Project Name | FY Total |
|-------------------------------------|--|---------------------------------------|
| P/ANL2004-222 | RF Capture Studies Using a Second Harmonic System on the IPNS Rapid Cycling Synchrotron (RCS) | \$61200 |
| P/ANL2004-224 | Improvement of High-Voltage Breakdown Characteristics in Linacs by Atomic-Scale Surface Smoothing Techniques | \$63000 |
| P/ANL2004-225 | EPICS on Emerging Computer Platforms | \$34700 |
| P/ANL2004-226 | Development of Ultrafast Laser Techniques for Advanced Accelerator Research | \$129000 |
| P/ANL2004-227 | Advanced Heavy-Ion Beam Dynamics | \$90200 |
| P/ANL2004-228 | Next-Generation Light-Source Storage Ring Design and Simulation | \$45000 |
| P/ANL2004-229 | Improvement of FNAL Run II Performance: Booster Beam Dynamics | \$39200 |
| P/ANL2004-231 | Improvement of FNAL Run II Performance: Tevatron Optics Modeling | \$29000 |
| P/ANL2004-232 | Improvement of FNAL Run II Performance: Optical Transition Radiation (OTR) Imaging for Protons and Antiprotons | \$18100 |
| P/ANL2004-233 | Improvement of FNAL Run II Performance: Electron Cooling | \$81200 |
| P/ANL2004-234 | RF Superconductivity for Future Accelerators | \$232200 |
| P/ANL2004-236 | SANS with Polarized Neutrons as a Tool for Studying Nanomagnetism in Nanostructured Materials | \$49000 |
| P/ANL2004-238 | Quantum Computation with Electron Spins: Qubit Networks of Endohedral N in C60 | \$79700 |
| P/ANL2004-239 | Evaluation of Fast Flux Test Facility | \$162600 |
| P/ANL2004-240 | Proteomic and Phage-Display Analysis of Mitochondrial Compartmental Oxidant Biosensors for the Study and Reversal of Sudden Death Events | \$96000 |
| P/ANL2004-241 | A New Approach to Recycling Spent Nuclear Fuel: Hybrid Solvent Extraction-Electrorefining | \$181800 |
| P/ANL2004-242 | Laser Surface Texturing for Friction Reduction | \$218400 |
| P/ANL2004-243 | Innovations for Small Modular Fast Reactor | \$256300 |
| Total # of Projects for ANL: | 159 | Total Cost for ANL: \$24873700 |

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BNL - Brookhaven National Lab

| Project ID | Project Name | FY Total |
|-------------------|--|-----------------|
| 02-002 | Crystallization and X-ray Analysis of Membrane Proteins | \$410554 |
| 02-008 | Creating a MicroMRI Facility for Research and Development | \$178948 |
| 02-009 | Targeting Tin-117m to Estrogen Receptors for Breast Cancer Therapy | \$49009 |
| 02-022 | Electrical Systems Reliability | \$103512 |
| 02-045 | Combined Use of Radiotracers and Positron Emission Imaging in Understanding the Integrated Response of Plants to Environmental Stress | \$149232 |
| 02-070 | Theory of Electronic Transport in Nanostructures and Low-Dimensional Systems | \$148483 |
| 02-071 | Pressure in Nanopores | \$57423 |
| 02-084a | Genomic Selex to study Protein DNA/RNA Interactions in Ralstonia metallidurans CH34 Regulating Heavy Metal Homeostasis and Resistance | \$161662 |
| 02-084b | Lead Resistance in Ralstonia metallidurans CH34 | \$169708 |
| 02-086 | Ultrafast X-Ray Science | \$104578 |
| 02-088 | X-Ray Photon Correlation Spectroscopy Studies of Nanostructured Block Copolymers | \$104775 |
| 03-004 | High-Brightness, High-Power Electron Beams | \$192464 |
| 03-006 | Feasibility Study of Optical Stochastic Cooling with a CO2 Laser | \$121834 |
| 03-013 | Proposal for Niobium/Tin Superconducting Magnet | \$156269 |
| 03-014 | Technology Development for Linear Collider Final Focus Quadrupoles with Small-Aperture High-Gradient Superconducting Coils | \$129829 |
| 03-026 | Developing a New, Unified Systems Theory on Size Distributions of Atmospheric Particles | \$45447 |
| 03-027 | Measurement of HO2 Radicals by ChemiLuminescence Analysis of Atmospheric Radicals (CLAAR) | \$99045 |
| 03-030 | Chemistry of the Rhizosphere | \$101573 |
| 03-039 | Integrated Analysis of Carbon and Nitrogen Metabolism in Plants and Subsequent Analysis of Photosynthetic Acclimation to Growth in Elevated pCO2 | \$67283 |
| 03-050 | Evaluation of High-Energy Radiation Effects in Materials | \$105354 |
| 03-056 | Structural Properties of Methane Hydrates | \$103647 |
| 03-061 | Dynamics of Wind Turbine-Tower-Foundation Systems | \$145957 |
| 03-064 | Investigation of Neutron and Gamma Probes to Detect Explosives in Sealed Containers | \$112370 |

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BNL - Brookhaven National Lab

| Project ID | Project Name | FY Total |
|-------------------|--|-----------------|
| 03-065 | Ultrasound and Infrared Imaging to Detect Degradation of Electric Cable Insulation | \$74604 |
| 03-072 | Application of Compton-Suppression Gamma-Ray Spectrometry to Counterterrorism Problems | \$134174 |
| 03-077 | Real-Time Consequence Assessment System for Atmospheric Terrorist Events in the Northeast Urban Corridor | \$72951 |
| 03-081 | Application of Thin Film-Like Dosimeters for Port Security and Anti-Terrorism | \$100696 |
| 03-083 | Novel Xenon Detector Concepts for Homeland Defense | \$103976 |
| 03-086 | Defining New Pathways for Disarming Anthrax Toxin | \$99543 |
| 03-094 | Structural Studies on the Integral Membrane Protein AlkB | \$96692 |
| 03-098 | Roles of Dopamine Receptor Agonists in Brain Metastasis of Breast Cancer | \$99091 |
| 03-099 | The microPET Study of Gene Expression in Rodents | \$94700 |
| 03-100 | Investigation of the "Early Response" in Functional MRI | \$123500 |
| 03-101 | PET Imaging of Violent Behavior | \$98978 |
| 03-103 | PET Study of Acetaldehyde Distribution and Metabolism to Better Understand Alcohol Related Diseases | \$98889 |
| 03-104 | Hydrogen Atom Transfer from Carbon to Metal - Relevance of a Novel Reaction to Catalyzed Hydrocarbon Conversions | \$56480 |
| 03-105 | Radioprotection in D. Radiodurans, a Radiation Resistant Bacterium | \$74668 |
| 03-107 | New Development of Norepinephrine Transporter Radioligands for PET Studies of Substance Abuse, Depression and ADHD | \$111095 |
| 03-108 | Experiments in the Short-Wavelength Regime Pertinent to the DUV-FEL Concept | \$131367 |
| 03-115 | Imaging Tandem Mass Spectrometry for High-Throughput "Fingerprint" Detection of Complex Molecules in Mixtures | \$109593 |
| 03-118 | Condition: Green Chemistry Radiolytic Studies of Ionic Liquids in Service of Security and the Environment | \$79517 |
| 03-119 | Exploring the Use of Powder Diffraction for Proteins | \$79445 |
| 03-121 | Element-Resolved Dynamics of Nanoscale Ferromagnets | \$79558 |
| 03-122 | Membrane Biophysics Using Model Membranes | \$79316 |
| 03-127 | High Pressure in Strongly Correlated Materials - An Optical Investigation | \$66865 |
| 03-129 | Polyoxometalate Giant Molecules: Novel Synthetic Methods, Characterizations and Potential Applications | \$95532 |

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BNL - Brookhaven National Lab

| Project ID | Project Name | FY Total |
|-------------------|---|-----------------|
| 03-135 | Exploratory Sol-Gel Synthesis | \$81047 |
| 03-137 | In Situ Soft X-Ray Absorption Spectroscopy Studies of Cathode Materials for Thin Film Lithium-Ion Batteries | \$46337 |
| 03-138 | Functional Bulk Mn-Based Nanocomposites | \$76906 |
| 03-144 | Nanostructured Transition Metal Oxides | \$76347 |
| 03-151 | Radio Wave Detection of Ultra High Energy Cosmic Rays | \$123923 |
| 03-161 | Generation of Coherent, Femtosecond, High Brightness VUV and X-Ray Beams Using High Order Harmonic Conversion | \$139719 |
| 03-162 | New Synthesis Techniques to Control Atomic Defects in Advanced Intermetallic Compunds | \$90577 |
| 04-011 | Femtosecond Photoinitiated Nanoparticle Surface Chemistry | \$79532 |
| 04-013 | Chirped Pulse Amplification at the DUV-FEL | \$78404 |
| 04-025 | Overcoming Coherent Instabilities at Medium-Energy Storage Rings | \$91415 |
| 04-033 | Layered Cobaltates with High Thermoelectric Power | \$61780 |
| 04-038 | Complex Thin Films and Nanomaterial Properties | \$79 |
| 04-041 | Physics of Quark Gluon Plasma (QGP) | \$69272 |
| 04-043 | Very Long Baseline Neutrino Oscillation Experiment | \$71099 |
| 04-046 | Advanced ³ He Detectors for the Spallation Neutron Source | \$72953 |
| 04-055 | Genetic NanoTags | \$12933 |
| 04-060 | The Use of Singular Point Genome Sequence Tags to Analyze Community Composition and Metabolic Potential | \$121236 |
| 04-061 | 3-D Electronic Wave Functions from EM Images | \$98945 |
| 04-062 | Functional MRI Studies in Rats using Implanted Brain Electrodes | \$78466 |
| 04-063 | Optimizing Functional Neuroimaging Techniques to Study Brain Function in Health and Disease States | \$100684 |
| 04-066 | Technological Development of a Fluorescence Probe for Optical Detection of Brain Functional Activation in vivo | \$27032 |
| 04-069 | Nuclear Control Room Unfiltered Air In-Leakage by Atmospheric Tracer Depletion (ATD) | \$59463 |
| 04-073 | Perfluorocarbon Tracer Sampling, Tagging and Monitoring Techniques for use at the Urban Atmospheric Observatory | \$65530 |
| 04-079 | Development of an Aerosol Mobility Size Spectrometer and an Aerosol Hygroscopicity Spectrometer | \$65589 |

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Project List -- Fiscal Year 2004

BNL - Brookhaven National Lab

| Project ID | Project Name | FY Total |
|-------------------------------------|---|--------------------------------------|
| 04-086 | Exploration of Thermal Diffusion Processes in CdZnTe for Improved Nuclear Radiation Detectors | \$86077 |
| 04-088 | An Integrated Approach of High Power Target concept Validation for Accelerator-Driven Systems | \$82747 |
| 04-104 | Hydrogen Storage Using Complex Metal Hydrides for Fuel Cell Vehicles | \$70265 |
| Total # of Projects for BNL: | 73 | Total Cost for BNL: \$7208543 |

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INEEL - Idaho National Engineering and Environmental Lab

| Project ID | Project Name | FY Total |
|-------------------|---|-----------------|
| AC101 | Parallel Computing with Cluster Technology | \$155394 |
| AC104 | Development and Validation of Advanced Simulation and Collaboration Capability | \$73349 |
| AE100 | An Innovative Gas-Cooled Fast Reactor | \$411436 |
| AE101 | Advanced Fission Product Detection Systems for the Next Generation Nuclear Reactors | \$230281 |
| AE102 | Development of Advanced Aqueous Processing to Support the Nuclear Fuel Cycle | \$174590 |
| AE103 | Radiation Chemistry of Supercritical Water | \$207812 |
| AE104 | Development of Experimental Methods for Measurements of Nuclear Cross Sections | \$478362 |
| AE105 | Evaluation of Alternate Materials for Coated Particle Fuels for the Generation IV Gas-cooled Fast Reactor | \$294010 |
| AE106 | Fast Test Irradiation Facility | \$199996 |
| AE107 | Investigation of Fundamental Thermal-Hydraulic Phenomena in Advanced Gas-Cooled Reactors | \$298257 |
| CS117 | Development of a Compact Laser-Compton X-ray Source | \$108249 |
| CS118 | Advanced Automated Ion Mobility Spectrometer for Explosives Detection | \$222304 |
| CS119 | First Responder and DOE Site Recon UAV Capability | \$243464 |
| CS120 | Transmission Line Security Monitor and Repeater System Concept | \$153851 |
| CS121 | Software Tool-kit for Effective and Repeatable Remote Attacks Against Command and Control Systems used in Electricity Generation and Distribution | \$98708 |
| CS122 | TEstbed for Personal Electronic Devices (TEPED) | \$96954 |
| ET116 | Advanced Control Architectures for Human-Robot Synergy in Complex, Multi-Operation Domains | \$134918 |
| ET118 | Intelligent Control of Multi Nodal Systems | \$84972 |
| ET121 | Human Factors for Management of High Consequence Events | \$126285 |
| ET122 | Developing the Scientific Basis for Landscape Level Management of Federal Facilities | \$134853 |
| ET123 | Genetic Control of Straw Stem Ultrastructure that Affects the Biomechanics of Stem Separation. | \$59913 |
| ET124 | Development of Analytical Decision-Making Tools for Energy Efficient Agricultural Biomass Production | \$94878 |

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INEEL - Idaho National Engineering and Environmental Lab

| Project ID | Project Name | FY Total |
|-------------------|---|-----------------|
| ET125 | Stable Enzymes for Hemicellulose Hydrolysis | \$74618 |
| ET126 | Pretreatment Technologies for Cellulosic Biomass | \$84991 |
| ET127 | Flow Characterization of Complex Biomass Flows for Bioenergy Feedstock Development | \$84906 |
| ET128 | Co-Firing of Coal and Refuse-Derived Fuel with Oil Shale for Control of Environmental Contaminants and Improved Energy Production: Laboratory Studies | \$85031 |
| ET129 | Highly Selective Sorbents for Removal of Arsenic from Drinking Water | \$85227 |
| ET130 | Investigation and Modeling of Dynamic Strain Rate Effects on Structural Material Response | \$84980 |
| ET131 | Novel Abrasion Resistant, Enhanced Flux Ultrafiltration Membranes | \$74738 |
| GC135 | Investigation of the Movement and Fate of Chlorinated Hydrocarbons | \$229543 |
| GC136 | Modeling of Flow and Colloid Behavior in Subsurface Fractures | \$260560 |
| GC141 | Calibration and Enhancement of Geophysical Imaging Tools in a Mesoscale Experimental Facility | \$259702 |
| GC150 | Multiscale Modeling of Multiphase (Unsaturated) Flow | \$86551 |
| GC151 | Modeling Solute Partitioning at Interfaces | \$85104 |
| GC152 | Estimating the Climatic Sensitivity of Vadose Zone Infiltration Rates through Paleohydrologic Analyses | \$33261 |
| GC153 | Development and Use of Transgenic <i>Caenorhabditis elegans</i> to Measure Bioavailability of Metals and Mutagenicity in Contaminated Media | \$105672 |
| GC154 | Experimental Stochastic Analysis of Unsaturated Flow using a Geocentrifuge | \$161109 |
| GC155 | Use of Genetic Markers as a Screening Tool for Ecological Risk Assessment - White Paper | \$4307 |
| GC156 | Manipulation of Flow in Subsurface Environments ? Coupling between Precipitation and Fluid/Mass Transport | \$400978 |
| GC157 | Stratigraphic Characterization of the Eastern Snake River Plain Aquifer using Geochemical and Paleomagnetic Analysis of INEEL Basalt Core | \$19980 |
| HT100 | Hydrogen Production from High Temperature Nuclear Reactors | \$470513 |
| HT101 | Polybenzimidazole-Based Composites as Candidate Materials for Hydrogen Containment and Purification | \$137227 |
| HT102 | Influence of surface properties on hydrogen effects in pipeline materials | \$116668 |
| HT103 | Hydrogen Delivery and Thermal Separation in Natural Gas Pipelines | \$128294 |

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INEEL - Idaho National Engineering and Environmental Lab

| Project ID | Project Name | FY Total |
|-------------------|---|-----------------|
| NE130 | An Improved Approach for Measuring Thermal Conductivity | \$186437 |
| NE131 | Bimodal Nuclear Thermal Propulsion | \$172294 |
| NS134 | Enhanced Isotope Ratio Measurement Sensitivity | \$150867 |
| NS135 | Smart Antenna Systems in a Wireless Local Area Network | \$248601 |
| NS137 | Security of Cyber Systems | \$163921 |
| NS139 | Novel Threat-Risk Index Using Probabilistic Risk Assessment and Human Reliability Analysis | \$20049 |
| NS140 | Wireless Security Research | \$233132 |
| NS141 | Thermomechanical Processing of Titanium 10V-2Al-3FE | \$150022 |
| NS143 | Investigation of New Generation Infrared Imaging Systems for the Stand Off Detection of Suicide Bombing Suspects | \$49482 |
| NS144 | Radio Frequency Personnel Identification Tool (The Power Boot) | \$59115 |
| PH103 | Residual Hazards Management: Decisions Leading Toward Success or Failure? | \$134716 |
| PH104 | Modeling an Earth Borehole System for Physical Property Determination in Shallow Subsurface Environments with Emphasis on Vadose Zone Applications. | \$85194 |
| PH105 | Improving Soil Water Flux Estimates in the Deep Vadose Zone | \$77358 |
| PH106 | A New Hydrogeophysical Method for Characterizing and Monitoring Preferential Flow Paths in Complex Layered and Fractured Basalt | \$71746 |
| PH107 | Dependence of Coal Bed Permeability on Pore Pressure and Adsorbed Gas Content | \$84979 |
| RP100 | Laser Ultrasonic Corrosion Monitor | \$248840 |
| RP101 | Advanced Test Reactor Three Dimensional Neutronics Modeling | \$236572 |
| RP102 | Hollow Waveguide Laser Ultrasonics for High Radiation Environments | \$282598 |
| RP103 | Estimation of Neutron Irradiation-Induced Displacements-Per-Atom | \$139099 |
| RP104 | Improved Techniques for In-Situ Measurements | \$93154 |
| SC116 | Supercritical Fluid Catalyst Regeneration Chemistry | \$146208 |
| SC117 | Atmospheric Pressure Surface Analysis Mass Spectrometry | \$131383 |
| SC118 | Surface-Sensitive Laser Acoustic Studies of Heterogeneous Catalysis | \$123656 |
| SC119 | Development of Microelectrode Arrays for In Situ Detection of Localized Corrosion | \$121797 |
| SC120 | Advanced Materials for Power Generation | \$97238 |

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| INEEL - Idaho National Engineering and Environmental Lab | | | |
|---|---|------------------------------|--------------------|
| Project ID | Project Name | | FY Total |
| SC121 | Effect of Environmental Variables on Bicarbonate Transport by Marine and Freshwater Cyanobacteria | | \$211289 |
| SC122 | Synthesis and Characterization of Hybrid Materials for Advanced Membranes and Molecular Ropes | | \$210633 |
| SC123 | Investigation Into Parallelization of Fate and Transport Models | | \$55132 |
| SM101 | Development Of Brazing Alloys And Application Methods for Joining Silicon Carbide To Titanium Alloy | | \$150091 |
| SM102 | Development of Advanced Ceramics for Armor Applications | | \$40694 |
| Total # of Projects for INEEL: | 74 | Total Cost for INEEL: | \$11333093* |

*Does not include \$481,204 of administrative and related implementation costs.

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KCP - Kansas City Plant

| Project ID | Project Name | FY Total |
|-------------------|---|-----------------|
| KC02001-(703522) | Condition-Monitoring of Machinery Using Artificial Intelligence | \$8042 |
| KC02004-(703525) | Advanced Noncontact Inspection Techniques for Precision Dimensional Measurement | \$0 |
| KC02005-(703527) | High-Voltage Cable Insulation Defect Investigation, Detection, and Analysis | \$71 |
| KC02008-(703530) | Research and Evaluation of Controller Area Network (CAN)-based Telemetry | \$29738 |
| KC02009-(703531) | Software-Defined Radio Systems | \$16918 |
| KC02010-(703532) | Specialized Getters for Gases Other Than Hydrogen | \$1705 |
| KC02012-(703536) | Portable Image Recognition and Analysis | \$39630 |
| KC02013-(703561) | Triple Point Field Attenuation for High-Power Ceramic-to-Metal Interfaces | \$90113 |
| KC02024-(703535) | Evaluation of Continuous Tape Casting of Ceramic Materials for Multilayer Structures | \$480 |
| KC03001-(703537) | RFID Tagging of Classified/Sensitive Material/Assets | \$240405 |
| KC03002-(703538) | Evaluate the Feasibility of a Single-Containment Vessel | \$175981 |
| KC03003-(703539) | Suspension-Coated APO-BMI/Carbon Microsphere Molding Compound | \$12975 |
| KC03004-(703540) | Enhanced Hydrogen Getter Development | \$176795 |
| KC03005-(703541) | Integrated Miniaturized Solid-Phase Microextraction/Gas Chromatograph/Mass Spectrometer | \$135061 |
| KC03006-(703542) | Preservation of Digital Data with Knowledge-Based Archives | \$232056 |
| KC03007-(703543) | Nano-fireset Technology | \$138758 |
| KC03008-(703544) | Distributed Initiation Control System | \$86548 |
| KC03009-(703545) | High-Precision Laser Micromachining Development | \$208766 |
| KC03010-(703546) | Packaging of Next-Generation Laser Optics | \$72670 |
| KC03011-(703547) | High-g Penetrator Telemetry Electronics(703547) | \$230606 |
| KC03012-(703548) | Microelectronic System in a Package with High-Density Interconnections | \$211752 |
| KC03013-(703549) | Backend Processing of MEMS(Microelectromechanical Systems) | \$289614 |
| KC03014-(703550) | Wireless Sensor Transmitter | \$182117 |
| KC03015-(703551) | Small-Device Simulation and Modeling of High-Voltage Electromagnetic Field Enhancements, Characteristics, and Sensitivity | \$51637 |
| KC03016-(703552) | Photonic Crystals as Dielectric Mirrors in a Laser Cavity | \$7883 |
| KC03017-(703553) | Biometrics Using High-Resolution Optical Coherence Tomographic Imaging | \$130358 |
| KC03018-(703554) | Knowledge-Aided Sensor Signal Processing & Expert Reasoning | \$46115 |

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Project List -- Fiscal Year 2004

KCP - Kansas City Plant

| Project ID | Project Name | FY Total |
|-------------------------------------|--|---------------------------------------|
| KC03019-(703555) | Investigation into Improved Techniques and Processes for Creating Small Holes (.005" Diameter) to Closer Location and Size Tolerances | \$76652 |
| KC03021-(703559) | Finite Element Modeling of Fiber Reinforced Composite Structures | \$2669 |
| KC03022-(703558) | Optimal Resource Allocation using Fuzzy Logic & Neural Nets for the Flexible Manufacturing System | \$37879 |
| KC03024-(703560) | Digitization of Reservoir Process Design and Machine Program Generation | \$291 |
| KC03026-(703562) | Relaxor and Antiferroelectric Material Development For High Energy Capacitors | \$71055 |
| KC03027-(703563) | High Power Ceramic Structure Machining and Characterization | \$182019 |
| KC04001-(703565) | Development of High-performance Microwave Packaging for Radio Frequency (RF) Micro-Electromechanical Systems (MEMS) | \$87793 |
| KC04002-(703567) | Demonstrate a Compact, Integrated Test Unit for Verifying Surface Cleanliness | \$76269 |
| KC04003-(703568) | Molecular Design & Optimization of Urethane Encapsulants | \$53580 |
| KC04004-(703569) | Laser Welding of Small Parts Fabricated Using LIGA Processes | \$79847 |
| KC04005-(703570) | Three-Dimensional Borescope with Eddy Current Probe | \$32202 |
| KC04006-(703571) | Pulsed Power Communication Device | \$31399 |
| KC04007-(703572) | Characterization and Application of Non-Contact Inspection Technology | \$169032 |
| KC04008-(703573) | Multi-chip Module Transverter Circuit | \$217083 |
| KC04009-(703574) | Application of Diskless Workstation Technology to Computationally Intensive Manufacturing Applications | \$227089 |
| KC04010-(703575) | Setback Generator for Microfiring Systems | \$122634 |
| KC04011-(703576) | Investigation of Electromagnetic Methods for Examination of Reservoir and Other Welds | \$17596 |
| KC04012-(703577) | Advanced Computer User Authentication Methods | \$192193 |
| KC04013-(703578) | Design Guides for Rapid and Flexible Test Equipment Software Development | \$40430 |
| KC04014-(703579) | Robust Feature Extraction/Pattern Matching Algorithms in Unconstrained Environments | \$236794 |
| KC04015-(703580) | An Accurate and Reliable Multiple Integrated Laser Engagement System (MILES) Compatible Semi-Automatic Pistol for Force-On-Force Engagement Training | \$230351 |
| Total # of Projects for KCP: | 48 | Total Cost for KCP: \$5001651* |

*Does not include \$93,913 of administrative and related implementation costs.

