Year End Self-Evaluation

Brookhaven National Laboratory

Fiscal Year 2001

7 January 2002

BROOKHAVEN SCIENCE ASSOCIATES
Under contract with the U.S. Department of Energy

Prime Contract Number AC02-98CH10886
Prepared by: The Office of Management Services
Brookhaven National Laboratory

Office of the Interim Director

Building 460
P.O. Box 5000
Upton, NY 11973-5000
Phone 516 344-2772
Fax 516 344-5803
marburger@bnl.gov

managed by Brookhaven Science Associates
for the U.S. Department of Energy

www.bnl.gov

January 8, 2002

Mr. Frank Crescenzo
Manager, Brookhaven Group
U.S. Department of Energy
Building 464
Upton, NY 11973

Dear Mr. Crescenzo:

BSA has completed its Year-End 2001 Self-Evaluation. The evaluation report is attached for your review and consideration. Based on our self-evaluation, BSA has determined that the overall performance of the Laboratory for the fiscal year is rated as "EXCELLENT" with an overall score of 3.46.

Sincerely,

Peter Paul
Interim Director

cc: T. Sheridan
K. Brog
S. Maloney
R. Lavelle
D. Ports

Attachment: FY2001 Self-Evaluation Report

PREFACE

This is the Annual Self Evaluation Report for Fiscal Year 2001 for Brookhaven National Laboratory. It reflects Brookhaven Science Associates' (BSA) assessment of how the Laboratory performed against each of the performance measures in the Prime Contract between BSA and the DOE for operating Brookhaven National Laboratory. The report is composed of an introduction, discussion of the performance for each Critical Outcome Measure, and Attachment 1, which consists of quantitative analysis of Science and Technology.

This document was prepared using Brookhaven National Laboratory's Integrated Information Management System (IIMS). The IIMS is a web-based, real-time planning and performance management tool, which was developed by the Office of Management Services (OMS) at Brookhaven National Laboratory to integrate laboratory planning and performance.

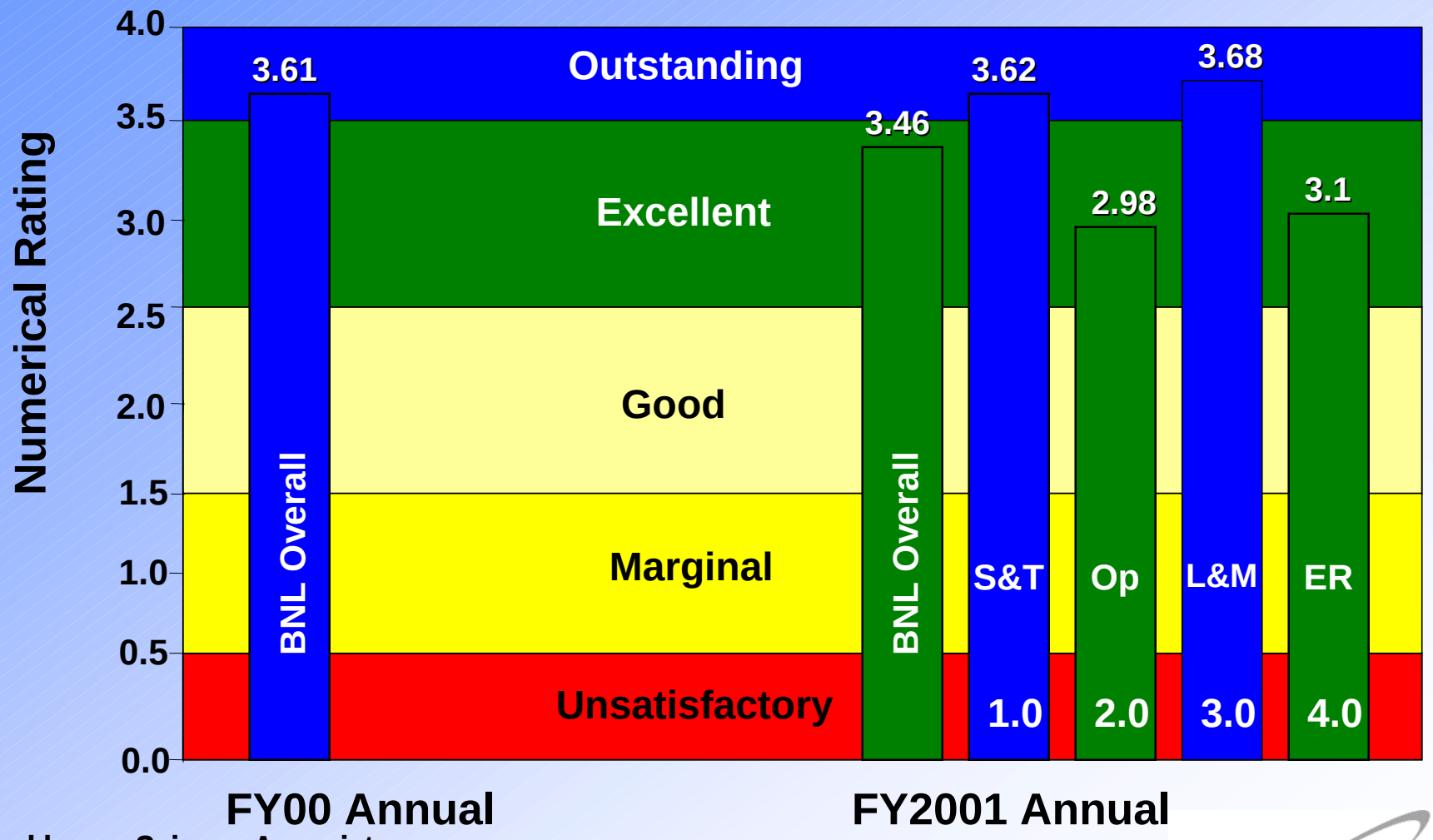
Introduction

With the Implementation of the Performance-Based Contract between Brookhaven Science Associates (BSA) and the Department of Energy (DOE) for operating Brookhaven National Laboratory (BNL), BSA is required to execute a Performance-Based Management System (PBMS). The PBMS is designed to include clear, reasonable, and objective performance measures as standards to assess BSA's overall performance of scientific, technical, operational and managerial obligations. For FY2001, the performance measures contained in the Prime Contract have been divided into four Critical Outcomes; Excellence in Science & Technology, Operational Excellence, Leadership & Management, and Environmental Restoration. The results of BSA's self-evaluation with respect to these critical outcomes are presented in this report.

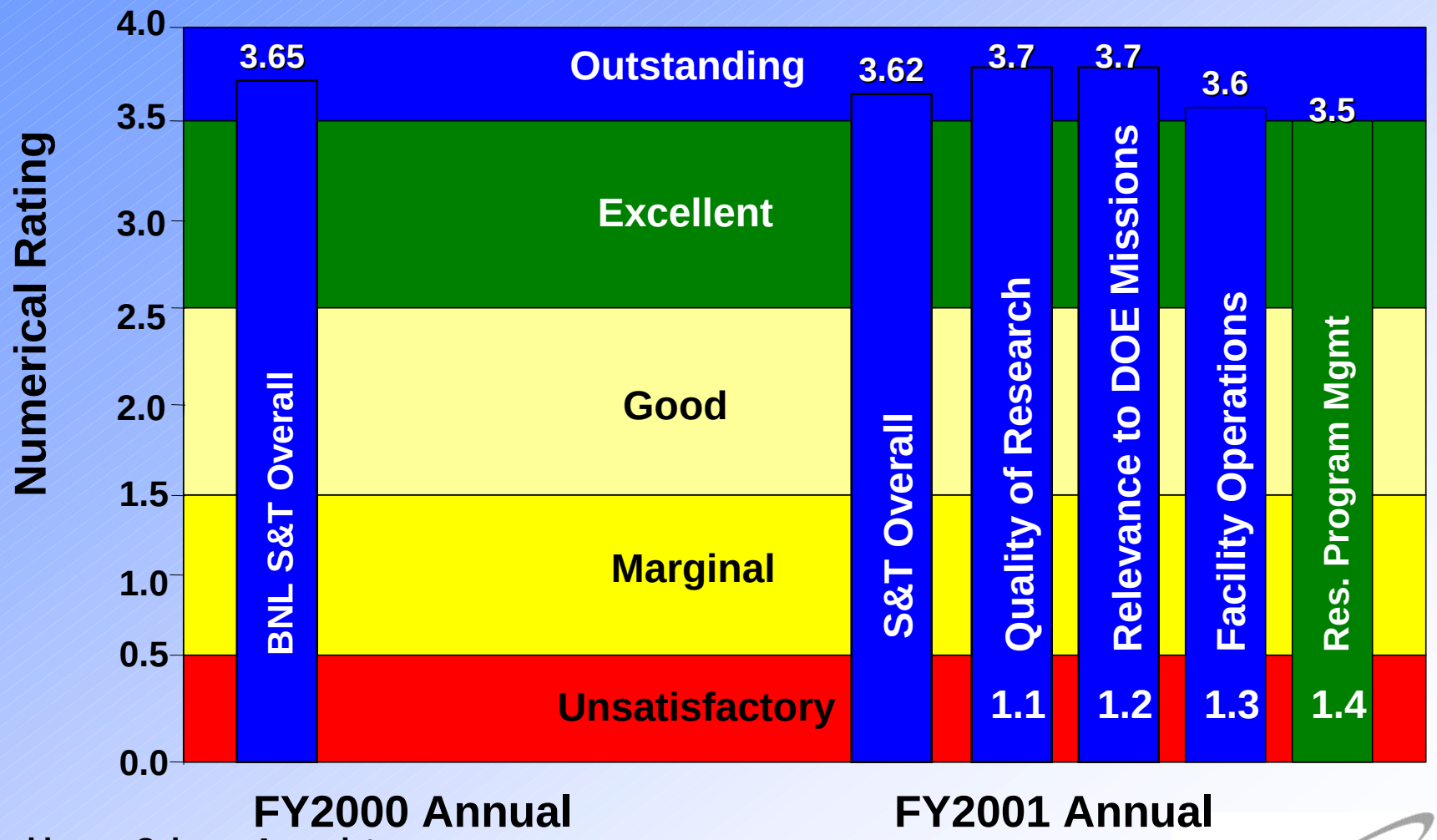
This evaluation report is organized as follows:

-Graphical representation of performance to the Objective Level
-Critical Outcome Tree
-Detailed Performance Report

Overall BNL Performance
FY 2001 Annual



Critical Outcome 1: Science & Technology



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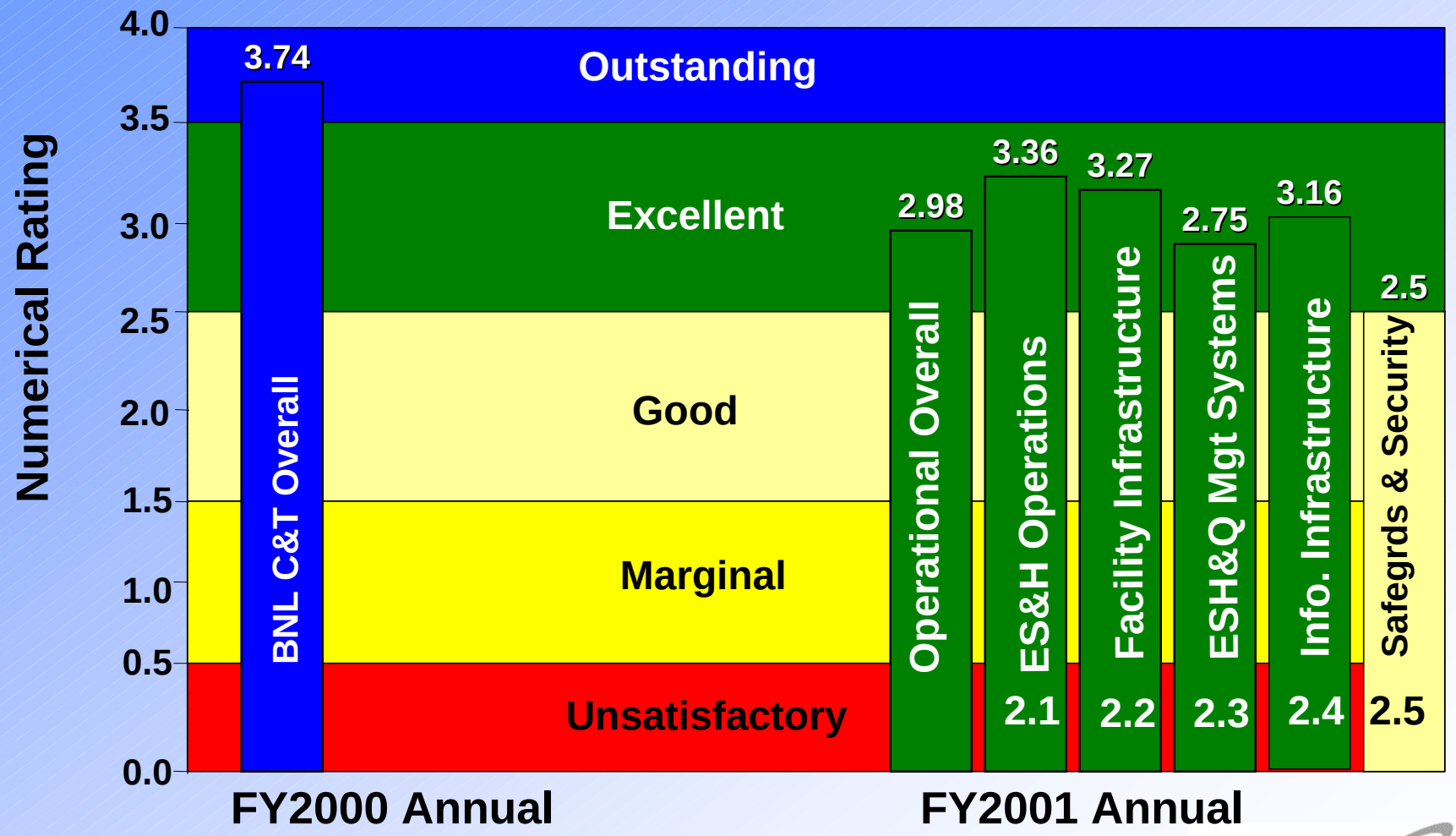
Critical Outcome 2: Operational Excellence



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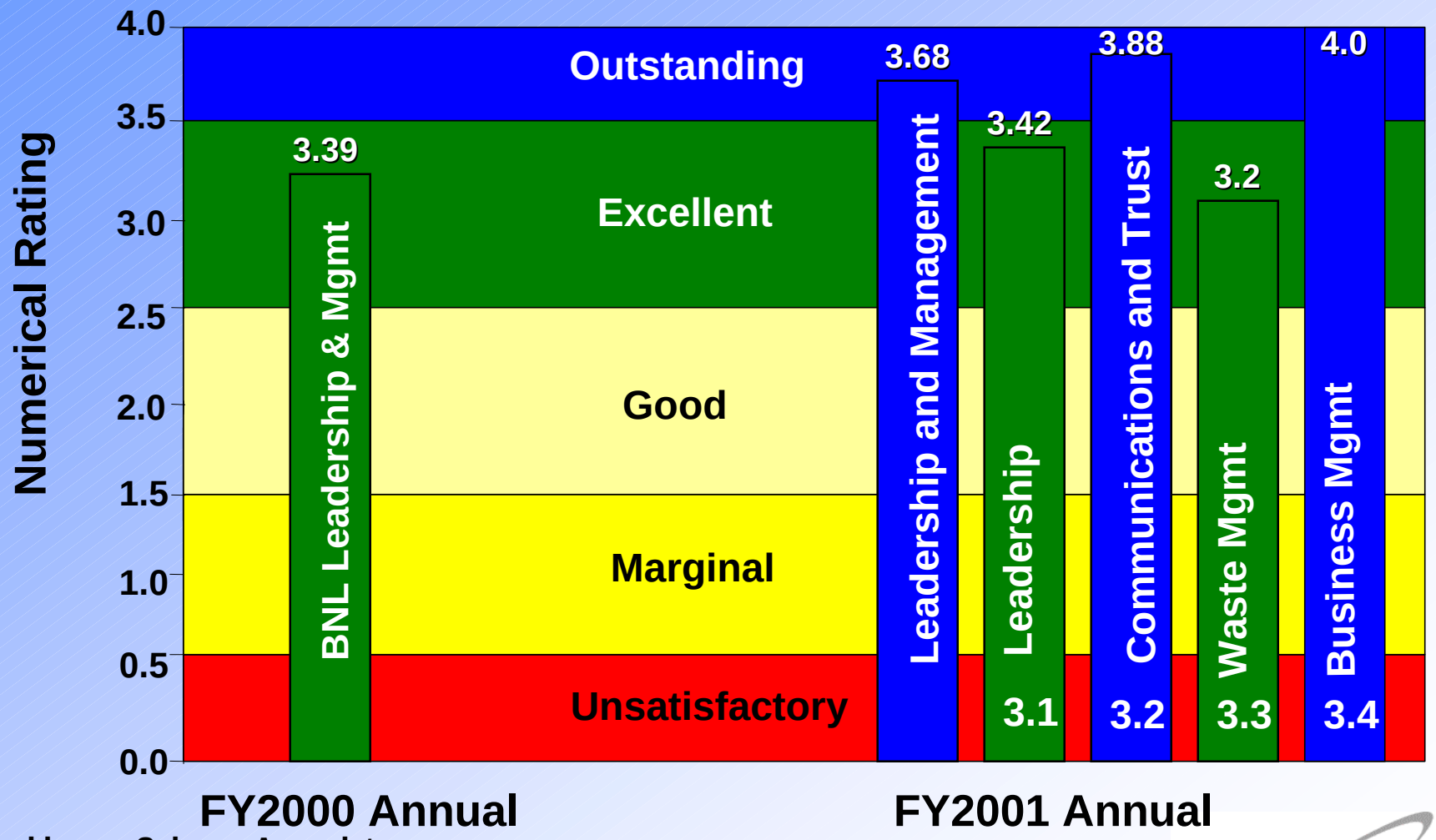
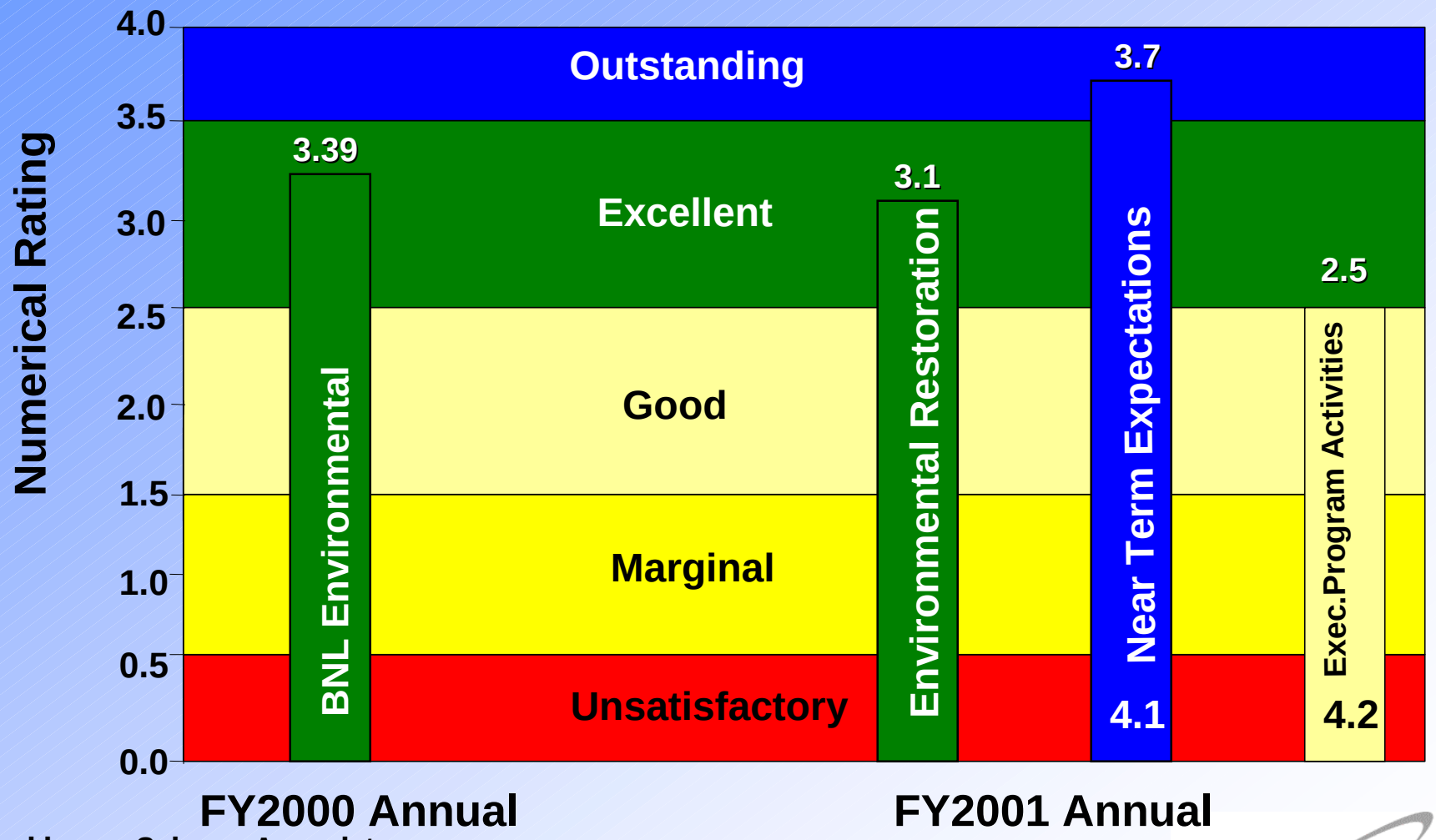
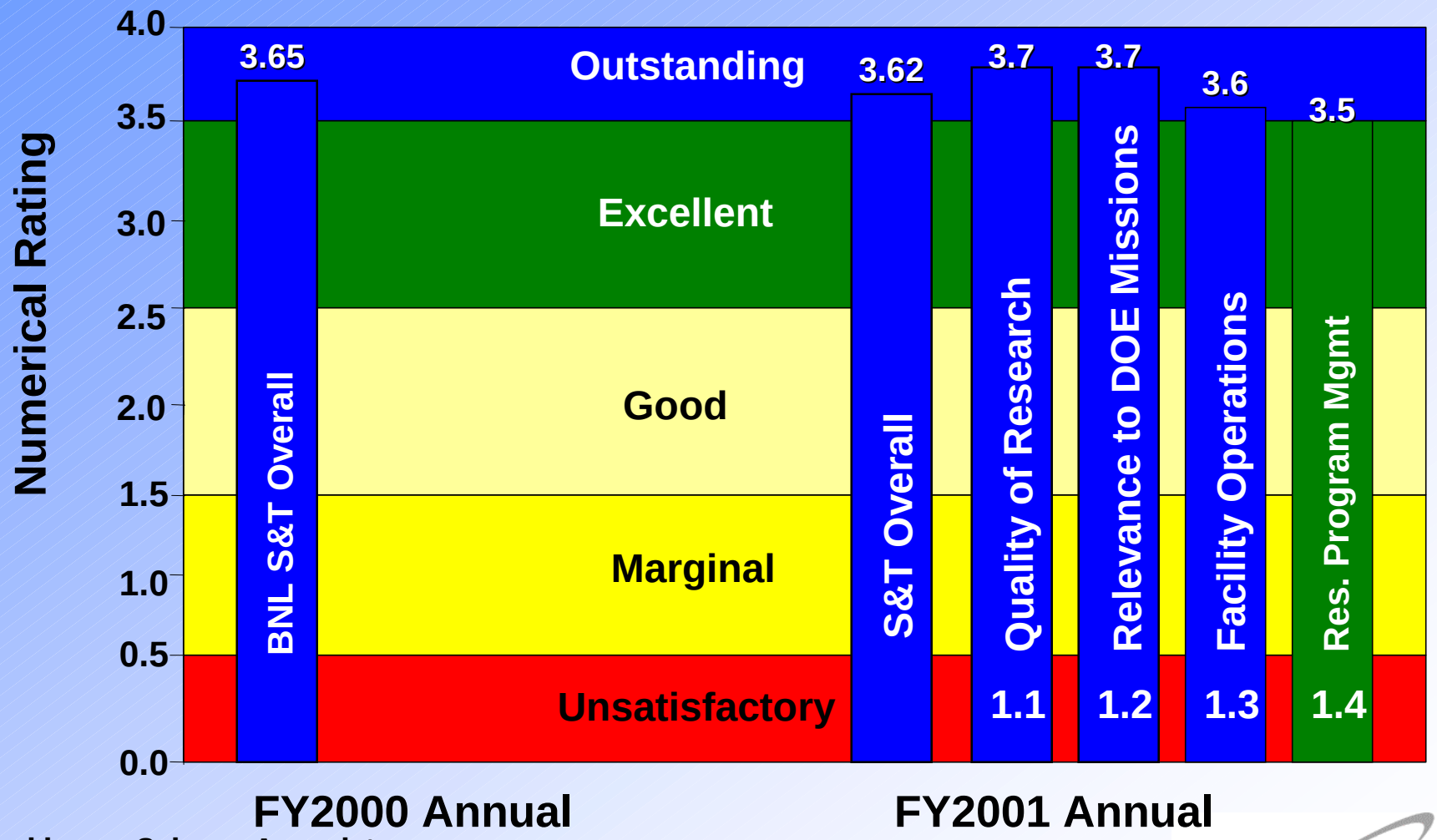
Critical Outcome 3: Leadership and Management



Critical Outcome 4: Environmental Restoration



Critical Outcome 1: Science & Technology



BROOKHAVEN NATIONAL LABORATORY

1.0 Basic Science & Technology

Critical Outcome

1.0

BNL will deliver innovative, forefront science and technology aligned with DOE strategic goals in a safe, environmentally sound, and efficient manner and will conceive, design, construct, and operate world-class user facilities.

60% of BNL Score

Objectives

1.1

Quality of Research

35% of C.O. #1

1.2

Relevance to DOE mission and national needs

10% of C.O. #1

1.3

Success in Constructing and Operating Research Facilities

30% of C.O. #1

1.4

Effectiveness and efficiency of research program management

25% of C.O. #1

Performance Measures

1.1.1 High Energy and Nuclear Physics

- Determine the quality of the High Energy and Nuclear Physics Research performed for FY 2001.

1.1.2 Basic Energy Sciences

- Determine the quality of the Basic Energy Sciences Research performed for FY 2001.

1.1.3 Life Sciences

- Determine the quality of the Life Science Research performed during FY 2001.

1.1.4 Energy, Environment & National Security

- Determine the quality of the Energy, Environment, and National Security Research performed during FY 2001.

1.2.1 High Energy and Nuclear Physics

•Determine if the High Energy and Nuclear Physics research fits within and advances the missions of DOE; contributes to U.S. leadership in the international scientific and technical communities; contributes to the goals and objectives of the Strategic plans of DOE and other national programs; and the extent of productive interaction with other Science & Technology programs.

1.2.2 Basic Energy Sciences

•Determine if the Basic Energy Science research fits within and advances the missions of DOE; contributes to U.S. leadership in the international scientific and technical communities; contributes to the goals and objectives of the Strategic plans of DOE and other national programs; and the extent of productive interaction with other Science & Technology programs.

1.2.3 Life Sciences

Determine if the Life Science research fits within and advances the missions of DOE; contributes to U.S. leadership in the international scientific and technical communities; contributes to the goals and objectives of the Strategic plans of DOE and other national programs; and the extent of productive interaction with other Science & Technology programs.

1.2.4 Energy, Environment & National Security

•Determine if the Energy, Environment & National Security research fits within and advances the missions of DOE; contributes to U.S. leadership in the international scientific and technical communities; contributes to the goals and objectives of the Strategic plans of DOE and other national programs; and the extent of productive interaction with other Science & Technology programs.

1.0 Basic Science & Technology

Critical Outcome

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Effectiveness and efficiency of research program management

25% of C.O. #1

Performance Measures

1.3.1 High Energy and Nuclear Physics, 1.3.2 Basic Energy Sciences, 1.3.3 Life Sciences, 1.3.4 Energy, Environment & National Security

- Performance specifications and objectives
- Reliability and safety of operation achieved
- Adherence to planned schedules
- Cost effectiveness of maintenance and facility improvements
- Assess new facilities design and development
- Effectiveness of user access program

1.3.5 SNS-Spallation Neutron Source Project

- Reviewers will consider the extent to which BNL provides effective and efficient leadership in the development of the Spallation Neutron Source (SNS) Project. In this project the Laboratory will perform assigned tasks and produce scheduled deliverables for the Spallation Neutron Source in accordance with the Inter-lab Memorandum of Agreement (MOA) and the approved annual work plans.

1.4.1 High Energy and Nuclear Physics

- Determine the effectiveness and efficiency of High Energy and Nuclear Physics research program management.

1.41.2 Basic Energy Sciences

- Determine the effectiveness and efficiency of Basic Energy Sciences research program management.

1.4.3 Life Sciences

- Determine the effectiveness and efficiency of Life Sciences research program management.

1.4.4 Energy, Environment & National Security

- Determine the effectiveness and efficiency of Energy, Environment & National Security research program management.

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Self-Evaluation of FY 2001 Science and Technology Performance

1.0 Excellence in Science & Technology

1.1 Introduction

Brookhaven Science Associates (BSA) rated its overall Science and Technology (S&T) performance for Fiscal Year (FY) 2001 performance as *outstanding* with a corresponding score of 3.62. The Laboratory achieved noteworthy accomplishments under each of the four Office of Science S&T Objectives and demonstrated progress in addressing comments raised by the Department of Energy (DOE) in previews, reviews and evaluations.

Individual scores for each of the four Office of Science Objectives are shown in the Table below. The scores were assigned.

Objective	Weight	Rating	Score
Quality of Research	35%	Outstanding	3.7
Relevance to DOE Mission and National Needs	10%	Outstanding	3.7
Success in Constructing and Operating Research Facilities	30%	Outstanding	3.6
Effectiveness and Efficiency in Research Program Management	25%	Excellent	3.5
Overall	100%	Outstanding	3.62

These scores were assigned by the Deputy Director for Science and Technology based on input from the Associate Laboratory Directors (ALDs) of the four BNL Science Directorates. In determining the evaluation scores, the Deputy Director considered many factors including benchmarks from past experience and DOE evaluations; major successes; peer review input and research program deficiencies; success in addressing issues to improve research program management both within science and technology organizations, as well as those initiatives taken at the institutional level.

In the following sections, highlights of performance are discussed. Detailed supporting information, as well as individual performance ratings provided by Associate Laboratory Directors (ALDs) for their respective directorates, is included in Appendix 1 of this report.

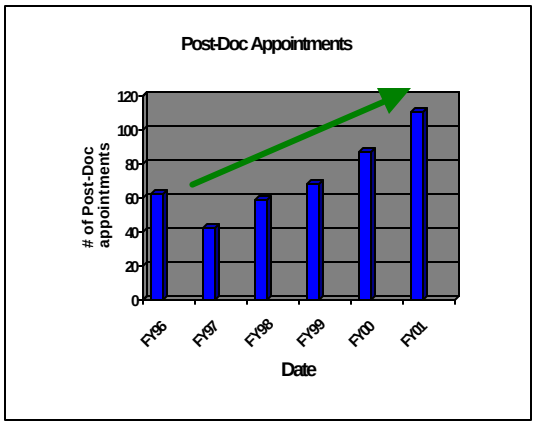
1.2 Institutional Level Performance

It is important to note that when BSA began managing Brookhaven National Laboratory (BNL), the primary focus of Laboratory management was to drive improvement in Environment, Safety, and Health (ES&H) and Community Relations. BNL's science and technology mission had been performing at an excellent level. As performance in ES&H and Community Relations improved, management attention has shifted to improving Science and Technology quality, alignment with DOE, and performance. Laboratory managers have focused on prioritized actions to address the core areas and major initiatives to achieve and sustain outstanding performance in Science and Technology. Many of the management changes are still maturing and will take several more improvement cycles before full benefits are realized. Key initiatives were adopted to attract and retain key scientific staff, improve strategic planning, improve LDRD management, and improve the integration of BNL capabilities and collaboration to maximize benefits of National Laboratory based research.