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| Project ID | Project Name | FY Total |
|-------------------|--|-----------------|
| LANL-2000510DR | A Scaleable Silicon-Based Nuclear Spin Quantum Computer | \$217991 |
| LANL-2001222ER | Scanning Tunneling Microscope Electron Spin Precession Detection for Fundamental Physics and Nanotechnology | \$328903 |
| LANL-2001511DR | Development of High Performance Cold Neutron Spectroscopy at LANSCE | \$797450 |
| LANL-2001518DR | Alpha Models: A Unique Opportunity in Fundamental Fluid Turbulence | \$585365 |
| LANL-2001553DR | Physics Issues in Proton Radiography | \$400677 |
| LANL-2001606DR | Scientific Opportunities With High Intensity Pulsed Cold and Ultra-Cold Neutron Sources | \$513016 |
| LANL-2001607DR | Research to Support Simulation of Complex Biological Systems | \$490223 |
| LANL-2001609DR | Performance Analysis and Modeling of Extreme-Scale Parallel Architectures | \$348643 |
| LANL-2001926ER | Plasma Generation of Nanoparticles | \$217683 |
| LANL-2001938DR | An Operating System for Scientific Computing | \$217495 |
| LANL-20020003DR | Nuclear Isomer Physics | \$1241268 |
| LANL-20020006ER | Unstable Fluid-Fluid Interfaces | \$215087 |
| LANL-20020007ER | Quantum Dynamics and the Quantum-Classical Transition with Entangled Spinor Wavepackets | \$150990 |
| LANL-20020008ER | Mobility and Integrity of the Bacterial Chromosomal Gene Pool | \$207512 |
| LANL-20020009ER | Cooling and Trapping Molecules with Laser Light | \$239272 |
| LANL-20020010ER | Macroscopic Matter Wave Dynamics | \$160428 |
| LANL-20020011ER | Unlocking the Mechanism of Protein Biosynthesis: Computational Investigation of the Ribosomal Functional Complex | \$209288 |
| LANL-20020012ER | Protein Machines: Regulation of Enzyme Function Through Substrate and Protein Interactions | \$145283 |
| LANL-20020014ER | Chemistry of the f-Block Elements in Room Temperature Ionic Liquids | \$158869 |
| LANL-20020015ER | Quantum Wavepacket Dynamics with Trajectories | \$218165 |
| LANL-20020016ER | New Catalysts Containing Phosphonium Groups for Chemical Conversions | \$420391 |
| LANL-20020017ER | Excited States Dynamics and Photochemical Reactions in Large Molecular Systems | \$226030 |
| LANL-20020018ER | Polymeric Chelators for Radioisotope Delivery Systems | \$254095 |
| LANL-20020019ER | Advanced Techniques in Discrete Simulation | \$218667 |
| LANL-20020020ER | Estimating the Bayes Error from Empirical Data | \$211357 |

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| Project ID | Project Name | FY Total |
|-------------------|---|-----------------|
| LANL-20020021ER | Identification of Interests, Trends and Dynamics in Document Networks | \$106693 |
| LANL-20020022ER | Distributed Sensor Networks with Collective Computation for In-Situ Sensing | \$206821 |
| LANL-20020023ER | Enabling Energy & Environmental Security: Chemical Extraction of Carbon Dioxide from Air | \$286914 |
| LANL-20020024ER | Bone Morphogenesis and Regulation by External Fields | \$169327 |
| LANL-20020025ER | Hydrogen Generation for Fuel Cells by Solid-Electrolyte Membrane Partial Oxidation Reactor | \$218176 |
| LANL-20020026ER | Time Reversed Acoustics Applied to the Earth | \$212713 |
| LANL-20020027ER | General Relativistic Astrophysics of Compact Sources: Core-Collapse Supernovae and Gamma-Ray Bursts | \$255833 |
| LANL-20020028ER | Photon-Counting Optical Spectrophotometry: Opening a New Window for Discovery in Astrophysics | \$229850 |
| LANL-20020029ER | Radio Emissions from Cosmic-Ray/Atmosphere Interactions | \$198588 |
| LANL-20020030ER | Ultrafast Broadband Optical Spectrometer for Dynamic Materials Characterization in a Magnetic Field | \$227573 |
| LANL-20020031ER | Real-Time Localization and Presentation of Neural Activity | \$227519 |
| LANL-20020032ER | Vibration-Free Cooling for Precision Cryogenic Measurements | \$180371 |
| LANL-20020033ER | Single-Domain Nanomagnets: Fabrication and Studies Through the Superparamagnetic Transition | \$236534 |
| LANL-20020034ER | Nanostructured Metals with Unusually High Fatigue Strengths | \$201909 |
| LANL-20020035ER | New Vortex Phases in Layered Magnetic Superconductors | \$192798 |
| LANL-20020036ER | Low Temperature Solid Solution Softening in Ordered Intermetallic Alloys - Towards Improvement of Ductility in High Temperature Materials | \$209100 |
| LANL-20020037ER | Algebraic Approach to Interacting Quantum Systems | \$187750 |
| LANL-20020038ER | Eliminating Short Time-Scales in Long-Term, High-Resolution Studies of Ocean Circulation: A First in Climate Modeling | \$184345 |
| LANL-20020039ER | Statistical Properties of Granular Chains | \$173972 |
| LANL-20020040ER | Implicit Subgrid Turbulence Modeling | \$170789 |
| LANL-20020041ER | Development of an Experiment to Measure Neutron Beta Decay Parameters with a Polarized Cold Neutron Beam | \$199777 |
| LANL-20020042ER | The Electric Dipole Moments and Time Reversal Violation in Low Energy Processes | \$277995 |
| LANL-20020043ER | Study of Open-Charmed Production at RHIC | \$222722 |

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| Project ID | Project Name | FY Total |
|-------------------|---|-----------------|
| LANL-20020046DR | Understanding Protein Function: From Chemical Reaction to Molecular Recognition | \$1304054 |
| LANL-20020047DR | Electronic Devices Based on Nano-cell Organic Crystals | \$990176 |
| LANL-20020048DR | Bringing Genomes to Life with Phage Antibodies and Mass Spectrometry | \$980501 |
| LANL-20020050DR | Beryllium Chemistry: Toward an Understanding of Chronic Beryllium Disease | \$1123090 |
| LANL-20020051DR | Life Cycles of Active Galaxies | \$974776 |
| LANL-20020052DR | Applied Quantum Technologies | \$1285759 |
| LANL-20020053DR | Probing the Structural Dynamics of Condensed Matter with Ultrafast X-ray Diffraction | \$981664 |
| LANL-20020054DR | Machine Learning for Real-World Data Analysis | \$851773 |
| LANL-20020055DR | New Windows into Shocks at the Mesoscopic Scale | \$1012754 |
| LANL-20020064DR | Interacting Complex Systems | \$1244431 |
| LANL-20020071DR | Damage Prognosis Solutions | \$495141 |
| LANL-20020072DR | Experimental Investigation of Fundamental Processes Relevant to Fusion Burning, Strongly Coupled, Multi-Material Plasmas | \$910254 |
| LANL-20020073DR | Advanced Arbitrary Lagrangian-Eulerian Methods for Complex Flows in Weapons | \$499064 |
| LANL-20020077PRD | Consequences of Competing Interactions on Quantum Phase Transitions in Many-Particle Systems | \$2829 |
| LANL-20020078PRD | Investigating the Kinetics of Free Radical Photo-Polymerizations for Nano-Scale Systems | \$29763 |
| LANL-20020081PRD | Protein Dynamics/Multidimensional Spectroscopy | \$10660 |
| LANL-20020084PRD | Elementary Particle Theory, General Relativity and String Theory | \$23862 |
| LANL-20020103PRD | Ion-Cutting and Bonding of Silicon | \$29423 |
| LANL-20020134PRD | Spectroscopic Investigation of Molecular Interactions in Dye-Sensitized Solar Cells | \$39382 |
| LANL-20020135PRD | Low Temperature Spectroscopic Studies of Individual Nanocrystals | \$22755 |
| LANL-20020136PRD | Sensors for Siderophores Based on Pheromone Detection | \$60573 |
| LANL-20020138PRD | Quantifying the Relationship between the Nature of Structural Defects, the Defect Density, and the Hydration State of Clay Minerals and their Interaction with Fluids | \$15374 |
| LANL-20020143PRD | Quantum Control in Atom Optics | \$20487 |
| LANL-20020161PRD1 | Tools for Realizable Quantum Information Processing | \$92416 |

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|-------------------|---|-----------------|
| LANL-20020167PRD1 | Solid State Systems for Electric Dipole Moment Searches | \$88883 |
| LANL-20020171PRD1 | High Pressure Synthesis and Characterization of Clathrates | \$60593 |
| LANL-20020183PRD1 | Search for Quantum Critical Points using High Magnetic Fields | \$55102 |
| LANL-20020194PRD1 | Fracture and Crack Growth Behavior in Nanostructured Materials Under Cyclic Loading | \$34212 |
| LANL-20020198PRD1 | Arid Land Soil Microbial Processes and Communities | \$36952 |
| LANL-20020202PRD1 | The Origin of Elastic Nonlinear Response | \$35593 |
| LANL-20020205DR | Advanced Linux for High Performance Computing | \$477458 |
| LANL-20020222ER | Energy Conversion and Photonics Based on Metal Complex Excited States | \$111803 |
| LANL-20020225ER | Interfacial Solutions: Quasiliquids and Tropospheric Chemistry | \$138218 |
| LANL-20020252PRD2 | Interface-Controlled Deformation Physics of Nanolayered Metals | \$56098 |
| LANL-20020288PRD2 | Chemical Tuning and Disorder in Quantum-Critical Superconductors | \$88977 |
| LANL-20020299PRD2 | Neutron Scattering Study on Quantum Magnetism in Correlated Electron Materials | \$92748 |
| LANL-20020304PRD2 | Ultrafast Studies of Dynamics in Condensed Matter Systems | \$90003 |
| LANL-20020360ER | New Modeling Techniques for Strongly-Coupled Atmospheric Processes that Occur in Wildland Fires | \$170838 |
| LANL-20020393PRD3 | Synthesis and Characterization of Nanomaterials | \$115554 |
| LANL-20020396PRD3 | Long-Time Dynamics of Floppy Systems | \$80812 |
| LANL-20020399PRD3 | Crystallization Mechanism in Metal-Oxide Thin Films | \$108243 |
| LANL-20020417PRD3 | Electron Microscopy Study of Defects at Interfaces in Nano-Scale Films | \$81283 |
| LANL-20020420PRD3 | Numerical Determinations of Viscoelastic Effect on Volcanic Deformation: A Tool for Eruption Prediction | \$103087 |
| LANL-20020421PRD3 | Dynamics of Granular Media | \$115561 |
| LANL-20020459ER | Ultrahigh Weight Biomolecule Separation and Detection | \$261207 |
| LANL-20020463ER | Nanochemistry of Catalysts | \$70104 |
| LANL-20020494PRD4 | Preparation and Characterization of Monodisperse Semiconductor Quantum Dots: Towards True Artificial Atoms | \$108469 |
| LANL-20020505PRD4 | The Effect of Forest Disturbance and Climate Change on the Isotopic Composition of Tree Rings and Respired Carbon Dioxide | \$101545 |
| LANL-20020517PRD4 | The Synthesis of Metal Complexes Containing Actinide-Transition Metal and Actinide-Actinide Metal Bonds | \$112258 |

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|-------------------|---|-----------------|
| LANL-20020521PRD4 | Novel Structures Based on Multicompartment Self-Assembly of Fluoro/Hydro-Carbon Surfactants | \$132772 |
| LANL-20020525PRD4 | Electronic Pumping of Nanocrystalline Quantum Dots | \$118839 |
| LANL-20020529PRD4 | Advanced Computational Methods in Mobile Computing and Computational Biology | \$59576 |
| LANL-20030022DR | Novel Physical Behavior of Nanostructured Materials Derived from Interface Atoms | \$1196765 |
| LANL-20030029DR | Structural Bioinformatics: Inferring Protein Function from Sequence and Structure on a Genomic Scale | \$1347761 |
| LANL-20030030DR | Neutrino Physics and Fundamental Symmetries | \$1427067 |
| LANL-20030036DR | New States of Matter Near Zero-Temperature Phase Transitions | \$1786619 |
| LANL-20030037DR | Physics-Based Analysis of Dynamic Experimentation and Simulation | \$1251794 |
| LANL-20030038DR | Stochastic Closure for Multi-Scale Simulations | \$516030 |
| LANL-20030050DR | Scaling Relationships in Biology: Developing and Applying a Unifying Theory from Molecular through Biosphere Scales | \$1694922 |
| LANL-20030059DR | Clathrate Hydrate Science and Technology | \$1296575 |
| LANL-20030067DR | Water on Mars | \$1178526 |
| LANL-20030068DR | Non-equilibrium Electron Spin Transport and Dynamics in Solids | \$1504726 |
| LANL-20030069DR | Interfacial Energy and Charge Transfer in Multifunctional Bio-Inspired Nano-Assemblies | \$1294461 |
| LANL-20030084DR | Quasiparticles and Phase Transitions in High Magnetic Fields: Critical Tests of our Understanding of Plutonium | \$1367952 |
| LANL-20030091DR | Actinide Partitioning at Solid-Solution Interfaces | \$1202070 |
| LANL-20030119ER | Synthesis of Labeled Glycosaminoglycans for Structural and Dynamical Studies of Macromolecular Complexes | \$327653 |
| LANL-20030129ER | Collisionless Magnetic Reconnection in 3D Geometries | \$252023 |
| LANL-20030137ER | Improving Local Search | \$281964 |
| LANL-20030138ER | Computational Study of Intense Short-Pulse Laser-Matter Interactions | \$274738 |
| LANL-20030151ER | Calculating the Kaon Bag Parameter B_K on Unquenched Lattices | \$282908 |
| LANL-20030162ER | Automatic Detection of Salient Objects in Real-World Imagery | \$237001 |
| LANL-20030169ER | Determining Fundamental Roles of Magnetic Field in the Universe: Laboratory Plasma Flow Experiments on Magneto-Rotational Instability (MRI) and Laminar Plasma Dynamo | \$253757 |

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|-------------------|--|-----------------|
| LANL-20030179ER | Bacillus Anthracis Iron Acquisition | \$267061 |
| LANL-20030181ER | Efficient Computation of Free Energy Differences Relevant to Rational Drug Design | \$240046 |
| LANL-20030210ER | Measure-Valued Solutions of the Lagrangian-Averaged Euler Equations | \$301393 |
| LANL-20030216ER | Strong Ultrafine Grain Metals by Severe Plastic Deformation and Strain Path Changes: Application to Beryllium (Be) | \$261183 |
| LANL-20030225ER | Processor-Coupled Computing Fabric | \$199689 |
| LANL-20030227ER | Estimation of Aquifer Recharge Using Time-Lapse Gravity Surveys | \$226669 |
| LANL-20030232ER | Catalysis by Artificial Inorganic Enzymes | \$255149 |
| LANL-20030248ER | Distributed Multi-scale Markov Chain Monte Carlo for Uncertainty Quantification in Inverse Problems | \$283071 |
| LANL-20030251ER | Using Neutrons to Explore Peculiar Elastic Behavior of Rocks | \$180704 |
| LANL-20030258ER | Immune Cell-Based Biosensor for Rapid Pathogen Detection and Identification | \$274754 |
| LANL-20030261ER | Transport Studies of Vortex Motion in High Temperature Superconductors, MgB(2), and Borocarbides. | \$277286 |
| LANL-20030292ER | Synthesis and Characterization of Selective Ligands | \$431827 |
| LANL-20030301ER | Magnetocarcinotherapy: A Novel Molecular Imaging Diagnostic and Treatment Method for Cancers | \$266823 |
| LANL-20030310ER | Polymer-Assisted Aqueous Deposition (PAAD) of Metal-Oxide Films | \$204904 |
| LANL-20030317ER | Three Dimensional Effects in Core-Collapse Supernovae: Rotation, Convection and Neutron Star Kicks | \$159206 |
| LANL-20030351ER | Computational Schemes for Multiscale Modeling of Polymers | \$214665 |
| LANL-20030352ER | Double Beta Decay | \$218576 |
| LANL-20030355ER | Thin-Film Semiconductor Sensors on Polycrystalline Substrates | \$356849 |
| LANL-20030356ER | An Integrated Microarray-Based Platform for Sensitive High-Throughput Pathogen Detection and Identification | \$380635 |
| LANL-20030359ER | Electrically Pumped Colloidal Nanoemitters: Combining Top-Down and Bottom-Up Approaches in Nanoscale Engineering | \$254291 |
| LANL-20030360ER | Viral Invasion: Breaching the Cells Outer Defenses | \$279847 |
| LANL-20030363ER | Testing for a Relativistic Symmetry in the Nucleon-nucleon Interaction | \$160187 |
| LANL-20030365ER | Cosmological Vacuum Energy | \$231644 |
| LANL-20030398ER | Desalination by Molecular Design | \$207330 |

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|-------------------|---|-----------------|
| LANL-20030400ER | Atomic Level Engineering of Nanostructures and Devices | \$251977 |
| LANL-20030419DR | Assembly and Actuation of Nanomaterials Using Active Biomolecules | \$508879 |
| LANL-20030420DR | Active Photonic Nanostructures | \$620472 |
| LANL-20030486DR | Astrophysical Survey Science and Technology | \$477463 |
| LANL-20030487DR | Physics of Information | \$1114852 |
| LANL-20030488ER | Formation and Distribution of Galaxies: An Advanced Computational Approach | \$368272 |
| LANL-20030489DR | Advanced Diagnostics for Characterizing Nanoscale Materials | \$956339 |
| LANL-20030494ER | Design of the Next Generation Ground-Based Gamma-Ray Burst Detector | \$77384 |
| LANL-20030497PRD1 | Analysis and Generation of Magnetic Flux Pinning Sites in YBa ₂ Cu ₃ O _{7-d} Films | \$104182 |
| LANL-20030508ER | Mass Spectrometry and Systems Biology Based Approach for Identifying Biomarkers in Cancers | \$251984 |
| LANL-20030519PRD1 | Solid-State Actinide Chemistry | \$128480 |
| LANL-20030522PRD1 | Searching for Superhard Materials from Nanometric Scale and at Extreme Conditions | \$143587 |
| LANL-20030526PRD1 | Identification of the Energy Gap in the 2D Metallic State of Strongly Interacting Fermions | \$127176 |
| LANL-20030534PRD1 | Genomic Instability and Mammalian Aging | \$48898 |
| LANL-20030544PRD1 | Ultracold Collisions of Charged Particles | \$112822 |
| LANL-20030549PRD1 | Physics of Metallo-Organic / Organic Materials and Devices | \$76721 |
| LANL-20030562PRD1 | Synthesis of Continuous Carbon Nanotubes | \$119021 |
| LANL-20030568PRD1 | Interaction of Magnetism and Superconductivity in Novel Superconductors | \$138307 |
| LANL-20030579PRD1 | Cosmic Cinematography: Opening a New Window for Discovery in Astrophysics | \$129181 |
| LANL-20030597ER | LOFAR - A Low Frequency Radio Interferometer for Astronomy and Space Sciences | \$33063 |
| LANL-20030604ER | Preparation & Characterization of Inorganic & Organic High-Nitrogen Energetic Materials | \$24714 |
| LANL-20030611PRD2 | Active Photonic Structures Based on Semiconductor Nanocrystals | \$33051 |
| LANL-20030619ER | Study of Dielectric Properties of Liquid Helium | \$72130 |
| LANL-20030622ER | Complex Dynamical Earth Systems | \$450116 |
| LANL-20030623ER | Space Weather Foundations | \$340322 |

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|-------------------|---|-----------------|
| LANL-20030624ER | Dynamical Astrophysics | \$388359 |
| LANL-20030625ER | Planetary Geophysics-Core to Crust | \$392669 |
| LANL-20030635PRD2 | Theoretical and Computational Studies of the Behavior of Plasma at the Edge of a Tokamak | \$103370 |
| LANL-20030637PRD2 | Global Three-Dimensional Magnetospheric Structure | \$112437 |
| LANL-20030642PRD2 | Superheating upon Superfast Dynamic Loading | \$141832 |
| LANL-20030643PRD2 | Theoretical Studies of Advanced Materials | \$102392 |
| LANL-20030663PRD2 | Electric Field Control of Optical and Electronic Properties of Semiconductor Quantum Dots | \$101219 |
| LANL-20030664ER | Compton Enhanced Gamma Reconstruction | \$74937 |
| LANL-20030666PRD2 | Host-Pathogen Interactions of Intracellular Microbes | \$104685 |
| LANL-20030671ER | New Directions in Catalysis | \$37742 |
| LANL-20030672ER | Novel Optical Processing Methods | \$44886 |
| LANL-20030680PRD2 | Pattern Formation and Dynamics in Systems with Competing Forces | \$97983 |
| LANL-20030699PRD3 | Trace-Level Analysis of Radionuclides Using Membrane-Based Ion-Selective Chemical Sensors | \$107646 |
| LANL-20030700PRD3 | Wiedemann-Franz Law at a Quantum Critical Point | \$24254 |
| LANL-20030718PRD3 | Neutrino Physics, Astrophysics and Cosmology | \$114593 |
| LANL-20030744PRD3 | Investigation of Electrical Properties of [Ba _{1-x} Sr _x TiO ₃ /Ba _{1-y} Sr _y TiO ₃] Multilayers for Applications in Tunable Microwave Devices | \$101393 |
| LANL-20030760ER | Selection of Binding Agents Against SARS Proteins for Diagnosis and Therapy | \$99706 |
| LANL-20030766PRD3 | Development of Self-Monitoring and Self-Repairing Structural Systems using Smart Materials | \$130883 |
| LANL-20030770PRD3 | Short-Term Decoherence in Quantum Optics | \$81892 |
| LANL-20030811PRD4 | Fracture and Damage Evolution of Fluorinated Polymers | \$109019 |
| LANL-20030835PRD4 | The Early Afterglows of Gamma-Ray Bursts | \$24101 |
| LANL-20030837PRD4 | An Organometallic Chemistry Approach to the Preparation of Fluorinated Polymers | \$108125 |
| LANL-20030839ER | Proteins in Protein Networks | \$416127 |
| LANL-20030840PRD4 | Fosmidomycin and B. Anthracis | \$82568 |
| LANL-20030859PRD4 | Fault Tolerant and Recovery-Oriented Computing | \$88650 |

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|-------------------|--|-----------------|
| LANL-20030861PRD4 | Mechanisms of Creep in Bulk Metallic Glasses | \$99267 |
| LANL-20030865PRD4 | Compton Imaging and High Energy Astrophysics | \$102813 |
| LANL-20030874PRD4 | Ion Beam Slicing with Point Defect Engineering | \$118943 |
| LANL-20040014DR | Localization and Itinerancy in Plutonium | \$1609629 |
| LANL-20040031DR | Scalable Reconfigurable Computing: Exploiting an Exponential Increase in Computational Density | \$988433 |
| LANL-20040040DR | Search for Variation of the Fine Structure Constant with Optical Frequency References | \$1358637 |
| LANL-20040042DR | Science of Geological Carbon Sequestration: Integration of Experimentation and Simulation | \$1019164 |
| LANL-20040049DR | Solid-State Quantum Information Processing : A New Approach to Demonstrate Quantum Entanglement | \$991728 |
| LANL-20040064DR | Energetic-Particle Interactions with Dense Plasmas: A Study Relevant to Boost and to Fast Ignition Using Laser-Driven High-Current Charge-Neutralized, MEV/Nucleon Ion Beams | \$1404514 |
| LANL-20040069DR | High-Power MM-Wave Source Technology | \$1063559 |
| LANL-20040072DR | Radiography with Background Radiation | \$1647871 |
| LANL-20040087DR | Understanding the Molecular Mechanisms of Pathogen Recognition by the Immune System: Biothreat Reduction through Predictive Science | \$1392480 |
| LANL-20040093DR | Understanding Electronic and Magnetic Communication Between f-Electrons in Actinide and Lanthanide Materials | \$1463195 |
| LANL-20040104DR | Testing Time-Reversal Symmetry with Ultracold Neutrons and with Solid State Systems | \$1328237 |
| LANL-20040120DR | Fluorobody Switches: Recognition Proteins Which Fluoresce upon Binding Targets | \$1306782 |
| LANL-20040134DR | Bose-Einstein Condensate Physics: Dynamics and Applications | \$1793735 |
| LANL-20040141DR | Statistical Physics of Infrastructure Networks | \$1499076 |
| LANL-20040167ER | Exploring the Turbulent-Viscosity Effect in Solar-Wind/Magnetosphere Coupling | \$105865 |
| LANL-20040171ER | Fermion Quantum Phase Transitions | \$266806 |
| LANL-20040184ER | Response Networks of M. Tuberculosis and Bio-threat Agents | \$236313 |
| LANL-20040187ER | Electroweak Symmetry Breaking | \$325042 |
| LANL-20040193ER | Dark Lightning: Throwing Light on Monster Convective Storms | \$179775 |

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|-------------------|---|-----------------|
| LANL-20040195ER | Precision Cosmology: A First Principles Approach to Galaxy Clustering | \$395698 |
| LANL-20040201ER | The Dynamic Response of Polymers Under Stress Using a Unique Probe for the Molecular Events Governing Materials Responses | \$208679 |
| LANL-20040212ER | Detecting Weak Gaseous Plumes in Hyperspectral Remote Sensing Imagery | \$255156 |
| LANL-20040213ER | Ion-Beam Synthesis and Luminescence Characterization of a New Class of Nanomaterials-Nanophosphors | \$321454 |
| LANL-20040218ER | Error-Minimizing, Implicit Adaptive-Grid Solutions of Time Dependent Problems | \$223372 |
| LANL-20040236ER | Computational Complexity and Quantum Entanglement | \$192311 |
| LANL-20040237ER | New Mathematical Tools for the Quantum Dynamics of a Bose-Einstein Condensate | \$229737 |
| LANL-20040256ER | Hybrid Density Functional Theory Investigations in Condensed Matter | \$269394 |
| LANL-20040259ER | Nonlinear-Acoustic Tomographic-Imaging of Damage in Solids | \$289221 |
| LANL-20040262ER | Understanding and Predicting the Initiation of DNA Transcription | \$225839 |
| LANL-20040284ER | The Dynamics of Two-Dimensional Turbulence | \$366452 |
| LANL-20040291ER | Tracking Single Molecules in Three Dimensions | \$230199 |
| LANL-20040294ER | Study of Phases with Hidden Order Parameter in the Actinides and other Strongly Correlated Electron Systems | \$227786 |
| LANL-20040295ER | Design Principles of Genetic Regulatory Networks | \$260255 |
| LANL-20040301ER | Understanding Global Planetary Processes Through a Study of the Moon's Surface Composition | \$277420 |
| LANL-20040326ER | Massively Parallel Fabrication of Complex Nanoscale Structures in Soft Materials | \$349246 |
| LANL-20040344ER | Understanding and Controlling the Chemistry of Biocidal Polymers | \$213456 |
| LANL-20040358ER | Measurement of Vibrational Anharmonicities for Chemical Dynamics | \$334383 |
| LANL-20040359ER | Spatially-Isochronous Time-of-Flight Mass Spectrometer | \$236310 |
| LANL-20040379ER | Modeling Invariance in Data Space | \$290076 |
| LANL-20040391ER | Quantum Devices for Electronic Circuitry and Advanced Detection | \$251495 |
| LANL-20040393ER | Genetic Programs Underlying Key Physiological States in Burkholderia Pseudomallei | \$252340 |
| LANL-20040408ER | Coherent Control of the Raman Fingerprint Spectrum via Single-Pulse Coherent Anti-Stokes Raman Scattering | \$258123 |

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Project List -- Fiscal Year 2004

LANL - Los Alamos National Lab

| Project ID | Project Name | FY Total |
|-------------------|--|-----------------|
| LANL-20040412ER | Mining the Sky with Both Eyes Open: Stereoscopic Monitoring of the Night Sky | \$414097 |
| LANL-20040415ER | Supernovae Neutrinos | \$318536 |
| LANL-20040419ER | Statistical Models for Natural Hraphs | \$226186 |
| LANL-20040425ER | A Dynamic 2-D Ultrasonic Particle Trap for Particle and Cell Array Processing of Biological Assays in Micro-Fluidic Channels | \$350645 |
| LANL-20040430ER | Synthesis of Continuous Carbon Nanotubes | \$279189 |
| LANL-20040438ER | Quantum Control and Information Processing Using Semiconductor Quantum Dots | \$327491 |
| LANL-20040454ER | High Throughput Isolation of Optimal Protease Substrates | \$324070 |
| LANL-20040461ER | Secure Communications in Fiber Links Using Randomness and Nonlinearity of Optical Fibers | \$211234 |
| LANL-20040478ER | Hyperthermal Surface Ionizer for Aerosol Chemical and Biological Analysis | \$340397 |
| LANL-20040480ER | Self-Healing High-Perfomance Parallel Computers | \$241838 |
| LANL-20040481ER | Efficient Modeling of Systems with Uncertainty on Multiple Scales | \$207562 |
| LANL-20040508ER | The Synthesis of Single Walled Carbon Nanotubes with Specific Diameters | \$317690 |
| LANL-20040558ER | Characterizing Thin Films by Laser-Generated Acoustics | \$197153 |
| LANL-20040840DR | Computational Models of the Water Cycle of Semi-Arid Basins | \$489221 |
| LANL-20040842DR | Fission Fragment Physics in Extreme Environments (U) | \$421024 |
| LANL-20040844DR | Phase Transitions and Strong Anharmonicities in Plutonium | \$1805455 |
| LANL-20040848ER | Exploring Novel Magneto-Electric Phenomena in Frustrated Spin Systems | \$380107 |
| LANL-20040849ER | Imaging Optical Interferometry | \$460053 |
| LANL-20040862ER | Software-Based, Power-Aware Computing | \$150950 |
| LANL-20040873ER | Integration of Disparate Sensor Systems/Data Sources for Homeland Security | \$71805 |
| LANL-20040877ER | Investigating the Mullin's Effect in Silica-Filled Polymers | \$23826 |
| LANL-20040882PRD1 | Exploring Protein Cameleons Using Single Molecule Spectroscopy | \$41469 |
| LANL-20040884PRD1 | Microscopic High Stiffness and High Damping Materials | \$8119 |
| LANL-20040885PRD1 | Mechanistic Studies on Fe(III)(hydr)oxide Dissolution and Actinide Mobilization in an Aqueous Aerobic Environment | \$34948 |
| LANL-20040894ER | Theory of Detonation in Heterogeneous Explosives | \$70895 |
| LANL-20040895ER | Probing Nucleosynthesis with DANCE | \$72685 |

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LANL - Los Alamos National Lab

| Project ID | Project Name | FY Total |
|-------------------|--|-----------------|
| LANL-20040897PRD1 | Supernova Light Curves | \$4085 |
| LANL-20040908PRD1 | Thermal Shrinkage and Compressional Expansion in Framework Oxides: Underlying Structural Mechanisms and Phase Stability | \$44777 |
| LANL-20040909PRD1 | New Theoretical and Computational Approaches to Ultra-Relativistic Heavy Ion Collisions | \$36060 |
| LANL-20040919PRD1 | Optical Probing of Dense Structured Media: 3D Radiative Transfer Theory at Work | \$47002 |
| LANL-20040923ER | Development of Technology for Particle Astrophysics and Other Applications | \$44115 |
| LANL-20040937PRD2 | Valence Ambiguity in Organoactinide Chemistry | \$26501 |
| LANL-20040938ER | Fission-Fragment Scattering Within Actinide Crystal Structures | \$57720 |
| LANL-20040941PRD2 | Magnetic Field Induced Quantum Critical Points in Correlated Electron Systems | \$30868 |
| LANL-20040953PRD2 | Multifunctional Homogeneous Catalysis for Alkane Functionalization | \$26027 |
| LANL-20040961PRD2 | Femtosecond Optical Combs for Precision Spectroscopy | \$46284 |
| LANL-20040967PRD2 | High Resolution Retinal Prosthesis: Theory and Experiment | \$50958 |
| LANL-20040969PRD2 | Coherent Terahertz Radiation From Intense Laser-Produced Plasmas | \$36531 |
| LANL-20040980DR | Advanced Computer Architectures and Algorithmic Implications | \$948230 |
| LANL-20040985PRD3 | MiniBooNE Neutrino Oscillation Analysis | \$39103 |
| LANL-20040990ER | Time Critical Threat Detection and Evidence Marshaling | \$290624 |
| LANL-20040991ER | Practical Discharge-Pumped, Dressed Atom, Coherent Light Amplifiers and Generators | \$29206 |
| LANL-20040992ER | Novel Polymers for Fuel Cells | \$250920 |
| LANL-20040993ER | Coarse-Grained Model for Polymer Solutions | \$79636 |
| LANL-20040994ER | Beryllium Alanate as a Hydrogen Storage Media | \$52319 |
| LANL-20040995ER | Understanding the Ultra-High-Energy Cosmic Rays with the High Resolution Fly's Eye Detector | \$108386 |
| LANL-20040996ER | Radiation Transport Code Development for Satellite and Other Space Probes | \$343525 |
| LANL-20040997ER | Intrinsic Nanoscale Quantum-Coherent Switches | \$226694 |
| LANL-20040998ER | Host-Pathogen Interactions | \$68766 |
| LANL-20041005PRD3 | Infinite Layer High-Tc Cuprate Superconductors | \$29532 |
| LANL-20041010DR | Dynamics of Complex Networks: Biology, Information, and Security | \$377253 |
| LANL-20041027PRD3 | Materials Interactions with Terahertz Radiation | \$19151 |

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LANL - Los Alamos National Lab

| Project ID | Project Name | FY Total |
|--------------------------------------|---|---|
| LANL-20041034PRD3 | Rydberg Atom Interactions in Fields and Plasmas | \$1753 |
| LANL-20041075ER | Investigations into the Fundamental Chemistry and Structure of Hybrid Organic-Inorganic Materials | \$122614 |
| LANL-20041078ER | Nano-Scale Physics and Near-Contact Hydrodynamics | \$108066 |
| LANL-20041086ER | Nuclear Materials Detection Algorithm Development for Port-of-Entry Applications | \$27380 |
| LANL-20041091ER | Generation of Novel Materials with Applications to LANL Programmatic Goals | \$9678 |
| LANL-20041097PRD4 | High Precision Measurements of CO2 and O2 to Determine Variability of Soil Carbon Turnover Time | \$26756 |
| Total # of Projects for LANL: | 297 | Total Cost for LANL: \$102147359 |

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Project List -- Fiscal Year 2004

LBNL - L. Berkeley National Lab

| Project ID | Project Name | FY Total |
|-------------------|---|-----------------|
| LB01024 | Dynamic Reorganization of Chromosome Architecture During Meiosis | \$61967 |
| LB02001 | Novel Terahertz and Infrared Source using a Laser Wakefield Accelerator and Applications | \$199101 |
| LB02002 | Solid-State Quantum Computer Development with Single Ion Implantation | \$146816 |
| LB02004 | Development of a Coherent Far-Infrared Synchrotron Radiation Source | \$228993 |
| LB02006 | Simulations of Femtosecond X-Ray Spectra of Photoexcited Molecules | \$73169 |
| LB02009 | Disorder and Multiple Length Scales in Non-Fermi Liquid f-Electron Intermetallics | \$74693 |
| LB02010 | Investigation of Charge Transfer in Organic Electronics Using Ultrafast Spectroscopy and Targeted Synthesis | \$119511 |
| LB02012 | Experimental Mathematicians Toolkit | \$59994 |
| LB02013 | Infrastructure for Improving Protein Structure Prediction in Computational Biology | \$150016 |
| LB02014 | New Machine Learning and Data Mining Methods for Genomics and Climate Data Analysis and Knowledge Discovery | \$86023 |
| LB02018 | Combinatorial Algorithms in Scientific Computing | \$68969 |
| LB02020 | Microbial Controls on Metals in the Environment | \$150000 |
| LB02026 | Reactivity of Nanoparticles in Natural Environments | \$79999 |
| LB02028 | Miniaturized Systems for Particle Exposure Assessment | \$16913 |
| LB02031 | Systems Biology: Biological Input-Output Devices | \$119937 |
| LB02039 | Effective Field Theory for Few and Many-Body Nucleon Systems | \$101000 |
| LB02040 | Allosteric Mechanisms in Protein Kinases | \$125042 |
| LB02041 | Structure and Functional Characterization of Heme Protein Sensors | \$99621 |
| LB02043 | Coherent Control and Quantum Information in Polyatomic Molecules | \$259334 |
| LB02044 | Scientific Investigations and Technique Development of Wet Spectroscopy, High-Pressure Photoelectron Spectroscopy, and Scanning Transmission X-ray Microscopy for Molecular Environmental Science | \$139895 |
| LB02045 | Parallel Methods for Robust Optimization and Uncertainty Quantification | \$105403 |
| LB02048 | Research on a Next Generation Vertex Detector | \$100004 |
| LB02049 | Conformation and Reaction Dynamics at the Single Molecule Level | \$85780 |
| LB03002 | Molecular Control of Interfaces Between Biological and Synthetic Materials | \$226758 |
| LB03004 | Comparative Studies Between Earth and Planetary Sciences | \$50000 |

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Project List -- Fiscal Year 2004

LBNL - L. Berkeley National Lab

| Project ID | Project Name | FY Total |
|-------------------|--|-----------------|
| LB03006 | Microscopic Imaging in High-Throughput Screening for Crystals of the Bacterial Ribosome | \$75228 |
| LB03008 | Application of Real-Time PCR with Reverse Transcription for Quantification of Specific Microbial Activity in Complex Communities | \$71999 |
| LB03009 | Short Period Superconducting Undulator Development | \$117059 |
| LB03012 | Interactive Visualization Methods for Exploration and Comparison of Multi-Billion Base Pair Sequence Data | \$79887 |
| LB03013 | Novel Ultra-high Resolution (to 10 meV) Inelastic Scattering Spectrograph to Study Coupled Electron-Orbiton-Phonon Interactions | \$167735 |
| LB03015 | Determining the Light-Absorbing Properties of Aerosol Particles | \$104110 |
| LB03017 | Modeling Quantum Coherence and Transport in Nanoscale Spin, Charge, and Flux Devices | \$54914 |
| LB03019 | Aberration Correction of Electron Microscopes | \$125603 |
| LB03020 | Ex-Situ and Remote Molecular Imaging and Spectroscopy | \$379599 |
| LB03021 | Optimal Solvers for Infinite-Dimensional Hamiltonian Systems | \$93807 |
| LB03022 | Superconducting Magnet Systems for Ex Situ NMR Spectroscopy | \$116731 |
| LB03023 | Soft X-Ray Spectroscopy of Liquid Surfaces | \$104330 |
| LB03024 | Characterization of Adult Stem Cell Involvement in Mammary Gland Development | \$73694 |
| LB03027 | Evaluation of Dynamic Air Quality Impacts of Distributed Generation | \$69999 |
| LB03028 | Electron Production and Collective Field Generation in Intense Particle Beams | \$95468 |
| LB03030 | Evolution of Computer Architecture Alternatives | \$174923 |
| LB03032 | Identification and Analysis of Determinants of Centromere Identity in <i>Drosophila</i> | \$174664 |
| LB03033 | Future Experiments in Neutrino Physics | \$64000 |
| LB03034 | Identification and Characterization of Conserved Noncoding Sequences Using Comparative Genomics and Transgenic Technology | \$64925 |
| LB03035 | Microscopic Theory of Protein Surface: Structure, Response, and Design | \$180059 |
| LB04001 | Properties of Nanocrystals under Extreme Conditions | \$157884 |
| LB04002 | Membrane-Protein Cryo-EM | \$99904 |
| LB04003 | High Throughput Strategy for Protein Complex Identification | \$195575 |
| LB04004 | Autonomous Sensors for Ocean Dissolved Organic Matter | \$232563 |

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LBNL - L. Berkeley National Lab

| Project ID | Project Name | FY Total |
|-------------------|---|-----------------|
| LB04005 | Development of Biosensors for Endocrine Disrupting Compounds in Agricultural Watersheds | \$67979 |
| LB04006 | Analysis of Complex Phosphorylation Patterns in a Key DNA Repair Protein by Coupling Surface Plasmon Resonance and Tandem Mass Spectrometry | \$161890 |
| LB04007 | Techniques of Sample Controls for a Transmission Electron Aberration-corrected Microscope | \$184026 |
| LB04008 | Gold-mediated Assembly of Germanium Island Arrays on Silicon | \$110521 |
| LB04009 | Next Generation Codes for Modeling Subsurface Processes | \$143926 |
| LB04010 | Molecular Microscopy and Tomography | \$74715 |
| LB04011 | Functional Interpretation of Cancer Genomes | \$684944 |
| LB04012 | Designing a Novel Reactor Neutrino Experiment for Measuring the Mixing Angle Theta13 | \$263332 |
| LB04013 | Coherent X-ray Diffraction Imaging (CXDI) | \$93656 |
| LB04014 | Neuroimaging with Advanced Molecular Probes | \$228425 |
| LB04015 | Structural Genomics Tools for Membrane Proteins | \$164728 |
| LB04017 | Research and Development for Double Beta Decay Experiments | \$280000 |
| LB04018 | Nanoscale Lithography to Guide Self-Assembly for the Creation of Functional, Hierarchical Nanostructures | \$72234 |
| LB04019 | Critical Accelerator Technologies for Future Advanced Light Sources | \$786191 |
| LB04020 | Extending Electron Delocalization in Mixed-Valent Molecular Assemblies | \$53605 |
| LB04021 | Structured Cathodes for Efficient Organic LEDs | \$103973 |
| LB04022 | Imaging Three-dimensional Signaling Networks in Normal and Malignant Tissue | \$107702 |
| LB04023 | Evaluating Aerosol Effects on Regional and Global Energy and Water Budgets | \$109968 |
| LB04024 | Optimizing Genomic Data Storage for Wide Accessibility | \$151574 |
| LB04025 | California Water and Energy System: An Approach for Addressing Future Crises | \$239970 |
| LB04026 | Making the Most of Sequencing: Improved Assembly, Improved Protocols, and True Comparative Annotation Tools | \$149812 |
| LB04027 | Spectroscopy and Dynamics of Pure and Doped Helium Nanodroplets | \$85052 |
| LB04028 | Novel High-temperature Membranes and Electrocatalyst Structures for Fuel Cells | \$149853 |
| LB04029 | Advanced Computational Methods for Photon- Molecule Collision Processes | \$284070 |

United States Department of Energy
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Project List -- Fiscal Year 2004

LBNL - L. Berkeley National Lab

| Project ID | Project Name | FY Total |
|--------------------------------------|---|--|
| LB04030 | Ultrafast Magnetization Dynamics | \$100500 |
| LB04032 | Developing Dynamic Soft X-ray Scattering to Probe Spatial and Temporal Fluctuations in Nanomagnets | \$93154 |
| LB04034 | Advancing the Next Generation of Rock-Fluid Imaging and Stimulation Technologies | \$67981 |
| LB04035 | Magnetism at the Nanometer Scale in Spin Polarized Materials | \$82825 |
| LB04036 | Development of Light-Switchable Potassium Channels | \$71994 |
| LB04037 | High Average Power Laser Amplifier | \$446283 |
| LB04038 | Gas Phase Studies of the Building Blocks of Life | \$59967 |
| LB04039 | Development of Techniques for the Study of Large Macromolecular Complexes Using X-ray Crystallography | \$49354 |
| LB04040 | Analysis and Modeling of Multicore Induction Cell Voltage Distribution | \$39987 |
| LB04041 | High-throughput Production of Proteins and Protein Complexes | \$120715 |
| LB04042 | Development of a Novel DNA/RNA Sequencing Tool | \$49991 |
| LB04043 | World Energy Scenarios: The Crucial Role of Energy Demand | \$75000 |
| LB04044 | Lensless Imaging of Yeast Cells | \$15058 |
| Total # of Projects for LBNL: | 86 | Total Cost for LBNL: \$12028553 |

United States Department of Energy
Laboratory, Plant or Site Directed Research and Development Report
Project List -- Fiscal Year 2004

LLNL - L. Livermore National Lab

| Project ID | Project Name | FY Total |
|-------------------|--|-----------------|
| 01-ERD-098 | Spectroscopy of Shock-Compressed Deuterium | \$115249 |
| 01-ERD-101 | Stroke Sensor Development using Microdot Array Sensors | \$134467 |
| 01-ERD-106 | A Hydrophobic Silica Aerogel-Granular Activated Carbon Composite for Removing Arsenic and Hexavalent Chromium from Groundwater | \$81215 |
| 02-ERD-002 | Single-Cell Proteomics with Ultrahigh-Sensitivity Mass Spectrometry | \$350678 |
| 02-ERD-004 | Structure and Spectroscopy of Black-Hole Accretion Disks | \$178638 |
| 02-ERD-006 | Reaching Isochoric States of Matter by Ultrashort-Pulse Proton Heating | \$419505 |
| 02-ERD-008 | Extremely-High-Bandwidth Diamond Tool Axis for Weapons Physics Target Fabrication | \$363577 |
| 02-ERD-010 | Ultrasonic Nondestructive Evaluation of Multilayered Structures | \$263131 |
| 02-ERD-012 | Proton Radiography of Laser-Plasma Interactions with Picosecond Time Resolution | \$109436 |
| 02-ERD-013 | Dense Plasma Characterization by X-Ray Thomson Scattering | \$166389 |
| 02-ERD-014 | Nanoscale Fabrication of Mesoscale Objects | \$357993 |
| 02-ERD-016 | A Three-Dimensional Model of Signaling and Transport Pathways in Epithelial Cells | \$125689 |
| 02-ERD-018 | Development of Ultrasensitive High-Speed Biological Assays Based on 2-D Flow-Cell Detection of Single Molecules | \$412595 |
| 02-ERD-021 | Modern Chemistry Techniques Applied to Metal Chelation with Medical and Environmental Applications | \$226444 |
| 02-ERD-023 | Gaseous Laser Targets and Optical Diagnostics for Studying Compressible Turbulent Hydrodynamics | \$183434 |
| 02-ERD-025 | The Properties of Actinide Nanostructures | \$408646 |
| 02-ERD-027 | Local-Scale Atmospheric Reactive-Flow Simulations | \$355142 |
| 02-ERD-033 | Rapid Resolidification in Metals Using Dynamic Compression | \$325507 |
| 02-ERD-035 | Remote-Sensing Signatures for Ballistic Target Interceptions | \$385866 |
| 02-ERD-040 | Development of a Fast Microfluidic Mixer for Studies of Protein Folding Kinetics | \$76149 |
| 02-ERD-046 | Magnetic Transition Metals and Oxides at High Pressures | \$277874 |
| 02-ERD-047 | A Revolution in Biological Imaging | \$754931 |
| 02-ERD-054 | Single-Particle Nanotracking for Genomes-to-Life Applications | \$271495 |
| 02-ERD-058 | Transport and Biogeochemical Cycling of Iodine-129 from Nuclear Fuel Reprocessing Facilities | \$235634 |

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LLNL - L. Livermore National Lab

| Project ID | Project Name | FY Total |
|-------------------|---|-----------------|
| 02-ERD-061 | Concealed-Threat Detection at Multiple Frames per Second | \$509625 |
| 02-ERD-066 | Dynamic Simulation Tools for the Analysis and Optimization of Novel Filtration, Sample Collection, and Preparation Systems | \$213429 |
| 02-ERD-070 | Exploring the Linkage between Impurities and Optical Properties in Rapid Growth of Crystals | \$971679 |
| 02-ERD-071 | Development of a Quantum-Limited Amplifier using a Direct-Current Superconducting Quantum-Interference Device | \$146330 |
| 02-ERI-003 | ViSUS: Visualization Streams for Ultimate Scalability | \$378985 |
| 02-ERI-004 | A Tunable, Monochromatic, 1-Angstrom, Compton Scattering X-Ray Microfocus for Multiwavelength-Anomalous Diffraction Experiments | \$206311 |
| 02-ERI-005 | Direct Imaging of Warm Extrasolar Planets | \$166987 |
| 02-ERI-006 | Exchange Coupling in Magnetic Nanoparticles Composites to Enhance Magnetostrictive Properties | \$223961 |
| 02-ERI-007 | Enabling Large-Scale Data Access | \$253343 |
| 02-LW-026 | Beta-Decay Experiments and the Unitarity of the Cabibbo-Kobayashi-Maskawa Matrix | \$100000 |
| 02-LW-043 | The Kinetic Stabilizer: A Route to a Simpler Magnetic Fusion System | \$132582 |
| 02-SI-004 | Short Pulse: Enabling Relativistic Applications for Advanced Inertial-Confinement Fusion | \$2182634 |
| 03-ERD-001 | Chemical Dynamics of High-Pressure Interfaces | \$204365 |
| 03-ERD-002 | Adaptive Optics Views of the Hubble Deep Fields | \$302105 |
| 03-ERD-003 | Photon Collider Physics | \$237199 |
| 03-ERD-004 | Quantum Electrodynamics and Electron Collisions in the Superstrong Fields of K-Shell Actinide Ions | \$377181 |
| 03-ERD-005 | Exploring Properties of Quantum Chromodynamics with Proton-Nucleus and Deuteron-Nucleus Collisions | \$390720 |
| 03-ERD-006 | Correction of Distributed Optical Aberrations | \$311834 |
| 03-ERD-007 | Ultrafast Radiation Detection by Modulation of an Optical Probe Beam | \$438782 |
| 03-ERD-008 | Electron Production and Collective Field Generation in Intense Particle Beams | \$230318 |
| 03-ERD-009 | A Coupled Turbulence-Transport Model for Edge Plasmas | \$316629 |
| 03-ERD-013 | DNA Detection through Designed Apertures | \$364249 |
| 03-ERD-015 | Strain Rate Scaling of Deformation Mechanisms | \$352274 |

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LLNL - L. Livermore National Lab

| Project ID | Project Name | FY Total |
|-------------------|--|-----------------|
| 03-ERD-017 | Phonon Dispersion Curves Determination in delta-Phase Plutonium-Gallium Alloys | \$699464 |
| 03-ERD-018 | Determination of the Microstructural Morphology of Shock-Induced Melt and Resolidification | \$324852 |
| 03-ERD-019 | Mononitride Fuel Development for STAR and Space Applications | \$151506 |
| 03-ERD-021 | Analyzing the Long-Range Transport of Asian Aerosols using an LLNL Atmospheric Model and CAMS/NOAA Measurements from Northern California | \$215731 |
| 03-ERD-022 | Environmental Fate of Organo-Phosphorus Compounds Related to Chemical Weapons | \$152905 |
| 03-ERD-023 | Propagation Models for Predicting Communication System Performance in Tunnels, Caves and Urban Canyons | \$39248 |
| 03-ERD-024 | Microfluidic System for Solution Array-Based Bioassays | \$337783 |
| 03-ERD-027 | Adaptive Mesh Refinement Algorithms for Parallel Unstructured Finite Element Codes | \$322907 |
| 03-ERD-030 | Entity-Based Modeling of Population-Based Systems | \$55213 |
| 03-ERD-031 | Detection and Tracking in Video | \$340454 |
| 03-ERD-033 | Scalable Discretization-Enhanced Solvers | \$429217 |
| 03-ERD-038 | An Agent that Can Prohibit Microbial Development and Infection | \$238937 |
| 03-ERD-039 | Thermally Driven Processes and the Atmospheric Transport and Dispersion of Stable Macroparticles | \$351977 |
| 03-ERD-040 | Photochromic Radiation Dosimetry | \$332280 |
| 03-ERD-042 | Predicting the Effects of Climate Change and Variability on Water Availability | \$699758 |
| 03-ERD-044 | Colliding Nanometer Beams | \$389974 |
| 03-ERD-048 | Long-Range, Passive Detection of Fissile Material | \$65643 |
| 03-ERD-049 | Identifying Gene-Regulation Mechanisms using Rule-Based Classifiers | \$49986 |
| 03-ERD-050 | Carbon-Nanotube Permeable Membranes | \$360523 |
| 03-ERD-051 | Development of a "Virtual Crystallizer" | \$740075 |
| 03-ERD-059 | Large-Aperture Diffraction Gratings: The Enabling Technology for High-Energy Petawatt Lasers | \$418012 |
| 03-ERD-060 | Molecular Engineering of Electrodialysis Membranes | \$894674 |
| 03-ERD-061 | Parallel Graph Algorithms for Complex Networks | \$418246 |
| 03-ERD-062 | Microbial Pathways | \$678077 |