1.2.1 Initiatives

1.2.1.1 Scientific Staff

BSA continues to replenish and rejuvenate the scientific staff. Most recently, BNL instituted a program to provide post doc subsidies to departments and, with BSA support, established the distinguished Goldhaber Fellowship Program. The total postdoctoral population is now 110, having risen from about 40 two years ago. BNL plans to reach approximately 150. However, postdoc salaries at BNL are about 30% below the DOE average, and salaries need to be increased if the upward trend is to continue. With an aggressive and focussed hiring effort for expert scientists in strategic areas, the S&T sector was able to attract a good number of new scientists, and technical staff. Additionally, BSA has focused on several quality of work- life improvements to attract visiting scientists. For example, the Laboratory upgraded benchtop lab facilities and improved services to the scientists and their families (e.g., English as a Second Language (ESL) educational program; improved onsite transportation, and improved access to the Internet). Some of the more significant recruits for FY01 are mentioned in the sections below. It should be noted, however, that despite the Laboratory initiatives, BNL has lost several scientists who are pursuing career opportunities at other research institutions. The most significant factor appears to be the termination of neutron scattering capabilities at BNL.



Laboratory management made joint appointments with universities such as Stony Book as a viable means to attract key scientific personnel. Joint appointments enable the Laboratory to share resources with the universities making the cost of top scientists more affordable for both the University and the Lab. Joint appointments also improve program integration, foster broader collaboration and bring graduate students into the Laboratory. Examples of previous successful joint appointments at Stony Brook are listed below. The DOE program for which research is focused is also identified.

- James Glimm - ASCR (Head Center for Data-Intensive Computing)
- Stanislas Wong - BES (Materials Science)
- Arthur Suits - BES (Chemistry)
- Michael White – BES (Chemistry)

In FY01, the following joint appointments were also established:

- Wonho Oh - ASCR (Center for Data-
- Intensive Computing)
- Helene Benveniste - OBER (Medical)
- DaXiong FU - OBER (Biology)

BSA continues to invest in upgrading Laboratory space to help attract and retain key scientific staff.

1.2.1.2 Planning (Long and Short Term)

BSA continues to improve the Science and Technology strategic planning processes. Much of the work performed on behalf of the Department of Energy is interdisciplinary and traditional DOE research program areas or Laboratory departmental titles often do not adequately convey the evolving priorities of discovery- or issue-oriented research. In FY01, the Laboratory implemented a planning process and framework built around research themes. This approach drives toward alignment with DOE priorities and integrates Laboratory research capabilities. . It is also provides flexibility and enables the Laboratory to efficiently address changing national research priorities.

As part of the strategic planning, BSA recognized the need to continually improve integration of research, not only among BNL scientific departments, but also among other research institutions,. Integration helps assure that the best capabilities are used to address the DOE priorities and it improves coordination and focus of these research initiatives. BSA developed "centers" which are managed by senior scientific staff responsible for developing strong links and alliances inside the Laboratory and with other institutions involved in the specific research area. The centers not only serve a vital role in focusing capabilities, but they operate with relatively small budgets, provide senior scientific leadership opportunities, and provide BNL with the flexibility to respond relatively quickly to changes in DOE priorities and focus of national issues. This model has served well in the past to foster interdisciplinary work. The success of the Center for Accelerator Physics, Center for Data Intensive Computing, and the Center for Neuroscience and Imaging, are indicators of how well this construct has worked and continues to work for the Laboratory. This year, BSA has established centers for neutron science, materials, and nanoscience. If and when a center matures to an integrated but self standing research unit they are converted into Divisions.

1.2.1.3 Laboratory Directed Research and Development

BSA clarified the roles and responsibilities for coordination, oversight, and administration of the LDRD program. As part of the program improvements in FY 2001, the Laboratory appointed a Scientific Director for the LDRD program. The Scientific Director and a committee consisting of senior management and scientific staff review all proposals, obtain additional information deemed necessary, and select the projects to be funded and the amount of each award. Awards are typically for two years, with the possibility of funding for a third year. The Scientific Director of the LDRD program performs a mid-year review of all projects. This review is a determining factor whether a project would continue into the next fiscal year. In addition, The Scientific Director instituted a monthly meeting with the DOE Brookhaven Area Office to update the progress of the program and verify that the BNL LDRD Program is meeting the overall LDRD requirements. In FY2001, BSA maintained its expenditures at a level of $6 Million, approximately 1.5 percent of BNL operating funds. We are planning to increase the LDRD budget in FY 2002 to $7 Million., ~ 2%. This is still significantly less than the average of 4% for other DOE science laboratories and BNL must strive to continue to build up its LARD funds. In FY 2001, key LDRD investments were made to enhance the Laboratory's capabilities in nanoscience, magnet design, and medical imaging studies ..

1.2.1.4 Improved Integration and Collaboration

The National Laboratory complex, particularly multi-program Laboratories such as BNL, provide capabilities for conducting research that is uniquely different from programs conducted at universities. Among them are the operation of large and unique facilities, the ability to integrate

and collaborate across research disciplines within the Laboratory and with other national laboratories and research institutions and with private companies. Management took several steps to improve the integration and collaboration both at BNL and with institutions outside of BNL. These actions include a planning focus along research themes; the formation of Centers as discussed above; and expanding and developing centralized Laboratory capabilities available to support core Laboratory research and . For example:

- The Instrumentation Department's technology areas (semiconductor detectors, gas and liquid detectors, microelectronics, lasers and optics, and micro/nano fabrication) are well aligned to support all core Laboratory research programs as well as the programs at other laboratories and universities. Iinstrumentation capabilities to support the nations nano-science initiative have been expanded. The development of the microPET technology in support of the BER program has been highly successful. In FY01, the department also completed the neutron high resolution detector for LANL/Lance Low Angle Scattering Station.

The Center for Data Intensive Computing (CDIC) has provided expertise to address simulation issues in the design, operation, and control of accelerators to support High Energy Physics and Nuclear Physics programs. For DOE's Biological and Environmental Research programs, the CDIC has developed new tools for the visual and statistical analysis of data. The CDIC has engaged in numerous projects that support DOE's Basic Energy Science program including computational fluid dynamics, many-body physics, and optics. As CDIC begins to obtain a funding base from ASCR and MICS is continuing strengthening is a high priority for the Laboratory.

- The Metals and Ceramics Sciences Program has been shifted to new management that is unified across all material science and condensed matter programs funded by BES. This organizational alignment has resulted in improved knowledge of sponsors' needs, in improved collaboration between Department researchers, and development of more comprehensive research proposals.

The Laboratory's focus on increasing interdisciplinary research collaborations has gad some successes. Examples of high impact collaborations include:

- A collaborative effort within the Center for Neutron Science and including the Physics Neutron Scattering Group has accomplished its near-term goals of moving HFBR instrumentation to HFIR, NIST and ANTSO and of establishing a BNL presence at HFIR toward construction of a cold triple axis spectrometer. They have also taken steps toward long-term plans for designing and building a direct-geometry instrument for the SNS.

- BNL has developed an interdisciplinary plan in nanoscience that is aligned with the DOE nanoscience goals. The BNL planning involved collaboration among six internal departments and divisions and capitalized on our strengths in chemistry and condensed matter physics. The program makes use of our very diverse synchrotron user facility, the NSLS, as well as our emerging strength in advanced, ultrahigh resolution Transmission Electron Microscopy (TEM). The proposed program expands our materials programs through collaborations with nearby university partners Columbia, Stony Brook, and Princeton. The Laboratory's capabilities have allowed participation in the Presidential Interagency National Research Initiative entitled "National Nanotechnology Initiative - Leading to the Next Industrial Revolution." The Laboratory assembled a Task Force, which includes members from the Biology, Chemistry, Physics, NSLS, Energy Sciences and Technology, and Environmental Sciences Departments and the Instrumentation Division. This Task Force organized a coherent portfolio of Laboratory Directed R&D (LDRD) projects focused on

three specific areas of research on nanomaterials. This Laboratory-wide investment enabled us to expand the scientific manpower in the area of nanoscience, both through postdocs and through new staff in specific areas such as nanotube imaging. The three LDRD areas are nanomagnetism, charge transfer in molecular materials, and catalytic materials. This "superproposal" approach to LDRD research promoted collaborations with various universities and national Laboratories relevant to the major thrust areas.

- In response to the BES-DOE initiative in nanoscience, the Chemistry Department has spearheaded two interdisciplinary research efforts in catalysis and charge transfer in molecular assemblies and nanoparticles that build on the scientific strengths of current programs and are aligned along DOE programmatic themes. This effort involves the participation of all the BES programs within the Chemistry Department as well collaborators from other BNL Departments (Physics, NSLS, Energy and Environmental Sciences, Biology) and outside universities. A significant amount of BNL LDRD funding has been invested in starting individual elements of these two thrust areas.

- BNL and Psimei Pharmaceuticals Ltd. have signed a CRADA to develop Brookhaven-invented boron compounds for use in experimental radiation therapy for cancer, as well as other cancer treatments.

1.2.1.5 Proposal Processes

In addition to continuing with the improvements and initiatives discussed above, BSA will focus additional management attention on the proposal processes. BNL has realized mixed success with proposal awards: excellent success in advanced computing, good success in nanoscience proposals, but mixed success with proposal in life sciences. BSA will increase the awareness of requests for proposals and implement steps to ensure proposals are responsive to DOE initiatives, are well aligned with the Laboratory's S&T mission capabilities and strategic plan, maximize the integration of Lab capabilities, and drive both internal and external collaborations where appropriate. A proposal office will be established in February 2002 to oversee the proper and timely preparation of proposals across the entire Laboratory. This will be achieved by redirecting existing resources. BSA will also improve communication with DOE research program offices.

1.2.2 Scientific Recognition

- Scientific Accomplishments at Brookhaven continue to be recognized through awards, publications in peer reviewed journals, appointments, and invited talks. Some examples from FY01 are highlighted below.

- Three physicists from BNL (Robert Pisarski, Samuel Aronson, and Serban Protopopescu) were named Fellows of the American Physical Society (APS). Samuel Aronson was recognized for contributions to nuclear and particle physics, including the physics of neutral Kaons, and the leadership, design and construction of major experiments, D0 ("D-zero") at Fermilab and PHENIX at RHIC." Robert Pisarski was cited for important contributions to the study of Quantum ChromoDynamics at high temperatures. Serban Protopopescu was named for his individual contributions and leadership in the discovery of the top quark at the D0 Experiment and for software simulation and algorithm development.

- Victor Emery (together with Alan H. Luther of Nordita in Copenhagen) were awarded the Buckley prize from the American Physical Society in recognition for their contributions in

Condensed Matter Physics; specifically, their fundamental contribution to the theory of interacting electrons in one-dimension. Subsequent to receiving this award, was elected a Fellow of the American Academy of Arts & Sciences.

- Andrey Zheludev was honored with The Presidential Early Career Award for Scientists and Engineers. The award is the highest honor given by the U.S. government to outstanding scientists and engineers beginning their careers. Zheludev, was awarded this in recognition of his internationally recognized research and discoveries in the field of quantum magnetism, achieved through skillful application of neutron-scattering techniques. (Zheludev subsequently moved to ORNL in order to be near an onsite neutron facility, a consequence of HFBR shut down)

- Nora Volkow, BNL Life Sciences ALD, was elected to membership in the Institute of Medicine (the medical equivalent of the National Academy); Daniel van der Lelie was elected Secretary of the International Society of Trace Element Biochemistry; Elena Lymar was the recipient of a Goldhaber Fellowship; and a BNL Scientist was appointed to the NRC's Committee on Air Quality Management in the United States.

- A BNL scientist continues as chair of the "Technical Survey Team" (TST); a group of experts that provide top-level, objective, technical review and strategic and program-related advice and recommendations to DOE/HQ on all projects under the MPC&A Program.

- BNL was ranked among the top five major institutions worldwide in terms of the impact of its environmental research according to a study completed by The Guardian, a British newspaper. The study was based on determining how often BNL work was cited by other scientists.

- The work of Dr. Louis DiMauro, which resulted in new insight into the mechanism of simultaneous two-electron ionization induced by strong-field laser excitation, was featured on the “Physics Update” page of the March 2001 issue of Physics Today.

- In 2001, three DOE 100 awards were received by Laboratory Scientists: S. Dewey et al received an award for research in drug addiction; T Butcher et al received an award for work in the development of a flame quality indicator; and J. Dunn et al was recognized for research in Lymes Disease.

1.3 Department of Energy Research Programs

Highlights of accomplishments under the four Office of Science objectives are discussed below. Key areas for management attention in FY02 are included under Objective 4, Effectiveness and Efficiency of Research Program Management.

1.3.1 High Energy Physics and Nuclear Physics (HEP&NP)

1.3.1.1 Quality of Research

- Scientists at Brookhaven in collaboration with researchers from Canada and the United Kingdom announced results of research conducted at the Sudbury Neutrino Observatory

(SNO). The new results, combined with previous work, now reveal a transformation of solar electron neutrinos to other neutrino flavors as they travel from the core of the sun to the earth. The experiments show that the flux of neutrinos produced in the sun is accurately predicted by detailed solar models.

- At the Quark Matter 2001 Conference joiuntly helt at Stony Brook University and Brookhaven National Laboratory , nearly 700 physicists from around the world gathered (in January!) to hear breaking news about the exploration of the new frontier in QCD physics recently opened by the operation of the Relativistic Heavy Ion Collider (RHIC). Among the findings are collisions between gold ions creating nuclear matter producing the highest energy density ever achieved in a scientific experiment (or otherwise on earth) .

- Scientists at Brookhaven, in collaboration with researchers from 11 institutions in the US, Russia, Japan, and Germany, announced a high-precission experimental result from the g-2 experiment that directly confronted the Standard Model of particle physics and showed a 2.6 standard deviation disagreement with that model. (The theoretical prediction was changed later when a sign error in the calculation was discovered. This reduces the discrepancy to 1.6 s

Scientists at the g-2 experiment which results directly confronted the standard model.

BNL physicists have produced a significant number of "doubly strange nuclei," or nuclei containing two strange quarks. Studies of these nucleihelp scientists explore the forces between nuclear particles, particularly within so-called strange matter, and contributes to a better understanding of neutron stars, the super dense remains of burnt-out stars, which are thought to contain large quantities of strange quarks. The result also all but rules out a bound H particle, the ground state of strange matter.

- Senior lattice gauge physicist, Michael Creutz, was named the winner of the Rahman Prize, a prestigious award for theoretical physicists.

1.3.1.2 Relevance to DOE Missions and National Needs

- The U.S. ATLAS project for the CERN Large Hadron Collider completed another successful DOE “Lehman” Review. Brookhaven responsibilities for project management, the Liquid Air Calorimeter System, and the forward Muon System are being met. Of particular note is the completion of the Lab cryostat constructed in Japan and shipped to CERN that is under construction in Japan. Work on the Tier I Computing Center for ATLAS is progressing as planned and significant progress has been made on contributions to the software effort for ATLAS. A new initiative in ATLAS is leadership in the Technical Coordination Office at CERN.

- BNL played a leading role in the installation of the D0 detector at Fermilab. Significant contributions were also made on the Forward Pre-shower Detector, the calorimeter system, DAQ, and other software responsibilities in preparation for the present commissioning run.

Significant progress has been made on the Brookhaven contribution to MINOS, the Long Baseline neutrino experiment at FERMILAB. A Brookhaven-led study of the feasibility of a search for oscillations was completed and heavy involvement in beam studies and beam instrumentation groups continues. A feasibility study of Muon Storage Ring for Neutrinos (Feasibility Study II) at Brookhaven was completed and shows significant advances in performance and costs beyond the earlier study at Fermilab.

- The Theory group continues to make significant contributions on collider physics for Fermilab and CERN projects as well as calculations related to the (g-2) experiment at Brookhaven and proposed experiments at Brookhaven on rare kaon decays and muon to electron direct conversion to search for lepton number violation. Significant effort continues on lattice gauge calculations using the RIKEN BNL QCD supercomputer.

- The RSVP proposal to the NSF for two major new experiments at the AGS (KOPIO, a rare kaon decay experiment complementary to the present E949, and MECO, a search for muon to electron direct conversion in the field of the nucleus, which is a very sensitive search for lepton number violation) have made excellent progress in setting up their organization as a project.

1.3.1.3 Success in Constructing and Operating Research Facilities

- The second RHIC physics run started in April 2001 and continued through the end of the fiscal year. This period was the first in which the collider ran at the full design energy of 100 GeV/amu and, near the end, the RHIC collider also reached its full design luminosity. Thus, the RHIC reached its full design performance levels prior to the end of Fiscal 2001 as planned. The colliding beam uptime availability for experiments during this run was lower than expected for the mature RHIC facility (~50 percent), but the causes of the lower availability have been identified and hardware improvements will be made during the next shutdown to mitigate the main sources of downtime. Also, during Fiscal 2001, polarized proton beams were successfully accelerated in the AGS using the new Optically Polarized Proton Source. The remainder of the “Siberian Snake” magnets were completed and installed in the RHIC ring during this year as well. Commissioning and first data runs for the Polarized Proton Program in the RHIC facility will commence in fiscal 2002.

- The RHIC Computing Facility (RCF) successfully operated for data taking and for data processing and analysis activities by the RHIC experiments. High performance of the RSF continues to be key to the successful production of quality physics in RHIC.

- BNL’s superconducting magnet production capabilities continue to be a major asset to BNL as well as other international research initiatives. Specialized magnets for the Relativistic Heavy Ion Collider's (RHIC) Spin Physics Program have been designed and manufactured. These specialized magnets, called helical dipoles, will allow collider operation with beams of polarized protons. In addition, superconducting micro-beta quadrupole focusing magnets for the HERA Collider at the DESY Laboratory in Hamburg, Germany, have been produced. Production continues on superconducting magnets for the Large Hadron Collider (LHC) at the CERN Laboratory in Geneva, Switzerland.

- RHIC was shut down on August 3, 2001, due to a failure in the main AGS motor-generator set. Only a small amount of RHIC experimental time was lost as the backup motor-generator set was quickly brought on line (in approximately 8 hours). It was later found that a recent overhaul of the main MG set had included flawed key parts from the external contractor and

the set is being repaired and will be put back in service in time for the next RHIC run in FY 2003. Having the backup ME set allowed the RHIC facility to use a former MG set as a backup to guard against single point failure of the facility, as it did on this occasion.

1.3.1.4 Effectiveness and Efficiency of Research Program Management

- BSA improved engagement with the RHIC user community and the Nuclear Physics Program Office in its operational and planning decisions to optimize the scientific output and articulate its impact and plans both within and outside the nuclear community. BSA aggressively worked to include the RHIC user community in its long-range planning. For example, BSA was well prepared for the DOE Long-range Planning process that culminated in the NSAC meeting in March 2001. BNL's priorities, RHIC –II and eRHIC, received strong community support. Similarly, the BNL priorities in High-Energy physics were presented at the HEPAP Planning Meeting in Snowmass in August 2001. As part of that preparation, a design concept for a 20 GeV muon-based neutrino factory based at BNL was successfully completed.

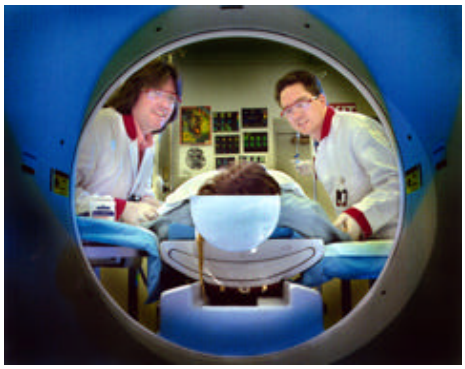
- The Theory Group has advanced significantly. BSA has taken a significant step toward rebuilding the Theory Group through the hiring of Alexei Tsvelik, a world-renowned theorist. A second junior level theorist, Fabian Essler, has been hired from the University of Warwick.

The Laboratory took specific short-term actions to bring RHIC-II and e-RHIC to BNL. The goal of the RHIC II Initiative is a 40-fold increase in the luminosity of the machine with necessary improvements of the existing RHIC detectors to exploit the luminosity increase to open up rare processes to investigation and to pursue new research paths opened up by analysis of the first round of experiments. A factor of 10 is achievable with electron and/or stochastic beam cooling and the full factor of 40 will be realizable by also including a factor of two tighter interaction point focusing plus an allowed beam bunch number increase by a factor of two. Consistent with Laboratory goals for LDRD, i.e., focus on long-term, high-risk initiative, an R&D effort partially funded by LDRD on electron cooling, is underway. We expect to complete an initial report at the end of FY 2002.

1.3.2 Biological and Environmental Research

1.3.2.1 Quality of Research

Medical imaging and addiction studies remain a cornerstone of OBER research at BNL. This research mission creates great opportunities for collaborations and jointly funded initiatives with other agencies, principally the NIH. Specific accomplishments in Radiotracer Chemistry and Neuroimaging using Positron Emissions Tomography (PET) include:



PET Imaging remains a cornerstone of OBER research at BNL

- PET and microdialysis were used to begin the first comprehensive study of solvent abuse (the most frequent form of substance abuse in children) in living systems beginning with a study of the pharmacokinetic and pharmacodynamic effects of toluene, the most widely abused solvent.
- The experimental medication, gamma vinyl GABA (GVG), which has shown great promise in

diminishing addictive behaviors in animals, has been labeled with carbon-11 for the first imaging studies of its distribution and pharmacokinetics in primates.

- Relapse in drug abusers frequently occurs when a drug abuser is exposed to an environment where the drug was formerly used. We have shown that exposure to environmental cues produces similar neurochemical changes to the drug itself illustrating the powerful role that environment plays on drug-related behavior.
- Aromatic amino acids, which may be accumulated in rapidly growing tumors, have been labeled with carbon-11 for PET studies in primates to determine their utility as tracers in cancer detection. D and L-boronphenylalanine have been labeled with carbon-11 for investigations of amino acid transport, melanoma imaging, and BNCT therapy for brain tumors.
- PET scanner designed for rats and mice (microPET) has been commissioned as a new scientific tool for preclinical research to measure biochemical transformations and the movement of drugs in the living animal, including the genetically modified animal, over time. Two specialized PET devices have been developed to measure radiotracers in blood. One is a beta probe implanted in a blood vessel and the other is a co-incidence detector positioned external to the wrist to measure positron emitter concentration. Both hold the promise of making PET studies simpler and safer. In all these projects the BNL Instrumentation Division played a crucial rule. Experience gained from the front-end electronics of large nuclear detectors was crucial for designing light-weight PET arrays.

BNL Instrumentation capabilities advanced the OBER Mission through development of the Mobile PET Camera.

- A new collaboration has been initiated to use the short-lived positron emitting isotopes to study environmental stressors on plants.
- BNL is also noted for its high field Magnetic Resonance Imaging (MRI) research. Recent MRI studies using the BNL 4 Tesla scanner have identified for the first time that high magnetic fields permit the detection of commonly employed contrast reagents at very low levels. This increased sensitivity may make it possible to detect the passage of contrast agents across the blood-brain-barrier (BBB) in the white matter of the normal human brain. This has tremendous potential for detecting slight perturbations of the BBB in conditions such as HIV infection and severe stress. Currently, these agents are widely used with clinical (low magnetic field) MRI scanners in the classification of tumors, MS lesions, and other pathologies.
- BNL and Psimei Pharmaceuticals Ltd. Have signed a CRADA to develop Brookhaven-invented boron compounds for use in experimental radiation therapy for cancer, as well as other cancer treatments.

Key Accomplishments in Biology

- As part of the Macromolecular Crystallography Program, the Laboratory established an Automated Structure Determination Platform for high–throughput in structural genomics and

released it to a worldwide crystallography community by studying the bacteria that cause the Black Plague, plant infections, and colds. Researchers have discovered that these three very different microorganisms share a common strategy---they all prevent the cells they are attacking from calling out for help. All three organisms produce a similar protein to interfere with the infected cells chemical signaling pathways, which are designed to alert the immune system to attack the germs.

- BNL biologists, in collaboration with scientists at the DOE Joint Genome Institute and scientists in Belgium, completed the genetic sequence of *Ralstonia metallidurans*, a toxin tolerant microbe. Understanding the genetic makeup of microbes that thrive in polluted environments will help scientists engineer bacteria that can clean contaminants from soil. Another Genome group collaboration has led to the completion of 100kb of contiguous sequence of a DNA repair gene.
- A research team working at BNL has determined the three-dimensional structure of a key protein on the bacterium that causes Lyme disease called OspC. The protein is derived from two strains of the Lyme disease bacterium. This research may lead to a second-generation vaccine that would be more effective than the current one.
- Scientists showed that a UV-sensitive rice called Norin 1 (progenitor of many commercial important rice strains) has a mutation in the DNA repair enzyme photolyase, probably a structural mutation. From this information, scientists could introduce the correct gene, thereby significantly increasing the productivity of this crop plant.
- Complete analysis of five human DNA-PKcs gene exons for polymorphisms in ~90 individuals showed that two amino acid changes associated with breast cancer susceptibility in mice are not common in the human population.
- The Genome Group tested and formulated improved methodologies for sequencing difficult regions of the human genome by using the Nested Deletion Strategy. This is being used to help complete the sequence of the chromosomes being sequenced by the Joint Genome Institute. Nested deletions are being investigated for their possible advantages in sequencing highly repeated DNA, which can cause problems in sequencing human DNA.
- Developed protocols for Serial Analysis of Gene Expression (SAGE) and Serial Analysis of Signature Tags (SAST), which allows for the validation of gene predictions as well as the identification of expressed regions that might be overlooked without experimental data. This technique has potential applications in the areas of counter terrorism and bioremediation.
- In research that could help assess the radiation risks faced by astronauts, improve the cancer-killing potential of radiation therapy, and distinguish between DNA damage caused by normal metabolism and that caused by low-level radiation, scientists at BNL developed a novel ultra-sensitive methodology to quantify varieties of radiation damage that previously could not be measured.
- BSA continues to achieve significant progress in Environmental sciences, particularly in Atmospheric Sciences. Examples of accomplishments include:
  - A chemical transport model was used to identify an episode of sulfate transport from Europe to the mid North Atlantic. Examination of the dependence of cloud-optical depth and albedo, on the liquid water path of clouds formed during this event, provided the first unequivocal observational evidence for the Twomey effect on a synoptic scale.

- A new aerosol chemical composition analysis technique is being developed jointly with the Georgia Institute of Technology was modified and adapted for aircraft operation. The technique allows for the continuous measurement of aerosol inorganic species with a time resolution of -3 min. The technique provides a sensitivity equivalent to previous techniques employed for aerosol analysis, but the time response is nearly a factor of 10 faster.

- In the Texas 2000 Air Quality Study, BNL chaired the Science Team; instrumented and flew the DOE G-1 aircraft; and provided instrumentation for a tall building site in one of the largest, most comprehensive studies of urban air quality ever conducted in the continental United States. Early results from the field program are providing insight into the cause of the extremely high rates of ozone formation.

- The PFT tracer technology was successfully deployed to facilitate characterization of BGRR environmental impacts.

- Nora Volkow, the Life Sciences ALD, was elected to membership in the Institute of Medicine (the medical equivalent of the National Academy); Daniel van der Lelie was elected Secretary of the International Society of Trace Element Biochemistry; Elena Lymar was the recipient of a Goldhaber Fellowship; and a BNL Scientist was appointed to the NRC's Committee on Air Quality Management in the United States.

- BNL was ranked among the top five major institutions worldwide in terms of the impact of its environmental research according to a study completed by The Guardian, a British newspaper. The study was based on determining how often BNL work was cited by other scientists.

1.3.1.2 Relevance to DOE Missions and National Needs

A major initiative in FY01 was the formation of a Center for Complex Protein Structures (CSCP), which will focus on solving the structures of membrane proteins. Membrane proteins are critical elements of biological processes and are directly related to DOE missions in the environmental consequences of energy generation and use and human health. Membrane proteins and protein complexes are important targets in bioremediation, cell signaling, and human function; they function in microbes as transporters and in the brain as receptors for neurotransmittors, yet they account for less than one percent of the known protein structures.

The DOE supports research associated with neuroimaging with PET, high-field MRI, radioisotope production, and space biology, which are key components of the extended life sciences programs in Medical, Biology and Chemistry.

The PET Imaging Center was expanded--- in November 2000, the MicroPET and a new PET scanner were delivered to BNL. The facility expansion and equipment acquisition received joint funding from DOE capital funds, NIH, and the President's Office of National Drug Control Policy. This interagency collaborative support further demonstrates the consensus for the importance of this ongoing research at BNL and its fulfillment of the national needs.

Scientific capabilities make BNL an ideal site for DOE to support NASA research.

BNL has a long tradition of being the leader in radiochemistry. More recently, efforts were directed toward radiotracers that will target biologic processes and are relevant to important DOE initiatives. For example, components of adenoviral proteins are labeled to monitor the bio-distribution of these proteins for tumor imaging and gene therapy. BNL, through the BLIP Program, continues to be a major provider of research radionuclides to US investigators.

The NASA Space Biology Program benefits from the existing high-energy sources at BNL to study the biological effects of radiation. This program has required the coordination of over 80 visiting scientists annually since 1995. The results from the ongoing research will have tremendous implications for future plans of space travel and exploration. Due to this important national need, a partnership with NASA to build a Booster Application Facility at BNL is in progress. The new facility (the Booster Application Facility or BAF) will open in 2003, but visiting scientists as well as BNL staff will continue to use BNL Laboratories and equipment for experiments on biological materials irradiated at the BAF.

A new initiative in "Imaging Gene Expression" received support from DOE since October 2000. The goal is to measure in vivo binding of labeled oligonucleotide to mRNA. This will allow gene expression imaging using PET. If the BNL scientists are successful, the work will be highly complementary to the major DOE initiative of bringing the "Genomes to Life."

In response to the national need to train clinician scientists, the Medical Department, under the direction of John Gatley, will be receiving a training grant from the National Institute on Drug Abuse/NIH. This will fund up to seven two-year post-doctoral fellowships over the next five years.

Another new initiative is "Imaging the Awake Animal Brain." A proposal was submitted in response to the DOE bioengineering call in February 2001. This proposal was successful against major competition. This initiative takes advantage of a strong multidisciplinary research team involving unique expertise from five Departments/ Divisions within BNL, from LBNL, and from SUNY-Stony Brook.

In the wake of the completion of the human genome sequencing project, BNL has joined four New York research institutions in a collaborative effort to turn that knowledge into promising drug targets. The National Institutes of Health awarded the New York Structural Genomics Research Consortium (NYSGRC) $4.5 million to develop high-speed methods to decipher the three-dimensional structures of proteins. In addition to BNL, the member institutions of the consortium are Albert Einstein College of Medicine, Mount Sinai School of Medicine, the Rockefeller University and Weill Medical College of Cornell University. This collaboration relies significantly on the capabilities at BNL for sequencing and structural determination.

BSA has continued strengthening its capabilities in Atmospheric Science by developing new instruments, novel measurement techniques, models, and participating in field and laboratory studies. The DOE Atmospheric Chemistry Program was re-competed in FY2000. BNL's strengthened chemistry and microphysics of the troposphere program now includes: 1) field studies in atmospheric chemistry, 2) instrumentation for field programs, 3) diagnostic and aerosol model studies, 4), multi-phase atmospheric chemistry, 5) aerosol size distribution 6) global emissions inventories of aerosol and aerosol and 7) global change education.

BNL continues to work for DOE's ARM, FACE, Terrestrial Carbon Cycle and Carbon Sequestration programs. Achievements include continued successful operation of the North

Carolina FACE Facility and the ARM External Data Center. BNL became the mentor for the ARM CIMEL sun photometers.

1.3.2.3 Success in Constructing and Operating Research Facilities

- In FY 2001, due to increased funding by the DOE, the BLIP had the longest consecutive operating period in the history of the facility, running 23.5 weeks compared to 14 weeks in FY 2000. This has greatly improved the availability of selected radiopharmacueticals available in the US such as Sr-82 needed for heart scans.

- BSA pursued and obtained funding for a new Cryogenic Electron Microscope (CryoEM) facility for the analysis of two-dimensional arrays of membrane proteins, isolated complex particles and frozen tissue sections. This facility will be closely aligned with the STEM facility, which has a large user interest group, and will allow unique experiments to be done in this area.