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LLNL - L. Livermore National Lab

| Project ID | Project Name | FY Total |
|-------------------|---|-----------------|
| 03-ERD-063 | Protein Model Database | \$409879 |
| 03-ERD-064 | A Two-Particle Formulation of Electronic Structure | \$177765 |
| 03-ERD-065 | Environmental Transport and Fate of Endocrine Disruptors From Non-Potable Reuse of Municipal Wastewater | \$283210 |
| 03-ERD-067 | Nitrate Biogeochemistry and Reactive Transport in California Groundwater | \$958489 |
| 03-ERD-068 | The Instrumented Cell | \$952319 |
| 03-ERD-070 | Laser-Matter Interactions with a 527-Nanometer Drive | \$1223339 |
| 03-ERD-071 | Optics Performance at 1 omega, 2 omega, and 3 omega | \$1029576 |
| 03-ERD-072 | Characterization and Optimization of High-Energy K-Alpha X-Ray Sources | \$242283 |
| 03-ERD-073 | A Compact Accelerator for Proton Therapy | \$311978 |
| 03-ERD-074 | Novel Methods for Bonding Disparate Materials | \$312384 |
| 03-ERD-076 | Persistent Monitoring Platforms | \$405643 |
| 03-ERD-077 | Plutonium and Quantum Criticality | \$1077899 |
| 03-ERI-001 | Tectonic Morphochronology of the Southern San Andreas Fault System | \$239220 |
| 03-ERI-002 | A Next-Generation Microlensing Survey of the Large Magellanic Cloud | \$90680 |
| 03-ERI-003 | A Computational Design Tool for Microdevices and Components used in Pathogen Detection Systems | \$277520 |
| 03-ERI-004 | Elucidation of the Mechanism of Gene Silencing using Small Interfering RNA: DNA Hybrid Molecules | \$75213 |
| 03-ERI-005 | Cellular Response to Heat Stress: System Stability and Epigenetic Mechanisms | \$62434 |
| 03-ERI-007 | Development of Sample Handling and Analytical Expertise for the Stardust Comet Sample Return Mission | \$356259 |
| 03-ERI-009 | Force Spectroscopy to Study Multivalent Binding in Protein-Antibody Interactions | \$84786 |
| 03-ERI-010 | Intracellular Chemical Measurements: A Generalized Approach with High-Spatial Resolution using Functionalized Nanoparticles | \$82549 |
| 03-ERI-011 | Single Molecule Techniques for the Study of Chromatin Assembly and Remodeling | \$85057 |
| 03-ERI-012 | Using Femtosecond Laser Subcellular Surgery as a Tool to Study Cell Biology | \$85068 |
| 03-FS-010 | Silicon Nanocrystal Laser | \$26650 |
| 03-FS-030 | Diode Laser Phase Conjugation | \$60138 |
| 03-LW-001 | A High-Efficiency Grazing Incidence Pumped X-Ray Laser | \$167327 |

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LLNL - L. Livermore National Lab

| Project ID | Project Name | FY Total |
|-------------------|--|-----------------|
| 03-LW-005 | Space-Time Secure Communications for Hostile Environments | \$208766 |
| 03-LW-017 | Mutations That Cause Human Disease: A Computational-Experimental Approach | \$191192 |
| 03-LW-024 | Diode-Pumped Alkali Atom Lasers | \$239931 |
| 03-LW-027 | Long-Time-Scale Atomistic Simulations | \$184646 |
| 03-LW-040 | Broadband Optical Parametric Amplification in Microstructured Devices | \$172930 |
| 03-LW-047 | Laser-Initiated Nanoscale Molecularly Imprinted Polymers | \$194008 |
| 03-LW-056 | Coherent Anti-Stokes Raman Microscopy: Specific Molecular In-Vivo Imaging at Superresolution without Fluorescence Labels | \$73394 |
| 03-LW-059 | A Novel Antimatter Detector with Application to Dark Matter Searches | \$237201 |
| 03-SI-001 | Biological and Synthetic Nanostructures Controlled at the Atomistic Level | \$1568312 |
| 03-SI-003 | ICE: The Image Content Engine | \$1948550 |
| 03-SI-004 | Advancing the Technology of Tabletop, Mesoscale Nondestructive Characterization | \$606808 |
| 03-SI-005 | Pathomics | \$3884363 |
| 04-ERD-001 | DNAPL Dissolution in Porous Media: Multiscale Effects of Multicomponent Dissolution Kinetics on Cleanup Time | \$238265 |
| 04-ERD-002 | Multiprobe Investigation of Proteomic Structure of Pathogens | \$476993 |
| 04-ERD-004 | Three-Dimensional Vectorial Time-Domain Computational Photonics | \$299741 |
| 04-ERD-005 | Infrared Diagnostics for Dynamic Events | \$340997 |
| 04-ERD-007 | Dynamic Combinatorial Libraries for Target-Driven Ligand Development | \$362845 |
| 04-ERD-010 | Time-Resolved Dynamic Studies using Short-Pulse X-Ray Radiation | \$442100 |
| 04-ERD-012 | Locally Adaptive Mesh Refinement for Linear Scaling Electronic Structure Calculations | \$330054 |
| 04-ERD-013 | Acoustic Characterization of Mesoscale Objects | \$370858 |
| 04-ERD-014 | Low-Voltage, High-Precision Spatial Light Modulator | \$226818 |
| 04-ERD-017 | Broadband Radiation and Scattering | \$263905 |
| 04-ERD-019 | Development of Absolute Spectroscopic Diagnostics for Nonlocal-Thermodynamic-Equilibrium Plasmas | \$230437 |
| 04-ERD-020 | Electronic Transitions and Phonons in f-Band Metals at High Pressures | \$268771 |
| 04-ERD-021 | High-Strain-Rate Deformation of Nanocrystalline Metals | \$348698 |

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LLNL - L. Livermore National Lab

| Project ID | Project Name | FY Total |
|-------------------|--|-----------------|
| 04-ERD-022 | Designer Nanocellular Materials for Laser Targets | \$498906 |
| 04-ERD-023 | Short-Pulse Laser Absorption and Energy Partition at Relativistic Laser Intensities | \$447306 |
| 04-ERD-024 | XChem | \$257229 |
| 04-ERD-025 | Ultrafast Transient Recording Enhancements for Optical-Streak Cameras | \$508919 |
| 04-ERD-026 | Fission Fragment Sputtering | \$159676 |
| 04-ERD-027 | Magnetic Dynamos and Stars | \$237190 |
| 04-ERD-028 | The Creation of a Neutron Star Atmosphere | \$381894 |
| 04-ERD-030 | Electronic Polymerase Chain Reaction | \$153012 |
| 04-ERD-032 | New Generation X-Ray Optics: Focusing Hard X Rays | \$416328 |
| 04-ERD-033 | Nanosecond Ultrasonics to Study Phase Transitions in Solid and Liquid Systems at High Pressure and Temperature | \$427206 |
| 04-ERD-036 | Multiscale Characterization of Body-Centered-Cubic Crystals Deformed to Large Extents of Strain | \$399797 |
| 04-ERD-037 | Dynamic Data-Driven Event Reconstruction for Atmospheric Releases | \$872314 |
| 04-ERD-038 | Nonlinear Free-Electron Light Sources | \$400174 |
| 04-ERD-039 | Bioforensics: Attribution of Biological Weapons Agents by NanoSIMS | \$221028 |
| 04-ERD-040 | Developing New Tools for In-Vivo Generation and Screening of Cyclic Peptide Libraries | \$385744 |
| 04-ERD-042 | Modeling the Production of Beta-Delayed Gamma Rays for the Detection of Special Nuclear Materials | \$203731 |
| 04-ERD-043 | Nanomechanics: Strength and Structure for Nanotechnology | \$205580 |
| 04-ERD-046 | Coupling Micromechanics and Reactive Fluid Flow in Fracture Networks | \$171807 |
| 04-ERD-047 | Exfiltration Interdiction Algorithm Development | \$179705 |
| 04-ERD-048 | High-Average-Power, High-Energy, Short-Pulse Fiber Laser System | \$299641 |
| 04-ERD-051 | Advancing Climate and Carbon Simulation | \$393177 |
| 04-ERD-052 | A Coupled Computational and Experimental Approach to Determine Functions of Deeply Conserved "Anonymous" Human Genes | \$496744 |
| 04-ERD-053 | Metal-Containing Organic and Carbon Aerogels for Hydrogen Storage | \$149441 |
| 04-ERD-054 | Development and Application of a Predictive Computational Tool for Short-Pulse, High-Intensity Target Interactions | \$456248 |
| 04-ERD-057 | Surrogate Nuclear Reactions and the Origin of the Heavy Elements | \$269536 |

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LLNL - L. Livermore National Lab

| Project ID | Project Name | FY Total |
|-------------------|--|-----------------|
| 04-ERD-058 | Stellar Astrophysics and a Fundamental Description of Thermonuclear Reactions | \$224835 |
| 04-ERD-059 | High-Energy-Density Galaxy Jets | \$282970 |
| 04-ERD-060 | Carbon Sequestration and Transport in Natural Environments, the Role of Organic Carbon and Microbial Processes in the Ocean: Observations and Modeling | \$213194 |
| 04-ERD-064 | High-Brightness, Laser-Driven, X-Ray Source for Nanoscale Metrology and Femtosecond Dynamics | \$295135 |
| 04-ERD-065 | Creating the Core Conditions of Extrasolar and Solar Giant Planets in the Laboratory | \$271002 |
| 04-ERD-067 | Resolution Boosting for Wide-Field and Compact-Snapshot Spectrographs | \$93381 |
| 04-ERD-068 | Protein Classification Based on Analysis of Local Sequence-Structure Correspondence | \$319643 |
| 04-ERD-069 | Ionization Chemistry of High-Temperature Molecular Fluids | \$450155 |
| 04-ERD-070 | The Large Synoptic Survey Telescope and Foundations for Data Exploitation of Petabyte Data Sets | \$364385 |
| 04-ERD-071 | Ultrafast, In-Situ Probing of Shocked Solids at the Mesoscale and Beyond: A New Paradigm for Materials Dynamics | \$1059768 |
| 04-ERD-074 | Field Deployable DNA Analyzer | \$150001 |
| 04-ERD-075 | Hydrogen Absorption in Fluids: An Unexplored Solution for Onboard Hydrogen Storage | \$119773 |
| 04-ERD-076 | Molecular Radiation Biodosimetry | \$565727 |
| 04-ERD-079 | Interaction of Viruses with Membranes and Soil Materials | \$134992 |
| 04-ERD-080 | Quantifying Sea-Level Cosmogenic Neutron/Gamma Backgrounds and Their Effects on Large Volume Sea-Level Detectors | \$74635 |
| 04-ERD-082 | High Fidelity Fluid Mechanical Model for the Early Time Prediction of Atmospheric Contaminant Clouds From Nuclear Explosions | \$79952 |
| 04-ERD-083 | Development of Generalized Mapping Tools to Improve Implementation of Data-Driven Computer Simulations | \$111858 |
| 04-ERD-084 | Characterizing the Regulatory Genome: Transcription Factor Proteins and Gene Regulation Networks in Living Cells | \$492451 |
| 04-ERD-085 | Is the Island of Stability Centered at Z=114? | \$201659 |
| 04-ERD-086 | Electro-Thermal-Mechanical Simulation Capability | \$140953 |
| 04-ERD-088 | A New "Natural Neighbor" Meshless Method for Modeling Extreme Deformations and Failure | \$94720 |

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| Project ID | Project Name | FY Total |
|-------------------|--|-----------------|
| 04-ERD-089 | High Resolution Aerosol Modeling: Decadal Changes in Radiative Forcing | \$59873 |
| 04-ERD-091 | Contaminant Uptake and Demography of the Loggerhead Shrike (<i>Lanius Ludovicianus</i>) at the Lawrence Livermore National Laboratory Site 300 | \$62675 |
| 04-ERD-093 | An Integrated Laboratory for the Study of Interventional Device Dynamics | \$211900 |
| 04-ERD-095 | Internet Ballistics: Supplanting Source IP as the Sole Arbiter of Internet Attribution | \$77638 |
| 04-ERD-097 | Explosive Particle Imager for Standoff Detection | \$106328 |
| 04-ERD-099 | Volume Radoptic Detectors | \$100420 |
| 04-ERD-101 | Investigating the "Trojan Horse" of <i>Yersinia Pestis</i> Virulence | \$199382 |
| 04-ERD-102 | Petascale Simulation Initiative | \$948909 |
| 04-ERD-103 | De Novo Identification of Regulatory Regions in Intergenic Spaces of Prokaryotic Genomes | \$111901 |
| 04-ERD-104 | TOF-SIMS Measurement of Metabolites From Single Cells | \$89390 |
| 04-ERD-105 | NanoBIS Determination of the Unoccupied Electronic Structure of Pu | \$402314 |
| 04-ERD-106 | Mapping Phonons at High-Pressure: Phase Transformation, Phase Stability and Elastic Anisotropy | \$109257 |
| 04-ERD-107 | Nanomaterials for Radiation Detection | \$44180 |
| 04-ERD-108 | Nonequilibrium Phase Transitions | \$28516 |
| 04-ERI-004 | Mission to Very Early Earth | \$207649 |
| 04-ERI-009 | Calcium Dynamics in Human Bone | \$228119 |
| 04-ERI-013 | Iodine-129 Accelerator Mass Spectrometry for Earth Science, Biomedical, and National Security Applications | \$199390 |
| 04-ERI-014 | Carbon Flux in a California Grassland Soil Sequence: The Role of Dissolved Organic Carbon in Carbon Sequestration | \$181518 |
| 04-ERI-015 | Single-Cell Level Investigation of Cytoskeletal Response to External Stimuli | \$83426 |
| 04-FS-001 | Development of a High-Stiffness Hybrid Passive/Active Magnetic Bearing for Precision Engineering Applications | \$67889 |
| 04-FS-004 | Ion Mobility Spectrometry | \$60699 |
| 04-FS-006 | Ceramic Lasers | \$50932 |
| 04-FS-007 | A Bright Source of High-Energy X Rays | \$74199 |
| 04-FS-008 | Simulation of Biochemical Pathway Adaptability using Evolutionary Algorithms | \$69881 |

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| Project ID | Project Name | FY Total |
|-------------------|--|-----------------|
| 04-FS-009 | Development of a Chemoenzymatic-Like and Photoswitchable Method for the Ordered Attachment of Proteins to Surfaces | \$74955 |
| 04-FS-010 | Prototype Chip Fabrication for Electrochemical Pathogen Detection | \$74848 |
| 04-FS-011 | Laser Pulse Compression by Stimulated Raman Scattering in a Plasma | \$38240 |
| 04-FS-014 | Protein-Protein Interaction Mapping of the Human DNA Damage Response Pathway | \$70725 |
| 04-FS-015 | Rapid Generation of a Nanocrystal-Labeled Peptide Library for Specific Identification of the Bacterium Clostridium Botulinum | \$74834 |
| 04-FS-016 | Demonstration of Silicon Nanocrystalline Lasers and Amplifiers | \$42892 |
| 04-FS-017 | Detecting, Locating, and Characterizing Remote Power Sources | \$73832 |
| 04-FS-018 | Direct Probing of Protein-Protein Interactions | \$74712 |
| 04-FS-019 | The Innermost Inner Core: Fact Or Artifact? | \$50388 |
| 04-FS-020 | Small Sample Heat Capacity Under High Pressure | \$47592 |
| 04-FS-021 | Cell-Type-Specific Genome-Wide Expression Profiling After Laser Capture Microdissection of Living Tissue | \$72417 |
| 04-FS-023 | Feasibility of Space-Based Seismometry Utilizing a Satellite-Borne Real Aperture Radar | \$49036 |
| 04-FS-029 | Constraints on Strong Earthquake Ground Motion From Nuclear Explosion Data | \$36138 |
| 04-FS-031 | Geophysics Experiments on High-Powered Lasers | \$40645 |
| 04-FS-032 | Two-Phase Noble Liquid-Gas Detectors for Detection of Coherent Elastic Neutrino Scattering | \$45728 |
| 04-FS-034 | Microfluidic Liquid Cell for Molecular Imaging in Aqueous Phase Using Atomic Force Microscopy | \$41412 |
| 04-LW-008 | Biomechanics of Spinal Fracture | \$150298 |
| 04-LW-017 | Development of Insulating Liquids for Detecting and Imaging of Low-Energy Particles | \$138538 |
| 04-LW-020 | Relativistic Antimatter Plasmas Created by Ultra-Intense Lasers | \$175479 |
| 04-LW-031 | Generation and Advanced Diagnosis of Femtosecond, High-Brightness Electron Beams | \$156065 |
| 04-LW-036 | Fractality of Fracture Surfaces in Polycrystalline Materials | \$128548 |
| 04-LW-048 | Understanding the Mechanism of Human P450 CYP1A2 using Coupled Quantum-Classical Simulations in a Dynamical Environment | \$157386 |

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LLNL - L. Livermore National Lab

| Project ID | Project Name | FY Total |
|--------------------------------------|---|--|
| 04-LW-049 | Investigation of AAA+ Protein Machines That Participate in DNA Replication, Recombination, and Response to DNA Damage | \$177315 |
| 04-LW-054 | New-Shape Memory Polymers for Actuators | \$164032 |
| 04-LW-062 | Renewable Reflective Optics Based on Thermolelastic Effects: Concept and Design Equations | \$57966 |
| 04-LW-065 | Application of Light-Emitting Polymers to Detect Pathogen DNA in Blood | \$189579 |
| 04-LW-069 | A Single Molecule Study of the Movement of a DNA Sliding Clamp | \$189884 |
| 04-LW-077 | Constraints on the Nature of Terrestrial Core-Forming Melts: Ultrahigh-Pressure Transport Property Measurements and X-Ray Computed Tomography | \$173856 |
| 04-SI-003 | Kinetic Simulation of Boundary-Plasma Turbulent Transport | \$1021207 |
| Total # of Projects for LLNL: | 220 | Total Cost for LLNL: \$68985350 * |

*Does not include \$811,354 of administrative and related implementation costs.

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NTS - Nevada Test Site

| Project ID | Project Name | FY Total |
|-------------------|--|-----------------|
| H1701024 | Bessel Probe | \$18596 |
| H1701043 | Framing Tube Design & Fabrication | \$18821 |
| H1701044 | High Speed 8 Channel Micro Digitizer | \$133509 |
| H1701064 | Raman Velocimetry Diagnostic | \$14909 |
| H1701074 | Laser Multi pulsed X Ray Generator | \$163298 |
| H1701084 | Digital Streak Camera | \$140237 |
| H1701094 | XML for Instrumentation | \$125480 |
| H1701134 | Compact Modular Marx for a Portable Flash X Ray Source | \$29882 |
| H1701144 | 1 Gigasample Per Second Remote Digitizer | \$56810 |
| H1701154 | Development of a Multichannel Velocity Interferometer Optical Dome | \$54318 |
| H1701164 | Digital Framing Camera | \$111923 |
| H1702014 | 40mm Image Converter | \$186611 |
| H1702034 | Picosecond Avalanche Pulsers | \$107208 |
| H1702044 | Capacitive Divider | \$29491 |
| H1702073 | Low Energy X Ray Radiographic Sources | \$1118 |
| H1702104 | High-Power Pulser | \$96070 |
| H1702124 | Low Voltage High Speed Streak Tube | \$36644 |
| H1702134 | Streak Camera Micro controller system | \$193311 |
| H1702184 | Ultrahigh Speed Long Data Length Transient Recorder | \$68160 |
| H1703013 | Tailored Neutron Source | \$23946 |
| H1703014 | MARXT Test Stand | \$69687 |
| H1703033 | Particle Discriminating Activation Detector | \$29654 |
| H1703054 | Two Bank DPFA | \$367074 |
| H1703064 | Associated particle neutron calibration facility | \$117145 |
| H1703094 | High Volume Anode (Optimized Geometry HOT tube) | \$87719 |
| H1703104 | High Output Tube | \$132269 |
| H1703114 | Sum Peak Counting of Short Lived Activation Product | \$50661 |
| H1703124 | ZnS Based Neutron Spectrometer | \$81918 |
| H1703134 | Compact Fabry Perot Development | \$196831 |

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NTS - Nevada Test Site

| Project ID | Project Name | FY Total |
|-------------------|---|-----------------|
| H1704014 | Study of LaBr3 as a high resolution room temperature spectroscopy | \$51710 |
| H1704023 | Real Time Photogrammatic Map | \$20341 |
| H1704114 | Evaluation of Region of Interest Based Search using an HPGe Detector | \$13469 |
| H1704194 | Temperature Measurement of Thermal Hot Spots Using SWIR Channels | \$46982 |
| H1704203 | Li6(Ce) Glass Fiber Detectors | \$7757 |
| H1704214 | Micro-machine distributed detectors | \$77738 |
| H1704234 | Micro Portal Radiation Monitor | \$46126 |
| H1704244 | MCNP Phantom Library | \$82694 |
| H1704264 | Application of Direction Detection Techniques to Generic Detectors | \$28733 |
| H1704304 | Dual Temperature Emissivity Study | \$3705 |
| H1704353 | RF Detection of High Explosive Materials | \$22703 |
| H1704374 | Portable long standoff antenna for communications and detection system applications | \$77301 |
| H1704414 | Micro machine distributed detectors | \$54625 |
| H1704454 | Design parameter Optimization of a 2D Gamma neutron Detector | \$29763 |
| H1704504 | LiDAR Experiment for City Models | \$113771 |
| H1704514 | One Path Photogrammetric Program for a Digital Frame Camera | \$143922 |
| H1704554 | Large Area Neutron Detector | \$76179 |
| H1704584 | An Investigation of Data Compression and Satellite Transmission Techniques for Aerial Measurement | \$85592 |
| H1705014 | Micro machine distributed detectors | \$168009 |
| H1705024 | Optical Diagnostics for Phase Changes in Metals | \$132090 |
| H1705034 | Covariance Mapping | \$8023 |
| H1705044 | Compact Penning Mass Spectrometer | \$73540 |
| H1705064 | Solid State Ultraviolet Laser Diode | \$86100 |
| H1705074 | Holographic visualization of dynamic processes | \$81363 |
| H1705154 | Fast GC Chemical Biological (CB) Evaluations | \$80837 |
| H1705184 | Lithium Niobate Terahertz Generator | \$253636 |
| H1705234 | Ultra Low Power High Voltage Power Supply | \$105805 |
| H1705254 | Flexible Short range Communications Network | \$62460 |

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| NTS - Nevada Test Site | | | |
|-------------------------------------|--|----------------------------|--------------------|
| Project ID | Project Name | | FY Total |
| H1705264 | Bone Dry | | \$87623 |
| H1705273 | Handheld direct Thermal Imager | | \$29700 |
| H1705284 | Pulsed Nd YAG Ring Laser | | \$62866 |
| H1705294 | Fourier Transform IR Improvements | | \$39615 |
| H1705304 | Cathodoluminescence and SEM EDS Analysis of Fissionable Dust Particles for Nuclear Nonproliferation and Environmental Assessment | | \$67859 |
| Total # of Projects for NTS: | 62 | Total Cost for NTS: | \$5065937 * |

*Does not include \$413,270 of administrative and related implementation costs.

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ORNL - Oak Ridge National Lab

| Project ID | Project Name | FY Total |
|-------------------|--|-----------------|
| 3210-2057 | Nanoelectronic Devices Made from Doped Nanofibers | \$14926 |
| 3210-2065 | Novel Platinum Support for Proton-Exchange-Membrane Fuel-Cell Cathode and Anode Active Layer | \$29632 |
| 3210-2067 | Nanocrystalline Giant Magnetostrictive Materials for Microactuator Applications | \$59952 |
| 3210-2069 | Development of a New High-Temperature Proton-Electron Mixed Conductor for Hydrogen Separation | \$18851 |
| 3210-2074 | Selective Area Chemical Vapor Deposition of Carbon Nanotube Films Using Seeded Molecular Beams | \$59989 |
| 3210-2076 | Permeable Environmental Leaching Capsules for Nondestructive In Situ Evaluation of Contaminant-Immobilization Techniques in Soil | \$38994 |
| 3210-2077 | High-Tc Silicon-Compatible Ferromagnetic Semiconductors | \$32051 |
| 3210-2078 | Development of Readout Electronics Architecture for a Silicon-Strip Vertex Detector Upgrade to the PHENIX Experiment | \$31987 |
| 3210-2079 | Controlling Size and Function of Metal Oxide Nanoparticles: Coupling Micellar Nanoreactor Synthesis and Hydrothermal Processing | \$41446 |
| 3210-2081 | An Innovative Technique for Bimaterial Interface Toughness Research | \$79682 |
| 3210-2083 | Nanoporous Inorganic Membranes for High Selectivity Hydrogen Separations | \$34385 |
| 3210-2084 | High-Aspect-Ratio Carbon Nanofiber Probes for Scanning Probe Microscopy | \$59562 |
| 3210-2085 | Construction of a Gene-Prediction Algorithm in Populus: Adding a New Dimension to Complex Biology | \$58873 |
| 3210-2087 | In Situ Studies of Hydrogen Storage Materials Using Neutron Scattering | \$98451 |
| 3210-2088 | Toward Neutron Star Merger Simulations: Gravitational Waves, Heavy Element Nucleosynthesis, and Gamma-Ray Bursts | \$74196 |
| 3210-2091 | Development of a Three-Dimensional Radioisotope Depletion Method Using Monte Carlo Transport | \$62895 |
| 3210-2092 | Zero-Loss Fiber Optic Splitter | \$69954 |
| 3210-2093 | Alanates for High-Capacity Hydrogen Storage | \$90141 |
| 3210-2094 | The Global Optimization Problem for Remote Sensing: A Guaranteed Efficient Solution | \$95000 |
| 3210-2095 | High-Speed Decay Lifetime Analysis Using Field-Programmable Gate Arrays | \$2132 |
| 3210-2096 | Sounds of Rapids as an Attractant for Migratory Fish | \$60239 |
| 3210-2099 | High Effective Hydrogen Storage Density | \$112244 |

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| Project ID | Project Name | FY Total |
|-------------------|---|-----------------|
| 3210-2100 | Metallic Nanofuels for Vehicles | \$52458 |
| 3210-2101 | Enhancing Storage of Hydrogen-Storage Materials Through Nanoscale Design | \$40517 |
| 3210-2102 | Development of a Novel Method for Rapid Cellular Material Extraction and Separation in Air | \$88635 |
| 3210-2103 | Advanced Diagnostics Algorithm for Cancer Detection Using Hyperspectral Fluorescence Imaging | \$84750 |
| 3210-2104 | Development of Novel Technology to Synchronize Pulsed, Broad-Area, Semiconductor Lasers | \$124993 |
| 3210-2105 | A Short Cut to Making Mouse Models for Stressor Resistance for Application to Longevity (Aging) and Other Exposure-Biology Research | \$74949 |
| 3210-2106 | Development of a Preamplifier for an Imaging Gamma-Ray Detector | \$64599 |
| 3210-2107 | Selectively Enhanced Adatom Diffusion | \$66929 |
| 3210-2108 | Biocatalytic Desaturation and Oxidation: A Technology with Multiple Applications | \$72971 |
| 3210-2109 | Environmental Isotope Forensics of Perchlorate Contamination | \$109928 |
| 3210-2110 | Superionic Electrolyte-Based Fuel Cell Concept for Portable Multifuel Power Sources | \$124743 |
| 3210-2111 | Super-Hydrophobic Nanopost Glass | \$164744 |
| 3210-2112 | Hydrogen Production from Naturally Occurring Iron Silicates | \$80043 |
| 3210-2113 | Cyclopentadienyl Iron Clusters as Nanoscale Building Blocks for Multi-Electron Electrocatalysis | \$87946 |
| 3210-2114 | Development of a Position-Sensitive Neutron Detector for Use at the High Flux Source Facilities: SNS and HFIR | \$71855 |
| 3210-2115 | Development of the "Ultimate" Scanning Tunneling Microscope for the Center for Nanophase Materials Science | \$82977 |
| 3210-2116 | Real Space Imaging of High Frequency Transport on the Nanoscale | \$67857 |
| 3210-2117 | Novel, Tunable, Ultrafast, Nonlinear Optical Switching | \$49890 |
| 3210-2118 | Development of a High-Throughput, Laser-Based Technique for Quantifying the Elemental Composition of Wood: Applications in the Forest Products Industry | \$42268 |
| 3210-2119 | Optically Manipulated Microelectronics Artificial Retina | \$49918 |
| 3210-2120 | Mesosopic Fluidic-Based Actuators | \$93898 |
| 3210-2121 | Creation of Switchable Photosystem II Designer Alga for Hydrogen Production | \$22413 |

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| Project ID | Project Name | FY Total |
|-------------------|---|-----------------|
| 3210-2122 | Development of a Multimode and Multispectral Automated Mueller Matrix Polarization Imaging System of Noninvasive Detection and Diagnosis of Skin Cancer | \$62554 |
| 3210-2123 | Design and Synthesis of Oriented Guest-Host Nanostructures for Enhanced Membrane Performance | \$48470 |
| 3210-2124 | A Hybrid Solid-State Process for Joining High-Temperature Materials | \$49927 |
| 3210-2125 | Alkali Silicate and Related Glasses and Novel Hydrogen Storage Materials | \$59809 |
| 3210-2126 | Development of an Innovative Triboluminescence Approach for Low- and Hypervelocity Impact Damage Sensing | \$19777 |
| 3210-2127 | An Energy Efficient Method for Semi-Solid Material Processing | \$65772 |
| 3210-2128 | Using Live-Cell Imaging Technologies to Probe Molecular Interactions Between Bacterial Cells and Heavy Metals | \$20362 |
| 3210-2129 | Development of a Rich-Air/Fuel-Ratio Sensor Correction System | \$19623 |
| 3210-2130 | An Image-Based Method for Screening and Diagnosis of Blinding Eye Disease | \$37953 |
| 3210-2131 | Direct Band Gap Semiconductors on Silicon for Solid State Lighting: Silicon-Based, Blue-Light Emitting Diodes | \$79096 |
| 3210-2132 | Biaxial Flexure Tests of Multilayers | \$19814 |
| 3210-2133 | Development of New Nanoparticle-Strengthened Ferritic and Martensitic Steels by Thermomechanical Treatment | \$17568 |
| 3210-2134 | Minimum Required Migration Distances--A New Tool for Estimating Climate Change Impacts | \$19962 |
| 3210-2135 | Novel Technologies for Wide-Scale Production of Magnesium and Hydrogen | \$60125 |
| 3210-2136 | Measurement of Species Distributions in Operating Fuel Cells | \$19972 |
| 3211-2035 | Enhanced Performance and Energy Savings Through Ultrahigh Magnetic Field Processing of Ferromagnetic Materials | \$99946 |
| 3211-2045 | Detector Development for Fundamental Neutron Physics at the Spallation Neutron Source | \$236323 |
| 3211-2046 | Three-Dimensional Neutron Structural Microscopy: Design and Demonstration | \$14848 |
| 3211-2057 | Neutron-Rich Radioactive Ion Beam Production with High-Power Electron Beams | \$139639 |
| 3211-2058 | Scaling Climate Models for Future Computer Architectures | \$318618 |
| 3211-2059 | Advanced Computational Methods | \$325756 |
| 3211-2060 | Genomic Characterization of Belowground Ecosystem Responses to Climate Change | \$293771 |

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| Project ID | Project Name | FY Total |
|-------------------|--|-----------------|
| 3211-2061 | Self-Organizing Polymers as Biomaterials | \$236305 |
| 3211-2062 | Materials Science of Nanostructured Carbons and Graphites | \$243097 |
| 3211-2063 | Aberration-Corrected, Ultrahigh-Resolution Electron Microscopy for Atomic-Level Characterization of the Structure and Chemistry of Nanophase Materials | \$239560 |
| 3211-2064 | Biologically Driven Controlled Synthesis and Directed Assembly of Nanophase Inorganic Materials | \$273719 |
| 3211-2065 | Creating New Climate Drivers and Interactions in Global Climate Models | \$300305 |
| 3211-2066 | Biomolecular "Locks and Keys:" High-Performance Computing for Investigation of Recognition Principles in the Complexes of Biological Macromolecules | \$228736 |
| 3211-2067 | Toward Common Components for Computational Nanoscience | \$249972 |
| 3211-2068 | Comprehensive Molecular Probing of Live Biological Cells | \$149999 |
| 3211-2070 | Zero-Net Power, Low-Cost Sensor Platform | \$260555 |
| 3211-2071 | Intelligent Consequence Management for Energy Assurance | \$204962 |
| 3211-2072 | Breakthrough Multi-Megawatt Space Reactor Power System Design | \$294305 |
| 3211-2073 | Distributed Intrusion Detection and Attack Containment for Organizational Cyber Security | \$219575 |
| 3211-2074 | Image to Intelligence Archive: Intelligent Agent-Based, Large-Scale, Spatial-Data Management and Analysis | \$306440 |
| 3211-2075 | Advanced Ion Trap Mass Spectrometry for the Rapid and Confident Identification of Biological Agents | \$300988 |
| 3211-2076 | NEUTROMEGAS: A Pixel Detector for Neutron Imaging | \$239604 |
| 3211-2077 | Nanoscale Control of Collective Phenomena Using Artificially Structured Materials | \$44934 |
| 3211-2079 | Materials Needs for Successful Implementation of Lean NOX Treatment Technology | \$149858 |
| 3211-2080 | Production of Hydrogen Using Nuclear Energy and Inorganic Membranes | \$249981 |
| 3211-2081 | Probing Explosive Nucleosynthesis Through Measurements at the Holifield Radioactive Ion Beam Facility | \$147536 |
| 3211-2082 | Nano/Micro Systems for Advanced Neuronal Interfacing | \$199848 |
| 3211-2083 | Nanorods for Energy and Photonics | \$218651 |
| 3211-2084 | A Revolutionary Infrared Nanoscale Processing Approach | \$191393 |

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ORNL - Oak Ridge National Lab

| Project ID | Project Name | FY Total |
|-------------------|---|-----------------|
| 3211-2085 | Artificial Cellular Receptors: Interfacing Nanostructured Hard and Soft Materials | \$263376 |
| 3211-2086 | Profiling Spin Injection at the Atomic Scale | \$229918 |
| 3211-2087 | Comprehensive Fusion Simulation: Component-Based Software Engineering and Evolutionary Time Advancement | \$369704 |
| 3211-2088 | Bringing Statistical Visualization to the Terascale and Beyond: Visual Analysis in Full Context | \$249595 |
| 3211-2089 | Nanochemistry: The Bridge from Materials to Biological Sciences | \$250052 |
| 3211-2090 | Characterizing the Complex Metaproteomes of Microbial Communities | \$147745 |
| 3211-2091 | Comprehensive Analysis of Microbial Proteomes Using Signature Peptides | \$174899 |
| 3211-2092 | Building ORNL's Capabilities for Genome-Scale Quantitative Measurements of Protein Complexes | \$193637 |
| 3211-2093 | Exploring New Methodologies in Detecting Low Abundance Protein Complexes | \$240637 |
| 3211-2094 | Flameless Combustion Engines in the Transition to Hydrogen | \$226808 |
| 3211-2095 | Assuring the Communications Infrastructure for the Electric Grid of the Future | \$247193 |
| 3211-2096 | Boron-Nitrogen Polymers/Boron Nitride System For Hydrogen Storage | \$59335 |
| 3211-2097 | Advanced Processes for Nuclear Fuel Microspheres | \$258449 |
| 3211-2098 | Genetic Variability in Host Responses to Bioterror Agents | \$238113 |
| 3211-2099 | Complex Oxides with Frustrated Orbital Ordering | \$199850 |
| 3211-2100 | H- Laser Stripping Proof-of-Principle Experiment for the Spallation Neutron Source Power Upgrade Proposal | \$307049 |
| 3211-2101 | Development of In-Situ Neutron Diffraction Capabilities for Studies of Deformation and Fracture Behavior under Hydrogen-Rich Environments | \$198708 |
| 3211-2102 | Quantum Circuit Modeling for Nanoelectronics | \$197650 |
| 3211-2103 | High-Throughput Biological Data Analysis and Modeling Tools for Genomes to Life Facilities | \$175042 |
| 3211-2104 | Cross-Cutting Data and Tools Infrastructure for Genomes to Life Facilities | \$197438 |
| 3211-2105 | Exploratory Computational Biology for Genomes to Life Facility III | \$199922 |
| 3211-2106 | Characterization of Spin Structure and Spin Dynamics of Nanostructure Assemblies Using In-Field Scanning Electron Microscopy with Polarization Analysis | \$11998 |
| 3211-2109 | Information Analysis and Fusion for Threat-Vulnerability Analysis | \$100000 |
| 3211-2110 | Advanced Plasmonic Sensor Array for Homeland Security | \$99587 |

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ORNL - Oak Ridge National Lab

| Project ID | Project Name | FY Total |
|--------------------------------------|---|---|
| 3211-2111 | A Neutron Science Portal Infrastructure to Facilitate Remote Access to Spallation Neutron Source Data and Computation | \$199971 |
| 3211-2112 | Photonic Bandgap Crystal Sensor | \$71745 |
| 3211-2113 | Redefining ORNL's Suite of Protein Analysis Technologies by Adding Flexibility, Analytical Capacity, and Biological Utility | \$52497 |
| 3211-2114 | Research and Development for Neutron Structural Biology and Soft-Matter Science | \$146384 |
| Total # of Projects for ORNL: | 116 | Total Cost for ORNL: \$15232173* |

*Does not include \$86,295 of administrative and related implementation costs.

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PNNL - Pacific Northwest National Lab

| Project ID | Project Name | FY Total |
|-------------------|--|-----------------|
| PN02001/1589 | A Protein Functional Analysis Platform for Information Integration | \$149681 |
| PN02002/1590 | Actinide Coordination Chemistry for Advanced Separations Technology | \$81678 |
| PN02004/1592 | Advanced Meteorological Modeling for Applied Dispersion Models | \$29998 |
| PN02005/1593 | Advanced Simulation Software for Subsurface Science | \$240412 |
| PN02013/1601 | Characterization of Shewanella oneidensis MR-1 Genes Involved in Environmental and Cell-Cell Sensing | \$270452 |
| PN02015/1603 | Computational Cell Environment | \$271827 |
| PN02016/1604 | Design and Simulation of the Future Integrated Energy System | \$200763 |
| PN02021/1609 | Development of Damage and Optimization Tools for the Design of Short-Fiber Thermoplastic Hybrid Composite Structures | \$225578 |
| PN02022/1610 | Development of Data Mining Capabilities for Proteome-Wide Analyses | \$180052 |
| PN02033/1621 | Filamentous Fungal Genetics | \$198864 |
| PN02035/1623 | Disposal of CO2 in Sedimentary Formations | \$186815 |
| PN02039/1627 | Kinetic Simulations and Network Analysis: The EGF Receptor Signaling Network | \$138049 |
| PN02044/1632 | Nondestructive Characterization of Life-Limiting Degradation of Nuclear Power Plants | \$53758 |
| PN02051/1639 | Proteomics of Morphology Determination in a Fungus | \$27790 |
| PN02053/1641 | Quantum Calculations for Systems With 104-105 Atoms: Application to Nano-Materials and Biochemical Reactivity | \$118910 |
| PN02062/1650 | Simulation Methodology Development for an Energy Transmission and Distribution System | \$47887 |
| PN02063/1651 | Single Chain Monoclonal Antibodies (scFv): A Versatile Source of Antigen Specific Reagents | \$199734 |
| PN02064/1652 | Single-Molecule Approach for Understanding EGF Receptor Interactions | \$253419 |
| PN02069/1657 | Synthesis Techniques and Characterization of Nanostructured Organic-Inorganic Hybrid Systems | \$188842 |
| PN02075/1663 | Yttrium-90 Fibrin Composites for Treating Minimum Residual Disease | \$70283 |
| PN03002/1665 | A Scalable Architecture for Content-Based Information Discovery | \$119927 |
| PN03003/1666 | Adaptive Data Integration Middleware for Dynamic Information Discovery | \$129380 |

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PNNL - Pacific Northwest National Lab

| Project ID | Project Name | FY Total |
|-------------------|---|-----------------|
| PN03004/1667 | Advanced Information Analysis and Processing | \$129335 |
| PN03005/1668 | Advanced Radiochemical Analyses | \$165091 |
| PN03007/1670 | Affinity Reagents for Surface Functionalization | \$91208 |
| PN03012/1675 | Brazing Techniques for Dense High Fired Alumina Ceramics | \$49746 |
| PN03014/1677 | Climate-Change Chemistry of Atmospheric Particles | \$79957 |
| PN03015/1678 | Communications Analysis | \$46397 |
| PN03017/1680 | Concept-Based Document Analysis: Human-Centered Information Discovery | \$102847 |
| PN03018/1681 | Cooperative Multi-Agent System for Data Mining and Fusion | \$109980 |
| PN03019/1682 | Data Anomaly and Signature Detection with Associated Data Utility Development | \$74388 |
| PN03020/1683 | DC-STREAMS: Detecting Change in Continuous, Time-Varying Data Streams | \$49999 |
| PN03021/1684 | Detection of Chemical Signatures in Rivers and Coastal Environments Using Bivalves | \$108159 |
| PN03024/1687 | Development of a Salmonid Based DNA Microarray for Toxicological Testing of Environmental Contaminants | \$145026 |
| PN03026/1689 | DNA Microarrays for Monitoring Chemically-Induced Stress in <i>Chironomus tentans</i> | \$67806 |
| PN03028/1691 | Electrode Structures for High Pressure Xenon Detectors | \$65811 |
| PN03029/1692 | Electronic Structure of Organic Light Emitting Diode Materials | \$89815 |
| PN03030/1693 | Elucidating Cell Signaling Networks in <i>Shewanella Oneidensis</i> MR-1 | \$170448 |
| PN03034/1697 | Framework for Climate Modeling Using Superparameterization Techniques | \$242834 |
| PN03037/1700 | Heuristic Entity Relationship Building Environment | \$242876 |
| PN03039/1702 | Highly Selective Monolayer Sorbents for Advanced Analytical Applications | \$218897 |
| PN03040/1703 | High-Speed Three-Dimensional Visualization of Intercellular and Intracellular Signal Transduction in Complex Cell Structures | \$268489 |
| PN03042/1705 | Hydrogen Storage Concepts | \$98300 |
| PN03043/1706 | Identification and Analysis of Hidden Multi-Relational Links | \$49232 |
| PN03044/1707 | Implementation of Parallel Solver in Coupled Fluid, Energy, and Solute Transport Computer Code (CFEST) | \$46690 |
| PN03045/1708 | Imprinted Media for Highly Selective Separation of Explosives, Chemical Warfare Agents and Biological Warfare Surrogate Organisms | \$139120 |

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| Project ID | Project Name | FY Total |
|-------------------|---|-----------------|
| PN03046/1709 | In Situ Magnetic Resonance Investigations of Metabolism and Mass Transport in Biofilms | \$201968 |
| PN03047/1710 | In Situ Spatial Analysis of Expression in Bioreactor Granule Microbial Communities | \$154073 |
| PN03048/1711 | Influence of Gd and Sm Doping on Atomic and Ionic Transport Properties of Novel Nanostructured Ceria-Zirconia Multilayers | \$185889 |
| PN03049/1712 | Influence of Surface Thermodynamic Properties on Bacterial Transport in Variably Saturated Porous Media | \$26026 |
| PN03052/1715 | Knowledge Signatures for Integrated Information Management | \$188408 |
| PN03053/1716 | Life-Limiting Degradation Mechanisms in Current Light-Water and Advanced Concept Reactors | \$54985 |
| PN03055/1718 | Modeling Power Systems as Complex Adaptive Systems | \$200720 |
| PN03056/1719 | Multilayer Thin Film Separation Membranes | \$20020 |
| PN03057/1720 | Multiple Sensor Data Integration and Decision Analysis - Chemical Signature Detection | \$73741 |
| PN03058/1721 | Multiple Sensor Data Integration and Decision Analysis -- Nuclear Signature Detection | \$42045 |
| PN03060/1723 | Neutron Scattering to Determine Biomolecular Conformations on Biosensor Surfaces | \$48321 |
| PN03063/1726 | New Thin-Film Electroactive Materials for Enhanced Separations | \$70948 |
| PN03067/1730 | Novel Near-Infrared Laser Absorption Spectrometer Development | \$105548 |
| PN03068/1731 | On-line Measurement of Particulate Organics in Diesel Exhaust by Chemical Ionization Mass Spectrometry | \$89792 |
| PN03070/1733 | Organic Synthesis Using Plasma-Facilitated Catalysis | \$85102 |
| PN03073/1736 | Peptide Permutation and Protein Prediction | \$234615 |
| PN03075/1738 | Preconcentration of Organic Signatures Based on Carbon Nanotube Composites | \$185141 |
| PN03078/1741 | Real-Time Detection and Multidimensional Characterization of Single Air-Borne Microorganisms | \$105915 |
| PN03079/1742 | Regenerable Sorbents for Carbon Dioxide Capture Based on Functionalized Nanomaterials | \$208438 |
| PN03081/1744 | Scenario and Knowledge Framework for Analytical Modeling | \$255644 |

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| Project ID | Project Name | FY Total |
|-------------------|--|-----------------|
| PN03082/1745 | Sensor and Tracer Technology for Characterization of Ultra-Low CO2 Leakage Fluxes and Pathways | \$124957 |
| PN03083/1746 | Single Enzyme Nanoparticles on Nanostructured Matrices | \$240076 |
| PN03085/1748 | Sonoluminescence Following Acoustically Driven Bubble Collapse | \$123715 |
| PN03086/1749 | Stress-Activated Control Mechanisms Underlying Signal Transduction Networks | \$390346 |
| PN03088/1751 | Supercritical Fluid Extraction of Bacterial Spores and Analysis for Specific Biomarkers | \$91154 |
| PN03089/1752 | Surface Functionalization for Biorecognition | \$89687 |
| PN03090/1753 | Synthesis and Characterization of Novel Nanoporous Transition Metal Phosphates with Inherently High Anion Adsorption Properties | \$50949 |
| PN03092/1755 | Transcriptional Profiling of Microbial Syntrophic Systems | \$334795 |
| PN03095/1758 | Using High Frequency Pulsed Ultrasound at Sub-Cavitation Conditions as a Mechanism to Enhance Energy Efficiency and Selectivity in Heterogeneous Catalytic Chemistry | \$65975 |
| PN03096/1759 | Validation of scFv Antibodies for Identification of Protein Complexes | \$125660 |
| PN04001/1760 | A Toxicogenomic Approach for Quantitative Structural Activity Relationship Modeling. | \$27000 |
| PN04002/1761 | Active Disk For Proteomics | \$50002 |
| PN04003/1762 | Advanced Materials for Preconcentration and Sensing | \$122029 |
| PN04004/1763 | Aftertreatment Systems Effectiveness | \$94948 |
| PN04005/1764 | Aquatic Multisensor Measurement | \$199482 |
| PN04006/1765 | Array Technology for Quantification of Proteins | \$160755 |
| PN04007/1766 | Atomistic Modeling of Defects and Transport Processes in Oxides | \$69129 |
| PN04008/1767 | Background Characterization and Sensitivity Analysis for Detection of Threats to Marine and Freshwater Environments | \$79777 |
| PN04009/1768 | Biological Data Fusion and Visualization | \$138897 |
| PN04010/1769 | Biological Markers in Nasal Secretion: An Application of Proteomics for Human Health Risk Assessment | \$49924 |
| PN04011/1770 | Building-Wake Feasibility Study | \$14692 |
| PN04012/1771 | Chalcogenide Nanowire Synthesis, Mechanisms, and Applications | \$49990 |

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PNNL - Pacific Northwest National Lab

| Project ID | Project Name | FY Total |
|-------------------|--|-----------------|
| PN04013/1772 | Chemically and Mechanically Stable Bipolar Membranes for Electrodialytic Desalination | \$22994 |
| PN04014/1773 | Chemostat Research Using Filamentous Fungi | \$174976 |
| PN04015/1774 | Class-Based Atmospheric States Mapping | \$24945 |
| PN04016/1775 | Community Data Sharing and Collaboratories for Biological Sciences | \$74630 |
| PN04017/1776 | Complex Adaptive Transactive Systems: Design and Operation | \$90327 |
| PN04018/1777 | Concurrent Single-Program-Multiple-Data (SPMD) Tasking in Global Arrays and its Application to Electronic Structure Calculations on Systems with Thousands of Processors | \$223642 |
| PN04019/1778 | Conversion of Grain Lipid Components to Chemicals | \$45992 |
| PN04020/1779 | Coupled Proton-Electron Dynamics in Iron Containing Phyllosilicates: An Experimental and Theoretical Investigation Using Neutron Scattering | \$89873 |
| PN04022/1781 | Decontamination of Building Material Using Complexant-Modified Strippable Paint | \$49832 |
| PN04023/1782 | Design and Demonstration of Integrated Biologically Based Risk Modeling Framework | \$124970 |
| PN04024/1783 | Development of a Novel Approach for Imaging Inhaled Particulates | \$113506 |
| PN04025/1784 | Development of High-Throughput Global Metabolomics Approaches Based on Mass Spectrometry | \$160067 |
| PN04026/1785 | Development of Spatially Resolved Proton Transfer Reaction-Mass Spectrometry for Characterization of Hydrocarbon Distributions in Monolithic Catalysts and Microreactors | \$69999 |
| PN04027/1786 | Ecological Sensors Using Enzymes Immobilized in Functionalized Nanoporous Silica Chips | \$81691 |
| PN04028/1787 | Electronically Excited States in Amorphous Solid Water | \$94975 |
| PN04029/1788 | Establishing a Direct Link between Aerosol Chemical Properties and Clear Sky Aerosol Radiative Forcing | \$74081 |
| PN04030/1789 | Evaluation of Engineered Vadose Zone Bioremediation vs. Natural Attenuation | \$50015 |
| PN04031/1790 | Fast, Two-Dimensional Gas-Phase Separations for Ultrahigh-Throughput Global Analyses | \$99959 |
| PN04032/1791 | Identification of Particles by Surface-Enhanced Raman Scattering Spectroscopy | \$23047 |
| PN04033/1792 | Information Fusion for Structured Guided Analyses | \$281753 |
| PN04034/1793 | Integrated Data Structures for Mapping Cellular Networks | \$356613 |

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| Project ID | Project Name | FY Total |
|-------------------|---|-----------------|
| PN04035/1794 | Integrated Demonstrations of Threat Detection and Early Warning Systems | \$328329 |
| PN04036/1795 | Integrated Multimedia Modeling | \$47317 |
| PN04037/1796 | Kinetics of Carbonate Mineralization Using In Situ X-Ray Diffraction | \$44949 |
| PN04038/1797 | Knowledge Management for Intelligence Analysis | \$56827 |
| PN04039/1798 | Maritime Microlayer Sampler: Radionuclide Identification and Quantification | \$73627 |
| PN04040/1799 | Mechanisms of Regulated Ligand Shedding | \$218357 |
| PN04041/1800 | Medium Curie Saltcake-Fractional Crystallization with Displacement Washing for Hanford Tank Waste Supplemental Pretreatment | \$46832 |
| PN04042/1801 | Microcantilever-Based Sensing | \$97289 |
| PN04043/1802 | Modeling Indirect Aerosol Effect on Cloud Scale | \$65042 |
| PN04044/1803 | Nanoparticle-Enhanced Pathogen Detection | \$68540 |
| PN04045/1804 | Nanophase Materials and Catalysts for Hydrogen Storage | \$259497 |
| PN04046/1805 | Natural Fiber Surface Modification | \$34803 |
| PN04047/1806 | Network Inference Testbed | \$100522 |
| PN04048/1807 | Next-Generation Chemistry-Aerosol-Meteorology Model for Addressing Climate Change and Air Quality Interactions | \$249827 |
| PN04049/1808 | Novel Structured Monolith Reactors for Gas-Liquid-Solid Reactions | \$35069 |
| PN04050/1809 | On-Demand Neutron Source | \$14469 |
| PN04051/1810 | Projection Methods for Multiscale Modeling of Materials | \$45323 |
| PN04052/1811 | Protein Cross-Linking in Solid State Designated for Identification and Characterization of Intact Protein Complexes | \$144972 |
| PN04053/1812 | Proteome and Bioenergetic Analysis of Growth States in a Syntrophic Co-Culture | \$265347 |
| PN04054/1813 | Proteomics of Filamentous Fungi | \$184802 |
| PN04055/1814 | Proteomics of Membrane Protein Complexes: Relating Calcium Signaling and Oxidative Stress | \$196373 |
| PN04056/1815 | Quantifying Uncertainty in Complex Scientific Simulations Using Iterative, Adaptive Response Modeling (Beyond Monte Carlo) | \$251454 |
| PN04057/1816 | Research into the Causes of Independent Component Analysis Selectivity | \$90428 |

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PNNL - Pacific Northwest National Lab

| Project ID | Project Name | FY Total |
|--------------------------------------|---|--|
| PN04058/1817 | Saliva as a Non-Invasive Biomonitoring Matrix for Determination of Exposure to Chemical and Biological Agents | \$118784 |
| PN04059/1818 | Selective Inhibition of Gene Function in Cells | \$156282 |
| PN04060/1819 | Small Metabolite Imaging | \$131442 |
| PN04061/1820 | Spatial and Temporal Characterizations of Single-Enzyme Catalysis Under Nanoscale Confinements | \$219669 |
| PN04062/1821 | Statistically Rigorous Quality Control for Proteome Analysis | \$139386 |
| PN04063/1822 | Stimulus Controlled Catalysis | \$99989 |
| PN04064/1823 | Structural Characterization of Molecular Machines | \$79644 |
| PN04065/1824 | Synchrotron X-ray Spectroscopy of Novel Organic Diphosphine Light-Emitting Materials | \$79932 |
| PN04066/1825 | Synthesis and Characterization of Novel Oxides for Spintronics and Catalysis | \$114821 |
| PN04067/1826 | Template Synthesis of Highly Nanocrystalline SiC with High Surface Area | \$89735 |
| PN04068/1827 | Toxicoproteomics-Based Core Analytic Capability for Chemical Toxicology and Environmental Sentinel Studies | \$200922 |
| PN04069/1828 | Transmodulation of Cell Responses in Epithelial Cells | \$146578 |
| Total # of Projects for PNNL: | 144 | Total Cost for PNNL: \$18292894 |

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PTX - Pantex Plant

| Project ID | Project Name | FY Total |
|-------------------------------------|---|---------------------------------------|
| PX01001 | Proximity Tracking Capability | \$1 |
| PX01009 | Circuitry Analysis to Produce Work Area Voltage Profiles Generated by Lightning Flashes | \$29000 |
| PX01015 | Explosive Synthesis & Formulation Process Optimization by Computer Modeling | \$91509 |
| PX02003 | Establish a Computational Capability at Pantex for Modeling Organic Compounds for Stockpile High Explosives and Design Agency Research Explosives | \$12614 |
| PX02011 | 3D Acoustical Resonance System | \$36241 |
| PX02015 | Development and Implementation of an Enhanced Chemical Reactivity Test | \$40497 |
| PX02016 | Application of Chemical Force Microscopy to Determine the Strength of Bonds between High Explosives and Binders | \$93424 |
| PX02020 | Non Contact Measurement and Infrared Temperature Imaging of Explosives | \$55578 |
| PX03001 | High-Precision Non-Contact White Light Digitizing Sensor | \$387583 |
| PX03002 | Enhanced Analysis Capability Supporting Accelerated Aging Studies | \$127557 |
| PX03004 | Formation and Detection of Pores in Polymeric Materials | \$230069 |
| PX03005 | Establishment of a High Explosive Explosives Powder Pattern Library | \$65073 |
| PX03006 | GMR Eddy Current System | \$74897 |
| PX03008 | Neutron Non-Destructive Imaging of Weapons Materials | \$298752 |
| PX03009 | Validating Ultra Sonic Output for Positional Accuracy | \$203398 |
| PX04002 | Pit Measurement System for Vertical Arrays | \$21421 |
| PX04003 | Characterization of Corrosion Mechanisms | \$163053 |
| PX04004 | Real-Time Gas Analysis of Weapon Component Internal Atmospheres | \$85305 |
| PX04005 | Advanced Radiation Alarm Monitoring System (ARAMS) | \$113533 |
| PX04008 | Pilot Plant Solids Addition Capability | \$13061 |
| PX04010 | Particle Size Control in Explosive Precipitation Processes | \$28131 |
| PX04012 | Fiber Optic Probe Development for Laser Spectroscopy | \$33804 |
| PX04013 | Characterization of Explosives in Solvents | \$46804 |
| PX04015 | Pilot LABSOSC System Evaluation & Application for Specific Gamma Spectrometry | \$87382 |
| Total # of Projects for PTX: | 24 | Total Cost for PTX: \$2338687* |

*Does not include \$98,124 of administrative and related implementation costs.