- Similarly, a Mass Spectrometer and Stopped-Flow Flourometer have been purchased. The mass spectrometer instruments enhance our crystallographic capabilities by allowing us to precisely measure the mass of proteins. The Stopped-Flow Fluorometer can simultaneously measure absorption, circular dichroism and fluorescence. It will be modified by BNL scientists to include the simultaneous measurement of linear dichroism and fluorescence polarization anisotropy.

The Laboratory continues to upgrade facilities and equipment to advance Laboratory capabilities in Biological and environmental research. Examples are noted below. Individually these may not be considered significant initiatives. However, collectively, they represent a substantial upgrade of the capabilities to meet the current and future needs of the DOE and the nation.

- The Macromolecular Crystallography Facility at the NSLS continues to be over-subscribed and fully utilized. “Fedex” operations have been expanded. T his is the process wherein outside users mail specimens to BNL for data collection by our staff. Beamline X26C installed a triple beam diffractometer. Recently, visiting scientists utilized this diffractometer to advance their investigation of the protein-solvent interface on insulin.

- Major upgrades in the high-field MRI facility hardware upgrade to include ultrafast gradients on the high-field MRI scanner were completed. The planning for a high-field MRI (7.0 Tesla microMRI) for animal research has progressed rapidly. Detailed plans for the space and construction necessary for the installation of the microMRI have been completed. The equipment has been ordered and is expected to be delivered to BNL by June 2002.

- This year, the expansion of the PET Imaging Laboratory was completed with funding provided by BNL. The addition of 2300 square feet almost doubled the area of the Laboratory adding a new analytical laboratory, new patient preparation areas ,and a new laboratory for the microPET animal camera. This new laboratory and instruments will advance studies on drug addiction and aging and allow the exploration of new areas of medicine including cancer and neurodegenerative disease.

- The aging CTI-931 PET scanner has been replaced with a second HR+ PET scanner, which was purchased with funding from DOE/OBER and the Laboratory. This is expected to greatly

increase our throughput of studies to increase reliability and quality as well as to provide identical backup capabilities in the case of instrument failure.

- A high-performance gradient power supply and a high-performance gradient coil for the BNL 4T MRI instrument was installed and completed performance testing. These are the last components we have required for ultra-fast imaging, and will allow execution of the Echo Planar family of MRI pulse sequences, which can provide human images with sub-second time resolution. This will immeasurably enhance relaxographic imaging projects, functional and physiological imaging efforts, and fast spectroscopic imaging studies.

The microPET scanner funded by DOE/OBER and the Laboratory was recently delivered and installed and personnel have been trained on its use. The microPET device is being used in preclinical studies in combination with other biochemical and behavioral methods and for imaging genetically modified animals.

1.3.2.4 Effectiveness and Efficiency of Research Program Management

A major focus of OBER research management has been on improving the alignment of our research with the DOE mission. Results of management attention and achievements in this area have been highlighted under Objective 2, *Relevance to DOE mission and National needs*.

To attack the difficult problem of membrane protein structures, strengths in molecular biology and biochemistry need to be brought together with the appropriate analytical tools in a critical mass. The Biology Department has strengths in protein expression and protein engineering. A Membrane Protein Crystallographer, a critical component of this center, was hired. We also recruited two soil molecular microbiologists who have expertise in membrane protein systems that are relevant to bioremediation and that will help direct the Center's efforts toward this DOE mission. A search was begun for a CryoEM scientist who would lead that equipment's research applications. It should be noted that the OBER-sponsored research area has potential applications in other DOE organizations including BES and NN. BNL has assisted DOE in the dissemination of its research results in order to achieve the maximum benefit from the funding provided.

The Clinical Research Program has successfully restarted after a three-month stand down imposed by the Laboratory Director in February 2000. An initiative to join the General Clinical Research Center (GCRC) at the State University at Stony Brook as a satellite facility is underway. This effort, if successful, would provide direct funding from the National Center for Research Resources (NCRR)/NIH to support the BNL Clinical Research Center (CRC) and encourage the expansion of collaborative research involving human subjects with BNL and Stony Brook. Similarly, a proposal to NCRR for additional equipment at the animal facility has been submitted by BNL. DOE sponsored an intensive review of the clinical research corrective action plan. A report was provided to BNL and BNL has submitted its response.

OBER research and the pace of discovery have provided frequent opportunities to communicate the positive aspects of DOE's science mission at BNL. The type of research (i.e., addiction, medicine, environmental sciences, etc.) is of personnel interest to a large cross section of the regional population. BSA has been aggressive in communicating the research initiatives as well as significant results through press releases, presentations at regional meetings, and research institutions.

Creighton Wirick was named Chair of BNL's Environmental Sciences Department.

BSA played a significant role in the development of the several DOE program plans, including the DOE BER Water Cycle Science Plan and the DOE BER Tropospheric Aerosol Program Plan. BSA also organized ARM Cloud Properties Working Group Meeting in Boulder, Colorado.

1.3.3 Basic Energy Sciences (BES)

1.3.3.1 Quality of Research

For the first time, spectroscopy has been used to measure the barrier to internal rotation for an alkyl free radical, ethyl (CH3CH2·), which is an important species in the combustion of hydrocarbons.

A recently developed ultra-short, tunable mid-IR radiation laser source has revealed a rich and complex structure in the electron spectrum resulting from multiphoton ionization in the alkali atoms not observed at visible wavelengths.

Using a novel Ag-membrane reactor, it has been possible to obtain quantitative, surface reaction kinetics for the partial oxidation of methanol in real time and under collision-free conditions.

For the first time, laser spectroscopy has been successfully used to study the reaction dynamics of oxygen adsorption on an important catalytic metal surface (Ag) through measurements of state- and energy-resolved product distributions.

High-resolution photoemission studies at the NSLS indicate that molybdenum hexacarbonyl fully dissociates on Au(111) and deposits Mo nanoparticles on the surface. The Mo nanoparticles are less chemically reactive than extended surfaces of Mo, being unable to dissociate CO. The Mo nanoparticles are transformed by reaction with sulfur to MoSx nanoclusters, also exhibiting size-modified chemical reactivity.

In collaboration with DuPont (CRADA), new homogeneous catalysts were developed for selective deoxygenation of diols, converting them to alcohols; these reactions are relevant to efforts to convert renewable feedstocks to useful industrial materials.

We have presented the first clear evidence of the involvement of Re-CO(O)-Re and Re-COOH as intermediates in photochemical CO2 reduction with rhenium(I) diimine complexes. The reaction mechanism for the formation of Re-CO(O)-Re with CO and H2O from Re-COOH observed in our study is quite different from that previously reported by others.

A combined experimental kinetic and electronic structural study has shown that charge transfer through OPV (oligophenylenevinylene) molecular ‘spacers’ is not limited by electronic tunneling, even over distances as large as 3 nm, in contrast to behavior of other spacers studied to date.

New insight into the mechanism of simultaneous two-electron ionization induced by strong-field laser excitation was obtained from electron energy spectra taken for the He atom using a unique electron-ion coincidence spectrometer developed in the laboratories of Dr. Louis DiMauro. This work was featured on the “Physics Update” page of the March 2001 issue of Physics Today.

A collaboration between Dr. Morris Bullock and chemists at Dupont have discovered a new class of homogeneous catalysts using inexpensive metals, molybdenum or tungsten, that operate by an unconventional ionic hydrogenation mechanism of ketones, which is an important step in the production of chemicals in the agricultural and pharmaceutical industries. This work has resulted in one patent award, two pending patents and is reported in a recent communication in the Journal of American Chemical Society.

The short-time dynamics of the transient species produced by pulsed radiolysis are being explored with the new Laser Electron Accelerator Facility (LEAF) in the Chemistry Department. The unprecedented time resolution afforded by the short-pulse capabilities of LEAF (6 ps) significantly advances our abilities to explore fundamental aspects of ionization, recombination and solvation, which are crucial for understanding charge transfer reactions in condensed media.

Joint experimental and theoretical studies in surface science and materials chemistry have made significant advances in understanding the binding, activation, and dissociation of sulfur containing molecules on metal oxide surfaces which are routinely used in industrial DeSOx and hydrodesulfurization applications. These studies provide a basis for the design of novel catalyst materials that are highly selective and chemically stable.

A new joint effort between the Chemistry Departments at USB and BNL is exploring radical-radical reactions important in combustion chemistry using state-of-the-art velocity map imaging (VELMI) which provides complete kinematic maps of the scattering dynamics.

BNL and Stanford University scientists have developed molecular wires millions of times smaller in diameter than a human hair.

Using synchrotron based high-resolution photoemission spectroscopy, chemists at BNL discovered that upon adsorption of sulfur on TiO_2 (110) at 600 K, the top layer of the oxide surface is converted to a sulfide in a self-limiting and thermodynamically unlikely surface reaction. First-principles density-functional calculations also suggest that the mechanism of the $O \rightarrow S$ place exchange reaction is driven by enhanced segregation of bulk oxygen vacancies to the surface.

BNL and University of Stony Brook chemists recently found that incorrect accounting for equilibrium transcytolemmal water exchange kinetics results in significant errors in the quantitative analyses of contrast reagents routinely used in clinical magnetic resonance imaging examinations.

Experimental studies of charge-stripe correlations in hole-doped antiferromagnets has stimulated a considerable amount of related theoretical and experimental work, as reflected in citations.

The identification of a monoclinic phase of PZT at the composition corresponding to optimal piezoelectric performance has allowed a complete theoretical understanding of this important class of materials, and has led to predictions of improved performance in materials with special nanoscale ordering of the component elements.

First principles calculations predicted the existence of new phases and helped elucidate the properties of MgB2 observed by various experimental probes.

A new family of anion-complexing additives has been synthesized based on Boron compounds with various fluorinated aryl or alkyl groups. These additives have electron deficient boron sites

that interact strongly with anions and break up ion pairs. The result is improvement in electrolyte conductivity and Li+ ion transference. Furthermore, these additives promote the dissolution of several Lithium salts that are normally insoluble in non-aqueous solvents.

A new technique has been developed using transmission electron microscopy that will improve the understanding of materials interfaces. The technique is based on quantitative analysis of the strong oscillatory interfacial contrast from a coherent electron source in diffraction mode. An accuracy of one picometer has been achieved in determining the displacement associated with an intercalated layer in a superconductor.

A number of prestigious awards were won by BNL physicists this year including the Buckley Prize for Vic Emery; Presidential Young Investigator Award; DOE Outstanding Young Investigator Award to Andrey Zheludev; the Brookhaven R&D Award to Peter D. Johnson; and the Brookhaven Engineering Award to Scott Coburn.

1.3.3.2 Relevance to DOE Missions and National Needs-Summary of Performance

- In response to the BES-DOE initiative in nanoscience, three interdisciplinary research efforts were proposed related to catalysis, charge transfer in molecular assemblies and strongly correlated electron systems. The proposed science programs build on the scientific strengths of current programs and are aligned along DOE programmatic themes. This effort involves the participation of all the BES programs within the Chemistry, Materials Science, Biology, NSLS, and Physics Departments, as well collaborators from outside universities. A significant amount of BNL LDRD funding has been invested in starting individual elements of these thrust areas.

- Work at the NSLS, ATF, and DUV-FEL contribute significantly to the DOE's program for short wavelength Free Electron Laser (FEL) technology development. The Accelerator Test Facility has a very strong position in the development of RF photocathode electron gun technology and has impacted significantly the pursuit of electron beam development for advanced accelerator concepts, including FELs. The ATF provides the highest-quality electron beams and infrastructure for supporting many experiments as well as continuous development of tools to characterize and manipulate electron beams. A unique aspect of the BNL program is the development of the High-Gain Harmonic Generation (HGHG) FEL that can provide excellent temporal coherence and ultra-short femtosecond output pulse duration using chirped pulse amplification. The theoretical foundation of the HGHG approach was verified by the first successful demonstration of an HGHG FEL in the infrared at the ATF. Finally, the NSLS plays a key role as a resource for developing and testing novel science and the experimental apparatus to pursue research at an Advanced X-ray Source. The integration of all of these elements is a unique opportunity at BNL that takes advantage of largely existing programs and personnel and allows the DOE to rapidly address the key questions posed by the Leone panel.

- The NSLS and Chemistry Department personnel in the BES Chemical Physics Program and in the BER Imaging programs (PET, MRI) underwent intensive, on-site DOE reviews during FY01. The review panel reports were very positive and supportive of these programs and of our facility operations. The Chemical Physics review also acknowledged the positive role of BNL's investments in post doc subsidies and LDRD funding which are vital to the effectiveness of small programs.

1.3.3.3 Success in Constructing and Operating Research Facilities

- The NSLS continues to provide a highly reliable and versatile user facility for experimenters throughout the world for many areas of Science and Technology, including Materials Sciences, Chemical Sciences, Life Sciences, Geosciences and Ecology, Applied Sciences, Engineering, Atomic Physics, Medicine and Nuclear Physics. A major structural modification to the NSLS Experimental Hall was successfully accomplished during the winter shutdown to accommodate the modifications to the X-17 beam line and experimental hutch.

- Re-vitalization of the VUV ring at the NSLS has resulted in significant new interest in the machine. Six new IR beams have been brought into operation, a new VUV beam line was established at U-13, and four upgraded soft x-ray lines were established. These innovations have produced new state-of-the-art beam line capabilities and have restored scientific interest as exhibited by increased users and increased scientific publications.

- Construction of the CMC undulator beam line at the APS was completed and a new beam line for inelastic x-ray scattering has been successfully proposed. Both facilities are led by BNL scientists in the X-ray Scattering Group.

- A collaborative effort within the Center for Neutron Science and including the Physics Neutron Scattering Group has accomplished its near-term goals of moving HFBR instrumentation to HFIR, NIST and ANTSO, and of establishing a BNL presence at HFIR toward construction of a cold triple axis spectrometer. They have also taken steps toward long-term plans for designing and building a direct-geometry instrument for the SNS.

- Electron beam quality requirements for initial FEL experiments at the DUV-FEL have been achieved. The DUV-FEL is a dedicated experiment for development of advanced FEL sources and science. The accelerator consists of an ATF developed photocathode gun driven by a solid-state laser system scaled from the LEAF gun driver. A four-tank S-band SLAC linac has been fitted with an electron bunch compression chicane developed by BNL in collaboration with scientists from LANL and SLAC. The accelerator can provide beam at energies above 200 MeV with pulses potentially as short as 100 femtoseconds and charge on the order of 1 nC. The long NISUS undulator will be used for the FEL experiments. The plan for the facility includes a series of experiments and upgrades of the machine that will lead to operation in the deep ultra-violet region (100 nm).

- As part of BNL's efforts in support of the National Nanoscience Initiative, plans for a nanoscale science research center were submitted in March 2001. The plans contained discussions of planned nanoscience and the necessary facility and equipment design in support of the planned science. The initial proposal was not accepted; however, based on feedback from DOE, the proposal was revised and resubmitted early in FY 2002.

1.3.3.4 Effectiveness and Efficiency of Research Program Management

<u>Nanoscience</u>

Within the last year, BNL has developed an interdisciplinary plan in nanoscience that is aligned with the DOE nanoscience goals. The BNL planning involved collaboration among six internal departments or divisions and capitalized on our strengths in chemistry and condensed matter physics, as well as with major research universities in the Northeast. The program also makes use

of our very diverse synchrotron user facility, the NSLS, as well as our emerging strength in advanced, ultrahigh resolution Transmission Electron Microscopy (TEM). The proposed program expands our materials programs through collaborations with nearby university partners, Columbia, Stony Brook, and Princeton. The plan includes steps to enhance BNL capabilities through significant internal investment.

BNL has a number of important experimental and theoretical capabilities for participation in a wide range of nanoscience research areas. These assets and activities allowed BNL to participate in the Presidential Interagency National Research Initiative entitled "National Nanotechnology Initiative - Leading to the Next Industrial Revolution." The Laboratory assembled a Task Force to develop a program that responds to this initiative. The BNL Task Force on Nanoscale Science, Engineering, and Technology (NSET Task Force) includes members from the Biology, Chemistry, Physics, NSLS, Energy Sciences and Technology, and Environmental Sciences Departments and the Instrumentation Division. This Task Force organized a coherent portfolio of Laboratory Directed R&D (LDRD) projects focused on three specific areas of research on nanomaterials. This Laboratory-wide investment enabled us to expand the scientific manpower in the area of nanoscience, both through postdocs and through new staff in specific areas such as nanotube imaging. The three LDRD areas are nanomagnetism, charge transfer in molecular materials, and catalytic materials.

LDRD investment and cross-functional collaborations supports DOE's nanoscience initiative. BNL research capabilities make the NSLS an ideal location for BNL's nanocenter.

This "superproposal" approach to LDRD research promoted collaborations with various universities and National Laboratories relevant to the major thrust areas. In addition, other BNL funds have been invested to enhance the instrumentation capability in the nanoscience areas of fabrication and materials synthesis. In addition to internal programs, the Laboratory is engaged in the DOE program in Nanoscience. BNL submitted three nanoscience proposals in areas aligned with our internal programs and our planning for the BNL Nanocenter. These programs also are collaborative with many nearby universities and make use of our unique facilities and strengths.

Next generation synchrotron radiation sources

At the National Synchrotron Light Source (NSLS), we are pursuing two initiatives to develop the next generation synchrotron radiation source. The first, Photoinjected Energy Recovery Linac (PERL) takes advantage of recent progress in photo-injectors and energy recovery linacs to provide higher brightness and shorter pulses than existing sources can offer. The second, Laser Seeded Free Electron Laser seeks to develop a high peak power, short-wavelength free-electron laser with excellent temporal and spatial coherence, capable of producing femtosecond pulses. BSA is aggressively pursuing R&D programs towards these initiatives. Examples of achievements include a preliminary conceptual proposal describing PERL (Photo Injected Energy Recovering Linac) that was prepared and submitted to DOE. An FWP for additional funding this fiscal year has also been submitted.

Management and Organizational Changes

Responding to feedback from the DOE, the Metals and Ceramics Sciences Program has been shifted to the BES Directorate. This change helps unify all material science and condensed matter programs funded by BES. This organizational alignment has resulted in improved knowledge of sponsors' needs, improved collaboration between Department researchers, and development of more comprehensive research proposals.

S. Dierker from the University of Michigan accepted the position of chairman for the National Synchrotron Light Source and began his duties in May 2001. Steve brings a substantial background in condensed matter physics, which will help restore the Laboratory's capabilities in condensed matter physics. In the short period since his appointment, Steve has focused on developing a long-range plan for the NSLS and realigning the organization to support this plan. Key to this plan are upgrading the existing synchrotron rings and advancing the design of the Photo-injected Energy Recovery Linac (PERL).

S. Shapiro assumed responsibilities for the Center for Neutron Sciences. This center serves to improve coordination between BNL scientific departments and other research institutions conducting or supporting research in neutron sciences. Integration is important because it improves the awareness and coordination of research initiatives to ensure alignment with scientific direction for the Laboratory and for the nation as a whole.

1.3.4 Advanced Scientific Computing Research (ASCR)

Work funded through ASCR continues to support core Laboratory and DOE research programs. Several high impact and strategic technology partnerships have been established through CRADA's.

Additionally, the Center for Data Intensive Computing (CDIC), formed in 1999, is rapidly becoming a key element of the Laboratory's research capabilities in support of applied and basic research programs, focusing on the applications of highly parallelized codes to computational programs for Laboratory research.

Key accomplishments for both technology partnerships and the CDIC are discussed below.

1.3.4.1 Center for Data Intensive Computing

Self-Evaluation of FY 2001 Science and Technology Performance

Modern science is critically dependent on computers and computing. A mix of capabilities is required, which range from advanced hardware to high level and focused software efforts to high-speed networking. The CDIC is rapidly becoming a key element of the Laboratory's research capabilities in support of applied and basic research programs to address this need. Initial funding for the CDIC was largely provided (~60 percent) through LDRD awards. Laboratory management anticipates a decrease in LDRD investment as the CDIC identifies new funding possibilities within core programs.

CDIC maintains a strong interaction with the State University of New York at Stony Brook with two joint appointments (including the Center Director), several graduate students, and several summer faculty supported. These are spread across the Departments of Applied Mathematics and Statistics and Computer Science.

The CDIC represents BNL in the multi Laboratory and university Terascale Simulation Tool Sand Technologies (TSTT) Center. The center is funded through DOE's Scientific Discovery through Advanced Computing (SciDAC) Program, and its goal is to eliminate the technical and human barriers preventing the effective use of powerful adaptive, composite, and hybrid methods in large-scale scientific simulations. At BNL, these techniques will be used to provide adaptive mesh refinement in the ocean model developed at Los Alamos as well as in magnetohydrodynamics and accelerator design.

The CDIC has provided expertise to address simulation issues in the design, operation, and control of accelerators. Examples include:

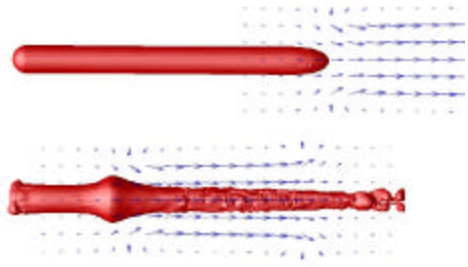
- Muon Collider Target
- Accelerator Design
- Computing with QCDOC (quantum chromodynamics on a chip)
- RHIC Data Management

Significant to DOE's Biological and Environmental Research Programs, the CDIC has developed new tools for the visual and statistical analysis of data. Examples of specific applications include:

- Evolution of Atmospheric Aerosols
- Parallel Implementation of an Atmospheric Aerosol Model
- Ocean Modeling with Automatic Mesh Refinement
- Analysis and Visualization of Human Brain Function
- Neuron Imaging
- Cardiac Electrophysiology

The CDIC has engaged in numerous projects that support DOE's Basic Energy Science Program including computational fluid dynamics, many body physics, and optics. Specific examples are:

- Magnetohydrodynamics of Multifluid Systems
- Atomization and Spray
- Quantum Mechanics of Magnetic Systems
- First Principles Calculations of Melting Phenomena
- Photonic Crystals



Computer Simulation of Liquid metal jet in a 20 Tesla solenoid with high magnetic field gradient.

Science, in general, is undergoing a type of phase transition in relation to computational science and BNL programs are all at various levels of participation. For success, CDIC management needs to make sure that the currently funded SciDAC and Applied Math Programs produce new scientific results and to focus on expansion of the core program in applied mathematics and the securing of additional funding from other program offices within the Office of Science.

1.3.4.2 Technology Partnerships

Work funded through the Laboratory Technology Research (LTR) Program in ASCR continues to support core Laboratory research programs. In FY01, several high impact and strategic technology partnerships were established through CRADAs funded through ASCR. Previously existing partnerships continue to be productive. BNL management of the LTR Program continues to be productive. Timely announcements are made to the scientific staff when DOE issues its call for proposals. Proposals are thoroughly reviewed internally for scientific merit, capabilities of the industrial partner, commercial potential, and relevance to SC missions. Excellent proposals continue to be submitted to DOE as evidenced by the success in obtaining LTR funding.

LTR Funded CRADAs Initiated in FY01

BNL PI & Dept.	Industry Participant	Project Title
P. Takacs (Instrumentation)	Ocean Optics	Metrology Tools for Surface Profile Measurement
K. Barkigia (Material Science)	Miravant Medical Technologies	Synchrotron-Based Structural Studies of Hydroporphyrin Sensitizers for Photodynamic Therapy

Three additional CRADA projects were chosen for funding by the LTR Program in FY01 and will be initiated in FY02.

Several of the active CRADA's funded through ASCR are briefly discussed below. Additional technology partnerships are discussed under the *Work for Others-Technology Transfer* section of this report.

The instrumentation capabilities at BNL are used in two active CRADAs, funded by LTR, with Long Island companies. In the first, we are working with Symbol Technologies to design, fabricate, and test two novel devices for collecting and transmitting data, an optical photosensor array, and a 2.4 GHz, single chip, frequency agile radio transceiver. The second project with a small Long Island business, Brookhaven Technology Group, is to generate a compact, cost-effective, high-brightness 5 MeV electron gun. Such high-brightness electron beams are needed for high-luminosity electron colliders and efficient short-wavelength Free Electron Lasers.

With two other DOE-LTR-supported CRADAs, the Laboratory participates in a cooperative research program with Oxford Superconducting, fabricating new superconducting materials. BNL will contribute significantly to the understanding of the interface structures between the superconducting materials, the buffer layers, and the substrates by employing transmission

electron microscopy. This understanding is essential for selecting materials and establishing deposition processes in the manufacture of superconducting wire.

LTR-funded CRADAs also leverage DOE's investment in biotechnology research at BNL. BNL and Oncogene Research Products are engaged in cooperative research to develop reagents to detect specific responses to DNA damage. The work is expected to have an important impact on ongoing biomedical research in cell growth and cancer. Oncogene anticipates that this research will lead to techniques for testing the effectiveness of specific cancer therapies. The DOE-LTR Program also funded several promising environmental technologies over the years. At present, BNL is conducting a research program with PhytoWorks, Inc., to study the basic mechanisms by which plants take up contaminants from sediments contaminated with toxic metals and radionuclides, and, ultimately, to explore methods which enhance this update of contaminants.

1.3.5 Energy Resource Mission (EE/FE/NE)

The Laboratory's role in the DOE Energy Resource mission is performed primarily under the auspices of DOE Offices of Energy, Efficiency, Fossil Energy, and Nuclear Energy Science and Technology, with some funding from other offices within DOE, such as the Office of Policy. In addition, the DOE Basic Energy Science Program described previously sponsors much of the underlying basic research supporting the DOE's Energy Resource mission. BNL is actively involved in three areas: reliable and diverse energy supply, clean and affordable power, and efficiency and productive energy use. Highlights of accomplishments and focus areas are discussed below.

BNL has several local, national, and international energy R&D partnerships that support continued US leadership in the energy field. This work supports DOE and NRC, EPA, New York State, and private industry programs. Energy research programs continue to be recognized for outstanding contributions in geothermal areas (R&D 100 Award), advanced oil heat technologies (ER-100 Award, NYSERDA), superconductivity and advanced battery technology developments, and nuclear energy. BNL received the first program award from NORA (National Oil Research Alliance). Major contributions were made to DOE's geothermal programs in the areas of cements, sillicates and coatings. We support the Office of Power Technologies with our work on liquid fuel BCHP. We continue to support DOE's Office of Science and the Office of Energy Efficiency in the development of high temperature superconducting cables. Additionally, Scientists performed research on three Nuclear Energy Research Initiative Projects, one in conjunction with Purdue University. A new program in human factors for the Nuclear Energy Plant Optimization Program was initiated. Some key program accomplishments are:

- BNL research on corrosion resistant materials and cements for reducing costs associated with the use of geothermal energy. During this past year researchers focused on corrosion testing of NiCrMo alloys, evaluation of coatings and mortars for resistance to sulfur oxidizing bacteria, numerical modeling of remediated wells and field testing, in collaboration with NREL.

- DOE Office of Power Systems, Building Cooling Heating and Power (BCHP) Program challenged BNL and the industry to prepare a comprehensive five-year plan that would provide clear benefits to homeowners through the development of advanced oil combustion technologies. BNL coordinated the development of the 5-year oil research plan, which proposes the commercialization of low NO_x heating burners and very high efficiency heating

systems. The program also will promote use of better quality petroleum fuels as well as domestic biofuels.

- BNL develops more efficient and nonpolluting heating systems as well as improvements to the distribution and use of energy in buildings. Researchers are developing advanced low NO_x oil burner technologies for use in homes and commercial buildings. Flame quality indicators developed at BNL are licensed and are becoming available commercially. BNL is involved with large-scale field tests of this technology, which was named by DOE as one of the Energy 100 technologies.

- Researchers also are developing standards for the ultra-low sulfur fuel for home heating use. The use of ultra-low sulfur fuel will significantly reduce emissions from home heating systems and increase efficiency by reducing fouling in boilers. A large-scale field test of this work is now in progress. Many of these programs are done in cooperation with the New York State Energy Research and Development Agency.

- The MARKAL-MACRO code has been selected by the Energy Information Administration as the model for the next World Energy Outlook report. MARKAL-MACRO is a technology specific, data-rich optimization model that provides least-cost energy system solutions under specified constraints to support policy and planning decisions. Some of this research is co-sponsored by EPA Region 2.

- Scientists in BNL's programs on Natural Gas Storage Systems work with US industry to demonstrate systems that will lead to significantly reduced costs for production and storage of liquefied natural gas. This includes assessing the production of Liquid Natural Gas from landfills, developing state-of-the-art storage tanks and refueling facilities, designing novel cryogenic fuel delivery systems, and developing strategies for market end-use.

- BNL is developing a program with Consolidated Edison of New York to examine critical infrastructure issues in the electric grid. This program, in partnership with Sandia National Laboratory, will focus initially on the reliability of power transmission cables.

- The Laboratory has several programs that develop next generation options for the production, transmission, storage, and use of fossil fuels. Key projects include fuel cells, thermophotovoltaic power generation, distributed energy systems, development of advanced materials, biochemical upgrading to increase available fossil fuel products, and natural gas storage systems.

- Scientists are developing battery materials for hybrid and electric vehicles that are not constrained by the availability of advanced cost-effective materials. The emphasis is on cathodes for high-rate lithium ion batteries. Work continues on novel methods to make new fuel cell electrocatalysts that substantially reduce the platinum requirements for fuel cells. These programs make use of the National Synchrotron Light Source for materials characterization.

- BNL also continues research on the material properties of high temperature superconductors. This research, which focuses on their manufacture and application, makes extensive use of our Transmission Electron Microscope (TEM) facility.

- DOE/NE recently initiated a Generation IV Nuclear Energy System Roadmap study; BNL is participating as a member of the Technical Working Group considering water-cooled reactor options.

- For the NEPO initiative, we are pursuing programs on operational improvement, aging management, and high burn-up fuel.

Recognition for Energy Resource R&D

The Laboratory received an R&D 100 award for the invention of the Flame Quality Indicator, a device that is designed to alert the homeowner when oil-burner service is required weeks before the burner's primary control would normally shut down the system due to severe flame-quality problems. Thus, problems can be corrected before they escalate and before the heat or hot-water supply is disrupted. Currently, Honeywell Corporation and Insight Technologies are performing a 100-unit field study of an improved version of the DOE-patented device that was originally developed at Brookhaven about a decade ago.

BNL in collaboration with Caithness Operating Company of Reno, Nevada, won a 2001 R&D 100 Award for developing a technology to recover commercial-quality silica from geothermal brine, a byproduct of geothermal energy production. Retrieving this valuable product from brine which is generally disposed of as waste, results in cheaper energy production. Brookhaven and Caithness are now taking steps to commercialize the process.

James McBreen was named fellow of the American Chemical Society, Martia Berndt received the Crosby Field Award for the best paper presented before the American Society for Heating, Refrigeration, and Air Conditioning Engineers, Mow Lin received an R&D 100 award for his research on silicates from geothermal wells, Devinder Mahajan was named to the Methane Hydrate Advisory Committee by Secretary Abraham, and Tom Butcher received an ER 100 award for his work on the flame quality indicator.

1.3.6 National Security Mission (NN, NNSA, EM)

Brookhaven National Laboratory has substantial capabilities to assist the nation in the areas nonproliferation and security (both national and global). As a national Laboratory, Brookhaven has advanced capabilities and expertise that puts it in a unique position to contribute to anti-terrorism efforts in the U.S. and abroad.

Several examples of initiatives and recent accomplishments are noted below.

- BSA has established an anti-terrorism working group to identify innovative approaches that may help to preserve the safety and enhance the long-term security of the United States and its people. The 20-member working group builds on an urban anti-terrorism technical support organization established at Brookhaven in March 2001. The working group represents most of the scientific disciplines within the Laboratory. Many of the group's ideas emphasize improved means to prevent and protect against attacks and to provide emergency response if prevention and protection should fail. The working group is collaborating with national as well as state and local agencies to ensure work is focused on the specific needs of the country. A key role of this group in FY02 will be to assist in increasing awareness and recognition of the Laboratory's capabilities.

- BNL invested LDRD funds to identify a technical approach to make major improvements in mass spectrometer sensitivity through the use of coded slit technology. Portable mass spectrometer "sniffers" with high sensitivity have applications for detecting traces of explosives or chemical weapons. Such instruments would provide an enhanced capability for law enforcement investigators to help prevent terrorist attacks and for first responders to assess the nature of the damage and remaining environmental threat.

- BNL has the lead technical role in developing the transparency arrangements for the US/Russia high-enriched uranium (HEU) purchase agreement. Under this agreement, 500 metric tons of highly enriched uranium from Russian nuclear weapons is being blended down to low enriched uranium for peaceful use in nuclear reactors.

- BSA provides assistance to DOE/NN-44 on implementation of the US/IAEA Additional Protocol to the US/IAEA Safeguards Agreement is essential to gaining ratification of similar Protocols by non-nuclear weapons states, thereby strengthening IAEA safeguards and the non-proliferation regime worldwide.

- BNL continued as DOE's lead Laboratory for technical support on the Fissile Material Cutoff Treaty (FMCT). BNL completed and distributed the BNL Report SAC-00-11 entitled, "A Review of the Status of the Fissile Material Cutoff Treaty from the Perspective of the Department Of Energy." This report provides a summary of the U.S. approach to the FMCT, identifies a number of unresolved issues, and provides recommendations for next steps that could usefully be taken by DOE.

- A significant recent achievement, conducted with BNL oversight, was the successful completion of a material balance for the production of fuel assemblies for the BOR-60 fast reactor at the Research Institute for Atomic Reactors (RIAR) in Dimitrovgrad, Russia. BNL continues to play a major role in the Nuclear Materials Conversion and Consolidation (MCC) project, which is an important component of the Materials Protection, Control and Accountability (MPC&A) program. Current MCC activities are underway at the Luch and Dmitrovgrad facilities in Russia. A critical goal of the MCC project is to reduce the number of sites and buildings that contain weapons-usable nuclear material, as well as to reduce the attractiveness of existing highly enriched uranium by down-blending it to low enriched uranium.

- BNL is leading an evaluation effort to ensure that the most appropriate and sustainable equipment is used in the MPC&A Program in Russia. During this fiscal year, BNL was instrumental in identifying, researching and evaluating potential Russian MPC&A equipment vendors who might be able to help Russia sustain the MPC&A upgrades for the long term. Under this project, revision 2 of the report entitled "An In-Depth Market Research Survey of MPC&A Suppliers in the Russian Federation," was published. A catalog of MC&A equipment, published jointly by BNL and the Research Institute of Automatics (VNIIA), Russia, was placed on the MPC&A website. This catalog is now widely used as a reference for selecting destructive and non-destructive assay equipment, as well as measurement capabilities and methodologies. BNL was instrumental in establishing and supporting a MINATOM MC&A Equipment and Methodological Support Working Group responsible for implementing modern equipment and methodologies within the MINATOM complex.

- A BNL scientist continues as chair of the "Technical Survey Team" (TST), a group of experts who provide top-level, objective, technical review, strategic and program-related advice, and recommendations to DOE/HQ on all projects under the MPC&A Program.

- Research started in support of the Department of Transportation/FAA's aircraft electrical wire aging program. NNSD has been awarded a competitive grant through the BAA process to conduct an investigation into the mechanisms of polymer degradation over time. This will include experimental investigations of the usefulness of tera hertz reflectometry that could lead to the development of new measurement technology for use in aircraft inspection. The Laboratory is partnered with United Airlines and Airbus on this multi year effort.

1.4 Work For Others and Technology Transfer

Approximately 20 percent of the Laboratory research budget comes from the *Work for Others* Programs. Approximately 11 percent comes from DOE work funded by other National Laboratories or under international agreements and the remaining 9 percent coming from other federal agencies (NIH, NASA, NRC, etc.) and the private sector.

1.4.1 Federal Sponsors

Department of Energy

DOE Work For Others involves research and collaboration in support of several national and international initiatives including Large Hadron Collider (LHC), Muon Collider/Storage Ring, D0 Collaboration, Solar Neutrino Collaboration, Global Climate Change and Carbon Management, International Nuclear Safety Program, and initiatives for Proliferation Prevention. Highlights of performance relative to these initiatives have been included in previous discussions under respective DOE programs that provide direct funding for those initiatives.

Spallation Neutron Source

BNL also has responsibility for the design, construction, and commissioning of the Spallation Neutron Source (SNS) accumulator ring and the beam transports from the linear accelerator (linac) to the ring and from the ring to the target station.

In FY 2001, BNL received $24M for its work on the SNS Ring and Beam Transport System. One major concern is for BNL to ramp up the staff support to the level of about 90 FTE's to complete the work plan. Due to the successful operation of the RHIC project, the required man-power was transferred into the SNS project in time for planned designs, procurements, and construction work.

Among the long-lead industrial procurements placed in FY 2001 were the prototype collimator, low field power supplies, injection kicker power supplies, and low field corrector magnets.

The major project milestones met in FY 2001 are the completion of the half-cell assembly, completion of the prototye RF system, completion of the component hand-off plan, and the Estimate-to-Complete cost exercise.

Many components have been shipped to ORNL and accepted by the SNS after successful Testing, which include HEBT dipole magnet, vacuum chamber gate valves, power supply interface, power supply controller, and ring dipole reference magnet.

The November DOE review commented BNL's accomplishment in the physics design, industrial procurement, and cooperative team work with the ORNL.

By the end of FY2001, BNL completed 100% of SNS R&D work, 65% of detailed engineering design, and 35% of industrial procurement which met the scheduled plan for BNL's contribution.

Other Governmental WFO Sponsors

Highlights of accomplishments for work funded by other governmental agencies is discussed below.

National Institutes of Health (NIH)

In work funded by the NIH, Laboratory scientists and researchers from other National Laboratories, universities, and pharmaceutical companies have continued to make significant progress in utilization of the NSLS to study biological structures by X-ray crystallography. The grant will allow Brookhaven scientists to develop new structural biology methods, equipment, and software for the NSLS. In FY01, NIH provided an additional grant of $2.6M to further enhance NSLS facilities.

Along with several other centers, BNL has been piloting procedures for the cost-effective large-scale determination of protein structures by X-ray crystallography. In partnership with Rockefeller University, the Albert Einstein College of Medicine, Cornell Medical School, and Mt. Sinai School of Medicine, BNL recently received an NIH grant to support further development of structural genomics technologies and to establish a pilot structure-production center.

NIH also provides substantial support for biomedical research through grants to individual investigators. Such grants support work at the Imaging and Neuroscience Center, investigations on DNA damage and repair, protein structure and folding, viral proteases and receptors, and the Lyme disease bacterium. This research has been highly successful. In addition to addressing NIH research needs, this type of research provides great opportunities to communicate scientific mission.

National Aeronautic Space Administration (NASA)

BSA continues to achieved planned progress in the construction and operation of the Booster Applications Facility (BAF) for NASA. The (BAF) will be a new experimental facility and accelerator that takes advantage of heavy-ion beams from the Brookhaven Alternating Gradient Synchrotron Booster for studies on radiation effects related to the space program. BAF will provide protons and heavy for space radiobiology studies and radiation effects on microelectronics. BAF is slated to be fully operational in 2003.

The National Space Biomedical Research Institute (NSBRI) is a consortium of 12 institutions working to prevent or solve health problems related to long-duration space travel and prolonged exposure to microgravity. BNL is one of the twelve NSBRI consortium institutions since 1999. Our current NSBRI projects focus on the risk assessment and chemoprevention of HZE-induced Central Nervous System damage, development of a heavy-ion microbeam and micron resolution detector for radiation studies, heavy-ion induced cluster DNA damage and the development of educational programs on space radiation effects.

The AGS is the only accelerator in the US capable of providing heavy ion beams at energies of interest for space radiobiology. Experiments continue in collaboration with investigators from universities, national laboratories, and other research institutes from the US and international research address the particular problem of high-energy heavy ion radiation exposure during future long-term deep space flights.

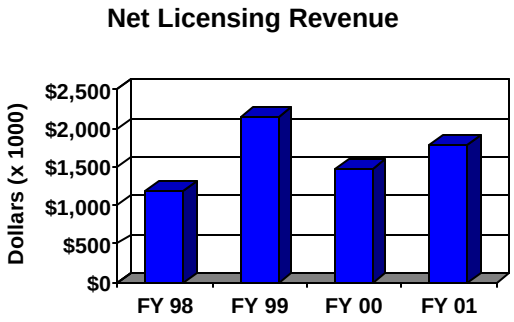
International Work

In FY01 Brookhaven scientists continued to apply their capabilities and skills to international work supporting DOE and its sister agencies in transferring technology to friendly nations. Our near-term focus is the former States of the Soviet Union, specifically in the areas of reactor safety, and decommissioning the nuclear navy. BNL supports the EPA's Office of International Affairs and DOD in several environmental cleanup projects in Kazakstan. Brookhaven's International Safeguards Project Office (ISPO) manages the US Support Program which assists the International Atomic Energy Agency (IAEA) in developing safeguards verification approaches, new measurement and surveillance systems, and integrated safeguards approaches which integrate traditional safeguards with new measures. Our MARKAL-MACRO computer code is being used increasingly by developing nations to help them design energy-efficient infrastructures.

1.4.2 Technology Transfer

A goal of the Science and Technology Program is to “Add value to the US economy through the development and application of new and improved technologies." BNL’s Technology Transfer Program has two primary objectives---to complement our research mission through involvement in technology transfer projects and enhance our research capabilities on behalf of DOE, and to be a resource for US industry, enhancing competitiveness in domestic and international markets.

Inventions arising from our biotechnology research programs continue to be of special interest to industry. Our strengths in medical imaging, radiopharmaceuticals, nuclear medicine, molecular genetics, genomics, structural biology, and protein engineering continue to produce new technology that is licensed to industry. Technology based on our T-7 gene expression system continues to evolve with new patents issued and new commercial licenses granted. At the close of FY01, there were 165 technologies in BSA's Patent Licensing Portfolio; 49 percent of these technologies are licensed to industry and 9.6 percent of the licensed technologies have been commercialized with new products based on these technologies now on the market. As shown on the adjacent graph, net revenue generated by the licensing program, which is re-invested in the Laboratory's research programs, continues to increase each year. In 1999, we received a one time, $1M up front license fee that significantly increased the FY99 figures; but, in fact, BNL’s program has experienced steady growth each year. At present, the program is considered one of the most successful in the DOE system.



Over the past several years, CRADAs have proven to be a valuable component of BNL's research portfolio. These programs enhance BNL's research capabilities and provide access to industrial expertise and capabilities. Cost-shared CRADAs generated several new technologies and numerous patents, created new commercial products and processes, and demonstrated the societal relevance and public benefit of DOE research. Technology partnerships funded by the LTR Program have been previously discussed under the respective DOE programs. Additional partnerships are briefly discussed below.

The Initiative for the Proliferation Prevention Program for the Newly Independent States (IPP-NIS) supports research partnerships at BNL that take advantage of the research capabilities of established scientific institutions in the NIS and the commercialization expertise of industry. DOE supports the research conducted by BNL and the NIS institute while our industrial partner supports its own work through a CRADA. BNL is a participant in six IPP-NIS CRADAs and it is anticipated that BNL will initiate three new IPP-NIS CRADAs during the upcoming year. BNL and Radkowsky Thorium Power Corporation currently work with the Kurchatov Institute to develop a new type of fuel for nuclear reactors.

The Laboratory has successfully attracted research funding from industry to support research collaborations under CRADAs. For example, BNL is working with Dow Chemical Company to create environmentally beneficial agricultural plants with novel applications for human health and nutrition. It is anticipated that through this collaboration with Dow, BNL will assist in the development of genetically engineered seed crops that can produce oil to replace conventional fuels and petrochemicals.

BNL's atmospheric chemistry and oceanography programs are extensively involved in sponsored research programs; several leverage DOE's investments in atmospheric chemistry. BNL's work for North Carolina State University involves data analyses with a series of diagnostic modeling exercises to understand the photochemical process forming ozone in the Nashville area. We conduct similar research for Pennsylvania State University by investigating the relationship among conditions leading to high ozone concentrations and increased levels of particulates in the urban polluted environment. Laboratory staff participate in a program sponsored by Science Engineering Associates to develop a unique application for a tracer technology developed by BNL for atmospheric studies. This tracer technology reveals leaks in underground containment barriers.

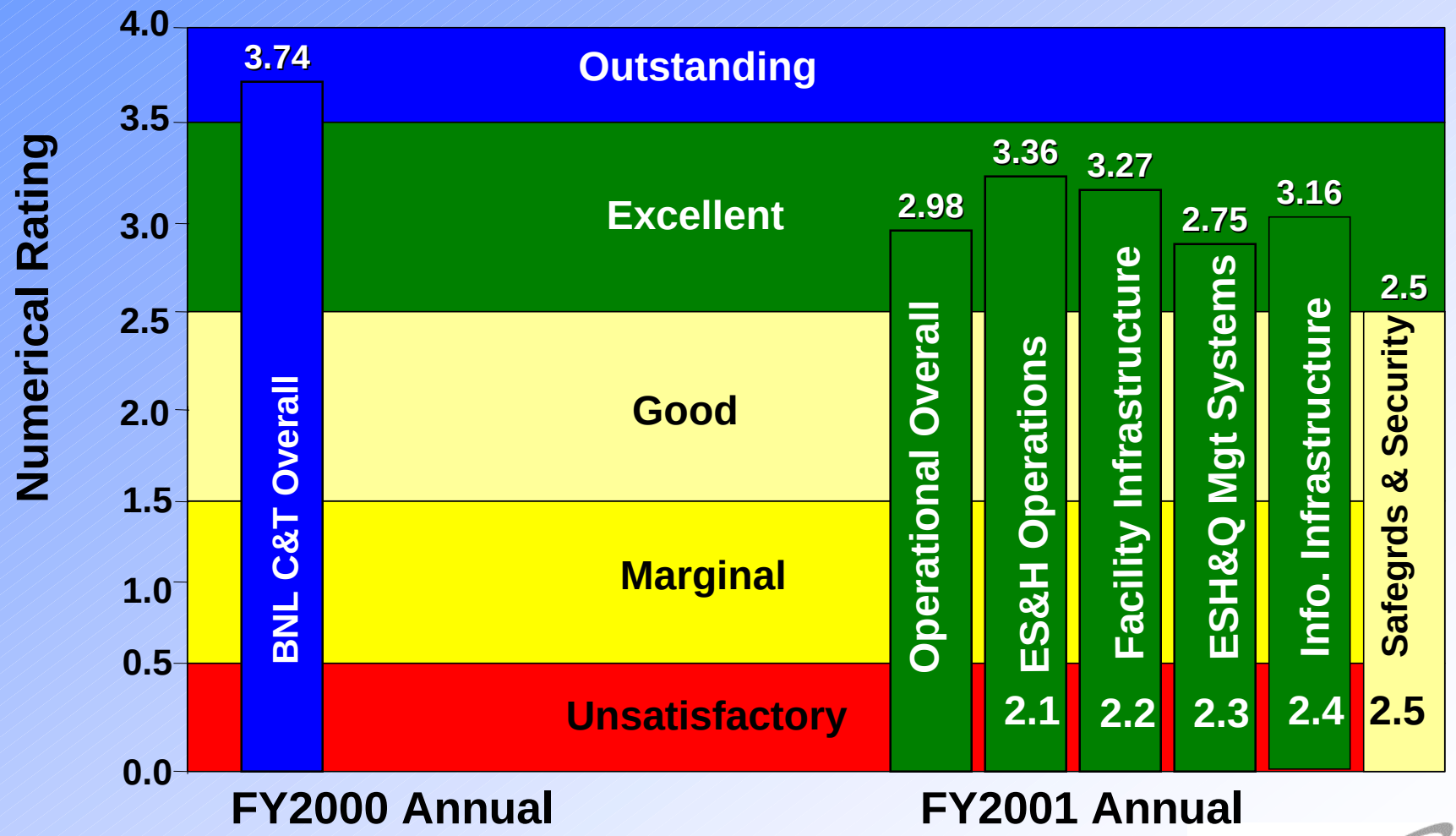
Our oceanography capabilities are the basis for a number of active sponsored research programs. Through the Woods Hole Oceanographic Institution (WHOI), BNL participates in the Global Ocean Ecosystem Dynamics (GLOBEC) Program. We have placed moorings and collected data for GLOBEC to establish a fundamental understanding of how the abundance of key marine animal populations varies in space and time. On a local level, we participated in a program sponsored by Suffolk County, using instrumentation developed at BNL to study the relationship between dissolved organic nitrogen and the brown tide blooms in the Peconic Estuary. Brown tide has significant environmental and economic consequences on Long Island.

BNL participates in the Long Island R&D Initiative sponsored by the local utility, KeySpan Energy, to develop new technologies with potential application in the utility industry. Staff use their experience with high-performance polymer cements to recycle boiler ash and other power-plant waste products. Waste materials incorporated into a composite cement are used for rapid setting patch materials to repair damaged roadways.

BNL conducts important research in advanced oil heat technologies under the sponsorship of the New York State Energy Research and Development Authority (NYSERDA). NYSERDA-sponsored research at BNL includes the development of an advanced oil burner capable of operation at two firing rates, which results in improved efficiency. Another NYSERDA-funded program includes the development of oil and gas heating systems that have improved electric power consumption and that can be operated during periods of power outages. In both of these programs, BNL is working with local small businesses to commercialize these improved heating technologies.

The Laboratory's research in Magnetic Resonance Imaging (MRI) includes several studies funded by the National Multiple Sclerosis Society.

Critical Outcome 2: Operational Excellence



BROOKHAVEN NATIONAL LABORATORY

2.0 Operational Excellence

Critical Outcome

2.0

BNL Will Conduct All Work And Operate All Facilities With Distinction, Fully Integrated With And Supportive Of Its Science, Technology, And Cleanup Missions, While Being Fully Protective Of Its Workers, Its Users, The Public, And The Environment, And Fully Responsive To DOE Expectations For ES&H, Quality, Facility, And Information Management.

20% of BNL Score

Objectives

2.1 **ES&H Operational Performance** — **15% of C.O. #2**

2.2 **Facility Infrastructure** — **10% of C.O. #2**

2.3 **ESH&Q Management Systems** — **45% of C.O. #2**

2.4 **Information Infrastructure** — **25% of C.O. #2**

2.5 **Excellence in Safeguards and Security** — **5% of C.O. #2**

Performance Measures

2.1.1 Environmental Composite (25% of 2.1)
This composite establishes a simple measure to assess the timeliness of routine regulatory report submittals, and continues to track the number of significant spills and compliance with the NY State Pollutant Discharge Elimination System (SPDES) permit limits. Also, included in this measure are Groundwater Protection, and Pollution Prevention.

2.1.2 Radiological Control Composite (25% of 2.1)
Radiological Control Operational Performance Objective- BNL will achieve operational excellence in Radiological Control.

2.1.3 OSHA Composite (25% of 2.1)
BNL will seek to achieve excellence in worker safety and health protection. In the area of Occupational Safety and Health BNL will seek to improve the following reportable rates: Total Recordable Case Rate (OSHA Recordables) TRCR, Lost Workday Case Rate (LWCR), Lost Work Day Rate (LWDR) Also, included in this measure is Chemical Safety Performance.

2.1.4 Training and Qualifications Composite (25% of 2.1)
Demonstrate Effectiveness of T&Q Program
•Workers trained and qualified to perform assigned work independently
•Worker knowledge commensurate with assigned responsibilities
1) Percentage of Staff Linked to Job-specific Training Assessments (JTAs) 2) Percentage of Requirement JTA Profiles for Staff Reviewed/Updated Yearly (at minimum) for Additional T&Q Needs 3) Percentage of Training and Qualification Requirements Completed by Staff

2.0 Operational Excellence

Critical Outcome

2.0

BNL Will Conduct All Work And Operate All Facilities With Distinction, Fully Integrated With And Supportive Of Its Science, Technology, And Cleanup Missions, While Being Fully Protective Of Its Workers, Its Users, The Public, And The Environment, And Fully Responsive To DOE Expectations For ES&H, Quality, Facility, And Information Management.

20% of BNL Score

Objectives

2.1 ES&H Operational Performance — **15% of C.O. #2**

2.2 **Facility Infrastructure** — **10% of C.O. #2**

2.3 ESH&Q Management Systems — **45% of C.O. #2**

2.4 Information Infrastructure — **25% of C.O. #2**

2.5 Excellence in Safeguards and Security — **5% of C.O. #2**

Performance Measures

2.2.1 Facility Project Management (30% of 2.2)
Facility construction and maintenance projects are managed to ensure scope, schedule and cost. Approved projects are completed on time, within budget, and meet baseline expectations. Uncosted carryovers are minimized.

2.2.2 Facilities/Infrastructure Management (30% of 2.2)
This measure includes the following: Reliable Infrastructure, Utility Services are Reliable, Building and Facilities are Reliable, Energy Utilization is Effectively and Efficiently Managed and Condition Assessment Survey Process.

2.2.3 Real Property Performance (20% of 2.2)
This measure includes the following: Space Consolidation. Measures consolidation of BNL mission activities from small, wood frame structures into existing permanent multi-use research facilities. BNL is planning to consolidate programs and support functions into facilities with lower occupancy over the next two years.

2.2.4 Strategic Infrastructure Plan (10% of 2.2)
Infrastructure planning documents are comprehensive, well written and integrated with BNL mission goals.

2.2.5 Recycling of Solid Waste (10% of 2.2)
The amount of solid waste sent to the Landfill will be controlled and reduced through recycling, whenever possible.

2.0 Operational Excellence

Critical Outcome

2.0

BNL Will Conduct All Work And Operate All Facilities With Distinction, Fully Integrated With And Supportive Of Its Science, Technology, And Cleanup Missions, While Being Fully Protective Of Its Workers, Its Users, The Public, And The Environment, And Fully Responsive To DOE Expectations For ES&H, Quality, Facility, And Information Management.

20% of BNL Score

Objectives

2.1 ES&H Operational Performance — **15% of C.O. #2**

2.2 Facility Infrastructure — **10% of C.O. #2**

2.3 **ESH&Q Management Systems** — **45% of C.O. #2**

2.4 Information Infrastructure — **25% of C.O. #2**

2.5 Excellence in Safeguards and Security — **5% of C.O. #2**

Performance Measures

2.3.1 ISM Performance Composite (10% of 2.3)
Develop a system for long-term performance monitoring of the ISM system by December 1, 2000.

2.3.2 Environmental Management System (20% of 2.3)
Achieve Laboratory-wide ISO 14001 registration.

2.3.3 IAP Implementation (30% of 2.3)
Includes % of required assessment activities completed on schedule, % of Institutional level Corrective/Improvement Actions completed on schedule and BHG review of BNL's Self Evaluation of its overall program

2.3.4 Quality Management System Verification (20% of 2.3)
Develop Verification Plan and Complete Verification

2.3.5 Rad Con Program Implementation Performance (20% of 2.3)
Based on the composite ratings received in the four program element reviews of the triennial assessment. Overall radiological control program performance evaluation based on annual self-assessment evaluation

2.0 Operational Excellence

Critical Outcome

2.0

BNL Will Conduct All Work And Operate All Facilities With Distinction, Fully Integrated With And Supportive Of Its Science, Technology, And Cleanup Missions, While Being Fully Protective Of Its Workers, Its Users, The Public, And The Environment, And Fully Responsive To DOE Expectations For ES&H, Quality, Facility, And Information Management.

20% of BNL Score

Objectives

2.1 **ES&H Operational Performance** — **15% of C.O. #2**

2.2 **Facility Infrastructure** — **10% of C.O. #2**

2.3 **ESH&Q Management Systems** — **45% of C.O. #2**

2.4 **Information Infrastructure** — **25% of C.O. #2**

2.5 **Excellence in Safeguards and Security** — **5% of C.O. #2**

Performance Measures

2.4.1 Information Service Composite Performance (20% of 2.4)
Re-engineer the desktop lifecycle support services, from procurement, through operations, to retirement. This includes the scientific as well as the administrative desktops.

2.4.2 Cyber Security Performance (45% of 2.4)
Provide a computing and communications environment that is secure, yet open for interaction to effectively conduct the Laboratory's business

2.4.3 World Wide Support Strategy (15% of 2.4)
Develop a World Wide Web support strategy that will centralize and standardize web functions across the site.

2.4.4 Scientific Computing Infrastructure Performance (20% of 2.4)
Develop a scientific computing infrastructure that is fully supportive of the Laboratory's scientific mission, focusing initially on those areas where leveraging existing expertise and local/regional collaborations can produce significant improvement over the current status.

2.5.1 Counterintelligence (CI) (100% of 2.5)
The initial purpose of this measure is to determine the effectiveness of improvements that have been implemented to address deficiencies noted during the OCI (DOE Office of Counterintelligence) appraisal

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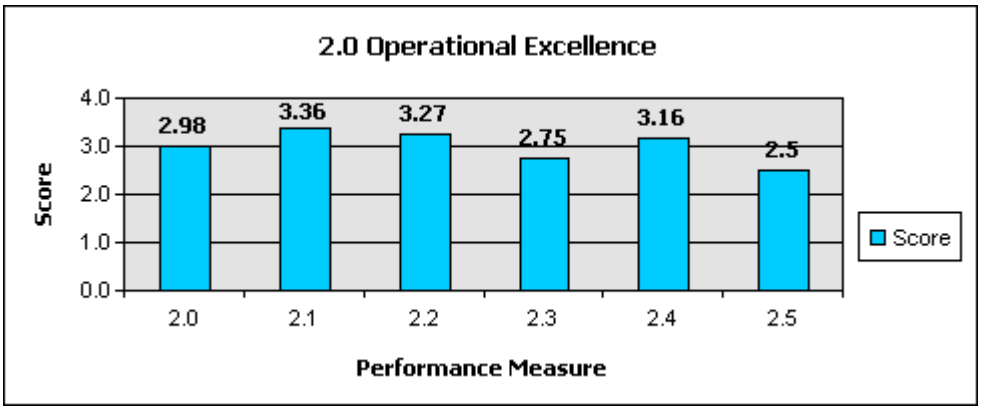
2.0 Operational Excellence

Critical Outcome Description

BNL will conduct all work and operate all facilities with distinction, fully integrated with and supportive of its science, technology, and cleanup missions, while being fully protective of its workers, its users, the public, and the environment, and fully responsive to DOE expectations for ES&H, quality, facility, and information management.
The weight of this Outcome is 20% of total.



2.0 Operational Excellence
2.1 ES&H Operations
2.2 Facility Infrastructure
2.3 ESH&Q Management Systems
2.4 Information Infrastructure
2.5 Excellence in Safeguards and Security

Summary for Operational Excellence

Operational Excellence is rated *Excellent* with a score of 2.98.
Highlights for each of the objectives are found below.

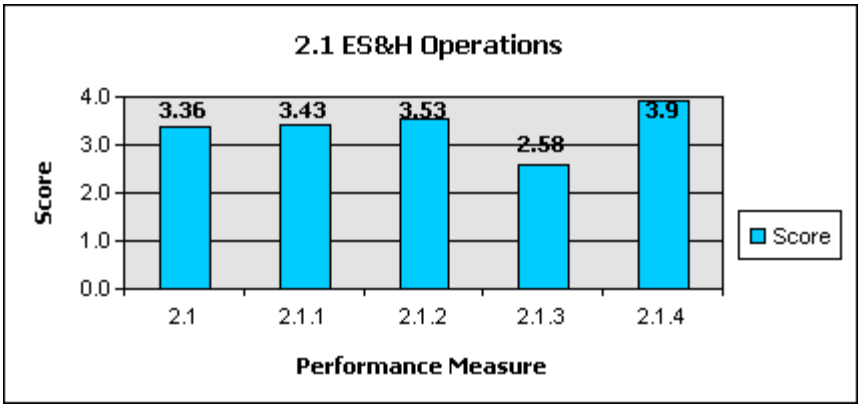
Results for Operational Excellence

Score (0~4.0)	Rating	Schedule Status
2.98	Excellent	Ahead of Schedule

2.1 ES&H Operations

Objective Description

The weight of this Objective is 15%.
Achieve integration of environmental stewardship, radiological, and safety management into all facets of the Laboratory's missions, and manage programs and operations in a manner that protects the ecosystem, workers, and public health.



2.1 ES&H Operations
2.1.1 Environmental Protection Composite
2.1.2 Radiological Control
2.1.3 Occupational Safety and Health
2.1.4 Training and Qualifications

Accomplishments - Summary for ES&H Operations

This Objective has been rated as *Excellent* with a score of 3.36.

- BNL continues to meet or exceed environmental performance goals by adhering to release limits, improving its groundwater protection programs, and minimizing waste generation. We are committed to pollution prevention. The pollution prevention program (including the Pollution Prevention Council) has been very successful. Strong lab-wide participation in the program is evident. In FY 2001, $120 K was spent on pollution prevention projects with short-term return-on-investment periods.

- Four of six non-conformances at the Sewage Treatment Plant were due to zinc excursions. Investigations showed that installation of slip liners to improve sewage system integrity was the predominant cause. Future projects of this nature will segregate the sludge and wash water for evaluation prior to sewer release.

- Laboratory organizations are operating 20% under their radiological ALARA goals. Test results for the Analytical Service Laboratory were over 95% acceptable through the end of the fiscal year. Approximately 95% of radiological corrective actions were closed-out on schedule.

- There were seven reportable and three non-reportable contamination events. The rate tracked below the rate of FY00. Follow-up investigations showed that many of the contaminations resulted from non-compliances (Medical) or from inadequate knowledge of conditions in the area (HFBR). Aggressive corrective actions have not yet shown sufficient demonstrable improvement. As a precautionary measure, the Laboratory temporarily increased the size of the posted areas in the HFBR external grounds when hot particles were discovered to allow for more controls on characterization activities but this would be considered a normal response to unexpected conditions.

- Of particular concern to Laboratory management however was an apparent reversal of the improving trend in occupational injury performance. Senior laboratory management has taken several actions to communicate the seriousness of the situation and and emphasize the importance of reducing occupational injuries. Additionally, BNL increased field presence of safety professionals and increased the emphasis

on reducing ergonomics-related injuries. Occupational injury performance remains a focus for Laboratory and DOE management.

- Chemical Safety Management conformance decreased from approximately 80% in FY00 to 63% in FY01. This decrease is considered an statistical anomaly as it was primarily due to a single failure, an individual who failed to update the CMS database after moving his operations and chemicals from one building to another. A critique identified several actions to increase awareness of Chemical Management System requirements and improve overall system performance. Industrial Hygiene experts have put a greater emphasis on CMS issues when participating on "Tier 1" inspections and the Laboratory has developed or enhanced on-line tools to assist staff in maintaining their chemical inventory up-to-date. Presentations on Chemical Management performance have also been given to BNL managers and to ES&H support staff. CMS inventory reviews are performed during the Occupancy Readiness Evaluations and Exit Readiness Evaluations.

- The Laboratory is performing in an outstanding manner in Training and Qualifications performance. Laboratory staff linkage to job-specific tasks is above 99%, as is employee training requirement profile review/update this year. The statistics are identical for transient staff in both areas. Transient staff has completed 87% of required training. The Guest Information System (GIS) is still early in its implementation, so focus is on improvements and upgrades to the system and procedures to ensure data integration, reliability, and consistency. Improvements will also be made to the update mechanisms for GIS to the training system.

Although not specific measures under this objective, DOE and other regulatory agencies conducted several assessments of BNL ES&H operations in FY01. These are listed below.

<u>New York State Department of Environmental Conservation (NYSDEC)</u>
Hazardous Waste Compliance
Permitted Emission Sources
Delivery and Storage of Petroleum
Chemical Storage Facilities

<u>Suffolk County Department of Health Services</u>
Routine surveillance of sewage treatment plant and liquid effluent discharges.
On-site staff inspections of toxic and hazardous materials storage requirements.

<u>BAO Assessments</u>
Cross Connection Control
Internal Dosimetry (conducted in collaboration with BNL
Radiological Air Sampling Program (Area MonitoringNon-ionizing Radiation (excluding lasers):
Chemical Protective Clothing (in collaboration with BNL):
Noise and Hearing Conservation

Results for ES&H Operations

Score (0~4.0)	Rating	Schedule Status
3.36	Excellent	Ahead of Schedule

2.1.1 Environmental Protection Composite

Accomplishments

The Laboratory continues to meet or exceed environmental performance goals by adhering to release limits, improving its groundwater protection programs and minimizing wastes in accordance with commitments to pollution prevention. All reports have been submitted ahead of schedule. Zinc excursions in the SPDES permit were investigated and were tied to the sewer system integrity improvement project due to zinc in the slip liners. An article in the Lab's biweekly Monday Memo raised awareness of spill prevention. The Source Water Assessment was completed and submitted to DOE ahead of schedule. BNL completed DQO process for 90.3% of projects. DQO cost savings are projected to be ~$325,000. All three waste streams are showing declines. All pollution prevention opportunities (260) were dispositioned and determined to be either viable or not viable based on agreed upon criteria regarding cost and technical feasibility. Approximately $120,000 was spent on Pollution Prevention projects this year resulting in funding of all short-term return on investment (ROI) projects.