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SNL - Sandia National Lab

| Project ID | Project Name | FY Total |
|-------------------|--|-----------------|
| 38605 | Microfabrication with Femtosecond Laser Processing | \$347433 |
| 38606 | Meso-scale Controlled Motion for a Microfluidic Drop Ejector | \$334982 |
| 38609 | Physical and Electronic Changes caused by Membrane Signaling as a Transduction Pathway in Affinity Based Biosensors | \$301384 |
| 38610 | Graduated Embodiment for Sophisticated Agent Evolution and Optimization | \$330436 |
| 38613 | Scalable Fault Tolerant Algorithms for Linear-Scaling Coupled-Cluster Electronic Structure Methods | \$245288 |
| 38614 | Micromagnetic Suspension | \$161625 |
| 38615 | Sensitivities for Large-scale Simulation Codes | \$226345 |
| 38616 | Engineered Superconductivity in Electron-hole Bilayers | \$281823 |
| 38617 | Silicon-based RF MEMS Components | \$306159 |
| 38619 | Nano-electromechanical Oscillators (NEMOs) for RF Filtering | \$298606 |
| 38620 | Continous Wave Intersubband Terahertz Sources | \$387265 |
| 38621 | Microsystems for Chemical Signature and Reagent Delivery | \$303231 |
| 38622 | Microfluidic Cellular Sample Pretreatment | \$269885 |
| 38623 | Automated Visual Direction of Mobile Manipulation | \$288205 |
| 38624 | Miniature Fourier Transform Ion Mobility Spectrometer for Real Time Detection and Identification of Explosives and Chemical Agents | \$254209 |
| 38627 | EM Interactions with Systems to Enhance Security | \$206908 |
| 38629 | Use of Seismic and Acoustic Responses to Assess Bomb Damage to Underground Facilities | \$196772 |
| 38655 | Free-Space Electro-Optic Sampling and Remote Mapping of Electromagnetic Fields from Emitting Structures Using Femtosecond Terahertz Transceivers | \$246238 |
| 38662 | Natural Gas Production Problems: Solutions, Methodologies, and Modeling | \$289423 |
| 38665 | Time Domain Reflectometry for Remote, Real-Time Water Quantity/Quality Monitoring of Perennial and Ephemeral Streams | \$192395 |
| 38668 | Functionalized Nanoelectrode Arrays for In-situ Identification and Quantification of Regulated Chemicals in Water | \$250363 |
| 38673 | Water Desalination | \$314480 |
| 38674 | Revolutionary Systems for Catalytic Combustion and Diesel Catalytic Particulate Traps | \$373890 |
| 38677 | Potential Application of Microsensor Technology in Radioactive Waste Management - With Emphasis on Headspace Gas Detection | \$242360 |

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| Project ID | Project Name | FY Total |
|-------------------|--|-----------------|
| 38681 | Identification of Chemical Plumes: Range-Resolved IR Lidar Enabled by New Photonic Technologies | \$539653 |
| 38684 | A Robust, Coupled Approach for Atomistic-Continuum Simulation1 | \$351037 |
| 38685 | Microscale Rarefied Gas Dynamics and Surface Interactions for EUVL and MEMS Applications | \$281127 |
| 38686 | High Fidelity Frictional Models for MEMs | \$395397 |
| 38687 | Soot Formation, Transport, and Radiation in Unsteady Diffusion Flames | \$277899 |
| 38688 | The Basics of Aqueous Nanofluidics: "Interphase" Structure and Surface Forces | \$292608 |
| 38689 | Design, Synthesis, and Characterization of Soft Matter Nanolayer Superlattices | \$330170 |
| 38690 | Photo-control of Nano-interactions in Microsystems | \$278592 |
| 38691 | Electrochemically Deposited Alloys With Tailored Nanostructures for LIGA Micromachines | \$345299 |
| 38692 | Nanostructured Materials for Directed Transport of Excitation Energy | \$194505 |
| 38693 | Modeling Local Chemistry in the Presence of Collective Phenomena | \$174081 |
| 38717 | Nano-Scale Energetic Materials By Inverse Micellar Synthesis | \$301749 |
| 38718 | Modeling of Rock Penetration | \$218596 |
| 38722 | Agile, Microsystems-Enabled Receiver | \$491890 |
| 39017 | Solution-Based Nanoengineering of Materials | \$343887 |
| 39670 | Simulations of Intense Petawatt Laser Pulses with Dense Z-Pinch Plasmas | \$305153 |
| 41193 | Bio MicroFuelCell | \$2938785 |
| 41194 | Augmented Cognition: Next-Generation Intelligent Systems | \$3816426 |
| 41674 | MicroEngine for Advanced Power Generation | \$398229 |
| 41726 | Direct Simulation of Solid-Fluid Systems | \$40000 |
| 42461 | Support-Active Site Interactions in Heterogeneous Catalysts | \$102886 |
| 42483 | An Analysis of the Automotive Industry as a Source for Weapon Components and Manufacturing Processes | \$172288 |
| 46070 | High Speed Micro-EDM | \$40000 |
| 46686 | Micro External Combustion Engine: The P3 Engine Prototype | \$20000 |
| 47795 | Lipid Membranes on Nanostructured Silicon | \$68268 |
| 49769 | Resin Infusion between Double Flexible Tooling | \$20916 |

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SNL - Sandia National Lab

| Project ID | Project Name | FY Total |
|-------------------|--|-----------------|
| 49772 | Studies on the Disbonding Initiation of Interfacial Cracks | \$20000 |
| 49915 | Critical Technology Development for Hard Target Defeat High-G Tolerant Fuze and High Explosives | \$752386 |
| 50065 | TALON | \$3943937 |
| 50396 | Compliant Membranes for MEMS Microphones | \$25000 |
| 50717 | Multi Scale Experimental/Numerical Study | \$50000 |
| 50772 | Cellular Observatory: Simultaneous Time- and Frequency-Resolved Microscopy | \$289806 |
| 52523 | Atomic Layer Deposition of Highly Conformal Tribological Coatings | \$401207 |
| 52524 | Assembly of Microsystems using Exothermic Multilayer Thin Films | \$341653 |
| 52526 | Intelligent Interaction Control as Applied to Metrology and Assembly of Micro-Scale Components | \$353783 |
| 52527 | Rapid Prototyping High-Density Circuitry (RpHdc) | \$339181 |
| 52528 | Elucidating the Mysteries of Wetting | \$452097 |
| 52530 | Next Generation Spindles for Micromilling | \$99174 |
| 52531 | Assembly and Actuation of Nanomaterials Using Active Biomolecules | \$510980 |
| 52532 | Modeling Biomembranes | \$337463 |
| 52533 | Reverse Engineering Biological Networks: Applications in Immune Responses to Bio-Terrorism Threats | \$382977 |
| 52536 | High Throughput Identification of Molecular Machines Involved in Membrane Signaling and Toxin Pathways | \$328937 |
| 52537 | Coupled Solid-fluid-mechanical Computational Modeling of Fracture and Fragmentation in Geomaterials, Such as Hard and Deeply Buried Targets (HDBT) | \$349942 |
| 52538 | Sequestration of Pathogens on Nanoengineered Surfaces | \$558421 |
| 52539 | A Combined Preconcentrator and Sensor for Live Water-borne Pathogens | \$309465 |
| 52540 | IP Storage: A Performance and Security Study | \$208835 |
| 52541 | A Parallel Circuit Simulator for Cell Biology | \$238222 |
| 52542 | Developing a Computationally Efficient Dynamic Multilevel Hybrid Optimization Scheme using Multifidelity Model Interactions | \$253376 |
| 52543 | Robust Large-Scale Parallel Nonlinear Solvers for Simulations | \$202976 |

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|-------------------|--|-----------------|
| 52544 | Development of Computational Algorithms and Inversion Capabilities for Transport/reaction Simulations of Chemical/biological/radiological Terrorist Attack Scenarios in Support of Homeland Security | \$746138 |
| 52546 | Massively-Parallel Linear Programming | \$210411 |
| 52548 | Active Photonic-Crystal Devices for Integrated Photonics and Silicon photonics | \$361568 |
| 52549 | Co-processing of Chalcogenide-Based Radiation-Hard Nonvolatile Memories by Sandia's MDL and BAE Systems. | \$328476 |
| 52551 | Functionalized Nanoparticles for Sensor Applications | \$432475 |
| 52552 | Novel In Situ Mechanical Testers to Enable Integrated Metal Surface Micro-machines | \$401774 |
| 52553 | Compliant Thermo-Mechanical MEMS Actuators | \$259951 |
| 52554 | An Integrated, Stacked System-on-a-chip | \$399385 |
| 52555 | Micro Mass Spectrometer on a Chip | \$310922 |
| 52556 | Quantum Coherence in Semiconductor Nanostructures for Improved Lasers and Detectors | \$357285 |
| 52557 | MOSFET-MEMS Integration | \$352361 |
| 52566 | Micro Optical Gyroscope Via Monolithic Active/Passive Optical Integration | \$374396 |
| 52570 | Materials Physics and Device Development for Improved Efficiency of GaN HEMT High Power Amplifiers | \$390179 |
| 52571 | Leaky-mode VCSELs for Photonic Logic Circuits | \$366574 |
| 52575 | Advanced Polychromator Systems for Remote Chemical Sensing | \$336249 |
| 52577 | Immunological Basis for High Reliability Systems Control | \$221127 |
| 52580 | Moving Target Identification Using Ultra High Range Resolution Data | \$261025 |
| 52581 | Advanced Mobile Networking, Sensing, and Controls using Graph Theory | \$345793 |
| 52582 | Compact TeraHertz (THz) Sources for Emerging Threats applications | \$322443 |
| 52583 | Understanding Communication in Counterterrorism Crisis Management | \$330354 |
| 52584 | Hyper-Velocity Impact Generated Flash | \$269116 |
| 52585 | Improving Human/System Interactions in Systems-of-Systems | \$500052 |
| 52586 | Distributed Detection & ID Algorithm Architecture for Unattended Ground Sensors | \$234591 |
| 52587 | Secure Chaotic Communications | \$280430 |

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|-------------------|---|-----------------|
| 52588 | System of Systems Modeling and Analysis | \$499664 |
| 52589 | Eye Safe Short Range Standoff Aerosol Cloud Finder | \$140838 |
| 52590 | Micro Flame-Based Detector Suite for Universal Gas Sensing | \$321596 |
| 52591 | Beyond Nanoparticles - Attack on a Chemical "Holy Grail" | \$251360 |
| 52592 | Advanced Proton-Exchange Materials for Energy Efficient Fuel Cells | \$387060 |
| 52593 | Alanate-Hydride Fuel Cell Demonstration Project | \$359915 |
| 52595 | Real-time Discriminatory Sensors for Water Contamination Events | \$324393 |
| 52596 | Advanced High Efficiency Direct Cycle Gas Power Conversion Systems for Small Special Purpose Nuclear Power Reactors | \$370320 |
| 52597 | Securing Mobile Code | \$302290 |
| 52598 | Novel Catalysts For Hydrogen Fuel Cell Applications | \$299822 |
| 52606 | Linking Optimization and Simulation in Critical Infrastructure Systems | \$372659 |
| 52698 | Decomposition of Contaminants Using Photochemically Active Nanoparticles | \$437110 |
| 52699 | Thermally Cleavable Surfactants | \$301919 |
| 52700 | Transition-metal Catalyzation of Complex-hydride Absorption/desorption Reactions | \$201623 |
| 52701 | Quantification of Environments and Surfaces within Micro-Packages | \$370623 |
| 52702 | Assembly of Ordered Electro-Optical and Bioactive Materials and Composites | \$399276 |
| 52703 | Advanced Packaging / Joining Technology for Microsystems | \$344278 |
| 52705 | Magnetostrictive Elastomers for Actuators and Sensors | \$150445 |
| 52706 | Development of a High-Throughput Microfluidic Integrated Microrray for the Detection of Chimeric Bioweapons. | \$193045 |
| 52708 | Zero-Power Radio Receiver | \$249411 |
| 52709 | Completely Passive Microwave Tag | \$218329 |
| 52710 | Security Coatings for Multichip Modules | \$305937 |
| 52711 | Detailed Modeling and Simulation of Contaminant Transport in Architectural Spaces | \$360793 |
| 52712 | Content-Based Video and Image Indexing System | \$172361 |
| 52713 | Bioaerosol Collection & Concentration for Microseparations-based Detectors | \$474951 |
| 52714 | Detecting The Toolmarks Of Genetic Engineering In Bioweapons Strains | \$255800 |
| 52716 | Joint Authentication/Encryption | \$196477 |

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|-------------------|--|-----------------|
| 52717 | Ultra High Temperature Ceramics for Hypersonic Vehicle Applications | \$256891 |
| 52718 | Leveraging Robotic Planning for Physical Security Analysis | \$227442 |
| 52720 | Ultra-Lightweight Telescope with MEMS Adaptive Optic for Distortion Correction | \$446742 |
| 52721 | Modeling Signals from Earth Penetrating Nuclear Weapons for Remote Kill Assessment | \$329209 |
| 52723 | Novel Micro-Preconcentrators For CW, Explosives And Water Surety | \$250379 |
| 52724 | Ion Mobility Spectrometer-Mass Spectrometer | \$305924 |
| 52725 | Cryptographic Assurance of Execution Correctness and Confidentiality | \$201771 |
| 52726 | Characterization, Performance and Optimization of PVDF as a Piezo-electric Film for Advanced Space Mirror Concepts | \$307148 |
| 52727 | Predictive Accelerated Aging of Microsystems: The Science of Dormancy | \$597601 |
| 52728 | Surety and Accountability Enhancements for Storage Containers | \$289926 |
| 52729 | Nuclear Safety Weaklinks for Thermal and Mechanical Environments | \$441433 |
| 52730 | Advanced Packaging Technology for Optical Firesets | \$293651 |
| 52731 | Miniature Transmitter Filter for JTA Using LIGA Technology | \$254005 |
| 52732 | Novel and Robust Environmental Sensing Devices (ESDs) | \$497058 |
| 52733 | Advanced Neutron Monitors for JTA and Stockpile Monitoring | \$320508 |
| 52737 | Development of an Efficient Large-Aperture High Damage-Threshold Sol-gel Diffraction Grating | \$197378 |
| 52738 | Laser Triggering of Water Switches in Terrawatt class Pulse Power Accelerators | \$194959 |
| 52739 | Experimental and Computational Study of Liquid-Solid Transition in Tin | \$96601 |
| 52977 | Flow Control and Mixing in Microfluidic Devices | \$20000 |
| 53464 | Atomic-scale Scanning Tunneling Microscopy Measurements of Nucleation and Growth of Ge/Si Alloy Structures | \$20000 |
| 53465 | Micro/Nanoscale Thermomechanical Manufacturing | \$20000 |
| 53585 | Novel Diagnostics for Rarefied Flows in MEMs Applications | \$228327 |
| 53586 | Geophysical Subsurface Imaging and Interface Identification | \$251001 |
| 53587 | Evolution of Near Surface Scalar Concentrations Through a Compact Cylinder Array Embedded in the Atmospheric Surface Layer | \$25000 |
| 53588 | Miniature High-Power RF Components Enabled by Meso-scale Manufacturing | \$110176 |

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|-------------------|--|-----------------|
| 53590 | Electrical Conductivity of Metal Alloys | \$173984 |
| 53591 | Hydrogen Futures Dynamic Simulation Model | \$200007 |
| 53681 | Design of Bio Specific Surfaces to Control Specific Cellular Responses | \$20000 |
| 54211 | Nanomagnetic Films | \$20000 |
| 54213 | A Multi-scale Approach to Modeling Carbon Nanotube Reinforced Composites | \$20000 |
| 55079 | Near Real Time Characterization for Assured HDBT Defeat | \$2666485 |
| 55086 | Prompt Global Response | \$2405321 |
| 55087 | Winning the War: A Systems Approach to Defending Our Borders | \$1697561 |
| 57300 | Integrated Superhard and Metallic Coatings for MEMS | \$51621 |
| 57307 | Microscale Separations of Biological Compounds Using Novel Polymeric Separations Materials | \$50118 |
| 57308 | Friction in Micromachine Interfaces | \$32404 |
| 57309 | Lipid Microarray Biosensor for Biotoxin Detection | \$40000 |
| 57310 | Advanced Manufacturing Techniques Using Rapid Prototyping | \$50674 |
| 57311 | Robust Hermetic Packaging Techniques for MEMS Integrated Microsystems | \$40000 |
| 58907 | Active Photonic Nanostructures | \$526640 |
| 59034 | 3-D Large Eddy Simulation of Turbulent Flow based on One-Dimensional Turbulence Modeling | \$80234 |
| 59916 | A Method of Evaluating Research Using New Innovation, Risk, and Impact Indicators | \$287383 |
| 61046 | Photonic Encryption using All-Optical Logic | \$80346 |
| 62269 | Nanoporous-Carbon Adsorbers for Chemical Microsensors | \$121208 |
| 62827 | Non-Lethal Technologies for the War on Terrorism | \$395413 |
| 64811 | Agent-Based Control of Distributed Infrastructure Resources | \$331404 |
| 65559 | Direct Single Ion Machining of Nanopores | \$61782 |
| 66170 | Investigation of the Effects of Intense Pulsed Particle Beams on the Durability of Metal-to-Plastic Interfaces | \$38678 |
| 66450 | Advanced Techniques for Multi-Objective Discrete Optimization | \$20000 |
| 66809 | Non-radioactive Safety & Performance Issues with Supercritical Water Reactor Safety (SCWR) Technologies | \$25000 |

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|-------------------|---|-----------------|
| 66810 | Radiation Performance Issues with Advanced Coolants for Next Generation Reactor | \$25000 |
| 67004 | Rapid Prototyping to the Nanometer Scale | \$294525 |
| 67005 | Robust Manufacturing of Gel-based Components for Nuclear Weapons | \$93194 |
| 67006 | Meso-/Micro-Optical System Interface Coupling Solutions | \$277340 |
| 67007 | Injection Molding of Net-Shape Active Ceramic Components | \$318437 |
| 67008 | Macro-Meso-Microsystems Integration in LTCC | \$351980 |
| 67010 | Studies of Signaling Domains in Model and Biological Membranes Through Advanced Imaging Techniques | \$343958 |
| 67011 | Imaging Self-Organization of Proteins in Membranes by Photocatalytic Nano-Tagging | \$294291 |
| 67012 | Protein Microarrays for Biowarfare Agent Detection and Characterization | \$336385 |
| 67013 | Interaction of Proteins with Lipid Films | \$271149 |
| 67014 | New Technologies for Understanding Membrane Protein Recognition and Signaling | \$85088 |
| 67015 | Massively Parallel Scalable Atmosphere Model | \$200021 |
| 67016 | High Performance Processing Architecture | \$161879 |
| 67017 | Substructured Multibody Molecular Dynamics | \$258826 |
| 67018 | Enhancing Simulation Performance on Clusters with Configurable Auxiliary Devices | \$174480 |
| 67019 | A Hybrid level-set/particle Method for Modeling Surface Evolution During Feature Scale Etching and Deposition Processes | \$135264 |
| 67020 | Penetrator Reliability Investigation and Design Exploration (PRIDE) | \$449256 |
| 67021 | Topology Optimization for Improving Sensor Performance | \$235371 |
| 67022 | Characterization and Application of Dielectrics with Controlled Leakage | \$321809 |
| 67023 | Nano-g Accelerometers Using Nanophotonic Motion Detection System | \$498746 |
| 67024 | Bragg Fiber Development | \$295945 |
| 67025 | Microwave to Millimeter-wave Electrodynamics Response and RF Applications of Semiconductor Quantum Nanostructures | \$350365 |
| 67026 | Development of GaN 20-100 Watt Ku-Band Power Amplifiers for Micro-SAR | \$299965 |
| 67027 | Evanescent Wave Planar Photonic Biosensor | \$302737 |

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|-------------------|--|-----------------|
| 67028 | Passive Electronically Steerable Array (PESA) for Miniature Synthetic Aperture Radar (miniSAR), Precision Guidance, and Intelligence/Surveillance/Reconnaissance (ISR) | \$300519 |
| 67029 | Advancements in Sensing and Perception using Structured Lighting Techniques and an Innovative Design Tool | \$226400 |
| 67030 | Biophysics of BW-Warhead Defeat with a Kinetic Interceptor | \$247361 |
| 67031 | Dispersal in Urban Canyons, Source Identification, and Collateral Damage/Mitigation Assessment | \$20252 |
| 67032 | Weaponization of Thermobaric Explosives | \$244775 |
| 67033 | Development of an Enterprise-Scale Agent-Based Autonomic Logistics Simulation Model | \$249736 |
| 67034 | Mobile Node Authentication in a Wireless Ad hoc Environment | \$212288 |
| 67035 | Novel Processing, Affordable Motion Compensation, and Mode Multiplexing for Miniaturized Synthetic Aperture Radar | \$431871 |
| 67036 | Coilgun Technology Demonstration Testbed | \$307760 |
| 67037 | Enhanced Perception for Remote 3D Mapping of Unknown Indoor and Outdoor Environments | \$340146 |
| 67038 | A Modular Micromagnetic Accelerometer-in Support of the mTalon Vision | \$272113 |
| 67039 | MICROFUZE Integration | \$488997 |
| 67040 | Realistic Crowd Behavior Models Using Individual Cognitive Agents | \$268 |
| 67041 | Analysis of Technology Impacts on Operations in Complex Environments | \$443267 |
| 67042 | CBW Cloud Knockdown and Neutralization | \$216217 |
| 67043 | Assessment of Bio-Killers in EDS for Biological Agent Destruction | \$55568 |
| 67044 | Adaptive Force Feedback Surface Control | \$247784 |
| 67046 | High-Capacity Earth Penetrator Instrumentation | \$314585 |
| 67047 | Systems Analysis of Networked Sensors | \$288674 |
| 67048 | Deployable Object Tracker for NMD Flights | \$146160 |
| 67049 | Continuous-Flow Detector for Rapid Pathogen Identification | \$205028 |
| 67050 | Biological-Security Decontamination Technology -- Reducing the Threat of Infectious Agent Spread | \$100849 |
| 67051 | Consequence Management, Recovery, and Restoration after an Intentional Contamination Event | \$100211 |
| 67052 | Fully Integrated System Dynamics Toolbox for Water Resources Planning | \$277603 |

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|-------------------|---|-----------------|
| 67053 | Predicting System Performance of Proton-Exchange-Membrane Fuel Cells: Computational Modeling with Experimental Discovery and Validation | \$323106 |
| 67054 | Optimal Allocation of Terrorist Countermeasures Using Risk-based Systems Pathways Analysis | \$278354 |
| 67055 | Silicon Field Emission Electric Propulsion Arrays (FEEP) Powered by Orbital Nuclear Reactors | \$350861 |
| 67056 | Advanced Fuel-cell Reactor for the Direct Cogeneration of Electricity During Selective Partial Oxidation of Hydrocarbons | \$368327 |
| 67057 | New Hydrogen Storage Material: Metal-N-H system | \$102269 |
| 67058 | Intrusion Detection for Wireless Networks | \$304745 |
| 67059 | Membranes for H2 Generation from Nuclear Powered Thermochemical Cycles | \$254826 |
| 67060 | Microfabricated BTU Monitoring Device for System-Wide Natural Gas Monitoring | \$99838 |
| 67061 | "Tunable" Ion Conductors for Low Temperature Oxide-based Fuel Cells | \$218148 |
| 67062 | Nuclear Nano-Batteries: on-board power for independent MEMS devices | \$54320 |
| 67063 | Integrated Tunable Light Sources for Miniature Sensors | \$99558 |
| 67064 | Ray Model of High Frequency Cavity Scarring | \$127739 |
| 67065 | New Smart Material to Address Issues of Structural Health Monitoring | \$83903 |
| 67067 | Noncontact Surface Thermometry for Microsystems | \$272181 |
| 67068 | High Speed Interferometric Deformation Measurements | \$270460 |
| 67069 | Fundamentals of Nanofluidics | \$281475 |
| 67070 | Simulating Self-assembly and Growth of Biological Nanostructured Materials | \$230008 |
| 67071 | A Low-Power Ultra-Fast Current Transient Measuring Device | \$89602 |
| 67073 | A Capillary Valve for Microfluidic Systems | \$92195 |
| 67074 | Electrochemically Switchable Materials for (Bio)Microfluidics | \$206649 |
| 67075 | Modeling of Friction-Induced Deformation and Microstructure | \$501771 |
| 67076 | Reversible Antibody Trapping for Selective Sensor Devices | \$196803 |
| 67077 | Correlated and Comprehensive Analytical Techniques for Homeland Defense | \$511758 |
| 67078 | Development of High Energy Density Dielectric Materials for Integrated Microsystems | \$299975 |
| 67079 | Nanolithography Directed Materials Growth and Self-Assembly | \$392928 |

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|-------------------|--|-----------------|
| 67080 | Development of a Novel Technique to Assess the Vulnerability of Micro-Mechanical System Components to Environmentally Assisted Cracking | \$183339 |
| 67081 | 3D Optical Sectioning with a New Hyperspectral Deconvolution Fluorescence Imaging System | \$539426 |
| 67082 | The Science of Solutes: Transition Metals in LIGA Nickel | \$286932 |
| 67083 | Novel Gel-Based Technology for Sensors and Weapons | \$100002 |
| 67084 | Coupled Nanomechanical Oscillator Arrays for the Study of Internal Dissipation in Nano-scale Structures and Collective Behavior in Large Systems | \$312608 |
| 67085 | Precisely Controlled Picoliter Vessels with Rapid Sample Preparation for Trace Biotxin Detection | \$225039 |
| 67086 | Adaptive Optics and Phase Diversity Imaging for Responsive Space Applications | \$244693 |
| 67087 | Infrastructural Development for Flexible Network of Devices | \$516720 |
| 67088 | Monolithic Reconfigurable Radio-Frequency Microelectromechanical System (RF MEMS) Antennas | \$334504 |
| 67089 | Next-Generation 3D Inspection System for Facility Monitoring | \$258215 |
| 67090 | Risk Assessment Meta Tool | \$150053 |
| 67091 | Featureless Spread-Spectrum Waveform Design and Processing | \$216526 |
| 67092 | Tracking Slow-Moving Objects in a GPS-Denied Environment | \$328904 |
| 67093 | Optical Communications | \$179677 |
| 67094 | A Unique Vibration-Based Miniature Power Generator for National Security Applications | \$230762 |
| 67095 | Image Georectification Using Digital Elevation Model Shadows | \$195801 |
| 67096 | Vulnerability Assessment of State-of-the-art Microelectronics | \$217364 |
| 67098 | Nonlinear Optical Detection of Biological and Chemical Aerosol Agents Using Femtosecond Lasers | \$355448 |
| 67099 | Polymer Electronic Devices and Materials | \$488703 |
| 67101 | Small Circuits for Cryptography | \$99216 |
| 67102 | Analysis of Multichannel Internet Communication | \$89145 |
| 67104 | Receiver for Ultra-Low Power Wake-up and Command | \$184412 |
| 67105 | Extraordinary Optical Transmission through Patterned Subwavelength Apertures | \$137572 |

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| 67107 | Reconstruction Algorithm Development and Assessment for a Computed Tomography Based-spectral Imager | \$335275 |
| 67108 | Power Combining Techniques for Solid State Power Amplifiers (SSPAs) | \$354754 |
| 67109 | Dispersive Diffractive Optical Elements for the Infrared | \$506930 |
| 67111 | Atmospheric Propagation of THz Radiation | \$114626 |
| 67112 | Thermophotovoltaic Power Sources | \$69386 |
| 67113 | High-Confidence Estimation of Relative Event Locations from Space-Based Sensors | \$158608 |
| 67114 | Critical Infrastructure System of Systems Assessment Methodology | \$465632 |
| 67115 | Dynamic Vulnerability Assessment | \$127441 |
| 67116 | Inflatable Antenna with Adaptive Actuators | \$261595 |
| 67117 | Data Driven Dynamic Models of Conflict | \$100743 |
| 67118 | MEMS / Fuze Diagnostic Extraction in High-G Environments | \$172791 |
| 67120 | Efficient Implicit Multigroup Radiation Calculations | \$142372 |
| 67121 | Model for Channel Resistance in Water Breakdown | \$69491 |
| 67122 | Embeddable Shock Physics Sensors | \$170680 |
| 67716 | Smart Detectors of Enrichment of Bio-Aerosols | \$20000 |
| 68063 | Computational Studies of JP-8 Diffusion Flames with Detailed Chemistry and Particulate Formation | \$20000 |
| 69143 | Design and Fabrication of Advanced Device Structures for Ultra High Efficiency Solid State Lighting | \$477774 |
| 69145 | Molecular Simulation of Beta-amyloid (A-beta) Peptide Interaction with Phospholipid Membranes. | \$49999 |
| 69146 | Nanoscale Testing of Deformation and Fracture in Engineering Materials | \$50663 |
| 69148 | Nanocrystal-Polymer Composites for High Luminous Efficiency LEDs | \$401819 |
| 69149 | Outstanding Challenges for AlGaInN MOCVD | \$407568 |
| 69150 | Nanoporous Polymeric Materials for Chemically and Spatially Multiplexed Sensing of Bioagents | \$96365 |
| 69151 | Evolutionary Complexity for Protection of Critical Assets | \$90695 |
| 69152 | Nanomechanical Stochastic Resonators | \$75979 |
| 69153 | Augmented Musculature Device | \$101229 |
| 69154 | Biomolecular Decision-making Processes for Self-assembly | \$360904 |

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| 69155 | Light-Powered Nanovehicle Propulsion | \$100679 |
| 69156 | System Dynamics Modeling to Assist Regional Water Planning: Modeling the Non-Market Value of Water | \$25000 |
| 69157 | Interactive Water Quality Modeling to Assist Regional Water Planning | \$25000 |
| 69158 | Microbe-Exuded Polymers and the Enhanced Corrosion of Carbonate Materials | \$50000 |
| 69159 | Nerve Cell Function and the Development of Cognitive Networks | \$74106 |
| 69160 | Ultrahigh Gain Fusion Concept | \$80385 |
| 69161 | Nanofluidic Devices for Rapid Detection of Virus Particles | \$128627 |
| 69162 | Solution Behavior of PEO: the Ultimate Biocompatible Polymer | \$102424 |
| 69163 | New Self-assembled Nanocrystal Micelles for Biolabels | \$99918 |
| 69164 | Rapid Detecton of Biothreat Agents Based on Cellular Machinery | \$102046 |
| 69165 | Patterning Quantum Dot Arrays using DNA Replication Principles | \$104093 |
| 69166 | Adaptive Algorithms for Use in the Rejection of Periodic Disturbances of Unknown Frequency | \$25000 |
| 69168 | Property-based Testing for Cyber Security Assurance | \$50000 |
| 69170 | Self-Assembled Ordered Carbon-Nanotube Arrays and Membranes | \$100455 |
| 69189 | Chemical Crosslinking and Mass Spectrometry Studies of the Structure and Dynamics of Membrane Proteins and Receptors | \$703291 |
| 69190 | Toxin Studies Using an Integrated Biophysical and Structural Biology Approach | \$325511 |
| 69191 | Top-Down Structural Studies | \$238444 |
| 69192 | Molecular Dynamics of Membrane Proteins | \$123104 |
| 69193 | Model-Building Codes for Membrane Proteins | \$183057 |
| 69198 | Poroelastic Wave Propagation on the Earth Simulator | \$172725 |
| 69239 | Development of Micro Reformers for Fuel Cells | \$59278 |
| 70799 | Developing the Foundation for Polyoxo-niobate Chemistry: Highly Tunable and Exploitable Materials | \$209804 |
| 71943 | Simulating Human Behavior for National Security | \$415464 |
| 71944 | Agent-based Modeling of Middle East Terrorist Recruitment | \$100523 |
| 71945 | Automatic Generation of Terrorist Operation Plan Hypotheses | \$389500 |

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| 72599 | Develop a System Dynamics Modeling Framework for Assessing Factors that Influence Water Resource Consumption | \$166613 |
| 72600 | Develop a Cooperative Water Management Process, Creating a System Dynamics Model of Water Resources in the Lower Rio Grande Basin | \$171791 |
| 72715 | Compact Ultrabright Multikilovolt X-Ray Sources for Advanced Material Studies, 3D Nanoimaging, and Attosecond X-Ray Technology | \$516146 |
| 72716 | Energy Systems Analysis Framework and Modeling | \$526207 |
| 73045 | Radiation/Geometry-Driven Jets: Proof-of-Principle Tests | \$76733 |
| 73185 | Superhydrophobic Surface Coatings for Microfluidics and MEMS | \$444100 |
| 73207 | Micro Optical Radar (MOR) Facial Recognition Project | \$825306 |
| 73362 | The Neuroscience of Group Collaboration | \$2427 |
| 74545 | Determining Explosive Ignition Criteria for Miniaturized Devices | \$100767 |
| 74546 | Quantum Squeezed Light for Probing Mitochondrial Membranes and Study of Neuroprotectants | \$194955 |
| 74547 | Characterization of a New Class of Surface Micromachined Pumps | \$25469 |
| 74548 | Risk of Biological Terrorism to Water Distribution Systems | \$107843 |
| 74759 | Explicit and Implicit Measures in Human Aversive Classical Conditioning | \$50000 |
| 74760 | Automatic Target Recognition Algorithms for Uncooled Thermal Imagery | \$199144 |
| 74795 | Magnetophoretic Bead Trapping in a High Flowrate Biological Detection System | \$79999 |
| 75441 | TPV Energy Scavenging for Hypervelocity Vehicles | \$68405 |
| 75442 | Assessment of Advanced Pulsed Power Fusion Concepts | \$256092 |
| 75443 | A Mathematical Method for Quantifying the Effectiveness of Management Strategies | \$87634 |
| 75513 | Developing Algorithms for Predicting Protein-protein Interactions from Experimental Constraints | \$71441 |
| 75514 | Instrumentation Development for Real Time Brain Wave Monitoring | \$81209 |
| 75786 | Maximally Autonomous Autodirective Antenna Array Technology | \$25000 |
| 76069 | Miniaturized Electronic Steerable Array Synthetic Aperture Radar | \$836994 |
| 76070 | Full-Earth Monitoring Sensor MESAWorks | \$796550 |
| 76305 | Systems Assessment of Water Savings Impact of Controlled Environment Agriculture Utilizing Wirelessly Networked SDACs | \$161437 |

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| 76306 | Inactivation of Avian Influenza (Bird Flu) with Sandia Developed Decontamination Formulations | \$100368 |
| 78132 | Deciphering the Genetic Regulatory Code Using an Inverse Error Control Coding Framework | \$72777 |
| 78307 | Climate Change Effects on International Stability | \$120613 |
| 78783 | Generalized Continuum Models for Inelasticity in Solids: Formulation of Theories, and Variational Methods for Computation | \$50000 |
| 79943 | GeSi Strained Nanostructure Self-assembly for Nano- and Opto-electronics | \$11959 |
| 80835 | Vulnerability Analysis for SCADA | \$113624 |
| 80838 | Molten Salt-Based Growth of Bulk GaN and InN | \$59899 |
| 81209 | Randomness Complexity and Cryptography | \$60000 |
| 81354 | System Study: Adaptive Optics for Weapon, Reconnaissance and Military Space Applications | \$27142 |
| Total # of Projects for SNL: | 354 | Total Cost for SNL: \$102095427 * |

*Does not include \$1,900,573 of administrative and related implementation costs.

United States Department of Energy
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Project List -- Fiscal Year 2004

SRP - Savannah River Plant

| Project ID | Project Name | FY Total |
|-------------------|--|-----------------|
| SR02015 | Alanates as a New High Capacity H2/T2 Storage Material | \$15137 |
| SR02016 | Catalyzed Metallic Glass for H2 Separation | \$17906 |
| SR02023 | Hydrogen Isotope Permeation Testing | \$42957 |
| SR02031 | Large-scale Fabrication Process for Hydride/Sol-Gel Composites | \$40165 |
| SR02033 | Laser Cladding for Tritium Permeation Barrier Coatings | \$23625 |
| SR02042 | Thermal Absorption Diffusion Isotope Separation Process | \$124672 |
| SR03001 | Plasma Arc Process to Decontaminate Palladium for Recycle | \$67034 |
| SR03002 | Discover New Hydride Metal-alloys Using the "Materials as Systems" & "Combinatorial Library Synthesis" Methodologies | \$101328 |
| SR03004 | Modeling of Pressure Swing Adsorption Processes For Hydrogen Separations | \$10239 |
| SR03005 | Fill Stem Decontamination Using Plasma and/or Atomic Oxygen | \$75194 |
| SR03006 | Heat Transfer and Modeling of Next Generation Metal Hydride Beds | \$142470 |
| SR03008 | Catalyzed Alkali Metal Borohydrides for Tritium and Hydrogen Storage | \$149637 |
| SR03014 | Glass Microsphere Encapsulation of Hydrogen Absorbents | \$83498 |
| SR03029 | Evaluation of Alternate Stainless Steel Surface Coatings and Methods for Passivation | \$45922 |
| SR03030 | Evaluation of Non-Reactive, Permeation Resistant Materials for Tritium/Hydrogen Storage & Processing | \$50385 |
| SR03036 | Tritium Reservoir Performance Prediction and Analysis Tools | \$118790 |
| SR03037 | Pinch Weld Process Improvement Using Secondary Variable Analysis and Advanced Weld Controls | \$184969 |
| SR03038 | Development of Stainless Steel Alloys with an Innate/Self-Healing Permeation Barrier | \$149177 |
| SR03046 | Multiplexed Vapochromic Ammonia and Moisture Sensors for Tritium Process Monitoring | \$108129 |
| SR03052 | Universal Tritium Transmitters | \$159733 |
| SR03053 | Ion Chamber for Tritium Monitoring to Minimize High Backgrounds Due to Surface Area Contamination | \$30840 |
| SR03054 | Tritium Reservoir Surface Defect NDE Inspection Feasibility Study | \$34087 |
| SR03060 | Palladium on Ceramic as an Alternative to Palladium on Kieselguhr | \$72247 |
| SR04001 | Advanced Crystalline Nanoporous Materials for Tritium/Hydrogen Storage | \$105077 |

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SRP - Savannah River Plant

| Project ID | Project Name | FY Total |
|-------------------------------------|--|--------------------------------------|
| SR04009 | Detection and Measurement of He-3 Bubbles by Positron Annihilation Lifetime Spectroscopy | \$131987 |
| SR04011 | Develop Low Cost, High Sensitivity Optical Gas Sensors using Surface Enhanced Raman Spectroscopy | \$152137 |
| SR04013 | Feasibility Study of Pd Recovery from Pd/k using ARC melter | \$25008 |
| SR04015 | Improved material for methane cracking | \$128441 |
| SR04025 | Ultra-Fast Mass Analysis of Hydrogen Isotopes | \$90457 |
| SR04030 | Laser Ablation for Spatially-Resolved Solid Phase Tritium Assay (Scoping) | \$86758 |
| SR04032 | Carbon Nanotubes for Sensors | \$86791 |
| Total # of Projects for SRP: | 31 | Total Cost for SRP: \$2654797 |

United States Department of Energy
Laboratory, Plant or Site Directed Research and Development Report
Project List -- Fiscal Year 2004

Y_12 - Y-12 Plant

| Project ID | Project Name | FY Total |
|-------------------|--|-----------------|
| Y1201006 | Net Shape Forming (NSF) | \$17077 |
| Y1201020 | Rapid In-situ Identification of Fissile Material Type in Cans | \$75448 |
| Y1201021 | Direct Electrolytic Reduction of Uranium Oxides | \$30150 |
| Y1201029 | Real-Time Beryllium Oxide (BeO) Monitoring | \$520721 |
| Y1201030 | Advanced Thermal Cutting Processes for Disassembly | \$66207 |
| Y1201033 | Enhanced Absorption of Microwave Energy | \$72697 |
| Y1201039 | Real-Time Monitor For Measuring Beryllium In Air | \$49543 |
| Y1201043 | High-density, Noncontact Inspection of Work Pieces | \$58097 |
| Y1201053 | Advanced Technology Assessment Team | \$75337 |
| Y1202005 | Hand-Held Enrichment Meter | \$34054 |
| Y1202007 | Alternative Fluorinating Agents to Produce UF4 | \$28855 |
| Y1202009 | Real Time Identification of Airborne Particles (Be, U, etc.) | \$33883 |
| Y1202014 | Advanced Melting Process Using High Flux Density Infrared (IR) | \$462495 |
| Y1202015 | Infrared (IR) Heating for Preheating Uranium Billets | \$131776 |
| Y1202036 | Chromatographic Separation | \$30882 |
| Y1202039 | Equal Channel Angular Processing | \$75233 |
| Y1202040 | Improved Material Properties Through Application of GBE | \$42888 |
| Y1202052 | Advanced Analysis Engine | \$154014 |
| Y1202053 | High Resolution Imaging System for Digital Radiography | \$188991 |
| Y1202096 | Zone Refining | \$174531 |
| Y1202097 | Alt. Uranium Casting | \$12909 |
| Y1202099 | Predictive Performance Indicators | \$38501 |
| Y1202101 | Tool Tuning | \$85574 |
| Y1202102 | Fisk Rad Detectors | \$26119 |
| Y1202103 | Fuzzy Logic Analysis of Measurement | \$33519 |
| Y1202105 | UNCC Hole Plate | \$46789 |
| Y1202106 | UFL HSM | \$89057 |
| Y1202107 | NCSU Artifact | \$108904 |
| Y1203001 | Radiograph Archival | \$42304 |

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Y_12 - Y-12 Plant

| Project ID | Project Name | FY Total |
|-------------------|---|-----------------|
| Y1203006 | Enhanced Chip Casting | \$17866 |
| Y1203010 | U-C Properties | \$192405 |
| Y1203014 | High Accuracy, High Density | \$156958 |
| Y1203016 | Salt Certification Substitution | \$109273 |
| Y1203020 | Holo Interferometry | \$119441 |
| Y1203021 | Micro CT | \$74018 |
| Y1203023 | SFM Process Monitoring | \$80627 |
| Y1203032 | High Speed Machining | \$137413 |
| Y1203039 | Advanced SDOR | \$104040 |
| Y1203043 | ID of Ultra Fine Particles | \$86387 |
| Y1203050 | Lugless Casting | \$73274 |
| Y1203051 | Multizone Furnace | \$104455 |
| Y1203059 | High Gradient Magnetic Filtration | \$305135 |
| Y1203065 | Digital DU | \$158945 |
| Y1203073 | LiH Assessment | \$188558 |
| Y1203074 | IWMS | \$2116100 |
| Y1203075 | Project 2 | \$97938 |
| Y1203076 | Tech Infusion | \$116953 |
| Y1204006 | Cone Beam X-ray CAT scan | \$189748 |
| Y1204008 | Mold Material | \$24939 |
| Y1204013 | Be Swipe Colorimetric Screening | \$29523 |
| Y1204015 | Chemistry Control Using Slow Solidification | \$14786 |
| Y1204019 | Surface Metrology | \$42529 |
| Y1204036 | Wireless Predictive Maintenance | \$95974 |
| Y1204037 | Process Radiation Detector System | \$71646 |
| Y1204040 | U Compatibility with Crucible Materials | \$290926 |
| Y1204041 | Slag Reprocessing | \$60205 |
| Y1204045 | Next Generation MW | \$66485 |
| Y1204059 | NMC&A Confirmatory Cart | \$88224 |

United States Department of Energy
Laboratory, Plant or Site Directed Research and Development Report
Project List -- Fiscal Year 2004

Y_12 - Y-12 Plant

| Project ID | Project Name | FY Total |
|--------------------------------------|--|---|
| Y1204062 | Synergistic Casting Methodology | \$44183 |
| Y1204087 | Direct Conversion to Oxide | \$41945 |
| Y1204102 | Kathabar Alternatives | \$27892 |
| Y1204103 | Precision Electroplating | \$75299 |
| Y1204110 | Crucible Materials Thermo Modeling | \$25958 |
| Y1204118 | Wireless Systems Security Assessment | \$10429 |
| Y1204126 | Engineered Security Concepts | \$88198 |
| Y1204127 | Integrated Machining & Inspection at GT | \$47427 |
| Y1204128 | Source Model | \$36103 |
| Y1204129 | Wall Enhancements | \$6582 |
| Y1204132 | Selected Material Sanitization | \$32404 |
| Y1204133 | EMBOS | \$625449 |
| Y1204134 | Tusk Fracture Toughness with SSM | \$21867 |
| Y1204135 | UM - Optimet | \$501 |
| Y1204136 | Portable Metal Analyzer | \$4161 |
| Y1204137 | UNCC Improving Machine Tool Productivity and Quality | \$30283 |
| Y1204138 | Machining Uranium and Uranium Alloys | \$317 |
| Y1204139 | Unique Mass Spectrometry Capabilities | \$4824 |
| Y1204140 | Nanostructured Material Machine Tools | \$107458 |
| Y1204141 | Ultrasonic Vibration of Molten Metals | \$22238 |
| Total # of Projects for Y_12: | 78 | Total Cost for Y_12: \$9274844 * |

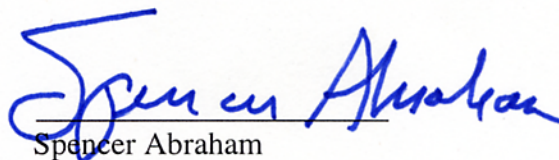
*Does not include \$592,313 of administrative and related implementation costs.

Departmental Procedures

The Conference Report accompanying the Energy and Water Development Appropriations Act for Fiscal Year 2002 (H.R. 4733) directs the Secretary of Energy to include in the annual report to Congress for all Laboratory Directed Research and Development (LDRD) activities the affirmation included below. In response to and as support for the annual affirmation, the Department revised its procedures for handling LDRD program charges on other Federal agency funded Work for Others projects in fiscal year 2002. These procedures changed the Work for Others process to ensure proper notification of other Federal agencies as to the LDRD charges prior to funding work at the laboratory. Specifically, each new and/or revised Work for Others proposal provided to a Federal agency must indicate the amount of LDRD charges that will be collected. Furthermore, the proposal notifies the sponsor that, by providing funding, the agency is acknowledging LDRD activities are beneficial to their organization and consistent with appropriation acts providing funds to that agency. Subsequently, each Work for Others funding acceptance document also includes the LDRD estimate acknowledgement.

Secretarial Affirmation

All LDRD activities derived from funds of other Federal agencies have been conducted in a manner that supports science and technology development that benefits the programs of the sponsoring agencies and is consistent with the appropriations acts that provided funds to those agencies.



Spencer Abraham

December 16, 2004

Date

LDRD Legal Authority and Order

The LDRD program operates under the same statutory and Departmental guidance that it has in past years, and the laboratories work closely with DOE personnel to assure the careful Federal oversight that both the letter and spirit of the guidance intends.

Authorization Basis

The Atomic Energy Act (AEA) of 1954, as amended, 42 U.S.C. 2011 et seq., Section 31, directs DOE to exercise its powers to ensure the continued conduct of R&D and training activities and to assist in the acquisition of an ever-expanding body of theoretical and practical knowledge in the fields of energy, its production, uses, handling, and effects. This mission was initially the responsibility of the Atomic Energy Commission (AEC), then the Energy Research and Development Administration, (ERDA) and subsequently that of DOE.

The current LDRD program is consistent with the mission of providing a program of conducting, assisting, and fostering research and development to encourage maximum scientific and industrial progress, contemplated in Section 3 of the AEA and confirmed in subsequent laws applicable to the successor agencies, ERDA and DOE. Public Law 95-39 (Section 303), dated June 3, 1977, authorized any laboratory under contract with ERDA, with the Administrator's approval, to "use a reasonable amount of its operating budget for the funding of employee-suggested research projects."

Section 3132(d) of the National Defense Authorization Act for FY 1991 (Public Law 101-510), set the funding limit for each Laboratory's program at 6 percent of the Laboratory's total operating and capital equipment budget. In FY 2000, Section 308 of the Energy and Water Development Appropriations Act (H.R. 2605) reduced the funding level to 4 percent with the additional restriction that none of the funds in the Environmental Management programs are available for Laboratory Directed Research and Development. This reduction had a notably deleterious effect on the LDRD program and the DOE National Nuclear Security Administration (NNSA) Laboratories. The Energy and Water Development Appropriations Act for FY 2001 (Section 306) restored the funding limit to 6 percent, and the explanatory language of the accompanying Conference Report (106-988) directed the Department's Chief Financial Officer "to develop and execute a financial accounting report of LDRD expenditures by laboratory and weapons production plant." The 6 percent funding level remained in effect in FY 2004.

DOE Orders Governing the LDRD Program

With this authorization basis, the LDRD program, since its inception in FY 1991, has been under continual oversight by DOE to ensure compliance with Congressional requirements. During

1991, the Department developed and implemented DOE Order 5000.4, *Laboratory Directed Research and Development*, establishing formal processes to manage and oversee the LDRD program. These processes have been subject to ongoing Departmental review and revision to ensure compliance with Congressional intent and with Departmental policies and requirements. On April 9, 1992, the DOE Order was revised to increase the emphasis on Departmental oversight of research and development activities. In 1993, individual program organizations provided additional instructions through a set of “Responsibilities and Guidelines.” In 1997, DOE updated the 1992 DOE LDRD Order to DOE Order 413.2, *Laboratory Directed Research and Development*,¹ and more recently to DOE Order 413.2A, *Laboratory Directed Research and Development*² to include the new NNSA.

DOE Order 413.2A provides guidance in the following areas:

- General criteria for the selection of LDRD projects;
- Limitations on the duration of LDRD projects;
- Limitations on the total maximum annual funding for the LDRD program;
- Excluded activities under LDRD funding;
- Responsibilities of DOE offices (including field offices); and
- Contractor requirements, including annual planning and reporting documents.