Analysis

Total score = 3.44 Excellent Composed of: Env. Results = 2.64 Excellent Groundwater Protection = 3.667 Outstanding Pollution Prevention = 4 Outstanding

Management Focus for the Coming Quarter

Maintain compliance by active assistance and education to Departments. Assess vulnerabilities and assessment trends. Focus on improving data input in EIMS and availability of data from ASL. Encourage site wide continued participation in the P2 program. This will be a measure in next year's performance. Consider additional DQOs for cost savings.

Results

Score (0~4.0)	Rating	Schedule Status
3.43	Excellent	Not Applicable

Notes

Environmental Results = excellent Groundwater Protection = outstanding Pollution prevention = outstanding

Issues and Trends

Performance Measure for Data availability in EIMS can be improved when processing of ASL data improves. Transmittal software is currently being reworked and this is a priority item. The Pollution Prevention Program (and the Pollution Prevention Council) has been very successful in reaching out to everyone in the lab. This year's proposals had several submittals, which were submitted by researchers showing their buy-in to reducing waste generated during experiments. Cost savings from pollution prevention and recycling projects have been documented for the past two years totaling over $2M in FY01 and $1.6M is FY00.

Assumptions

Due to the impact of the SPDES excursions on this performance measure a mid-year change to the toxicity level of zinc and other non-hazardous heavy metals was requested and granted by the DOE.

2.1.1.1 Environmental Results

Accomplishments
All reports have been submitted ahead of schedule. Zinc excursions were investigated and were tied to sewer improvement project.

Analysis
While an overall rating of *Excellent* was achieved, SPDES performance and spills during FY01 were only ranked *Good*. The most significant contributor to these rankings were zinc excursions at the Sewage Treatment Plant which was responsible for four of the six non-conformances documented this year. The Good ranking was enhanced by a contract change, which reclassified the zinc excursions as non-toxic. Scoring for each was as follows:
Measure Score Ranking Numerical Score (out of 5) SPDES Excursions: 45, Good 2.2; Significant Spills: 10, Good 2.6; Timeliness: 5, Outstanding 5.0; Average 3.3.
A score of 3.3 out of a maximum score of 5 is equivalent to a score of 2.64 out of 4.

Management Focus for the Coming Quarter
Maintain compliance by active assistance and education to Departments. Assess vulnerabilities and assessment trends.

Results

Score (0~4.0)	Rating	Schedule Status
2.64	Excellent	Ahead of Schedule

Compliance Component	Score
Consistently meet all SPDES permit limits	45
Eliminate Significant spills	10
Submit reports in a timely matter	5

Notes
SPDES violations include zinc excursions at the Sewage Treatment Plant, which was responsible for four of the six non-conformances documented this year. A significant spill was caused by a break in a photographic chemical waste line. This 5 gallon spill was considered reportable because the photographic fixer is listed as a RCRA D011 unlisted hazardous waste due to the silver content.

Issues and Trends
The zinc violations were investigated and an assessment was conducted. Results of the investigation showed that upgrades to the sewer system, including cleaning, slip-lining, and spot repairs were the predominant causes of these excursions. Analysis of the slip lining and of sludge collected from the sewer mains and manholes contained soluble zinc. Future projects of this nature will segregate the sludge and wash water for evaluation prior to sewer release.

2.1.1.2 Groundwater Protection

Accomplishments
The Source Water Assessment was completed and submitted to DOE on December 27, 2001. This result was *Outstanding*.

Analysis
Source Water Assessment ahead of schedule, scored 4 EIMS data availability 74.4%, *Excellent* was scored 3 DQO 90% completion, scored 4.

Management Focus for the Coming Quarter
Focusing on improving data input, compatibility, and availability from BNL Analytical Services Lab. Considering additional DQOs for cost savings.

Results

Score (0~4.0)	Rating	Schedule Status
3.66	Outstanding	Ahead of Schedule

Component	Metric Rating
Submit Final Draft of Source Water Assessment for BNL potable water wells to DOE by 1/1/2001.	Outstanding
Data availability in the Environmental Information Management System (EIMS).	Excellent
Data Quality Objectives	Outstanding

Issues and Trends
Performance Measure for Data availability can be improved when processing of ASL data improves. Transmittal software is currently being reworked and this is a priority item.

2.1.1.3 Pollution Prevention

Accomplishments
All three waste streams are showing declines. Approximately $120,000 was spent on Pollution Prevention projects this year resulting in funding of all short-term ROI projects.
Rating is Outstanding. All pollution prevention opportunities (260) were dispositioned as viable or not viable based on agreed-upon criteria regarding cost and technical feasibility. Of those, 97 were determined to be viable, 91 were implemented as low cost opportunities, and 17 proposals were generated for the 21 proposals considered viable and high cost (81%).

Analysis
Data Source: PEP2000 database maintained by G. Goode
260 out of 260 P2 Opportunities dispositioned
97 were determined to be "viable"
91 were implemented as low cost opportunities
17 proposals were generated for the 21 viable high cost opportunities, far exceeding the 25% requirement

Management Focus for the Coming Quarter
Encouraging continued site-wide participation in the P2 program.

Results

Score (0~4.0)	Rating	Schedule Status
n/a	n/a	Ahead of Schedule

Pollution Prevention Measure	Rating
Reduction in Hazardous, Mixed and Low-Level Radioactive Waste Streams	Outstanding
Evaluation and Implementation of Pollution Prevention Measures	Outstanding

Issues and Trends
The Pollution Prevention Program (and the Pollution Prevention Council) have been very successful in reaching out to everyone in the lab. This year's proposals had several submittals, which were submitted by researchers showing their buy-in to reducing waste generated during experiments. Cost savings from pollution prevention and recycling projects have been documented for the past two years totaling over $2M in FY01 and $1.6M is FY00.

2.1.2 Radiological Control

Results

Score (0~4.0)	Rating	Schedule Status
3.53	Outstanding	n/a

2.1.2.1 ALARA Collective Dose Goals

Accomplishments
Lab organizations are 20% below radiological ALARA goals for an outstanding rating.

Results

Score (0~4.0)	Rating	Schedule Status
3.7	Outstanding	n/a

2.1.2.2 Radioactive Contaminations under ORPS

Accomplishments
At the end of the fourth quarter (09-30-01) there were seven contamination events that were reportable with 10 actual contaminations for a grade of *Excellent*. Follow-up investigations revealed that the contaminations fell into two broad areas: incomplete knowledge of conditions (HFBR mostly) or new compliances by individuals (Medial mostly). For the non-compliances, worker and researcher attention to detail and rad work practices are deemed to be the

predominant causes of these events. Increased attention is being given to individuals to eliminate contamination.

Results

Score (0~4.0)	Rating	Schedule Status
3.25	Excellent	n/a

Issues and Trends

Excellent performance is predicted based on the current trend. A significant increase in the HFBR work scope will require additional measures to continue the favorable trend.

2.1.2.3 ASL Performance

Accomplishments

Test results through the end of the fiscal year showed both non-radiological and radiological sample results were over 95% acceptable for an “Outstanding” score.

Results

Score (0~4.0)	Rating	Schedule Status
4	Outstanding	n/a

2.1.2.4 RCD Corrective Actions by BHG

Accomplishments

At the end of the fiscal year the score was two late corrective actions out of 39 total items for a score of about 95%.

Results

Score (0~4.0)	Rating	Schedule Status
3	Excellent	n/a

Notes

The RCD performance measure is more conservative than the BSA measure on the same topic.

2.1.3 Occupational Safety and Health

Accomplishments

Performance Measure 2.1.3.1 is scored at 3.3 and is 20% of the weight. Performance Measure 2.1.3.2 is scored at 2.4 and is 80% of the weight. The summary Score for 2.1.3 is 3.3 x 0.2 + 2.4 x 0.8 = 2.58

Results

Score (0~4.0)	Rating	Schedule Status
2.58	Excellent	n/a

2.1.3.1 Improve Rates: TRCR, LWCR, LWDR

Analysis

In Spring 2001, an apparent reversal of the improving trend of BNL Occupational Injury Performance Measures was observed: Initially, this was thought to be due to slips and falls during the winter period but the trend continued after the winter ended. An analysis of this trend indicates broad slippage site-wide.

The Safety and Health Services Division (SHSD) Manager made a presentation to the BNL Management Council and offered to make department/division specific presentations. The SHSD Manager also discussed the Occupational Injury trends at an ESH Coordinators' Meeting, (attended by BAO). The key messages included more management involvement of incidents, including analysis of near misses, and improved accident investigation reports. Lab Director emphasized the need to be more aggressive in looking at Occupational Injury experience within our operation to the Management Council members and addressed the issues in a Monday Memo to all staff.

Safety and Health Services has increased field presence of its staff in BNL's Work Planning and Control activities and in participation in department/division Tier 1's. More emphasis in ergonomics-related injuries was initiated during the summer of 2001. The communication of Occupational Injury and Workers Compensation data was increased with the addition of "Fact of the Week" and broader distribution of the weekly report. Safety and Health Services and Occupational Medicine Clinic continued their weekly Case Management meetings to identify Occupational Injury and Workers Compensation cases that warrant more management attention, and to seek better understanding of causes.

Results

Score (0~4.0)	Rating	Schedule Status
3.30	Excellent	

Reportable Rate	Rating	Actual or Projected Score
TRCR (Total Recordable Case Rate)	Good	3.20
LWCR (Lost Workday Case Rate)	Good	1.50
LWDR (Lost Work Day Rate)	Good	47.19

Notes

TRCR is in the Good range (2.80-3.79) with a rate of 3.20 thru 4Q FY01...Score of 2 LWCR is in the Good range (1.20-2.00) with a rate of 1.50 thru 4QFY01...Score of 2 LWDR is in the Good range (38.85-52.55) with a rate of 47.19 thru 4Q FY01...Score of 2.
Composite score 2 x 0.33 + 2 x 0.33 + 2 x 0.33 = 1.98...Good

2.1.3.2 Chemical Safety Performance

Accomplishments

A. Conformance to Chemical Management System Inventory Requirements:
Performance Measure was scheduled for the 3rd and 4th quarters of.The score for the FY01 is 62.9% (based upon 6 evaluations) for a Marginal rating.
B. Disposition of Chemicals for Terminated or Transferred Staff:
The data collected for this measure as of September 29, 2001 is as follows:
84% (39/46) of terminating staff met the 1 month deadline to reconcile their inventory for an Excellent rating.
The combined score for this metric is 73.45 resulting in a "Good" rating.

Analysis

Lab performance in this measure dropped from 80.4% in FY00 to 62.9% in FY01. A total of six rooms were surveyed in FY01 as compared to five in FY00. This low rating was considered anomalous due to the failure of the individual to update the CMS database after moving his operations and chemicals from one building to another, receiving an overall score of 0%. This person has been instructed of his responsibilities with respect to CMS inventory. A critique was performed and the CMS incident was discussed during the department management review.

SHSD has taken the following actions to help increase CMS awareness:

- CMS inventory reviews are now performed during the ORE and ERE processes.
- SHSD identified and distributed a list of chemical owners who have had no CMS action over 1 year. The recently approved Working with Chemical Subject Area emphasizes the responsibility of users and supervisors for maintaining chemicals inventory in the work area and updating the CMS database as appropriate. To further assist in chemical management improvement, the CMS team has developed on-line tools to assist department/division in maintaining their chemical inventory.
- IH members who participate on dept./div. Tier I inspections have put a greater emphasis on CMS issues.
- The CMS Team has developed new web pages, which will allow for an efficient and user-friendly method to add, transfer, and delete bar coded chemicals from the CMS database.
- The CMS Team continues to review employee terminations and LOA to ensure that chemicals are being properly deleted or transferred to responsible individuals.
- SHSD Manager has made presentations on this performance measure at the BNL Management Council meetings and at ES&H Coordinators and Reps meetings.

Results

Score (0~4.0)	Rating	Schedule Status
2.4	Good	On Schedule

2.1.4 Training and Qualifications

Accomplishments

See 2.1.4.1 and 2.1.4.2

Analysis
See 2.1.4.1 and 2.1.4.2

Management Focus for the Coming Quarter
See 2.1.4.1 and 2.1.4.2

Results

Score (0~4.0)	Rating	Schedule Status
3.9	Outstanding	Not Applicable

2.1.4.1 T&Q Metric for Permanent Employees

Accomplishments
1) Currently 99% of employee staff are linked to job-specific tasks
2) 99% of Employee training requirement profiles have been reviewed/updated this year.
3) Currently the Laboratory is at a 96% completion rate of required training.

Analysis
Out of 2,964 employees, 2934 have job-specific task assignments.
All line organizations reviewed/updated their employee required training profiles. Organizations accomplished this review in a variety of ways such as through a formal comparison to working planning and experimental documentation, meetings with departmental supervisors and managers, employee mailings, and Training Coordinator/Training Office review of program. 37,408 training requirements, 35,991 are complete.

Results

Score (0~4.0)	Rating	Schedule Status
3.9	Outstanding	Not Applicable

2.1.4.2 T&Q Metric for Transient Staff

Accomplishments
1) Required training links have been assessed for 99% of our transient staff.
2) Profiles for transient staff have been reviewed/updated for 99% of our transient population.
3) Currently the Laboratory is at an 87% completion rate of required training for transient staff.

Analysis
Due to the recent implementation of the Guest Information System (GIS), required training links are applied to all staff based on information collected about the type (user, contractor, guest), and type of work. Linking requirements to these staff members is fully automated. In addition, training needs are added to longer-term staff through New Employee/Guest and Contractor Vendor Orientation procedures, work planning/experimental review processes, and the JTA review process. Because GIS and this automated linking system is new--and the quality review of the data and processes were conducted this spring/summer, these reviews/updates are complete. Out of 9,952 training requirements, 8,647 are complete.

Management Focus for the Coming Quarter

Because the GIS system is still early in its implementation, focus will be on improvements and upgrades to the system and procedures to ensure reliable and consistent data collection and improve the mechanisms for how the GIS data updates the training system.

Results

Score (0~4.0)	Rating	Schedule Status
3.9	Outstanding	Not Applicable

Notes

This measure is reporting status for all guests, contractors, and users. The previous exclusion of some transient staff from being included in this report (if they were here for 60-days or less) was removed once the GIS and training systems were integrated as part of GIS implementation.

Regulator Assessments

Although not specific measures under this objective, DOE and other regulatory agencies conducted several assessments of BNL ES&H operations in FY01. Highlights are briefly described below:

New York State Department of Environmental Conservation (NYSDEC)

Hazardous Waste Compliance- An unannounced inspection resulted in two violations of hazardous waste regulations – one involving unlabelled waste (corrected on the spot) and the other involving storage of waste/used batteries outside 90-day storage areas. The second violation was subsequently corrected and formal notification of correction was submitted to NYSDEC.

Permitted Emission Sources. The assessment focused on the Central Steam Facility, spray-painting operations in Building 458, and Building 197 lithographic presses. The inspection included a review of documents, facility inspections, and interviews. No deficiencies were noted.

Delivery and Storage of Petroleum Fuels- This inspection focussed on the delivery and storage of petroleum fuels and management of the tank storage. Five issues required corrective actions. These included maintenance of piping systems serving tanks 5 and 6, testing of the cathodic protection systems, inspection of the "tell-tales" installed on Tanks 9 and 10, testing of the secondary containment system permeability, and color coding of fill ports on Tanks 5 and 6. All corrective actions are complete with the exception of maintenance of piping serving Tanks 5 and 6. All required maintenance will be performed before returning this piping to service.

Chemical Storage Facilities- This inspection focused on the delivery and storage of regulated chemicals, and the management of the tank storage systems. There are eighteen storage facilities registered under this program. Issues requiring resolution include the provision of containment areas at chemical delivery sites, materials of construction for tank subject to melting, and stenciling of valve positions.

Suffolk County Department of Health Services

As part of the County's routine surveillance of BNL, quarterly inspections are conducted of the sewage treatment plant and routine inspections performed of liquid effluent discharges (i.e., State Pollutant Discharge Elimination System permitted point-source discharges). No compliance issues identified during FY01. Suffolk County also has on-site staff that regularly inspects activities to evaluate conformance with Article 12 toxic and hazardous materials storage requirements.

BAO Assessments

Cross Connection Control: The BOA conducted a review of the BNL Cross Connection Control Program assessing compliance to Safe Drinking Water Act requirements, associated State guidance, and adherence to BNL procedures (i.e., Subject Areas). A draft report has been received. This report identifies four Concerns, six Findings, six Observations and one Noteworthy Practice. This draft report is undergoing a factual accuracy review.

Internal Dosimetry (conducted in collaboration with BNL): Assessment concluded that there have been significant improvements to the program and that previously identified 10CFR835 programmatic issues have been resolved. However, there were issues identified that collectively indicate a need for significant improvement in quality assurance areas of: Work Practices, Design, Procurement, and Management Assessment.

Radiological Air Sampling Program (Area Monitoring): Concluded that BNL has a sound radiological air-sampling program. However, BNL has yet to fully implement aspects of the DOE Air Monitoring Guide. There was a general concern about the internal dosimetry program related to sample results from the Analytical Services Laboratory. No issues were identified that present significant health and safety concerns. Issues in this program likewise called out the quality assurance areas of Work Practices, Design, and Procurement.

Non-ionizing Radiation (excluding lasers): The assessment found that BNL is not meeting all of DOE's safety requirements for static magnetic fields and radio frequency radiation (e.g., lack of initial or baseline hazard assessments). Implementation of BNL Standard 2.3.2 (RF and Microwaves) was considered inconsistent across BNL. Survey equipment calibration was an issue. BNL's standard needs updating to be conformant with DOE's non-ionizing radiation exposure limits. BNL has issued an SBMS Static Magnetic Field Subject Area to address documentation issues identified in the assessment report.

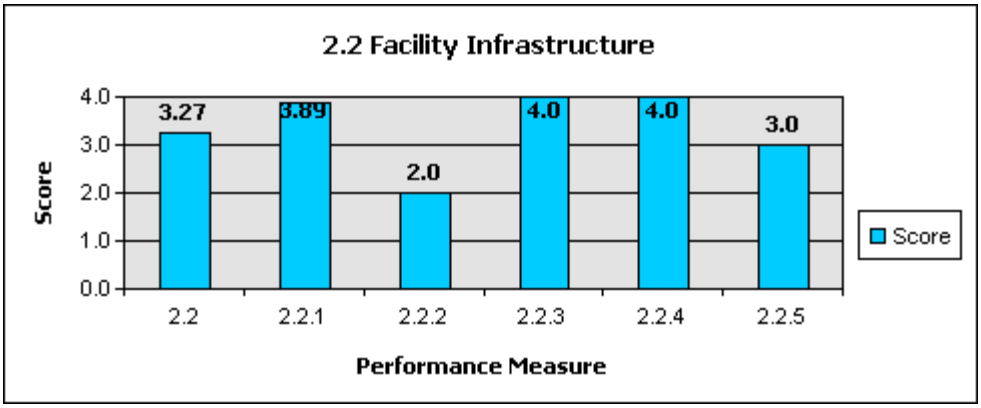
Chemical Protective Clothing (in collaboration with BNL): Found BNL's program is in general agreement with OSHA and DOE requirements. Some deficiencies in BNL's written program with respect to revisions in OSHA standards were noted. Field review found implementation of BNL's written program was not consistent across the site. There were several observations of documentation not available for Hazard Assessment and Chemical Protective Equipment Specifications, and one observation of no documentation of selection or use training.

Noise and Hearing Conservation: This assessment reviewed BNL's written program against DOE's requirements and department/division implementation of the requirements. The assessment noted that BNL has recently made several noteworthy program enhancements in the areas of training and documentation. Some key program requirements are not consistently implemented in all departments and divisions. Opportunities for program improvement were identified in 1) use, care, and maintenance of personnel protective equipment, 2) follow-up with workers who have standard threshold shifts, and 3) consistent use of recognized exposure assessment methodologies by all departments/divisions.

2.2 Facility Infrastructure

Objective Description

The weight of this Objective is 10%.



2.2 Facility Infrastructure
2.2.1 Facility Project Management
2.2.2 Facilities/Infrastructure Management
2.2.3 Real Property Performance
2.2.4 Strategic Infrastructure Plan
2.2.5 Recycling of Solid Waste

Accomplishments - Summary for Facility Infrastructure

Performance under the Facility Infrastructure Objective has been rated at *Excellent* with a score of 3.27. Highlights of performance include:

- 2.2.1 Project management is *Outstanding*. All line item projects are on or ahead of schedule and within their cost baselines. All but two GPP projects scheduled for completion have been completed on time and within approved scope.

- 2.2.2 Building and Facilities infrastructure and the on-site Electric utility continue to be extremely reliable: *Outstanding*. Site energy use is down 0.39%. While this was an improvement over last year, reductions were impacted by a colder-than-normal winter and were not as large as hoped: *Good*. The overall trend for energy reduction is on track to meet federal and DOE energy reduction goals. Although not directly related to the measure FY 2001 was a very successful year for energy management at BNL. Some of the major accomplishments and initiative are listed below:

- **NYPA savings - $11,124,000:** We continue to enjoy very low electric rates from the New York Power Authority (NYPA), nearly half of what we would have to pay the local utility, LIPA. BNL's average rate for FY01 was $0.052/kWh. This is a lower rate than any facility in the downstate area, and among the lowest in the Northeast. Further, we are currently paying less per kWh in real dollars than we were when we started with NYPA in 1981.

- **2001 LIPA load curtailment savings - $372,182:** BNL earned a substantial rebate for curtailing various operations during periods of peak electric demand, helping Long Island avoid power

disruptions. In fact, the demand was so close to the available generation that without our participation LIPA would have had to initiate rolling blackouts.

- **Keyspan gas contract saved over $1,700,000:** BNL's three-year contract with Keyspan for the supply of natural gas ended in March of 2001. In addition to reducing emissions, BNL saved a substantial amount of money compared to burning oil.BNL has the flexibility to burn either natural gas or oil, whichever is cheaper.

- **Fuel purchasing strategy saves $592,000:** BNL has the ability to store over 1.8 million gallons of fuel. Careful timing of oil purchases, along with select use of natural gas, provided these savings. These additional savings can be attributed the diligent efforts of the personnel at the Central Steam Facility.

- **Five new IHEM projects worth $940,000 were funded in FY01:** BNL received funding for these projects from the former In-House Energy Management Program (IHEM), now operated through the Federal Energy Management Program (FEMP). The projects are: Microturbine demonstration project, Solar heating and pool cover at the BNL pool, eliminate once-through cooling in building 902, Energy Management Control System (EMCS) optimization – Phase II, and an LED lighting replacement project.

  Many energy challenges demand management attention, including: uncertainty in future electric rates, the possible demand to implement federal requirements to purchase "Green" energy (in short supply in the Northeast), and continued pressure to meet federally mandated energy reduction goals.

- Condition Assessment Surveys (CAS) have been delayed due to higher priorities. Cycle time is currently between 4 and 5 years warranting an *Unsatisfactory* rating. The laboratory will continue to consider condition assessment surveys in prioritization processes.

- 2.2.3 Building occupancy has improved over 15%. Over the past two years occupancy in 9 key facilities has increased from approximately 78% to over 94%.

- 2.2.4 High quality planning-related documents were delivered on-time to DOE resulting in an "outstanding" grade.

- 2.2.5 The Laboratory continues to meet its goals in the recycling of municipal solid waste. About 37% of our MSW (paper, cardboard, cans, bottles, tires, etc) was recycled resulting in an "outstanding" rating.

Results

Score (0~4.0)	Rating	Schedule Status
3.27	Excellent	Not Applicable

2.2.1 Facility Project Management

Accomplishments

Facility Project Management is proceeding in accordance with baselines. All line item projects are on or ahead of schedule and within their cost baselines. All but two GPP projects scheduled

for completion have been completed on time and within their approved scope. Obligations are slightly ahead of schedule and costs are on schedule.

Results

Score (0~4.0)	Rating	Schedule Status
3.89	Outstanding	n/a

2.2.1.1 Funds Committed

Accomplishments

As of September 30th, 2001, funds actually committed are $9,699k, funds planned to be committed are $8,759k. Fund commitments are ahead of schedule.

Results

Score (0~4.0)	Rating	Schedule Status
4	Outstanding	On Schedule

Report Date	Value of a[1]
2001 Mid-year	1.0
2001 Year-end	n/a

Notes

The funds committed include line item projects and GPP project funding for FY01. A Baseline Change Proposal (BCP) was submitted for the Groundwater Protection line item project. This BCP revised the obligation schedule for the project due to a directed change by DOE. This directed change was due to the requirements of new DOE Order 413.1 that require a minimum of eight weeks to achieve approval of Critical Decision-3 (CD-3), which allows obligation of funds for construction.

2.2.1.2 Funds Costed

Accomplishments

Funds costing is virtually on schedule. As of September 30th, 01, funds actually costed are $8,924k, funds planned to be costed are $9,128k. Therefore a2 is equal to .980

Results

Score (0~4.0)	Rating	Schedule Status
3.95	Outstanding	On Schedule

Report Date	Value of a2
2001 Mid-year	.980
2001 Year-end	.980

Notes
The cost progress for line item projects and GPP projects are predominantly on schedule. A slight delay in costing of sewage sludge disposal for the Sanitary Upgrade Phase III line item accounts for achieving less than 100%.

2.2.1.3 Project Schedule Compliance (GPP and IHEM)

Accomplishments
As of September 30th, 2001, eleven out of thirteen projects were completed by the baseline completion date. This results in a measure for b1 of .85.

Analysis
There were two GPP projects that were not completed by their scheduled baseline completion dates, the Building 901 Retaining Wall Repair and the Compressor Replacement for PAT Helium projects. The B901 Retaining Wall project was delayed by high bid prices received on the initial design, which required redesign and rebidding. The project has been successfully rebid and a contract has been awarded. The Compressor for PAT Helium project was delayed due to delays in the order and delivery of control components. These items have been ordered and are awaiting delivery.

Management Focus for the Coming Quarter
Effort will continue to be made on planning and timely execution of GPP projects.

Results

Score (0~4.0)	Rating	Schedule Status
3.5	Excellent	n/a

Report Date	Value of b^1
2001 Mid-year	1.0
2001 Year-end	.85

Notes
The B901 Retaining wall project was perceived to have a high degree of risk by bidding contractors due to the uncertainty of working on the earthen roof of B901 with restrictions on vibration and allowable heavy equipment. This accounted for the initial high bid prices. The Compressor for PAT Helium project was delayed due to a sole-source computer control vendor that was nonresponsive to the solicitation request for an extended period.

2.2.1.4 Project Schedule Compliance (Line Item)

Accomplishments
As of September 30, three out of three line item milestones were completed on time. Therefore b2 is 1.0

Analysis
The Design Start milestone was completed on time for the Electrical System Modifications Phase II project and the Ground and Surface Water Protection Upgrades project. The

Construction Complete milestone was completed on time for the Electrical Modifications Phase I project.

Results

Score (0~4.0)	Rating	Schedule Status
4	Outstanding	n/a

Report Date	Value of b2
2001 Mid-year	1.0
2001 Year-end	1.0

2.2.1.5 Scope completed within approved baseline

Accomplishments

As of September 30th, 01, twelve out of twelve GPP projects were completed within their approved scope. Therefore C is equal to 1.0

Analysis

All projects scheduled for completion this year that were completed were completed within their approved scope. Two projects scheduled for completion but not completed (B901 Retaining Wall and Compressor for PAT Helium) are on track to complete the baseline scope in FY02.

Results

Score (0~4.0)	Rating	Schedule Status
4	Outstanding	n/a

Report Date	Value of c
2001 Mid-year	1.0
2001 Year-end	1.0

2.2.2 Facilities/Infrastructure Management

Results

Score (0~4.0)	Rating	Schedule Status
2	Good	n/a

2.2.2.1 Reliable Infrastructure

Accomplishments

Building and Facilities Infrastructure and the on-site Electric Utility continue to be extremely reliable. The combined performance measure for the year was 0.9992, implying that the average BNL customer saw less than seven hours of any unplanned heating, air conditioning, water, lighting or electric outage disruption during the year. Most of the seven hours likely occured

when buildings were unoccupied or lightly occupied. Many outages are not perceived by the customer or cause minimal or no disruption of mission-related activities.

Results

Score (0~4.0)	Rating	Schedule Status
4	Outstanding	Not Applicable

PM Number		Value	Rating
2.2.2.1	Reliable Infrastructure	n/a	n/a
2.2.2.1.1	Utility Services Reliable	4.0	Outstanding
2.2.2.1.2	Building & Facilities Reliable	4.0	Outstanding

Issues and Trends

There are disturbing trends, which will tend to degrade this measure in the future: -aging infrastructure -cuts in maintenance budgets -growing maintenance backlogs

2.2.2.2 Energy Utilization is Effectively and Efficiently Managed

Accomplishments

Buildings & facilities energy conservation performance improved in the 4th quarter (as predicted) after the effects of a colder than normal winter were felt in the energy statistics. Energy use-to-date (compared to last fiscal year) is down 0.39% resulting in a good rating.

Analysis

Energy conservation performance improved slightly in the 4th quarter, although overall energy reductions were not as large as hoped, mostly due to this year's weather. We continue to make progress toward Federal and DOE energy reduction goals.

Results

Score (0~4.0)	Rating	Schedule Status
2	Good	Not Applicable

Notes

Small reduction in building energy use was due to several factors including: reclassification of building space and process space; increase in programmatic work in bldgs. 902 and 901; and increase in use of water treatment facility. These account for about 24% of the impact this year. The balance of 76% of the increase was associated with the colder winter. There was an increase of heating degree-days by approximately 11%.

Issues and Trends

BNL's overall trend is still good. The reduction for 2001 vs. 1985 (base year) is 22%. The goal is a 30% reduction by 2005. The previous goal was a 20% reduction by 2000.

2.2.2.3 Condition Assessment Survey Progress

Accomplishments

FY01 funding for facility Condition Assessment Surveys (CAS) fell victim to extensive budget curtailments within Plant Engineering. We are currently on a 4 - 5 year pace to complete CAS for the entire site.

Management Focus for the Coming Quarter

Plant Engineering requested incremental FY02 funding for CAS. The funding request scored reasonably well in the prioritization process (3PBP) and made "bin 1". However, FY02 incremental funding was not obtained. Plant Engineering is currently looking at reprioritizing other essential work to free operating funds and resume CAS inspections.

Results

Score (0~4.0)	Rating	Schedule Status
0.	Unsatisfactory	Behind Schedule

Report Date	Condition Assessment Survey Progress (cycle time)
2001 Mid Year	5 year cycle time
2001 Year-end	7 year cycle time

Notes

Our cycle time is currently between 4 and 5 years. We requested an incremental budget increase to cover the cost of contracted inspections which would allow us to achieve a cycle time of less than 3 years. $225,000 dollars per year is needed for this activity.

Issues and Trends

If we do not obtain funding to contract out the inspections, our inspector is able to cover approximately 600,000 square feet per year. Eventually that will result in a 7 year cycle time.

2.2.3 Real Property Performance

Results

Score (0~4.0)	Rating	Schedule Status
4	Outstanding	n/a

2.2.3.1 Space Consolidation

Accomplishments

Building occupancy in our existing permanent multi-use research facilities has improved over 15%. This two-year effort has raised office occupancy in nine key facilities from 78-79% to over 94%, a 15% gain.

Analysis
Departments are highly motivated to consolidate due to budget and management pressures.

Results

Score (0~4.0)	Rating	Schedule Status
4	Outstanding	On Schedule

Building Number	Design Occupancy	Actual Occupancy 10/1/99	% Occupancy 10/1/99	Actual or Projected Occupancy 9/30/01	Acutual or Projected % Occupancy 9/30/01
463	112	96	86%	101	90%
480	39	38	97%	38 38	100%
490	202	102	50%	154	76%
510	341	294	86%	341	99%
515	120	100	83%	116	97%
535	82	74	90%	81	99%
555	152	100	66%	133	88%
815	73	56	77%	47 47	65%
911	216	185	86%	246	115%
Totals	1337	1045	79%	1257	94%

2.2.4 Strategic Infrastructure Plan

Accomplishments
All items completed on schedule

Results

Score (0~4.0)	Rating	Schedule Status
4	Outstanding	On Schedule

Required Document	Performance Measure Milestone Date	Actual or Projected Date
Commitment Affirmation Letter	10/31/00	10/30/2000
ESH&I Mgmt Plan	4/30/01	4/30/2001
Inst. Plan, Site & Facilities Section	5/30/01	5/04/2001
Energy Mgmt Plan Update	5/30/01	5/25/2001

GPP Program Plan	8 weeks after CURL approval	11/1/2000
Special Maintenance Plan	8 weeks after CURL approval	11/1/2000
Site Master Plan	9/30/01	9/30/2000
Alt. Financing for Energy Mgmt Study	12/31/00	9/25/2000
Site Master Plan Implementation	2/28/01	2/27/2001
Dev line item, GPP implementation schedule/proposed funding program	4/30/01	4/30/2001

Notes

All milestones are complete and on time.

2.2.5 Recycling of Solid Waste

Accomplishments

38% of our "municipal solid waste" stream (excluding construction debris) was recycled in FY01.

Results

Score (0~4.0)	Rating	Schedule Status
3	Excellent	n/a

Notes

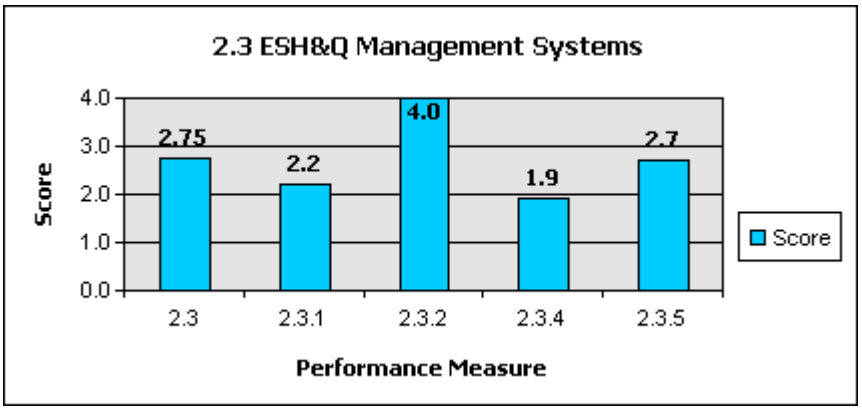
428.62 tons have been recycled out of a total of 1118.24 total tons of municipal solid waste generated for a 38% recycling rate for FY01.

2.3 ESH&Q Management Systems

Objective Description

The weight of this Objective is 45%.

BNL will develop and implement next generation management systems and establish the necessary organizational constructs to ensure continuous improvement in ES&H performance and operations support.



2.3 ESH&Q Management Systems
2.3.1 ISMS Performance Composite
2.3.2 Environmental Management System
2.3.4 Quality Management System Verification
2.3.5 Rad Con Program Implementation Performance

Accomplishments -Summary for ESH&Q Management Systems

This Objective is rated as *Excellent* with a corresponding score of 2.75.

2.3.1 The Integrated Safety Management System (ISMS) Composite is rated *Good* with a score of 2.2. Progress towards developing and implementing an ISMS measurement system was less than expected. Some of the delay was due to competing priorities. The more significant cause of the delay was the revised approach chosen for development, which has shown to take substantially more time to prepare and implement than anticipated when the measure was developed. It should be noted however, that the revised process is integrated with other management assessment programs. It has gotten positive comments from DOE HQ, Battelle Corporate entities, and other National Laboratories, so that the impact on the Lab as a whole is considered markedly positive in spite of the negative impact on SBMS progress.

The pace of upgrading Accelerator Authorization Basis Documents is on target to complete the work in the initial five-year plan. Progress for the BLIP documents is behind schedule but documents for other facilities are either on or ahead of schedule. Some enhancements to institutional level project scheduling would be beneficial to facilitate resource allocation reporting.

2.3.2 The laboratory achieved ISO14001 Registration ahead of schedule, earning an *Outstanding*. BNL is the first DOE Office of Science laboratory to achieve such status. In its recommendation for certification, NSF-ISR, singled out 14 aspects of Brookhaven's program as being particularly noteworthy. These included Brookhaven's comprehensive use of computer technology to help provide environmental guidance, the thoroughness of the Laboratory's experimental and project reviews, and its systems for identifying environmental protection priorities and tracking issues. NSF reviewers also noted that Brookhaven's EMS was the most thoroughly and systematically implemented program they have encountered to date. From their unique registrar role for BNL since 1999, NSF noted dramatic cultural

change at Brookhaven. Minor non-conformances, primarily related to records management issues were also identified. Corrective/improvement actions are in progress.

2.3.3 The Laboratory's Assessment Program has been rated as *Excellent* with a score of 2.7. This rating was determined jointly by BSA and DOE utilizing a collaborative protocol that evaluates three aspects of assessment program: Approach, Deployment, and Results. Strengths identified included demonstrated early identification and response to operational issues and significant improvement in corrective action management. Areas for improvement were primarily related to the need to improve management involvement in all phases of the assessment program and to improve assessment processes to determine the degree of field implementation. The Laboratory and DOE expect to use the measurement process on a continuing basis. Success will require a consistent understanding at the Laboratory and in DOE of expectations associated with the assessment program and the evaluation approach.

2.3.4 Progress towards verification of the Quality Management Program has been slower than initially anticipated and the associated measures have been rated as *Good* with a corresponding score of 1.9. The primary delay being that the more thorough approach (noted in 2.3.1 above) took longer to develop and implement than initially anticipated. This approach engages line users of management processes and drives accountability for all aspects of system deployment. A total of 3 quality program management system/key process maturity evaluations have been completed: *Engineering Design* process, *Acquisition Management*, and *Work Planning and Control*.

2.3.5 The Radiological Control Program is rated as *Excellent* with a score of 3.0. RadCon Division has continued their steady rate of improvement initiated in early FY99. The expected rate of improvement noted in last year's overall evaluation was achieved. While most program elements were very good, areas of excellent performance were offset somewhat by areas of good/marginal performance. The excellent areas include analytical services, technical qualifications of the staff, radiation protection training, and performance on contract performance measures. Areas of good performance include external dosimetry and the ALARA program. The one area of marginal performance is the Radiation-Generating Devices (RGD) program.

In last year's annual evaluation there were several areas that were identified as needing emphasis during FY01 including procedural compliance, field performance of radiological workers, non-radiological technical capability, ALARA, internal dosimetry, and corrective action systems. BNL has demonstrated improvement in all of these areas.

Transportation Safety Management:

Although not part of the FY01 Critical Outcome performance measures, BNL focused substantial effort on improving its transportation safety program. Key tasks completed in FY01 include. Examples include:

- Identified and trained a primary Transportation Safety Officer (TSO) and appropriate alternates. Established a Transportation Safety Working Group that advises the operating organizations and the Deputy Director for Operations on transportation safety matters associated with the transfer or shipment of hazardous materials both on and off site, and established Points of Contact within all Departments and Divisions that do transportation activities to facilitate communication of transportation safety related matters.

- Developed Hazardous Materials Transportation Safety Program Description (Manual), a Management System Description and related site-wide procedures (SBMS subject areas) to define program

responsibilities, requirements, and processes for transportation safety. Developed a Laboratory "Materials of Trade" (MOT) inventory.

- Upgraded organizational Standard Operating Procedures (SOP's) for Waste Management, Safeguards and Security, and Procurement & Property Management that had to do with transportation, so that they were in compliance with the HMTM.

- Modified Contractor/Vendor and General Employee Training to introduce Transportation issues, and developed web based training "Transportation of Hazardous Materials General Awareness" for staff members involved in transportation related activities.

Full implementation of the Laboratory's transportation safety program remains a high priority for both BAO and BSA. Operational issues related to transportation safety and compliance reported through ORPS at the beginning of FY02 confirms the need to maintain the focus.

Price Anderson Amendments Act:

In FY01, the DOE Office of Investigation and Enforcement (EH-10) conducted a review of the BNL PAAA Program. Areas evaluated included screening of noncompliances for PAAA applicability; reporting Noncompliances into the DOE Noncompliance Tracking System (NTS); and internal resolution of nuclear safety noncompliances. Results were reported to the Laboratory Director in February 2001 and concluded that BSA's PAAA Program is generally established, formalized by procedure, and in basic conformance with DOE expectation and guidance. It further stated that various improvements would be appropriate based on the deficiencies noted in their report. The deficiencies were in the areas of timely PAAA review and reporting; BNL QA Program issues; and BNL Radiological Control Program issues. BNL prepared and issued a corrective action plan to address the ten areas for improvement noted in the report. The majority of the corrective actions have been completed and those that remain open are being tracked in the BNL Institution Assessment Tracking System (ATS). The Laboratory's progress in addressing follow-up actions from the EH-10 review was included in the corporate oversight assessment begun at the end of FY01.

Results

Score (0~4.0)	Rating	Schedule Status
2.8	Excellent	Not Applicable

2.3.1 ISMS Performance Composite

Accomplishments

This composite measure focused the development and implementation of a systematic approach for ISMS measurement and improvement. An additional element of the composite was related to upgrading the accelerator authorization basis documents. Overall performance for this composite is rated Good, with a corresponding score of 2.2. Details of performance relative to each measure are discussed below.

Results

Score (0~4.0)	Rating	Schedule Status
2.2	Good	n/a

2.3.1.1 Long Term Performance Monitoring of ISM

Accomplishments

A systematic approach for long-term performance monitoring BNL's Integrated Safety Management System was developed and submitted to BAO for review on January 25, 2001. Comments received from BAO (on February 6) primarily related to the need to emphasize an understanding of the degree of implementation of laboratory processes. BSA agrees with BAO and we continue to ensure this objective will be achieved through the methodology. BAO's response was timely. Based upon the agreed metrics, a “marginal” rating is warranted although this score is not reflective of the actual performance in this area. The framework is based on determining management system maturity phases of three areas of management system performance; Development/Definition, Deployment/Implementation, and Assessment/Improvement. Specific criteria, consistent with Malcolm Baldrige methodologies are used to determine a maturity phase of the Management System or key process that is used to deliver or support ISMS core functions and Guiding Principles. This approach is consistent with the process described in the ISMS program description.

It should also be noted that the general approach has been discussed with staff at PNNL and also by members of the BSA Corporate Oversight ESH&Q Assessment Team. These reviews evaluated the approach as sound. In fact PNNL is exploring the use of a similar approach. Achieving this milestone was delayed for two primary reasons. First, the intention was to develop a framework that could be used for any management process at the Laboratory. This effort has been successful because the same approach is being used for verifying and benchmarking the implementation of the Laboratory's QA program. The development of the process required more time than initially anticipated. A second reason for the delay was the need to pull laboratory resources off this effort to focus on improving the Laboratory's Transportation Safety Program. Although performance with respect to the Transportation Safety Program is not directly captured through the Critical Outcome process, it was evaluated as enough concern to reprioritize effort. The Laboratory appropriately balanced priorities to ensure a correct level of attention was given to improving the program.

Results

Score (0~4.0)	Rating	Schedule Status
1	Marginal	n/a

2.3.1.2 Benchmark ISMS measurement system

Accomplishments - Summary

The laboratory's performance against this measure is rated as *Excellent* with a score of 3.5. The measurement system was benchmarked/piloted utilizing the Laboratory's Environmental Management System (EMS) on February 5, 2001. The benchmarking activity was conducted with a cross functional/disciplinary team the management system Point of Contact, subject matter experts, and individuals representing line organizations. Improvement actions for the

measurement approach were identified and incorporated into the evaluation protocol. The measurement approach was again benchmarked/piloted utilizing the EMS in April 01 with a report written on May 10, 2001.

A score of 3.5 is given, although the initial benchmarking/piloting activities were conducted well ahead of schedule justifying an *Outstanding* rating. Based on the lessons in the first exercise, the Laboratory appropriately conducted a second benchmarking/pilot exercise prior to using the approach to evaluate other laboratory management systems and processes. The completion date for the second piloting exercise corresponds to an *Excellent* rating.

Additionally, a subsequent review of the process conducted by Battelle Corporate and DOE HQ as part of a review of the Laboratory's QA program resulted in a request for BNL to present the assessment methodology and the lessons learned in its development at a joint DOE/Contractors meeting (EFCOG, QSIG, QAWG, DOE/PAAA) to be held in Las Vegas in November 2001. The BSA ESH&Q Corporate Oversight Team also confirmed that the approach was technically sound. However, the team indicated that BNL needed to develop a clearer understanding of long-term strategy on how to use/deploy the approach to evaluate the status of the ISMS. Particularly, how to present overall status of the ISMS (or other programs (e.g. QA)) where many management processes contribute to the system, with all supporting processes at varying maturity levels.

Results

Score (0~4.0)	Rating	Schedule Status
3.5	Excellent	n/a

Notes

It's important to note that one reason this approach for measuring the status of the Laboratory's ISMS was chosen was because it provided a framework that could also be used to measure the status of virtually any program or aspect of Laboratory operations. Upon review of the process, the Laboratory's Quality Programs and Services Office adopted it to be used as an approach for evaluating the status of BNL's Quality Management Program.

2.3.1.3 ISMS improvement plan

Accomplishments - Summary

Direct application of this measure and associated metrics warrants an unsatisfactory rating. The purposes of this and the two preceding measures were to develop and implement a methodological approach for evaluating the overall “health” of the Laboratory's Integrated Safety Management System (ISMS), and identifying key areas for improvement. This is an issue that is being struggled with throughout the DOE Complex.

While the laboratory has made reasonable progress towards the measure, completion as established by the measure and metrics has been delayed for several reasons, primarily because more time has been required to complete the evaluations than was initially anticipated. The time required is impacted by both process and familiarity issues. The process requires the formation (and some training) of a peer/user review group. The group is provided with information related

to the system to be evaluated. The evaluation approach uses “Baldrige” methodology, which is somewhat unfamiliar to many individuals participating in the evaluation. Additionally, the approach chosen intentionally requires line managers to have a lead role in conducting the evaluations. Therefore, the commitment to complete the evaluations must be balanced against other institutional priorities.

Several external groups, including BSA corporate entities and DOE HQ, have reviewed the concept and approach. Feedback received has been very positive; each identified areas where improvement should be considered. For long-term success, it is important that the laboratory take the necessary time in these early stages to manage the development of the measurement process. Based on feedback received, the laboratory is improving the focus on the collection and uses of objective information to determine the “maturity” of subject programs, particularly, the degree of implementation. Additionally, a recent BSA ESH&Q Corporate Oversight review team commented on the need to improve the laboratory’s strategy for using the collective set of evaluations to present the status of an overall program (e.g. ISMS) and then using that information to focus management attention for improvement.

It’s important to note that when the performance measure was developed, the exact approach that BSA would pursue for ISMS measurement was unknown. This impacted our ability to accurately predict resources for timely completion in accordance with agreed upon delivery dates. Additionally, as work progressed on the development of the measurement methodology a better understanding of needs and strategy evolved. We desired a process that met the following criteria:

- Well aligned with the Laboratory management principles and constructs (i.e. SBMS)
- Drives accountability for awareness of degree of implementation and factors that affect implementation
- Drives accountability for continued assessment and improvement of key processes
- Drives accountability for efficiency of processes
- Can be used to measure the status of other programs (e.g. QA, Safeguards and Security, etc)

As a result the laboratory pursued the development and implementation of system maturity evaluation process as discussed in the previous two measures.
As noted above, we developed and deployed a process that could be used to measure the status of other programs such as Quality Assurance. In FY01, the Laboratory had Critical Outcome Measure to verify the deployment of the Laboratory’s QA program (measure 2.3.4) part of that initiative a total of 4 management system/key process maturity evaluations were completed:

- Environmental Management
- Acquisition Management
- Design Review
- Work Planning and Control

All of these have key roles in the BNL’s Integrated Safety Management System. In fact, the Work Planning and Control Management System defines and implements the key processes for

implementing ISM core functions and Guiding Principles for activity level work. The evaluation for all of them identified key improvement opportunities to drive the maturity of the respective systems/processes. Therefore, although the laboratory did not achieve the specific measure (i.e. a full evaluation of ISM), the work that has been done should warrant an adjustment to the evaluation rating based on BAO's consideration of the above.

Results

Score (0~4.0)	Rating	Schedule Status
0.5	Unsatisfactory	n/a

2.3.1.4 Accelerator Safety Basis documentation

Accomplishments - Summary

Performance for this measure is rated at *Good* with a corresponding score of 2.5

Very good overall progress is being made in upgrading Laboratory accelerator authorization basis documents. Specific documents called for upgrade in this measure included the NSLS Accelerator Safety Envelope (ASE) and BLIP Safety Analysis Document (SAD) and ASE.

DOE approved the NSLS ASE on September 25, 2001. The BLIP SAD and ASE are slightly behind schedule. There are two main factors believed to have contributed to the delay:

- The initial upgrade schedule assumed that, for the most part, very little new analysis would be required for the SADs. BLIP staff has found that there is a fair amount of uncertainty in this assumption, particularly as the laboratory has enhanced expectations for processes and tools for conducting facility analysis. Significant time by facility personnel, ESD and RCD has been required to evaluate BLIP emissions.
- Additionally, BLIP was faced with significant budget considerations. Management priorities were appropriately focused on securing funding for the BLIP. It should be noted however, if work on the SAD was initiated earlier and spread over the year, the conflict in priorities might not have occurred.

In addition, the Laboratory has successfully completed other important authorization document upgrades. Examples include: The RHIC ASE was revised and approved by DOE; the ATF ASE was also developed and approved by DOE; in FY01 work on the Source Development Laboratory documentation enabled the Laboratory ES&H committee to recommended approval of its SAD and ASE on October 17, 2001. The C-AD is ahead of schedule having the BAF SAD close to approval.

As required by the performance measure, an assessment was also conducted to identify any obstacles to satisfactory completion of the Laboratory's accelerator authorization upgrade initiative. Note: The assessment was completed in October 2001 but it evaluated performance of the FY01 period. The full assessment report has been reviewed with DOE/BAO and the development of a corrective/improvement action plan is in progress. Notable strengths and areas for improvement are included below.

Strengths:

- Laboratory facility staff universally expressed that the process of updating the SAD's and ASE's has been beneficial. They indicated that the initiative has resulted in improved understanding and analysis of facility hazards and associated controls.
- Very strong awareness of processes and responsibilities for accelerator authorization basis documents was observed. Those interviewed expressed that a key reason awareness was high is due to the fact that representatives for all laboratory organizations responsible for accelerator operation as well as DOE Facility representatives participated in the subject area development.
- There is clear continuous engagement throughout with DOE counterparts (Facility Reps) in the Collider-Accelerator Department and the NSLS. Laboratory organizations and DOE both recognized this as a critical factor in the success of the work in those departments.
- C-AD and NSLS have implemented an Unresolved Safety Issue (USI) process to ensure potential impacts of facility changes are captured on an on-going basis. C-AD has appended twelve USIs to their current SADs. This is a proactive practice that not only exercises USI processes but should also results in efficiency of the overall SAD upgrade initiative.

Areas for Improvement:

- At the institutional level, the only "project plan" is a schedule with estimated document completion dates. The institutional level schedule will be enhanced to include major project milestones for the Laboratory accelerators. This will facilitate tracking status, balancing institutional resources (e.g. ES&H committee, senior management review, etc), and provide a better framework for estimating the impact of additional SADs and ACEs required to support the expanding accelerator based research at BNL.
- Assignment of responsibilities for the Laboratory's Point of Contact for the Facility Safety Management system has been changing due to other Lab considerations. The laboratory needs to take action to restore stability in the assignment of these responsibilities.
- A need to develop or revise lab-wide procedures (SBMS) has been identified. Specific examples include:
  - The Laboratory has not clearly defined a consistent set of requirements regarding the need for independent review of calculations that support conclusions in the SADs.
  - The Subject Area requirements for Accelerator Readiness Reviews (ARR) need to be revisited to ensure DOE order requirements can be satisfied while providing facility managers the maximum flexibility.
  - The Subject Area procedures for the USI process need to be clarified to ensure a consistent understanding in the use of that process for maintaining authorization basis documents up-to-date.

Results

Score (0~4.0)	Rating	Schedule Status
2.5	Good	n/a

2.3.2 Environmental Management System

Accomplishments

The Laboratory as a whole (i.e., all facilities, experiments and operations managed by BSA at BNL) successfully achieved ISO 14001 registration on July 10, 2001, ahead of schedule by 81 days, earning an *Outstanding* rating on this performance measure. BNL distinguishes itself as the first National Laboratory to achieve this registration. The auditors remarked that the BNL EMS program was "the most thoroughly and systematically implemented EMS" that they have had the opportunity to review.

Analysis

Excellent work by all staff at BNL in achieving this milestone.

Results

Score (0~4.0)	Rating	Schedule Status
4.0	Outstanding	Ahead of Schedule

2.3.3 Overall Evaluation of the Laboratory's Integrated Assessment Program

Accomplishments - Summary

A joint (BAO and BNL) evaluation of the Laboratory's Assessment Program was conducted. It resulted in a rating of *Excellent* with a corresponding score of 2.7.
The evaluation was conducted utilizing a process developed that evaluates three areas of the Laboratory's assessment program:

Approach: This evaluates how effectively BNL defines expectations and provides supporting tools and processes for managing the Laboratory's assessment. How well assessment activities are planned is also considered as part of this category.
Deployment: This evaluates the extent to which self-assessment activities are conducted and managed in accordance with the established plan.
Results: This evaluates the success of the Laboratory's assessment program in achieving improved performance and reducing institutional risk. The evaluation focuses on the laboratory's ability to achieve defined expectations, self-identify performance vulnerabilities, take actions to manage those vulnerabilities, and determine the effectiveness in improving Laboratory performance.

The evaluation also served as a "pilot" for a new process to objectively evaluate the Laboratory's assessment program on an ongoing basis. BAO and BNL agreed that evaluation of institutional-level self-assessment activities would be primarily focused on ES&H performance and that evaluation of organizational self-assessment programs would be based on the "Life Sciences" and "Facility and Operations" Directorates. These organizations were selected because the BNL Office of Independent Oversight had conducted reviews of their self-assessment programs in FY01. Due to cost and schedule considerations the evaluation did not include the use of a "peer reviewer" from another Laboratory.

Key observations including strengths and areas for improvement of the Laboratory's assessment program resulting from this review are noted below.

Approach:
Planned institutional level ES&H assessments were developed in partnership with BAO. There was insufficient senior (or corporate) management engagement scoping planned Institutional Level ES&H Assessments. Additionally, the scope of planned assessments was largely focused on compliance. Considerations of previous assessments and assessment results, risks, lessons learned, etc., were not evident in development of the scope.

BNL must define and implement a systematic causal analysis process. Additionally, the Laboratory has not formally defined the criteria for justifying extensions to institutional level corrective action due dates.

Both Self-Assessment Plans (Facilities and Operations (F&O) and Life Sciences (LS)) were comprehensive and covered all areas of their respective "businesses." There is clear evidence of management involvement (all levels) in the development of the F&O self-assessment program. LS managers review and approve the self-assessment plan.

Deployment:
Management Council Meetings are used to communicate ES&H assessment results, operational trends, etc. The focus is on results or trends indicating performance deficiencies. There is little evidence that results of institutional assessments are effectively considered for Lessons Learned. The Laboratory did an excellent job in analyzing and responding to the sewage treatment plant (STP) exceedances. There is evidence that routine review of trends is occurring, specifically OSHA injury statistics, ORPS, ATS, training statistics, etc.

There was evidence that institutional level corrective actions are being tracked in ATS.

In the area of radiological controls, some planned Triennial Assessment activities were not completed as scheduled. The decision to delay the assessments was based on budget shortfalls. The decision was communicated to DOE/BAO and considered to be a reasonable response. The assessment schedule has been shifted without affecting the Laboratory's ability to satisfy contractual obligations.

Communication with respect to status and monitoring progress towards achieving FY01 Critical Outcome performance measures in the area of ISM should have been better. The Laboratory failed to achieve one of the ISM measures. This was not discussed with DOE until well past the deliverable date.

There was evidence of LS senior management involvement in the FY01 LS Operations and radiological control reviews. However, routine involvement and support by Medical Department managers in the ES&H self-assessment program is not evident.

Plant Engineering continues to be proactive in the performance of Tier I Inspections and Safety Inspections. F&0's annual performance review retreat is considered to be an effective process for engaging staff, reviewing past performance and planning for the following years performance.

Results:
In FY01 the Laboratory has made substantial improvement in managing institutional level corrective and improvement actions. In FY01 the Laboratory improved performance for

corrective/improvement actions closed out on schedule from a rate of 61% in October 2000 to 89% cumulative at the end of FY01.
The laboratory has sustained the improvement achieved in timely closeout of ORPS reports.

There were several examples of timely self -identification of issues through Laboratory self-assessment in FY01. For example, the Laboratory recognized that SPDES exceedances at the sewage treatment plant required management action. The assessment that was performed identified the cause and enabled corrective action to minimize the potential for future occurrences. Additionally, an assessment performed by the Laboratory on the Accelerator Authorization Basis Upgrade Project in the early stages of the project, identified several actions that will better enable the Laboratory to successfully complete the project on schedule.

Biology Department Occurrence Report identification and completion of corrective action items is effective. A number of occurrences at the Medical Department indicate that additional focus/attention should be paid to Departmental procedures, self-identification and resolution (management support) issues.

Central Shops continues to improve in the area of Injury/Illness (as compared to the fabrication industry). The Lost Workday (Away) Rate is at its lowest in ten years.

Evaluation of “pilot process”
The evaluation team felt that the process provides a framework and criteria that can be used to objectively evaluate the Laboratory’s assessment program on an ongoing basis. However, substantial work is required to have an effective and efficient collection and evaluation process.

Results

Score (0~4.0)	Rating	Schedule Status
2.7	Excellent	n/a

2.3.4 Quality Management System Verification

Accomplishments

QAP Verification Plan was developed and submitted on time (see Metric 2.3.4.1.). Verification process is underway (see Metric 2.3.4.2).

Results

Score (0~4.0)	Rating	Schedule Status
1.9	Good	On Schedule

2.3.4.1 Develop Verification Plan

Accomplishments

Verification Plan, incorporating DOE BHG comments was submitted on February 15, 2001.

Results

Score (0~4.0)	Rating	Schedule Status
4	Outstanding	On Schedule

2.3.4.2 Complete Verification

Accomplishments

The management system evaluation process was designed, piloted and improved based on input from outside consultants, the BNL QP&SO and the DOE BAO. This was completed by the end of April 2001. Evaluations of the Acquisition Management System, the Engineering Design process, and the Work Planning & Control Management System have been performed.

Analysis

The Quality Programs & Services Office (QP&SO) conducted the verification of the BNL Quality Assurance Program (QAP) throughout FY01. Although the QP&SO has been working very closely with DOE BAO in moving the process steadily forward, all of the Management System evaluations were not completed by the projected date of July 30, 2001. There are several reasons for this.

- The Verification Project Plan is based on evaluating the laboratory's management systems through which the QAP requirements are embedded. A process for evaluating management systems was developed and piloted as part of the Verification Project (January - March, 2001). The time to develop the evaluation process was not anticipated.
- Management System Stewards have the ultimate responsibility for the evaluation; the QP&SO coordinates and facilitates the process. This approach enhances buy-in for the process and responsibility for the results. However, not all Management System Stewards could commit to conducting an evaluation within the timeframe outlined in the Verification Plan.
- It takes about 10 weeks "running time" to perform each evaluation.

Although the QAP Verification was not complete as planned, much has been accomplished and learned:

- The Management Systems that have been completed this fiscal year (Acquisition Management, Engineering Design Process, and Work Planning & Control) were strategically selected to be done first based on their significant interaction with the QAP.
- The evaluation process is valid and productive in understanding the strengths and areas for improvements for the management systems across the laboratory. The process itself has been improved with each iteration.
- Management System Stewards find the process of value in looking at the performance of their system as it cuts across different departments/divisions.
- The MS Evaluation process has received external review; those reviews have confirmed the validity and value of this type of evaluation.

Results

Score (0~4.0)	Rating	Schedule Status
1.0	Marginal	

Notes
Currently improving the MS evaluation process based on feedback from previous evaluations and the joint Battelle/DOE Review of the BNL Quality Assurance Program.

At least one MS evaluation will be completed in the first quarter of FY02.

2.3.5 Rad Con Program Implementation Performance

Accomplishments
This is a roll-up of the 2.3.5 performance measures and has no separate results.

Results

Score (0~4.0)	Rating	Schedule Status
2.7	Excellent	n/a

2.3.5.1 Performance measurement based on ratings

Accomplishments
There were only two triennial assessments conducted in FY01. The two assessments were workplace monitoring and emergency exposures. Both assessments showed slightly above good ratings for an average on this metric of 2.5.

Results

Score (0~4.0)	Rating	Schedule Status
2.5	Good	n/a

2.3.5.2 Radiological Control Program

Accomplishments
Overall rating for the Radiological Control Program for FY01 is *Excellent.* The detail of the rating is contained in the letter from S. Layendecker to the Radiological Control Division dated 10-15-01.

Analysis
Overall, RCD is performing at the very good level. Procedural compliance is improving, self-assessments are being performed, technical qualifications remain high, field support is considered excellent, assessments are noting steady improvement in performance, and there is little significant adverse data.

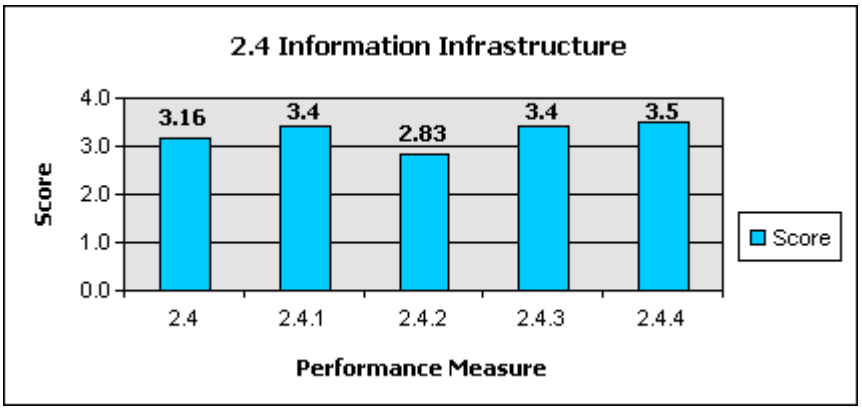
Results

Score (0~4.0)	Rating	Schedule Status
3	Excellent	n/a

2.4 Information Infrastructure

Objective Description

The weight of this Objective is 25%.
Conduct information services and related operations with distinction, as described by and in support of Operational Excellence. Focus on developing the institutional-level operating infrastructure needed to underpin an excellent business/information technology infrastructure.



2.4 Information Infrastructure
2.4.1 Information Services
2.4.2 Cyber Security
2.4.3 World Wide Web Support Strategy
2.4.4 Scientific Computing Infrastructure Performance

Accomplishments - Summary for Information Infrastructure

Significant overall progress has been made toward improving the site-wide computing and communications infrastructure. Key areas for improvement in FY01 included Desktop support, Cyber Security, Scientific Computing and the World Wide Web. A general summary of accomplishments appears below, with greater detail indicated within each individual performance measure section.

In the arena of desktop computing, substantial improvements were completed in the first half of the fiscal year in support of the administrative systems. A major accomplishment has been the deployment of an enterprise-wide management system (HP Openview) for asset management and software distribution, as well as the establishment of a modern, well-trained Customer Service Center. More recently, good progress has also been made in the deployment of the HP Openview agent (Radia) on the scientific desktop.

Cyber Security continues to be the highest priority. Most major initiatives, developed in response to the Laboratory's Cyber Security Program Plan (CSPP), are on schedule. As a result of the DOE Cyber Security audit in March/April, 2001, focus has been placed on strengthening the involvement of BNL line management in the implementation of the Laboratory's CSPP. This requirement is currently being met, with one of the key elements being the development/

implementation of individual Cyber Security Plans for each scientific department and a system (developed with the BNL Office of Management Services) for tracking departmental Cyber Security information (e.g. conduit exception requests, Radia deployment status).