¹ DOE Order 413.2, March 5, 1997.

² DOE Order 413.2A, op. cit., p. 1.

DOE Program Management and Oversight

Overview

DOE's oversight of LDRD activities ensures that the objectives stated in DOE Order 413.2A, *Laboratory Directed Research and Development*, are accomplished by each laboratory's LDRD program. The objectives are to "maintain scientific and technical vitality of the laboratories; enhance the laboratories' ability to address future DOE missions; foster creativity and stimulate exploration of forefront science and technology; serve as a proving ground for new research; and support high-risk, potentially high-value research and development."

The oversight process is consistent with DOE's overall management approach and philosophy for all research and development activities, and includes annual planning and reporting documents and program and peer reviews. The Department followed a rigorous process in developing the LDRD policy and establishing the 6 percent maximum level. The 6 percent limit is a maximum and not an automatic provision. The Department approves a specific level of funding and a plan for each laboratory annually. In addition to the requirements and specific oversight mechanisms defined in DOE Order 413.2A, the Department conducts an annual evaluation of the full spectrum of science and technology at the laboratories as part of the overall appraisal of contractor performance. This evaluation spans all programmatic activities, and specifically includes LDRD, looking at its quality of science, strategic alignment, and relevance to DOE missions.

Much of the input to this retrospective evaluation comes from independent external peer review committees composed of scientific leaders from industry and academia as well as from the Federal research community including the laboratories themselves. The result of this science and technology evaluation is additional input for the Department in the assessment of the value and level of funding for LDRD activities. In addition, LDRD is an integral element of the laboratories strategic planning process and all research and development, including LDRD, conducted at the laboratories is reviewed at least annually through on-site reviews.

The Office of Science (SC), the Office of Nuclear Energy, Science and Technology (NE), and the NNSA have established a common oversight process to ensure the laboratories effectively manage their LDRD programs in accordance with DOE Order 413.2A. The process is designed to allow flexibility to the laboratory in implementing its LDRD program, while ensuring effective DOE oversight and stewardship of the taxpayers' dollars.

Planning

Each laboratory is required to submit an annual LDRD Program Plan for approval to the cognizant Secretarial Officer and Site Office Manager before the start of the fiscal year. The plan

must include a requested funding level as well as a general description and justification of the LDRD program. It must describe how the LDRD program will contribute to and strengthen the laboratory's science and technology capabilities, support the laboratory's mission and benefit the Department and the Nation. In addition, each laboratory must establish and describe criteria for selecting and prioritizing projects. These criteria include utilizing internal peer and scientific management reviews that support and validate the innovative scientific and technological excellence of the program. The cognizant Site Office reviews the laboratory's proposed annual LDRD plan and funding level and provides its written recommendation to the cognizant Secretarial Officer.

As part of this recommendation, the Site Office Manager certifies that the laboratory's method for accumulating LDRD funds meets the requirements of DOE Order 413.2A. The Order requires Site Office Managers to annually review and certify to Headquarters that the laboratory's method for accumulating LDRD funds is consistent with the maximum allowable funding, and is in accordance with terms and conditions of the laboratory's contract. The Site Office LDRD managers, as well as the field financial managers, are involved in conducting these reviews in early summer of each year. Financial accountability, as demonstrated by these reviews, is a strong factor in the Site Office's recommendation to the Department of the LDRD funding level.

The cognizant Secretarial Officers annually approve each laboratory's LDRD plan and the maximum funding that may be expended on LDRD activities for the next fiscal year. This approval is based on the reasonableness of the documentation, the Site Office's recommendation, results from the prior year's review of the program, and the Laboratory's overall performance in managing its LDRD program. The approval also considers input from appropriate Departmental program managers. Throughout the fiscal year, the DOE works closely with each laboratory and reviews any proposed LDRD program modifications or adjustments to ensure that the laboratories realize optimum mission benefits. No individual LDRD project may begin without concurrence from DOE.

Implementation

DOE has established efficient management policies and processes to provide effective oversight of the LDRD program. The management processes ensure proper oversight of current research thrusts while maintaining flexibility to address future needs.

The laboratories implement the LDRD program in accordance with the requirements in DOE Order 413.2A. While the timing or details of discrete DOE oversight activities may differ somewhat from laboratory to laboratory, the oversight processes among all the DOE program offices have certain key elements in common. For example, all LDRD projects are reviewed and approved by the cognizant Federal official prior to any work starting. In addition, DOE conducts a review of each laboratory's LDRD program to ensure consistency with Department policy, and to review technical success and proposed research. In the case of the NE and the three NNSA

laboratories, the review is conducted late in the fiscal year (August/September), permitting review and concurrence of proposed research for the next fiscal year. SC conducts their LDRD program reviews earlier in the year (May/June), prior to completion of the research proposal review cycle, and consequently has a separate activity later in the year that involves DOE concurrence of the next year's research portfolio. Representatives from other laboratories, as well as appropriate Departmental program managers, are invited to participate in the LDRD program reviews, to share lessons learned, and to promote best practices and continuous management improvement across the laboratories. All the laboratories have processes to review and assess the performance of individual research projects, and DOE is involved in those processes at the field offices as well as Headquarters. Again, the timing and details of this activity may vary among the program offices, but the end result is the same: corrective actions resulting from the oversight are implemented as needed, including changes in project scope, emphasis, or funding.

In addition to the specific oversight mechanisms defined in DOE 413.2A, the Department and its contractors conduct an annual evaluation of the full spectrum of science and technology at the laboratories as part of the overall evaluation of contractor performance. This evaluation spans all programmatic activities, and specifically includes LDRD, looking at its quality of science, strategic alignment, and relevance to DOE missions. Much of the input to this evaluation comes from independent external peer review committees composed of scientific leaders from industry and academia. The results of this science and technology evaluation are additional input for Headquarters in assessing the value and determining the funding level for LDRD activities.

Reporting

At the end of the fiscal year, each laboratory is required to submit an annual LDRD report to the cognizant Secretarial Officer and Site Office Manager. The LDRD Annual Report includes a technical and financial overview of the program as well as a short summary of each funded project. The Annual Report, in conjunction with the LDRD Program Plan, contains a description of the laboratory's LDRD management process, a summary of how the laboratory's LDRD portfolio relates to DOE/Laboratory missions, initiatives, and strategic plans, a description of the peer review process under which the LDRD projects are evaluated along with any relevant results; and a summary of the metric data as success indicators. Aggregated performance indicators, such as patents, awards, and follow-on funding, collected on the LDRD portfolio at each Laboratory are useful in revealing trends on the overall productivity of the program over time, although some of the more measurable results occur years after project completion.

The Site Office reviews the laboratory's LDRD Annual Report and forwards it to the Cognizant Secretarial Officer certifying the adequacy of the laboratory's LDRD management process and Laboratory adherence to the established criteria for LDRD projects. The Cognizant Secretarial Officer also reviews each laboratory's Annual Report to assess the laboratory's LDRD management systems and program performance. As part of this review, SC, NNSA, and NE ensure that the appropriate Headquarters program managers are involved as questions related to their programs are discussed and resolved.

In its independent FY 2001 report to Congress, the General Accounting Office stated,³

“All the LDRD projects we reviewed at the ...laboratories we visited met DOE’s guidelines for selection [and] had created the internal controls necessary to reasonably ensure compliance with DOE’s guidelines. The key controls in place included using DOE’s guidelines to control and conduct the project-selection process ...and ensuring appropriate DOE oversight and review of the results of the process.”

In summary, DOE’s oversight includes project approval, financial certification reviews, appraisal process reviews, Program Plan reviews (both in the field and at headquarters) and onsite reviews (both of technical content as well as management processes). Annually, DOE issues an approval letter for each laboratory’s LDRD Program Plan and confirms the maximum LDRD funding level that may be used for the program. Throughout the fiscal year, DOE works closely with each laboratory and reviews any proposed additions or adjustments to the program to ensure compliance with the DOE Order and that optimum mission benefit is realized by both DOE and the laboratories.

³ GAO-01-927, *op. cit.*, p. 10.

Laboratory Program Management

Overview

The DOE laboratories have implemented similar processes to manage their LDRD programs and select projects for funding. These processes have three major components: (1) a top-level strategic planning process to identify strategic science and technology areas for LDRD investment; (2) a call to the laboratory scientific and technical community for innovative and relevant proposals within the DOE mission areas; and (3) a scientific peer-review process to select an LDRD portfolio from these proposals, and a ranking process by senior management to prioritize the portfolio of projects for funding.

Strategic Planning

Early each fiscal year, laboratory directors and their senior management begin the LDRD cycle for the following year with a review of strategic directions, an assessment of the health of the science and technology underpinning laboratory missions, and an evaluation of the need for far-reaching fundamental research and development to maintain laboratory vitality for future missions. These activities identify the laboratory's strategic research and development needs. The review provides target allocations and determination of the LDRD program funding level as a percentage of the laboratory's total operating and capital equipment budget.

Within the LDRD program, priorities and budgets are set for three types of projects: (1) research and development demonstrations or proof-of-concept; (2) multifaceted research and development that has the potential to alter the laboratories' approach to solving programmatic challenges; and (3) long-range, high-risk fundamental research and development in broad science and technology areas underlying the laboratories' competencies and mission areas.

This process demonstrates the importance that laboratory senior management places on LDRD as a tool to maintain the vitality of the laboratories and to meet future programmatic needs and missions.

Call for LDRD Proposals

Once the strategic direction for the LDRD program is established, the laboratory LDRD program office issues calls for proposals to the scientific and technical community. This open call for proposals encourages the broadest participation from all laboratory scientific and technical staff, and ensures that the most innovative approaches are brought forward. Proposed projects range from those that focus strictly on strategic science and technology development to those highly innovative, creative projects that enhance the capabilities of the laboratories to accomplish their missions.

Selection of Projects for Funding

All proposals are subject to two types of review: scientific peer review and management review. The scientific peer review is based on criteria that include an evaluation of the proposal's innovation, impact, risk, programmatic and strategic relevance, scientific quality, feasibility, and quality of the project team. In a recent report reviewing the LDRD Program, the General Accounting Office described the peer-review process as follows:

“All laboratories used DOE’s LDRD Order 413.2A as the primary guidance to review and select projects. Individuals involved in the review and selection of the projects had the requisite background and experience to provide credible review. Those individuals had wide-ranging scientific backgrounds—usually a Ph.D. in scientific research and practical experience in basic scientific research. When the subject matter of a project proposal was outside the knowledge base of the review team, the laboratories generally contracted with outside experts to provide reviews and recommendations on the merits of that proposal. In general, each laboratory established review panels comprising individuals from across the laboratory, which provided for diverse opinions to ensure that various points of view were brought to bear on the selection decision.”

The management review includes participation by laboratory senior managers, program leaders, and leading scientists in selecting a portfolio of projects of the highest quality that are aligned with the strategic requirements of both DOE and the laboratories. Analysis of LDRD program data from the last few years indicates that the total estimated dollar value of those proposals that meet or exceed the selection criteria far exceeds the funding available at a 6 percent funding level. Each laboratory Director is responsible for final portfolio balance and project funding decisions.

In addition, the laboratories conduct reviews to assess technical progress and track project costs. In the post-performance stage, separate and independent external peer review advisory committees consisting of subject matter experts from academia and industry conduct peer reviews of LDRD projects as an integral part of the Department’s scientific program reviews. These scientific peer reviews are conducted for all technical divisions on a rotating basis as part of the contract mechanism and annual performance evaluation.

The various peer review and self-assessment processes described above are designed to ensure that the laboratories’ LDRD programs comply with DOE requirements, represent innovative and creative science, strengthen technical capabilities, and contribute to each institution’s pursuit of excellence in science and technology. The peer review process has evolved over several years of continuous improvement and is consistent with principles employed by other peer review processes performed by other agencies, such as the National Science Foundation and National Institutes of Health. The laboratories and DOE will continue to look for ways to improve these processes to enhance and strengthen the LDRD program.

Plant Directed Research, Development and Demonstration Program

Program Overview and Philosophy

The National Nuclear Security Administration (NNSA) Defense Programs (DP) Plant Directed Research, Development and Demonstration (PDRD) Program supports science-based manufacturing related to the NNSA weapons mission. Projects emphasize applied science and technology that enhance the manager's technology development capabilities and core competencies. Technical staff at the plants have the opportunity to explore innovative scientific and technological opportunities that hold high potential for payoff in mission applications.

The PDRD Program described in this document is consistent with Congressional intent as stated in the Energy and Water Development Appropriations Act for FY 2001 (Section 310) and the Defense Authorization Act for FY 2001 (Section 3165) which authorized the establishment of a Plant Managers Research, Development, and Demonstration Program at the following sites:

- The Kansas City Plant (KCP), Kansas City, Missouri,
- The Y-12 Plant (Y-12), Oak Ridge, Tennessee,
- The Pantex Plant, Amarillo, Texas, and
- The Savannah River Plant (SRP), Aiken, South Carolina.

The conference agreement allows for a maximum of two percent of the plants' NNSA operating budget to be utilized for the PDRD Program. The Authorization Act and Conference Report language instruct NNSA to establish and conduct an LDRD-type program for the nuclear weapons plants. The LDRD enabling legislation serves as a guide for the PDRD Program. The authorization basis for LDRD as defined by Section 3132(d) of the National Defense Authorization Act for FY 1991 and the policy and guidance contained in DOE Order 413.2A will be followed to the extent practicable.

By extension of the LDRD authorization basis, PDRD funds are to be used for research, development, and demonstration projects that are of a creative and innovative and potentially high value to the NNSA facility conducting the effort. The projects are selected by the Contractor Manager of a site for the purpose of maintaining or improving the vitality of the enterprise in mission-related scientific disciplines. The PDRD Programs provide the NNSA nuclear weapons plant managers the flexibility to invest in longer-term, higher-risk, and potentially higher-payoff research activities that enhance the science and technology capabilities of the plants.

In structuring the PDRD Program to enhance and maintain the "vitality" of the nuclear weapons plants, specific attention will be placed on the following areas:

- Retention and recruitment of individuals with knowledge, experience, and skills that are critical to the success of site operations today and in the future;
- Exploration of enhanced core competencies and achievement of new or improved capabilities required for current and future technical missions; and
- Replenishment of the pipeline of proven concepts that can improve or replace current practices, products and processes with developing and demonstrating innovative agile process technologies.

Individual programs at each site will be structured to incorporate Defense Program goals and will be consistent with the NNSA Strategic Plan and that site's corresponding goals and objectives for the future.

Program Description - Roles & Responsibilities

The PDRD Program is focused on relevant manufacturing-related technologies. It should be noted that the PDRD Program provides the site managers with broad flexibility for program implementation while NNSA's role is one of oversight and concurrence. Acting as the Cognizant Secretarial Officer designee, the Assistant Deputy Administrator for Military Applications and Stockpile Operations, through the applicable Federal Program Manager, has primary responsibility for the PDRD Program. The NNSA Site Offices are responsible to assure that their site's program plan and accounting practices are consistent with the intent of the implementing legislation, that the projects selected are representative of the NNSA and site's strategic mission, and that the results of promising projects are highlighted and transferred to other NNSA programs for further development.

Program Components

The PDRD Program at each of the four sites will consist of four main components:

1. A top level program planning process that results in identification of strategic manufacturing science and technology areas for targeted investment;
2. A call to plant scientific, engineering, manufacturing, and /or program management personnel for innovative and relevant proposals in the target investment areas;
3. A review process to select from the proposals a project portfolio for funding; and
4. A process for measuring and evaluating the program's effectiveness.

Fiscal Guidance

The maximum funding level established must not exceed 2 percent of the NNSA operating budget for the year as determined by Congress. The system of accrual of these funds shall, to the extent reasonable, provide for equitable contributions by all sources of NNSA funding. Construction line item and Work-for-Other projects are excluded. Expenditures shall be

considered an allowable cost in accordance with the terms and conditions of the operating contract and shall be identifiable and traceable within the accounting system for ease of annual certification.

PDRD funds may not be used to substitute for or supplement funding for any tasks or project required, planned, and budgeted by the NNSA or any other agency to meet current mission needs. PDRD funds may be used to fund conceptual or preliminary designs, but may not be used to fund any construction design (e.g. Title I). PDRD funds may be used to fund capital expenditures for acquisition of general-purpose equipment as long as the equipment is required to complete the project and would not otherwise be readily available from the plant inventory. PDRD funds may not be used to supplement a site's general capital equipment budget. Occasionally a small proportion of funds may be used to survey and evaluate the suitability of competing commercially available technical solutions in order to develop an optimum procurement recommendation.

The FY 2001 Energy and Water Development Appropriations Subcommittee Conference Report directed the Chief Financial Officer (CFO) to develop and execute a financial report of expenditures by site. The CFOs of the sites are responsible for preparing this report and it will include written assurance that the method for accumulating funds is consistent with DOE Order 413.2A. In addition, CFOs shall assure that cost information reported by their site is in agreement with the site financial records.

Defense Programs' Oversight of the Program

The purpose of program oversight is to ensure that each site carries out the objectives stated in the law enabling the Program. Site Offices review the plant program and processes to ensure that they adhere to NNSA policy and guidance, are consistent with DP mission needs, and recommend approval of the program plan for the upcoming year to the Program Manager.

As part of the appraisal of overall contractor performance, the Site Office will conduct an annual evaluation of the full spectrum of activities at the site. This evaluation spans all programmatic activities, and specifically includes an evaluation of the quality of the technical work, strategic alignment, and relevance to the NNSA missions. Technical program reviews to ensure that the PDRD Program and individual projects are in support of the NNSA mission are also conducted.

The Plants participating in the program will provide to their Site Office a proposed program plan for the upcoming fiscal year. Both the Site Office and the Federal Program Manager will review and analyze the plan, taking into account NNSA policy, alignment with guidance, mission relevance, strategic planning, operational needs, and general program performance. Additionally, each site's proposed plan and requested program funding level is evaluated against Congressional requirements regarding support of NNSA's national security mission. The Program Manager assembles the annual PDRD program plan which includes the individual site

plans, and submits it to the cognizant Secretarial Officer or designee along with a recommendation on the plan and the program funding level. At the start of the fiscal year, the cognizant Secretarial Officer or designee assesses the plan and the Program Manager's recommendation and makes the final decision to approve the program plan.

Plants participating in the program will propose projects for review by the Site Office and the Program Manager. Site Office and Program Manager concurrence is required prior to initiating work on any project. Throughout the fiscal year, the Site Office works closely with their site by reviewing any proposed modifications or adjustments to the program for adherence to NNSA guidelines and the site's program plan, and notifying the Program Manager of any potential issues.

Fiscal Year 2004 PDRD Program Expenditures

The following table shows FY 2004 PDRD program expenditures by site. It should be noted that the table includes all PDRD costs including individual project costs listed in Note 1 and any administrative costs not specifically assigned to individual FY 2004 projects, if applicable.

| Plant | NNSA/DP Funding (\$M) | PDRD Costs (\$M) | PDRD Fraction |
|--------------|------------------------------|-------------------------|----------------------|
| KCP | \$374.9 | \$5.1 | 1.36% |
| Pantex | \$438.5 | \$2.4 | .55% |
| SRP | \$133.1 | \$2.7 | 2.00% |
| Y-12 | \$589.3 | \$9.9 | 1.68 % |

Site Directed Research, Development and Demonstration

Program Overview and Philosophy

The National Nuclear Security Administration (NNSA) Defense Programs (DP) Nevada Test Site Directed Research, Development and Demonstration (SDRD) program supports technology development related to the NNSA weapons mission. The program is administered by the Management and Operations contractor for the Nevada Test Site (NTS). Technical staff at NTS operational sites has the opportunity to explore innovative scientific and technological opportunities that hold high potential for payoff in mission applications.

Section 310 of Public Law 107-66, the Energy and Water Development Appropriations Act for FY 2002 states *“The Administrator of the National Nuclear Security Administration may authorize the manager of the Nevada Operations Office to engage in research, development, and demonstration activities with respect to the development, test, and evaluation capabilities necessary for operations and readiness of the Nevada Test Site: Provided, That of the amount allocated to the Nevada Operations Office each fiscal year from amounts available to the Department of Energy for such fiscal year for national security programs at the Nevada Test Site, not more than an amount equal to 2 percent of such amount may be used for these activities.”*

Furthermore, the Act and accompanying Conference Report authorizes NNSA to establish and conduct an LDRD-type program for the nuclear weapons plants. The LDRD enabling legislation serves as a guide for the SDRD program. The authorization basis for LDRD is defined by Section 3132(d) of the National Defense Authorization Act for FY 1991, and the policy and guidance contained in DOE Order 413.2A will be followed to the extent practicable.

By extension of the LDRD authorization basis, SDRD represents research, development and demonstration work of a creative and innovative nature selected by a senior management committee for the purpose of maintaining the vitality of the Site in mission-related scientific disciplines. SDRD provides Nevada Test Site managers the flexibility to invest in longer-term, higher-risk, and potentially higher-payoff research activities that enhance the science and technology capabilities.

In structuring the SDRD program to enhance and maintain the “vitality” of the NTS and the technical base for carrying out the NTS DP mission, specific attention will be placed on the following areas:

- Retention and recruitment of individuals with critical skills;
- Maintenance of core competencies required for current and future technical missions; and
- Developing and demonstrating innovative, agile technology to replace outdated technology.

The program will be structured to incorporate NNSA National Security Response and Defense Programs' goals and will be consistent with the NNSA Strategic Plan.

Program Description - Roles & Responsibilities

The SDRD program is analogous to the LDRD program with appropriate differences to assure the program is focused on instrumentation and diagnostic technologies critical to the performance of the NTS stockpile stewardship and nuclear security response missions. The main elements and responsibility matrix for the SDRD program is given below. It should be noted that the SDRD program, like the LDRD program, provides NTS with broad flexibility for program implementation and NNSA's role is one of limited oversight and concurrence. Acting as the Cognizant Secretarial Officer designee, the Assistant Deputy Administrator for Research, Development and Simulation, through the DP Program Manager, has primary responsibility for the SDRD program. The Federal Site Office at NNSA/Nevada is responsible for implementation and oversight.

Program Components

The SDRD program will consist of three main components:

1. A top level program planning process that results in identification of strategic science and technology areas for targeted SDRD investment;
2. A call to scientific, engineering, and /or other technical personnel for innovative and relevant proposals in the target SDRD investment areas; and
3. A review process to select from the proposals a SDRD project portfolio for funding.

Program Planning. The SDRD program will use appropriate strategic plans and DP goals to identify strategic technology needs and establish SDRD objectives to address near-term, mid-term and long-term competence for assigned missions.

Call for Employee-suggested Proposals. Once the strategic direction is established, a call for proposals will be issued to the NTS scientific and engineering community. This broad-based call for proposals will result in participation of numerous scientists, engineers, and technicians yielding numerous innovative approaches to meeting the strategic SDRD objectives.

Review and Selection of Proposals for funding. All proposals are subject to two types of review, a technical review by scientists, engineers, and program management personnel, and an operational management review. The technical review is performed against criteria that include an evaluation of the proposal's balance of innovation, impact, and risk with programmatic and strategic relevance. The management review includes participation by senior functional and programmatic management to select sound technical proposals that are aligned with the strategic goals and objectives of the NTS mission.

Fiscal Guidance

The maximum funding level established for SDRD must not exceed 2 percent of the NNSA operating budget for the year as determined by Congress. Construction line item projects are excluded. SDRD expenditures shall be considered an allowable cost in accordance with the terms and conditions of the operating contract and shall be identified in the accounting system.

The FY 2001 Energy and Water Development Appropriations Subcommittee Conference Report directed the Chief Financial Officer (CFO) to develop and execute a financial report of SDRD expenditures by project. The CFOs of the Sites are responsible for preparing this report and it will include written assurance that the method for accumulating SDRD funds is consistent with DOE Order 413.2A. In addition, CFOs shall assure that cost information reported by their Site is in agreement with the NTS financial records.

Defense Programs Oversight of the SDRD program

The SDRD oversight activities ensure that NTS carries out the objectives stated in the law enabling the Program. SDRD oversight is managed through the NNSA/NSO in a process that is consistent with the LDRD oversight process. The Site Office reviews the program and process to ensure that it adheres to NNSA policy and guidance, is consistent with DP mission needs, and recommends approval of the SDRD program plan for the upcoming year to the DP Program Manager.

As part of the appraisal of overall contractor performance, NNSA/NSO will conduct an annual evaluation of SDRD activities at NTS. This evaluation looks at the quality of the technical work, strategic alignment, and relevance to the NNSA missions. This annual evaluation relies heavily on the NTS self-assessment process. The result of this evaluation is additional input for DP in the assessment of the value and level of funding for the SDRD activities.

Technical program reviews to ensure that the SDRD program and individual projects are in support of the NNSA mission will be conducted in conjunction with LDRD working group meetings. Due to the similarities between the SDRD program and the Plant Directed Research Development and Demonstration (PDRD) program, SDRD Managers will also participate, when feasible, in PDRD working group meetings. The NTS SDRD Program Manager will schedule all Principal Investigators to present their work at least once during the life of their project.

Nevada Test Site will submit to NNSA/NSO and DP, a proposed SDRD program plan for the upcoming fiscal year. Both the Site Office and the DP Program Manager will review and analyze the plan, taking into account NNSA policy, alignment with guidance, mission relevance, strategic planning, operational needs, and general program performance. In coordination with the DP Program Manager, the Site Office resolves any outstanding issues with the proposed plan and provides a recommendation to the Cognizant Secretarial Officer or designee on the plan and the program funding level. Prior to the beginning of a new fiscal year, the Cognizant Secretarial Officer or designee assesses the information submitted by the sites and issues a memorandum

approving the SDRD program plan and the maximum percent of the site's operating budget that may be used to fund the program.

NNSA/NSO concurrence is required prior to initiating work on an SDRD project.

Fiscal Year 2004 SDRD Program Expenditures

The following table shows FY 2004 SDRD program expenditures. It should be noted that the table includes all SDRD costs including individual project costs listed in Note 1 and any administrative costs not specifically assigned to individual FY 2004 projects.

| Site | NNSA Funding (\$M) | SDRD Costs (\$M) | SDRD Fraction |
|-------------|---------------------------|-------------------------|----------------------|
| NTS | \$305.8 | \$5.5 | 1.80% |