In mid-FY01, DOE approved a revised measure for the World Wide Web, which focused on enhancing the WWW infrastructure. An emphasis on technical training has accelerated progress toward developing the Web-based capabilities and expertise needed to improve BNL's business and scientific processes. Development of a distributed-editing capability for the Web was delayed due to Web resources being diverted toward Cyber Security initiatives during the last half of FY01. Closure of web conduits to the Internet (to ensure a secure perimeter), and the related migration of web sites has a higher priority than the original milestone goal. In addition, during the last quarter of FY01, Microsoft bought the NCOMPASS software, being used at BNL for distributed editing. This change in vendor ownership, and subsequent repackaging of the product introduced further delay of the distributed editing milestone. Since the new product will be a technically superior product for the BNL environment, the deployment of distributed editing was put on hold until the end of CY01.

Attention continues to increase and progress has been steady toward the development of a scientific computing infrastructure -- focused on established internal expertise and existing local/regional collaborations – that will meet the needs of the Laboratory's scientific research programs. At the core of this program are the Visualization services, which have seen growth in both the research component (proposal generation) and the service component (Visualization infrastructure). Growth has also occurred in the use of the various computing services centered in the BNL Scientific Computing facility. Examples of the latter include the BNL Linux Cluster, and ITD's Scientific Computing Shared Services.

Results

Score (0~4.0)	Rating	Schedule Status
3.16	Excellent	n/a

2.4.1 Information Services

Accomplishments

Desktop support was re-engineered and ITD re-aligned accordingly, to provide more effective support of desktop functions. The hardware services function was outsourced and the services re-defined; a (co-sourced) customer service center was established; and an Enterprise Management System, HP Openview (HPOV), was procured, tested and deployed in desktops. HPOV is also critical for the continuing success of the Laboratory's Cyber Security Program.

Analysis

All major initiatives key to the re-engineering of the desktop lifecycle support services have been achieved on schedule. Since the Hardware Services and Helpdesk were re-engineered via outsourcing and co-sourcing options, respectively, it was also critical to establish an environment that enabled BNL employees and contractors to successfully work together. In order to provide an objective analysis of the functioning of these new services, they were baselined during Q2

FY01, via a laboratory-wide user survey, which will be re-performed annually. Initial survey findings supported the improvements of this re-engineering effort. The other major milestones, involving the rollout of the Enterprise Management System HP Openview (HPOV), were accomplished after some initial resistance from customers. Improvements to desktop services resulting from this deployment will be continually evolving, as system administrators across the site become increasingly familiar with the product's capabilities.

Management focus for FY02 will shift from the re-engineering of the desktop lifecycle support services to the improvement of other infrastructure areas critical to information services. One major initiative is the development of a network-bridging plan that is critical to the success of the BNL science mission. In addition, another strong focus will be on a program for developing a resource-efficient NT server environment at BNL.

Results

Score (0~4.0)	Rating	Schedule Status
3.4	Excellent	On Schedule

Milestone	Performance Measure Milestone date	Actual or Projected Date	Points	Rating
Outsource the hardware service function	12/31/00	08/31/00	4	n/a
Purchase, test, deploy software distribution tools	12/31/00	12/31/00	3	n/a
Purchase, test, deploy remote management tools	12/31/00	12/31/00	3	n/a
Purchase, test, deploy asset management tools	12/31/00	12/31/00	3	n/a
Establish Customer Service Center	12/31/00	08/31/00	4	n/a

Notes

2.4.1.1 The Hardware Services function was outsourced in August 2000 and the services provided re-defined. For example, procurement of parts is now an optional service provided by ITD or directly by the user.

2.4.1.2 Software Distribution tools (Radia agents) were deployed on administrative desktops.

2.4.1.3 The vendor is working on establishing a remote management capability using Radia and PC Anywhere. There have been delays in deployment, primarily since the technology, despite vendor claims, did not exist. After BNL switched to the Radia client, the vendor began work on developing the remote management technology. Procurement and testing have been done and the capabilities/requirements needed to deploy are understood.

2.4.1.4 Asset Management tools (Radia) were deployed on 1600 nodes by 12/31/00.

2.4.1.5 A Customer Service Center, co-sourced with ITD and Entex personnel was established and an Automatic Call Distribution system installed. In 1st Q FY01, the Help Desk was enhanced by the hiring of a Customer Support Manager and by the merger of the ITD and BSD Help Desks. Other notable improvements included additional training of Help Desk staff, and expanded hours of coverage.

Issues and Trends

Installation of HP Openview agents (Radia) on the desktops has verified that this process is not disruptive to the users and that the agent itself consumes very few resources. The ongoing issues are: 1) to continue to demonstrate the value of HP Openview on the administrative desktop (in particular, educate the system administrators who can use these new tools to their advantage) and 2) to complete installation on the scientific desktops where resistance was encountered early in FY01. As of the end of FY01, the trend has been very positive, with approximately 2000 Radia agents (HPOV) installed on scientific desktops.

Installation of these agents across the site is critical to ensuring that the BNL Cyber Security program has the capabilities needed to fully protect the Laboratory from the ongoing and increasing threats.

There is an outstanding issue concerning the vendor's delivery of an effective remote management tool. The issue has not yet been totally resolved. There are also technology limitations presently restricting the remote management and software distribution tool to the Windows environment.

2.4.2 Cyber Security

Accomplishments

There has been substantial progress in the implementation of the Laboratory's Cyber Security Program Plan (CSPP) and the major milestones indicated in this performance measure. Included are: Establishment of the Perimeter Defense Network (PDN) (e.g. firewalls, proxy servers, VPN); implementation of authentication services (Cryptocards); a Kerberos server was installed, evaluated, and an ITD Kerberos pilot is in process; establishment of threat assessment and intrusion detection subsystems; establishment and expansion of MITTENS (Monitoring Independent Trends to Enhance Network Security) prototype. It should be noted that the analysis capability provided by the MITTENS tools is not available commercially, and is being developed in-house. MITTENS has strong potential for patentability, which is currently under review. A high-level application security strategy has been developed and reviewed internally. A Security Administration pilot, which will focus on centralized user access and administration for systems and applications, has been defined in conjunction with a consulting firm. During FY01, an ongoing process was established for the regular review of BNL's Cyber Security Program status by Cyber Security Operations and the Cyber Security Advisory Council. The commitment to perform a comprehensive vulnerability assessment was met ahead of the schedule projected in the performance measure milestone. The assessment was conducted by DOE Chicago Operations, Safeguards and Security Services in March/April, 2001. The results were assessed in April and work was begun immediately on a strategy to address the vulnerabilities found. This strategy includes an increased emphasis on the role of BNL line management in dealing with Cyber Security issues.

Analysis

Overall, the Cyber Security performance measures achieved an excellent rating for this fiscal year. This was possible only due to extraordinary effort from the Cyber Security Operations staff in meeting the expected technical and ongoing operational challenges and additionally, working with management and other ITD staff to overcome several major unanticipated obstacles. An early problem was a major DOE funding reduction of $624,000 that threatened to severely impact BNL's ability to continue to implement its Cyber Security Program Plan as projected. As a result of numerous appeals the funding issue was resolved, with assistance from DOE, Counterintelligence, and the Laboratory Director; ensuring that all major Cyber Security projects were kept on track. Another unexpected challenge for Cyber Security arose after the April 2000 DOE audit and vulnerability assessment, which found that BNL's Perimeter Defense Network (PDN) was much more vulnerable than expected. Developing and implementing a plan to correct this situation and simultaneously develop a strategy for raising the level of participation of BNL line management in Cyber Security initiatives required substantial additional effort toward the end of the fiscal year. This required resources beyond those available in the Cyber Security Staff alone. Via the "lessons learned" in meeting the original milestones and addressing the unexpected obstacles, the end-result will be an improved BNL CSPP as well as better processes in place for sustaining this ongoing improvement.

Management Focus

In Q1 of FY02 the deployment of the Cyber Security Information Management System (CSIMS), originally developed (by OMS and ITD) to track progress of the individual Departmental Cyber Security Plans will be finalized. Via its reporting and querying capabilities, CSIMS will help to ensure that BNL meets its goals of tightening the PDN, ensuring effective host-based security architecture. The system will also ensure that such vulnerabilities, such as Conduit Exception Requests are consistently documented.

A formal CSPP review process, designed to directly include BNL line management input in the update process for BNL's security plan, will be established. The review process will also include CSAC, CyberSecurity Operations and DOE/BOA.

Management attention will also continue to focus on meeting the milestones established in the original CSPP, in particular for the areas of Kerberos and application strategy. Access of foreign nationals to systems/applications will be of particular importance, especially in consideration of the events of 9/11/01. In addition, Cyber Security will begin development of a plan for responding to the anticipated "paradigm shift", i.e. the anticipated increase in the intensity of attacks, using strategies/technologies that easily outpace current defenses.

Results

Score (0~4.0)	Rating	Schedule Status
2.83	Excellent	On Schedule

Milestone	Performance Measure Milestone date	Actual or Projected Date	Points	Rating
Evaluate Multi-Tier Network architecture & Perimeter Defense Network	Year 2001	Year 2001	3	n/a
Establish Perimeter Defense Network	3/31/01	3/31/01	3	n/a
Implement Host-based security and authentication services	7/31/01	7/31/01	3	n/a
Establish a Security Info. Mgmt. System	4/15/01	4/15/01	3	n/a
Comprehensive vulnerability assessment	9/30/01	5/01/01	4	n/a
Develop application level security strategy	9/30/01	TBD	1	n/a

Notes

2.4.2.1 Discussion of the PDN and the Multi-tier network are held regularly in the CSAC meetings, as well as discussed internally within Security Operations. In addition, the program is formally reviewed monthly during meetings with DOE/BAO.

2.4.2.2 The PDN was implemented on schedule. This includes a number of elements, such as firewalls, proxy servers, Virtual Private Networks, split DNS namespace, virus scan technology.

2.4.2.3 Host-based security is on target; including establishment of the use of Cryptocards and continued expansion of this initiative; the evaluation of the Kerberos server and implementation of a pilot program within ITD. HP Openview agent (Radia) deployment is well underway and included as an important element of host-based security. This tool provides the means to assess the current state of BNL's systems, the identification of security risks and the ability to rapidly correct problems in mass numbers through software distribution.

2.4.2.4 Threat Assessment and Intrusion Detection Subsystems (ISS RealSecure) have been established. A data fusion system (MITTENS) for Monitoring Independent Trends to Enhance Network Security was prototyped, and expansion of this prototype continues.

2.4.2.5 A comprehensive vulnerability assessment was conducted by DOE Chicago Operations, Safeguards and Security Services in March/April, 2001. This included both an External Penetration test and an Information Security Audit, performed by ISS. Results from this review have been discussed internally and with BNL management. An aggressive plan has been developed to address the vulnerabilities noted in the findings. Working with the Office of Management Services, a system (CSIMS) has been developed to track progress on Radia deployment and the minimization of conduits through the PDN.

2.4.2.6 A high level application strategy was defined and included in the CSPP. A more detailed strategy was reviewed internally and a consulting firm was employed to assist with a Security Administration pilot focused on centralized user access and administration for systems and applications. A Security Administration pilot has been defined and proposed. The progress on accomplishing this milestone is behind schedule. Once the pilot program is completed, the results will dictate the direction this project will take and at that point the actual application strategy will be defined in appropriate detail. To get to this point additional time and effort is needed; hence the rating for this performance measure milestone is indicated as "1".

Issues and Trends

The results from the DOE assessment conducted in March/April, 2001 and the subsequent activities required in order to reduce the vulnerabilities to BNL's networking and computing infrastructure, have improved line management involvement in Cyber Security issues. It is expected that the establishment of the CSIMS and associated review processes (for Radia data, conduit exceptions, etc.) will help to promote continued BNL management involvement and departmental responsibility for Cyber Security issues at the Laboratory.

It is clear from recent virus attacks, and also from recent the recent events of 9/11/01, that there will be a trend toward a much higher level of Cyber Security attacks. These attacks will be of increasing intensity, using technology/strategies against which current defenses will not be effective and will also be very difficult to anticipate. Effective response to such attacks may necessitate reprioritization of FY02 objectives and the need to change plans, direction, and also deal with associated costs as quickly as possible.

2.4.3 World Wide Web Support Strategy

Accomplishments

A major accomplishment is the training of Web Application Services personnel in application and database design technologies, as well as in XML and Unix server component technologies. The training was comprehensive and all proposed training was completed in advance of target. Progress has been steady in the implementation of policy and standards for web site creation and content management. This includes the establishment of basic templates as well as the creation and implementation of a web content development/approval/publish process for BNL's primary Web presence.

Analysis

With one exception, all of the performance measure milestones for the World Wide Web were met or exceeded. To achieve this result, several obstacles had to be overcome during the fiscal year. In the beginning of FY01, a major resource issue was that the manager of the Web Application Service was consumed by his responsibility to lead the Lab-wide HP Openview Rollout. When this responsibility was reassigned, and attention turned to the Web performance measure milestones, it became clear that the original FY01 World Wide Web measure was no longer appropriate. A performance measure revision request was submitted and approved during Q2 to reflect BNL's current needs and priorities. During Q3, the Web performance measure milestones were again adversely impacted due to high-priority requests for web resources to address some of the findings from the April, 2001 Cyber Security vulnerability assessment. Specifically, this involved support for the closing of web-conduits and the associated web-site

migration. Failure to achieve the scheduled milestone for “Distributed Editing Capability” is due to this end-of-year resource problem, and also the recent Microsoft acquisition of the NCOMPASS content management product. This new version of the product will result in a better match for BNL’s environment, i.e. the IIS server, but the product will not be available for BNL testing until November at the earliest.

Management Focus for the Coming Quarter

Management focus will continue to be on the problem of web resources; balancing the need to provide the necessary support to the web-site migration project (an essential part of the effort to minimize the conduits in the BNL PDN) with the need to provide BNL with a World Wide Web support model that will address BNL's scientific and administrative initiatives.

Results

Score (0~4.0)	Rating	Schedule Status
3.4	Excellent	On Schedule

Milestones	Performance Measure Milestone Date	Actual or Projected Date	Points	Rating
Train staff in appl. & database technologies	6/30/01	02/28/01	4	n/a
Train staff in XML & Unix server component technologies	9/30/01	09/30/01	4	n/a
Implement content management templates reflect web page creation policies and maintenance	9/30/01	09/30/01	3	n/a
Establish dev/apprv/publish process for web content	9/30/01	04/30/01	4	n/a
Implement distributed editing capability through content management sys.	9/30/01	12/31/01	2	n/a

Notes

2.4.3.a.1 - The Web applications group has undergone a major training effort and the staff completed a number of courses in web application and database design. Training was completed in February 2001.

2.4.3.a.2 – Training in Unix server component technologies has been completed. XML training was also completed ahead of schedule in August 2001.

2.4.3.b.1 - NCOMPASS, a Web content management tool has been purchased and basic content management templates have been created. Such templates include, for example, a standard navigation bar, font definitions, and a privacy and security link. Work to enhance the templates is ongoing.

2.4.3.b.2 – A process for developing/approving/publishing web content was created and implemented. All content for BNL's primary Web presence is developed, tested and staged (i.e. made available for review) internally. It is then published to the production server via a process controlled by ITD.

2.4.3.b.3 – Templates have been established, but work is needed to align them with the current BNL web-page style. Full implementation of a distributed editing capability is currently on hold. See Issues and Trends for details, including a clarification of the rating for this performance measure milestone.

Issues and Trends

As a result of the Cyber Security assessment and vulnerability study in April, 2001, it was determined that BNL's Perimeter Defense Network (PDN) was less than effective due, in part, to numerous (over 200) web server conduits. Since it was imperative that BNL correct the condition as rapidly as possible, many departments chose to migrate their web sites. This focus on massive web-site migration required extensive support from the Web group, and severely impacts the group's ability to support other web initiatives during the second half of the fiscal year. This migration has been given priority over the Distributed Editing project.

To further complicate achieving of this milestone, during Q4, Microsoft purchased the NCOMPASS content management product that was procured by BNL earlier in FY01. The Microsoft version of this product is expected to have advantages over the original product, particularly as applied to Microsoft web services (IIS). However, this new version of the product will not be shipped to BNL until the end of October 2001 at the earliest. The decision to use the latest version of the product, and therefore put distributed editing on hold, is appropriate from a technical perspective, recognizing that achievement of the milestone date will be delayed until the end of the calendar year. Note that the projected date indicates that the performance measure milestone should actually have received a rating of "1" rather than the indicated "2". The higher rating is justified since BNL had no control over the vendor decision (which occurred at the very end of FY01), nor the 10/31/01 shipping date for the new Microsoft version of the distributed editing (NCOMPASS) product.

2.4.4 Scientific Computing Infrastructure Performance

Accomplishments

Efforts have been directed at upgrading the scientific computing infrastructure by focusing on the areas of existing expertise - such as visualization - and also by supporting initiatives that foster collaboration with local/regional institutions such as the Center for Data Intensive Computing, Stony Brook University, Columbia University and others. The Visualization Team has been successful in increasing its involvement with the generation of peer-reviewable research proposals, with five proposals generated during the fiscal year. They have also made rapid progress in the evaluation of parallel visualization tools, e.g., through the implementation of distributed VTK on small and large Linux clusters. A plan to upgrade to the Visualization Theater has been resourced and is on schedule. Support of advanced scientific applications in a number of areas is well underway and the involvement of the Visualization Team in such

projects continues to increase steadily.
Scientific computing resources in the BNL Computing Facility (BCF) have been upgraded. This includes a hardware upgrade, which has doubled the number of nodes in the BNL Linux Cluster (BLC). The system administration resources in support of this system have also been increased, and are provided to both the BLC and the CDIC Linux Cluster by the ITD Scientific Computing Shared Services group. The Linux Clusters are used in support of the Visualization function as well as for other scientific initiatives. In addition, collaboration with the Center for Data Intensive Computing (CDIC) has been enhanced by the development/support of a secure connection between the CDIC's Galaxy machine, located in the BCF and its counterpart at Stony Brook University. See the Notes Section for additional details on these accomplishments.

Analysis

All of the key FY01 performance measures milestones for developing a scientific computing infrastructure have been met on or before schedule. In addition, the research component indicator of “one or more peer-reviewable research proposals” was surpassed by the generation of five proposals in collaboration with CDIC and others. The growing list of advanced applications currently supported by the Visualization Team, the increasing number of collaborators, and the expanded hardware in the BCF are major factors contributing to the “significant improvement” over the FY00 status of BNL’s scientific computing infrastructure.

Management Focus for the Coming Quarter

In the first quarter of FY02, management will continue its support of the improvement initiatives for the Laboratory's Scientific Computing Infrastructure, i.e. the enhancements to the Visualization program and to the BNL Computing Facility (BCF) that were begun in FY01. Visualization efforts will include implementing a high-speed visualization system on a Linux Cluster platform and the development of remote visualization methods. In addition, focus will be placed on new technology assessments, e.g. investigating, deploying and supporting computational grid technology, which will likely be important for a number of multi-site collaborations, such as the US ATLAS and DOE SciDac programs.

Results

Score (0~4.0)	Rating	Schedule Status
3.5	Excellent	On Schedule

Performance Measure	Milestone Date	Actual or Projected Completion Date	Points	Rating
Research Component	9/15/01	4/30/01	4	n/a
Service Component	9/15/01	9/15/01	3	n/a
Upgrade computing resources reqd for enhanced Visualization function	3/01/01	2/28/01	3	n/a
Expand collaboration with the CDIC	4/15/01	2/01/01	4	n/a

Notes

2.4.4.A.1 The work of the Visualization Team has been incorporated into the field work proposal of CDIC and also is included in the Topical computing proposal for lattice QCD. Collaborators of QCD include Columbia University and BNL. A proposal to visualize Atmospheric data was generated with CDIC/Stony Brook. A collaboration with TGS and SGI on Cluster computing is being formalized and a DOE proposal on Oil and Gas with solid rock images has been developed.

2.4.4.A.2 The Visualization Team's evaluation of parallel visualization tools has been making rapid advancement through the implementation of distributed VTK on small and large Linux clusters. VTK was evaluated as a parallel visualization tool; a paper on the work was submitted in June, 2001 and accepted for publication; parallel visualization tool DX was evaluated as part of the BNL ERULF (student) program; and Remote visualization software from SGI was evaluated. The Visualization Team also assisted CDIC/Stony Brook in utilizing parallel visualization and remote visualization tools. Through these multiple initiatives, the Visualization Team continues to increase its expertise as well as its involvement with local/regional collaborators.

A plan to upgrade to the Visualization Theater's hardware (Linux server and projector system) to enable the theatre to run as a high-resolution display has been resourced and is on target. In addition, a plan was developed to increase the resolution of the Visualization Theatre using Linux Cluster graphics in collaboration with SGI. Software enhancements include modifications (in progress) to software from Template Graphics Systems so that physics applications like root (used by MINOS and RHIC) can be run directly in the theatre for group meetings and demos.

Support for advanced scientific applications is well underway with Visualization Team involvement steadily increasing. Examples of supported visualization applications include: visualization of domain wall fermions for Lattice QCD as part of the NSF project; X-ray computer microtomography applications using parallel VTK; remote visualization applications used in ATLAS/STAR; software development for neutrino oscillation experiment MINOS; software development for condensed matter computations as part of the NSF project; support for KOPIO, a rare kaon decay experiment; and collaboration with Argonne National Laboratory (ANL) on parallel reconstruction codes. Report of the progress in high energy and nuclear physics visualization has taken place at the IEEE Optics West conference, ACAT 2000 in Fermilab and was presented at HEPVIS in Boston.

2.4.4.B.1 The BLC was upgraded on schedule with all components procured, installed and operational by 2/28/01. In addition to the hardware setup, this included configuration of all the nodes and basic testing procedures. The system administration resources provided by the ITD Shared Scientific Shared Services group have been increased.

2.4.4.B.2 The infrastructure installed between the Stony Brook and CDIC machines required the establishment of a private network in order to provide a connection that was secure. The resultant connection enables the users to perform scientific computations that would not be possible on only one of the two systems.

Issues and Trends

Positive trends have been seen within all computing environments supported in the BCF, including, as examples, growth in usage of the BNL Linux Cluster, and ITD's Scientific Computing Shared Services. Of special interest is the steady increase in the number of requests

to have visualization services involved at all stages of research projects, but in particular at the earliest point in time, namely, at the proposal stage.

Although the trends have been positive, progress has been mainly in the area of visualization. Scientific computing capabilities and services must be viewed as strategic to the Laboratory's mission and expanded accordingly toward establishment of a true "center of excellence". It is critical that the planning process used to gather scientific computing (including BNL Computing Facility (BCF)) requirements from key stakeholders (e.g. RHIC/ATLAS) be improved and formalized in order to provide/sustain a computing facility that continually meets the needs of the Lab's scientific mission. Human resources also must be enhanced via additional staff with the requisite computing skills. Current resources for expansion of scientific computing capabilities are severely limited, preventing the facilities from growing more attractive to users, as well as inhibiting the successful accommodation of new work. Continued enhancement of the scientific computing infrastructure is key to productive and cost-effective BNL computing, so such growth is essential. In its absence, independent pockets of computing will proliferate, even in cases where they are not justified by a unique need. The result will be a more costly, less capable scientific computing environment.

2.5 Excellence in Safeguards and Security

Objective Description

The weight of this Objective is 5%.
BNL will develop and implement management programs to maintain and continuously improve a safeguards and security and counterintelligence infrastructure in order to ensure effective protection of national security interests, proprietary information, sensitive information, personnel, property and the general public.

2.5 Excellence in Safeguards and Security
2.5.1 Counterintelligence (CI)

Accomplishments

In September 2001, the DOE Office of Counterintelligence (OCI) performed a special appraisal on the status of the actions taken by BNL to resolve the findings and recommendations from the August 2000 inspection. The special appraisal found that BNL had made considerable progress in taking the appropriate corrective actions in most of the program areas. The special appraisal did not include those areas of the Counterintelligence Program that had been previously rated as

satisfactory during the August 2000 inspection. Ratings for the special inspection were given in two forms; (1) each program area; and (2) overall rating. The ratings are based on the status of the actions taken on the inspection recommendations. To date BNL has accomplished closing out 48 of the 55 recommendations within the eight elemental areas that are listed in the contract performance measurement.

Analysis

The BNL Senior Counterintelligence Officer (SCIO) has developed corrective action plans for the newly identified findings and associated recommendations. The resolution of several of the corrective actions is dependant on decisions and actions that need to be taken by DOE Headquarters or other DOE entity, and are out of the direct control of the SCIO. However, tracking of these actions will be handled by the SCIO. Most of the corrective actions that BNL can resolve have short completion dates and they can be met.

Results

Score (0~4.0)	Rating	Schedule Status
2.5	Good	Not Applicable

Notes

The final rating from the special appraisal has been broken out in an unusual manner by the inspection team. The rating will be indicated in two parts; (1) Counterintelligence Program; and (2) Foreign Visits and Assignments Program. This provides a clear distinction between the two programs as independent entities.

Assumptions

Based on the overall special appraisal rating, and not including the foreign visits and assignments rating, the CI Program has achieved a 2.5 score which puts it in the good category.

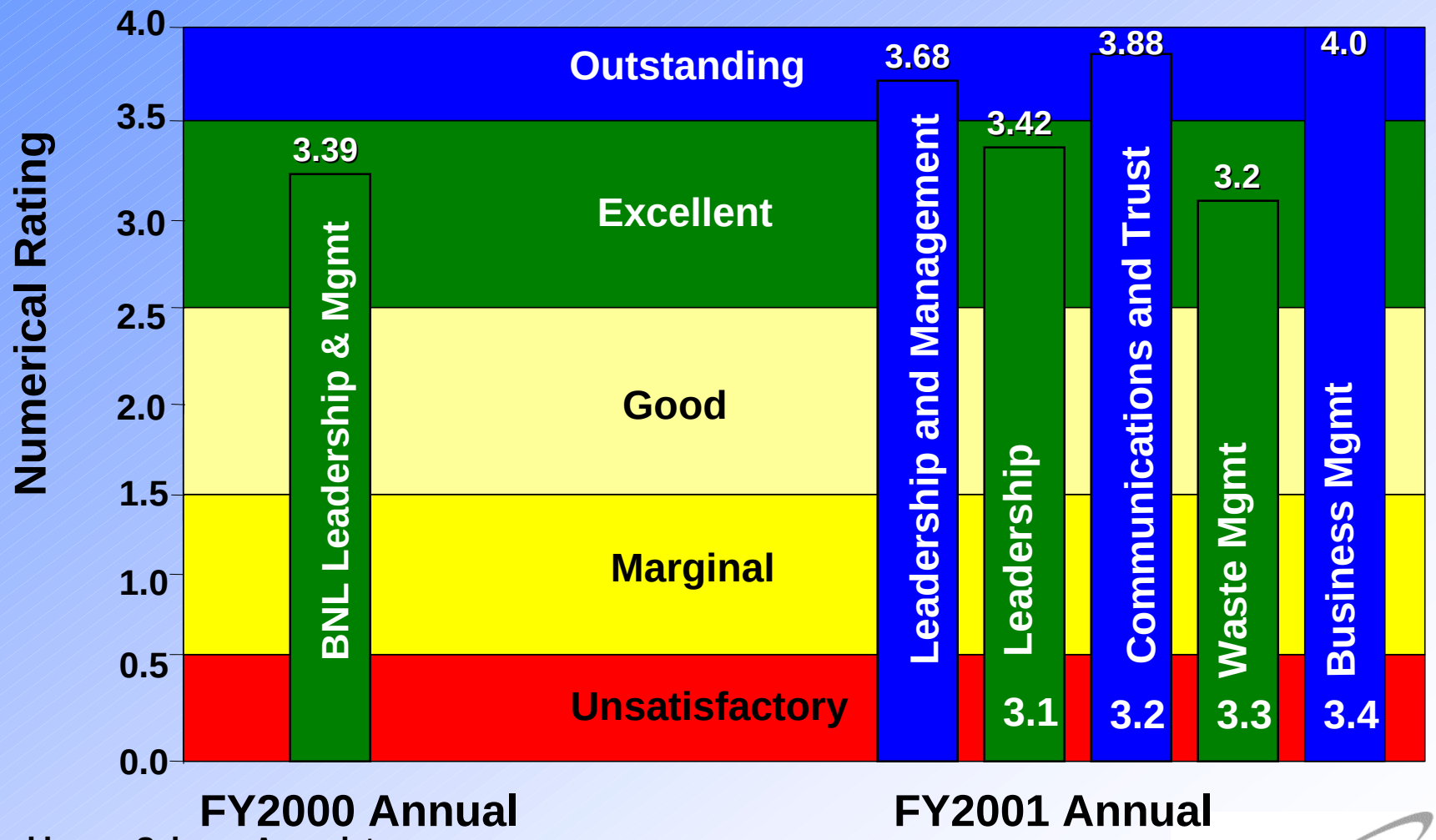
2.5.1 Counterintelligence (CI)

see 2.5 for details

Results

Score (0~4.0)	Rating	Schedule Status
2.5	Good	n/a

Critical Outcome 3: Leadership and Management



3.0 Leadership and Management

Critical Outcome

3.0

BNL Will Be Recognized By Its Users, Staff, Stakeholders, And Customers As Having The Highest Quality Leaders And Staff; Being A Community Asset, Good Neighbor And Valued Employer; Being An Exemplary Environmental Steward; And Supporting Its Missions With The Best Business Practices.

12% of BNL Score

Objectives

3.1

Leadership

35% of C.O. #3

3.2

Communications and Trust

35% of C.O. #3

3.3

Waste Management

10% of C.O. #3

3.4

Business Management

20% of C.O. #3

Performance Measures

3.1.1 Talented and Empowered Employees Performance (80% of 3.1)

•Level 3 managers participating in 360° Leadership Feedback process and having action plans.
•Establish evaluation criteria for succession planning.
•Level 1 and 2 managers with personal development goals
•Implementation of Lessons Learned on Performance Appraisal and Goal Planning
•Exempt employees with established goals.
•improvement from average of 1998 and 1999 position openings in “Officials & Managers’ and “Professionals” for which at least 1 viable diversity candidate was offered.

3.1.2 Quality of Worklife Performance (10% of 3.1)

•Assessment of Training, Employee Involvement, Diversity, and Communications.
•BHG review of BNL’s Self-Assessment on upgrading services and facilities to the user community with input form RHIC and NSLS User Offices, the Users Executive Committee, and BNL management.

3.1.3 Corporate Involvement Performance (10% of 3.1)

Brookhaven Science Associates believes that active corporate involvement is a critical success factor in the management of BNL.

3.2.1 Effective and Understanding Performance (70% of 3.2)

Enhance the effectiveness of Laboratory communications and the Laboratory’s relationships with internal and external stakeholders.

3.2.2 Stakeholder Involvement Performance (30% of 3.2)

Create opportunities for stakeholder involvement and participation in Laboratory decision-making processes

3.0 Leadership and Management

Critical Outcome

3.0

BNL Will Be Recognized By Its Users, Staff, Stakeholders, And Customers As Having The Highest Quality Leaders And Staff; Being A Community Asset, Good Neighbor And Valued Employer; Being An Exemplary Environmental Steward; And Supporting Its Missions With The Best Business Practices.

12% of BNL Score

Objectives

3.1

Leadership

35% of C.O. #3

3.2

Communications and Trust

35% of C.O. #3

3.3

Waste Management

10% of C.O. #3

3.4

Business Management

20% of C.O. #3

Performance Measures

3.3.1 Routine Waste Disposition (40% of 3.3)
Wastes, derived from current laboratory activities, are managed properly to ensure regulatory compliance and cost efficiency. Lab institutionalizes processes which estimate planned waste generation, consider waste reduction options, formulate cost effective treatment/disposition approaches, and confirm available funding prior to the initiation of the activity of the waste producing activity. The contractor does not generate any waste that cannot be properly disposed of within 12 months or in accordance with the 435.1 Implementation Plan

3.3.2 Waste Shipping and Disposal (40% of 3.3)
Performance against this Measure is based on fiscal year incurred costs captured by BNL. Disposition costs include costs paid by DOE through DOE held contracts. Unplanned FY Disposal/Disposition Costs are defined as those costs resulting from unplanned characterization, shipping disposal, and general costs of mitigation/facilitation to resolve waste acceptance issues at the designated waste receiving facilities. WMD is granted authorization control of characterization techniques used to define the nature of the waste. WMD is granted authorization control for all waste shipments at BNL. Cost for disposition of the unplanned disposal cost is bore by the organization originating the waste issue.

3.4.1 Business Services Composite (25% of 3.2)
This performance measure (3.4.1) is a roll up of three measures in the Finance and Administrative Directorate; Uncosted Balances (3.4.1.1)from the Budget Office, PeopleSoft Users (3.4.1.2) from BSD and Consolidation of S&M (3.4.1.3) from PPM.

3.4.2 Business System Composite (75% of 3.2)
BNL will improve enterprise-wide business management systems in support of world-class research at Brookhaven National Laboratory to provide consistent, cost-effective, and efficient means of managing the business functions of the Laboratory.

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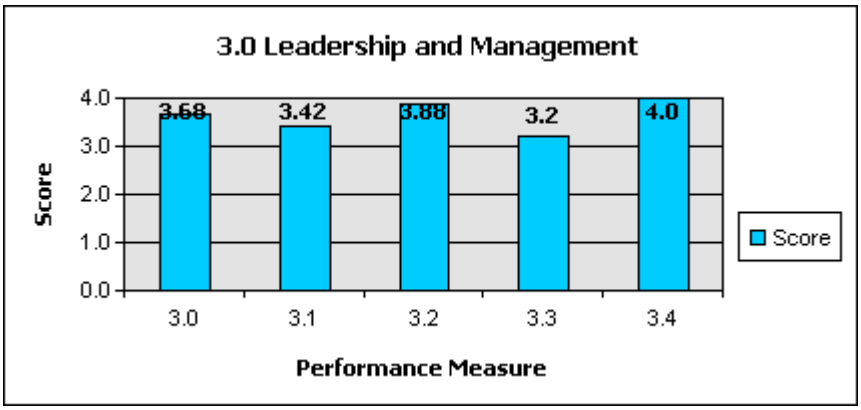
3.0 Leadership and Management

Critical Outcome Description

BNL will be recognized by its users, staff, stakeholders, and customers as having the highest quality leaders and staff; being a community asset, good neighbor and valued employer; being an exemplary environmental steward; and supporting its missions with the best business practices.

The weight of this Outcome is 12%



3.0 Leadership and Management
3.1 Leadership
3.2 Communications and Trust
3.3 Waste Management
3.4 Business Management

Accomplishments –Summary for Leadership and Management

Summary comments for these objectives are contained in the individual objective writeups below.

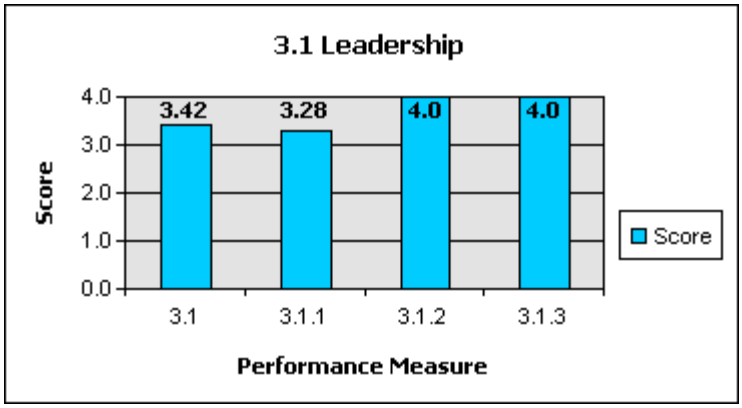
Results

Score (0~4.0)	Rating	Schedule Status
3.68	Outstanding	Not Applicable

3.1 Leadership

Objective Description

The weight of this Objective is 35%.



3.1 Leadership
3.1.1 Talented and Empowered Employees Performance
3.1.2 Quality of Worklife Performance
3.1.3 Corporate Involvement Performance

Accomplishments –Summary for Leadership

Objective 3.1 (Leadership) is comprised of 3 supporting Peformance Measures; 3.1.1 Talented and Empowered Employees Performance, 3.1.3 Quality of Worklife Performance, and 3.1.3 Corporate Involvement Performance.

At the end of Fiscal Year 2001, the scores in the supporting Performance Measures for Leadership yield an overall score of 3.42, Excellent.

Analysis

The rating for the "Talented and Empowered Employees Performance" (3.1.1-Excellent) is a mix of both "Outstanding" performance in the areas of Leadership Feedback and "Good" performance in the area of Managers with Personal Development Goals in the FY2001 Goal Planning. At the end of the reporting period, 68% of the level 1 and 2 managers had Personal Development Goals. Ninety percent of the Laboratory’s exempt employees had completed individual goal planning in the same time frame.

The ratings for the components of "Quality of Worklife Performance" (3.1.2-Outstanding) are consistently "Outstanding". Assessment of Training, Employee Involvement, Diversity, and Communications" benefited from significant improvements in all four focus areas of the 2001 survey. BNL's self assessment on the upgrading of services and facilities in the user community lists numerous upgrades in the areas of transportation, food services, communications, and other areas. Significant improvements were made in all areas.

The rating for "Corporate Involvement Performance" (3.1.3) is Outstanding with a score of 4.0. The year included several noteworthy accomplishments including the selection of a new ALD for Energy, Environment and National Security and a new director of Environmental Management Projects; the ongoing selection process for the next Laboratory Director; improvements in various management systems; and the conduct of numerous management assessments.

Results

Score (0~4.0)	Rating	Schedule Status
3.42	Excellent	On Schedule

3.1.1 Talented and Empowered Employees Performance

Accomplishments

The results for this rollup measure reflect an overall high degree of success on the design and implementation of performance management systems, management development, and achieving diversity.

The measures used to gauge success in these areas were representative, but did not capture the scope of efforts. In concert with achieving the lessons learned and goal planning performance management objectives, the Laboratory responded to management concerns and adjusted the performance management process to make it more user friendly and, in particular, more relevant to the type of work that employees do.

The efforts in diversity went beyond obtaining diverse candidates for open positions, by laying the groundwork by developing internal diversity programs and establishing outside relationships that will enhance the Laboratory's ability to attract a greater number of high caliber candidates in future years.

Results

Score (0~4.0)	Rating	Schedule Status
3.28	Excellent	On Schedule

3.1.1.1 Managers participating in Leadership Feedback process with action plans

Accomplishments

A second round of 360 Leadership Feedback was conducted in September 2000 with 140 managers participated. Participants included all BNL managers, from level 1 to level 3 who had not participated in the first round, i.e. all level 3 managers plus level 1 and 2 managers who were hired after the first round had been conducted a year earlier.

All of the 140 participants have action plans addressing the areas of greatest need for development identified in the feedback process.

Results

Score (0~4.0)	Rating	Schedule Status
4	Outstanding	On Schedule

3.1.1.2 Establish Evaluation criteria

Accomplishments

Criteria for review of succession plans were established to include consideration of Diversity candidates and the incorporation of development plans for identified successors.

Human Resources met with all managers responsible for preparing succession plans to conduct a personalized review of their succession plans against these criteria.

Human Resources staff, together with managers, have reviewed and updated all of the 39 succession plans for a completion rate of 100%. This yields a performance level of Outstanding.

Results

Score (0~4.0)	Rating	Schedule Status
4	Outstanding	On Schedule

Notes

On March 7, 2001, the Laboratory Director and the Director of Human Resources participated in a meeting with Battelle-partnered National Laboratories to exchange information on practices and the status of succession planning at each of the Laboratories

3.1.1.3 Managers with Personal Development Goals in FY2001 Goal Planning

Accomplishments

The Management Performance Appraisal form, which was posted in SBMS in September 2000, included a separate goal section for the definition of a self-development goal. Goals for Level 1 and 2 managers were developed and approved in early FY 2001.
At the end of FY 2001, there are 37 Level 1 and 2 organization chart managers who, based on the date of their hire or promotion into their position would be expected to establish goals for FY 2001. Of the thirty-seven, twenty-five included a self-development goal among their goals for FY 2001. This represents 68% of the total 37 managers, corresponding to a rating of Good.

Results

Score (0~4.0)	Rating	Schedule Status
2.1	Good	On Schedule

3.1.1.4 Implementation of Lessons Learned

Accomplishments

With the release of the SBMS Performance Appraisal subject area in September 2000, the Laboratory accomplished a number of the Quality Review Board action items based on Lessons Learned in the review. The subject area included a uniform set of performance evaluation forms, guidance related to both performance appraisal and goal planning, timeframes for completion of goal planning and performance appraisal (including transferred employees), and procedures for multiple inputs in performance appraisal. The inclusion of these items implemented the bulk of the action plans.

In early FY 2001, upon input from a number of senior managers regarding the performance appraisal process, the Laboratory Director appointed a team to review the SBMS subject area on performance appraisal. This team was charged as a “fact finding” and recommendation committee to get input from a cross section of staff as to what works well and what does not in the area of performance appraisal. The team submitted its report on April 20th. The work of this team addressed the action plan calling for a follow-on quality review board.

Human Resources developed a plan to implement the team's recommendations and developed materials to implement the changes in FY 2001. Because the changes substantially alter some of the aspects of the performance appraisal process, the remaining Quality Review Board action plans were addressed within the context of introducing the Performance Appraisal changes.

The changes include a redefinition of which employees are required to set goals, the use of four summary performance levels rather than the previous five, and a new scientific staff performance appraisal form which relates to the nature of work in scientific research. The new Scientific form and revised forms for other staff were incorporated into an update of the Performance Appraisal Subject Area in SBMS.

With the completion of these changes, Human Resources conducted a self evaluation of the implementation of all actions and changes over the course of the year using Baldrige criteria. The self-evaluation and a performance level of Outstanding are being approved by the Laboratory Director and BAO as the measure requires.

Results

Score (0~4.0)	Rating	Schedule Status
3.8	Outstanding	On Schedule

3.1.1.5 Percent of Exempt employees with established goals

Accomplishments

Laboratory organizations conducted individual goal planning for exempt employees for FY 2001 in October and November 2000 after completing their performance appraisal covering performance during FY 2000. Laboratory organizations reported to Human Resources that 1677 of the total 1858 exempt employees had established goals for FY 2001 for a completion rate of 90%.

Results

Score (0~4.0)	Rating	Schedule Status
3.6	Outstanding	On Schedule

Notes

In FY 2001, the Laboratory changed its requirement for goal planning in response to management concerns and the recommendations of a review team on the performance appraisal process. For FY 02, all supervisors and employees designated by supervisors will be required to establish goals. The designation will be based on whether their jobs are appropriate for goal planning.

3.1.1.6 Diversity candidate offered position openings in "Officials & Managers" and "Professionals"

Accomplishments

In FY 2001, there were 191 requisitions filled in the Officials & Managers and Professional EEO Categories. Of those 191, 122 or 63.9% had at least one diversity candidate. This corresponds to a raw increase of 2.9% and an improvement of 4.6% from the 61.1% two base years. An increase up to 4.9 percent correlates to a performance level of Good.

Results

Score (0~4.0)	Rating	Schedule Status
2.4	Good	On Schedule

3.1.2 Quality of Worklife Performance

Accomplishments

This is a rollup of measures 3.1.2.1 and 3.1.2.2.
For 3.1.2.1, the Laboratory conducted a re-survey for the factors of Training, Employee Involvement, Diversity, and Communications. The favorable survey results and analysis were communicated to Senior Management.
For 3.1.2.2, the Laboratory enhanced the living and working conditions at the Laboratory by performing many improvements to various aspects of life at the Laboratory. The activities that were improved included recreation, social, safety, security, transportation, food service, communication, and personal conveniences. In addition, there were specific accomplishments for the RHIC and AGS Users.

Analysis

A score of 4.0 is assigned for 3.1.2.1, Assessment of improvement in Training, Employee Involvement, Diversity, and Communications based on completing the re-survey and transmitting the favorable results and analysis to Senior Management. The Final Analysis illustrated that all four focus areas showed improvement. Training and Development +5% (47%), Employee Involvement +3% (57%), Diversity +1% (78%), Communication +3% (63%).
For Performance Measure 3.1.2.2, the QOL Committee found ways to enhance living and working conditions at the Lab which would enable the Laboratory to continue to attract and retain the best and brightest people and to ensure that the Lab matches our world-class science with a commensurate level of support for our Employees, Guests, Visitors and Users. The activities listed in 3.1.2.2 were accomplished jointly, primarily under the QOL Program, by: QOL Program Office, Recreation Office, Staff Services Division, and User Administration Offices, with engineering support by Plant Engineering.

Results

Score (0~4.0)	Rating	Schedule Status
4	Outstanding	n/a

Assumptions

For Performance Measure 3.1.2.2 a score of 4 is provided based on the assumption that the BAO review will reach a similar conclusion.

3.1.2.1 Assessment of Training, Employee Involvement, Diversity and Communications

Accomplishments

1. Design draft questionnaire/coding section completed ISR
2. BNL Review of questionnaire completed BNL
3. Three Monday Memo articles were written announcing the Survey and communicating the action plans that were a result of the 1998 focus groups.
4. Survey implemented in July.
5. 65% response rate, 60% completed surveys, 7% paper surveys submitted.

6. August Survey results returned to BNL from ISR.
7. September results communicated to Senior Management, Department and Division Managers, to the staff by Department and Division Manager for individual results. Overall results were published in a Bulletin Article.

Analysis

The Diversity Manager submitted to ISR (survey vendor)additional questions from Public Affairs on internal communications. They revised certain questions from the 1998 survey to reflect changes at BNL.

Final Analysis: All four focus areas showed improvement. Training and Development +5% (47%), Employee Involvement +3%(57%), Diversity +1% (78%), Communication +3%(63%).

Responses were recorded by race and gender. Demographics were important to capture for each race and gender so that remediation can be targeted appropriately, which was the intent of the Diversity Focus Group. In the 1998 survey, Black opinions scored about 20% less favorably than the rest of the Lab on Diversity. In 2001, Black opinions improved in all four areas, Training + 4%, Employee Involvement +1%, Communication +1%, Diversity +4 .
Hispanic opinions declined in all four areas, Training –1%, Employee Involvement –3%, Communication –5%, Diversity –4%.
Asians responded more favorably in Communication +1 , unchanged in Training but declined in Employee Involvement –2% and Diversity-2%.
Caucasian opinions improved in Training +5 %, Employee Involvement +4%, and Communication +5%,unchanged in Diversity.

In the breakdown by gender, both males and females responded more favorably in most categories when compared to 1998. Female responses; Training +6%, Employee Involvement +4%, Diversity +4%, Communication +2%. Male responses; Training +4%, Employee Involvement +3%, Diversity unchanged, Communication +2%.

Results

Score (0~4.0)	Rating	Schedule Status
4	Outstanding	n/a

3.1.2.2 BAO review of BNL's Self-Assessment on upgrading services and facilities to the user community

Accomplishments

The activities listed below were accomplished during FY 2001 and enhanced the quality of worklife as well as supported the needs of users and on-site residents.

RECREATION/SOCIAL
Pool Upgrade: Existing facility upgraded with renovations to the pool and locker rooms. Pro-rated pool fees have been established to accommodate short-time guests.
Weight Lifting Facility: Second floor constructed with treadmill, stairmaster, etc. Exercise stations installed.
Guest Services Libraries – Cavendish, Compton, Fleming, Curie House, Recreation Building, and Brookhaven Center – The QOL office ran a successful book drive, with employees donating over 2,500 books. Donations on-going as of 10/01. Libraries established in June 2001.

Family game room constructed next to the Center Club in Building 50. Contains game tables, board games, and Guest Services Library.
Visiting Scientists Lounge/Coffee/Meeting room was established in the VanSlyke Room of Building 490. This endeavor, jointly accomplished, was started by Medical Staff, with no funding available to support the project. QOL staff voluntarily assisted the effort through donated furniture, equipment, computers, etc., from departments/divisions throughout the Laboratory. This room is functional and in use for breaks from work as well as for regularly scheduled meetings.

SAFETY/SECURITY
Street Lights – Residential Area – Yale Road – September, 2001

TRANSPORTATION
Shuttle Service: Number of shuttles to NSLS increased based on demand by NSLS User community.

Sidewalks: Sidewalks installed around Berkner Hall.
QOL-Guest Services Bicycle Program: Developed and implemented by the QOL office. Twenty-three bicycles among five participating departments for their guests and users.

FOOD SERVICES
Vending Machines: Several machines changed out/upgraded in the RHIC & AGS areas.
Coffee Room: Constructed the new coffee room in building 179B (Housing Office). This is open 24 hours a day/7 days a week with vended coffee, seating, microwave, refrigerator - along side the existing vending area in the building.

C0MMUNICATION
BNL's Guest Information System: HR and BSD spearheaded an effort to establish a new guest information system (GIS) to provide a mechanism for guests to register to perform work at BNL, provide access to training, and provide financial system support to sponsoring departments. The System interfaces with the Foreign Visits and Assignment System. The RHIC & AGS Users Center played a significant role in initiating, improving, and determining future upgrades for this system. Implemented January 01.
Security Messages and other relevant e-mail notices downloaded into word documents for posting in housing area Laundry Building for on-site residents.
QOL Coordinator attends Hospitality Committee meetings to foster relationship between volunteers and Laboratory staff.
Information Hotline: Development of an Info-Line commenced by CEGPA staff. Info-Line to contain the elements such as a) Site Operations/Emergency Closings; b) Week's Events; c) Cafeteria Hours & Menu; d) BNL Weather; e) BERA Facilities; f) Center Club; g) Transportation; h) Hospitality. Work toward implementation on-going into FY02.
ESOL Coordinator: New OMS position has been defined and funding provided by BSA. Interviews being scheduled as of writing of this report.

GENERAL
Electronic Mall: (Corporate Express: Stationery; Resource Books) In response to NSLS User requests, BNL's on-line vendor for carrying stationary items was made accessible to Users, allowing them to order stationery, and other items directly from vendors.

PERSONAL CONVENIENCES
Dormitory Laundries – Cavendish & Curie House – July, 2001
QOL-Guest Services – Want Ads: QOL office assists guests in obtaining furniture, household items needed (at no or low cost to the guest) – On-going
QOL-Guest Services Workshops
- Income Tax Workshop: April 2001 – 15 attendees
- Family Safety/Health Workshop: May 2001 – 14 attendees
- Medical Workshop: May 2001 – 5 attendees

"How To" Guides/Informational Flyers:
- Where/When To Find Food At BNL: December 2000
- Purchase an Automobile: July 2001
- Obtain a Driver's License: July 2001
- Where to Buy Used/Inexpensive Furniture: July 2001
- Shots for Tots: Free vaccinations for children with no insurance coverage: July 2001 – On-going (these guides, offered to guests as a stop-gap measures, are being incorporated into the formal Guest Services Guide)

BNL-Longwood School Liaison: June 01, the Diversity Office staff was identified to assist parents who live on site with the registration and proper placement of their children in the NY State school program. Flyers were distributed advising of the availability of this program.

Guest Services Guide: Compilation and first edit completed FY01. Professional editing commencing November '01. This guide contains Emergency & Safety Procedures; Telephone Information; Communications; On-Site Services; Family Assistance; Health Care Child Care and Schooling; On-Site Recreation; Family fun Off-site, Food Services; Maps, Travel and Transportation; Shopping.

BNL Residents/Employee Yard Sales: July & August 2001. First Yard Sale well-attended (approximately 8 sellers and 30 buyers. Second Yard Sale – Rain. Residents have requested Yard Sales continue to be held from time to time.

Computer Center in Recreation Building for Guests' Use: September 2001

Renewed focus on Upton Nursery School: Enrollment increased by 22%. Renewed focus on cleanliness and professional appearance of facility; space dedicated to use specifically for Upton Nursery School.

Lab Calendar: OMS/QOL Development of the web-based Lab Calendar is on-going. Conference rooms, managed by Staff Services, are on-line for viewing and for reserving rooms. A list of other on-site Conference Rooms and their contacts is provided. Links to Department-managed Seminar schedules, as well as various recreation web-sites, including BERA, LongIsland.com, Staller Center. Other operational elements of the of the Lab Calendar include Student Message Board, General Message Board, and PPM (Procurement & Property Management) Calendar. Other calendars have been created, i.e. Directorate events, Human Resources, Budget, Awards, Sr. Managers' Availability, Health, and Gym/Recreation Bldg but are not yet completely loaded. Work toward full implementation and marketing of the Lab Calendar continues into FY02.

QOL Corporate Assessment: Representatives from four universities, including USB Stony Brook reviewed the Laboratory's QOL Program with recommendations for the path forward. Recommendations are under review by the Laboratory as of this report.

Accomplishments specific to the RHIC & AGS Users:
Set-up RHIC & AGS Users' Center:

- Users' Center has provided a place where users can fulfill all BNL/DOE administrative requirements in one centralized location. It is Laboratory-based because it spans five departments, three directorates, and three User facilities.
- Single, clearly defined point of contact with the Laboratory's administration and services for RHIC, AGS, and Tandem Users.
- Coordinate and consolidate administrative procedures for Users (DOE, BNL, departmental), especially in the area of training and security.
- BNL-473s are now being done for all foreign nationals participating in research at RHIC, AGS, and Tandem.
- Training: Greatly simplified and coordinated approach in training users.
- Most training (initial and retraining) is now done at Users' Center instead of various places around site.

Experiment-specific user check-in and guest orientation forms to help direct new guests around BNL's site.

Web page that contains experiment-specific training requirements for RHIC experiments.

Guidebook for Guest Conducting Research. The first lab-wide booklet that outlines the administrative, legal, safety, and personal steps that a facility-user or guest scientist must undertake before, during, and after their stay at Brookhaven.

BNL ID badges are obtained at the Users' Center eliminating guests from having to go to the BNL Center.

Radiation badges can be obtained at the Users' Center eliminating guests from having to go to the Collider-Accelerator Department.

User Updates. Initiated an electronic bulletin used as a vehicle to communicate with the user community on issues of importance to users and any developments at Brookhaven that might affect users.

On-line front-gate notification form, which allows guests to inform the Users' Center of their arrival date so they can gain access to Brookhaven site.

Senior members of the Directorate and the Physics Department attend the monthly meetings of the Users' Executive Committee. This has been very beneficial in communicating the needs of the users to Brookhaven's infrastructure.

Users' Center web page, which contains information pertinent to Users of RHIC, AGS, and Tandem.

Thesis Award was established to recognize the most outstanding thesis related to research conducted at the RHIC or AGS complex. The award was established by Stony Brook University and Battelle Memorial Institute and will be awarded annually.

Accomplishments specific to NSLS Users:
Information pertaining to services is submitted with input from the NSLS User Administrator (ex-officio member of the User's Executive Committee) and also summarized from user survey responses requested by the NSLS following experimental closeout. Information pertaining to facilities is submitted with input from NSLS Administration.

Services:
Informational websites were created: (1) Listing all user-related documentation, requirements, obligations and information concerning how to apply for beam time, how to register to use BNL resources, how to perform experiments safely, and visitor amenities including locations of food and coffee vending machines available at NSLS, (2) Providing a glossary of NSLS-related terminology, (3) For obtaining 8 types of guest computer accounts not otherwise readily available or not available from one source (4) Providing a Beamline Guide with general information about each beamline from one source and linking to each beamline homepage containing information about the beamline's staff, equipment and research techniques, (5) Offering an online tour of the NSLS, (6) Listing all known synchrotron-related workshops, seminars and conferences around the world.

Four FTP sites were established to facilitate transfer of user research data to/from BNL and submission of abstracts and science articles. FTP reduces transfer time and provides convenience. Previously completed by tape back up, writing to CD, or email. Online webforms were created to facilitate user submissions of: (1) publication references—over 900 user and staff citations per year (2) registration forms and subsequent production of invoices for the NSLS Annual Users' Meeting (3) experimental abstracts, previously requiring knowledge of LaTex, (4) scientific highlights concerning research performed.

Online training for users was established and is available on- or offsite, reducing onsite registration and training process time.

Check-out process was implemented to assist with experimental close-out, return of BNL property, and proper shipping procedures.

Student courses in taking data measurements rapidly were held, accommodating 45 students, whose registration and training processing was accomplished in under an hour to facilitate access to the their studies on the experimental floor in a relatively short time. Bicycles for users (5) were purchased by NSLS following the implementation of a labwide bicycle program.

Facilities:
User training room was enlarged in User Administration to accommodate 7 users (formerly 4) for NSLS training to access the experimental floor. Added 7 computers for web-based training (formerly trained by video).

Lab and office spaces were provided in one common area in Bldg. 535, a building that is attached to the NSLS via a tunnel and a more convenient location for users; users were exempt from costs associated with the move.

The NSLS Library and User Lounge received upgrades in response to a user survey. A new computer was installed; copier and fax machines were upgraded and network connections were provided for laptop use by users.

A new general user laboratory was constructed, equipped with fume hoods, sinks and de-ionized water, in response to growing demand for lab facilities by users.

Sound Abatement was installed to significantly reduce noise on the experimental floor, consisting of 550 sound absorption panels.

A 4’x5’ informational video/flat screen wall was constructed in the NSLS lobby, providing NSLS video presentations, closed circuit telecasts from Berkner Hall, access to the internet, and highlighting users’ scientific accomplishments.

Warehouse space was provided to some of the research teams in a more climate-controlled building allowing for protection of equipment.

Additional sandwich and vending machines were installed in the NSLS lobby as a result of a flood of user requests to provide more food and coffee for users in a facility open 24 hours/day, 7 days/week. Onsite food service, transportation and housing are users’ main concerns.

Analysis

The Laboratory has taken several major steps during FY01 to enhance the accomplishment of our mission related to user facilities. These are (1) establishment of a Quality of Life (QOL) Steering Committee; (2) Conduct of a BSA Peer Review of QOL and (3) Accomplishment of a comprehensive set of large and small improvements across virtually all aspects of QOL (listed above). The charge for the QOL Steering Committee was to evaluate ways of enhancing living and working conditions at the Lab to continue to attract and retain the best and brightest people and to ensure that the Lab matches our world-class science with a commensurate level of support for our Employees, Guests, Visitors and Users. The activities listed above were accomplished jointly, primarily under the QOL Program, by the QOL Program Office, Recreation Office, Staff Services Division, and User Administration Offices, with engineering support by Plant Engineering. The Peer Review was conducted under the direction of Dr. Fred Preston, VP for Student Affairs at Stony Brook University, and a team of three other distinguished experts in related areas. Their report, received in June 2001, made a series of key recommendations, including QOL guidelines, organizational structure and specific program-related items. The report is under review by BSA for implementation, as appropriate, during FY02.

The efforts undertaken in FY01 were done with a bare minimum of resources, but addressed a set of important needs. While there is a good deal of work remaining, this was an excellent beginning and will continue. We believe it is an outstanding effort with excellent results; feedback from our user community has verified this conclusion. It is, therefore, scored as "Outstanding."

Results

Score (0~4.0)	Rating	Schedule Status
4	Outstanding	n/a

3.1.3 Corporate Involvement Performance

Accomplishments

Corporate Involvement performance is rated as “outstanding” with a score of 4.0. BSA has been active and can demonstrate success in all areas considered in the evaluation. BSA is committed to optimizing the integration of programs and management systems within the National Laboratory complex, in particular laboratories managed or co-managed by Battelle, in order to deliver mission critical results in a more timely and cost-effective manner. Significantly, many of the management processes introduced at BNL have matured to the point that BSA has been able to share its knowledge, expertise, and lessons learned with other sites within the DOE complex.

This is an important aspect of corporate involvement and consistent with DOE's expectations established through DEAR 970.5203-2, Performance Improvement and Collaboration.

Specific examples of noteworthy accomplishments and ongoing corporate initiatives that support the proposed rating are listed below for each of the evaluation criteria:

Provide highly skilled candidates for senior manager positions at the Laboratory:

- BSA provided viable and highly skilled candidates for the selection of ALDs for Environmental Management and for Energy, Environment, and National Security directorates. These individuals have come from both within and outside of the Laboratory, which provides an excellent mix of perspectives and experience at senior management levels.
- The BSA Board is providing outstanding leadership in the conduct of the search for a new Laboratory Director. The search committee is made up of Oak Ridge National Laboratory Director Dr. William Madia; University at Stony Brook Provost Dr. Robert McGrath; and Dr. Donald Engleman, Chair of BSA Science & Technology Steering Committee, and Professor of Moleculor Biophyics & Biochemistry, Yale University.

Provide proven management systems and processes:

- A financial management integration task force has been formed by Battelle to assess opportunities for cost savings in common and shared processes in financial management systems. Led by the Chief Financial Officer from PNNL, the group seeks to share cost improvement initiatives and facilitate the sharing of appropriate accounting, financial and funding mechanisms across the participating laboratories. As a result, Brookhaven has reduced costs in certain air travel agreements, increased our credit card program rebate, and will potentially achieve savings through participation in software rebates.
- Supported by Battelle, the development of a causal analysis program was initiated in FY01. This program is expected to enhance the communication and response to lessons learned by having common frameworks of causal factors among Battelle affiliated Labs.
- Building on input from and participation of Battelle staff at PNNL, BNL developed and deployed an approach for evaluating the maturity of management systems. Initial feedback from laboratory staff, as well as DOE HQ and Battelle, is positive, and the process appears to have promise as a core element of the Laboratory's assessment program.
- A Lab-wide Environmental Management System, fully conformant to the ISO 14001 international standard, was developed at BNL, making it the first, and only one, of 20 DOE Laboratories, and first Long Island-based institution, to achieve ISO 14001 registration. The EM model at BNL has been tailored to meet specific needs at PNNL, ORNL and NREL. Using the BNL prototype model for meeting ISO 14001 registration requirements, cost and schedule savings of at least 25% are expected at other DOE laboratories.
  Facilitating the implementation of these [management systems] with long term assignments of key leaders and short term assignments of SME's

- Battelle provided expertise for the development of BNL's Tracking and Trending Program. The program is expected to be an important contributor to the Laboratory's assessment program.
- BNL personnel have played a significant role in deployment of SBMS at ORNL. Additionally, Battelle personnel, assisted by BNL personnel, provided extensive SBMS support to INEEL, where the SBMS initiative has become the centerpiece of that Lab's efforts to "remove non-value-added work" from site operations to meet significant budget challenges.

Conducting management assessments in various areas of Laboratory Operations:

- A Corporate Assessment of Quality of Life (QOL) at BNL was completed in June, 2001. Commissioned as an assessment of a wide range of QOL perspectives across the entire Laboratory, a team of highly-qualified individuals was lead by Dr. Fred Preston, VP for Student Affairs at SBU. The Team examined QOL-related support for employees, visitors, users and guests, and made a series of recommendations that are currently under consideration. These addressed basic organization, Lab-wide coordination, and provided a set of guiding principles as well as detailed suggestions for improvement.
- Battelle provided highly qualified quality assurance experts to participate in a joint assessment with DOE HQ representatives of the Laboratory's QA program. The assessment indicated that the Laboratory's QA program initiative was on track and several strengths were identified. The assessment confirmed Laboratory concerns in the need to focus on attention on procurement activities in small science organizations.
- A corporate assessment directed by the BSA board of Laboratory ES&H performance was started in the fourth quarter of FY01. The focus of the assessment is on BNL leadership changes; Management Systems Feedback and Improvement; Organizational and Institutional Self-Assessments; and PAAA program corrective action status. The assessment will be completed in the first quarter of FY02.

Provide strategic guidance to the science, technology, and cleanup missions of the Laboratory

- Battelle has formed a standing planning committee (Technical Council) consisting of the Deputy Directors or Chief Scientists from five Laboratories (including Battelle Columbus) to define common goals and cross-Laboratory initiatives. The goal is to create major new DOE mission-related initiatives that offer collaborative capabilities across DOE Laboratories (not just the Battelle-affiliated labs). Within the Battelle-affiliated laboratories, the focus has been on achieving better alignment, connectivity, and stewardship of S&T capabilities in order to bring the best capabilities to significant national and international technical challenges.
- When a review in FY 2000 of the Laboratory's environmental restoration activities indicated that project performance was slipping, Battelle provided expertise to participate in a comprehensive review of the project status and identify appropriate actions to restore project management to a level that will enable the Laboratory to achieve cleanup goals.
- Contributed to BNL programs in the National Nanoscience initiative, a new Energy Strategy for a Carbon Constrained World, the Genomes to Life initiative and the Scientific Discovery through Advanced Computing Program through an expanded Chief Research Officers Council. The number of collaborative research projects that utilize the

"best and brightest" from BNL and the other Laboratories affiliated with Battelle has greatly increased to encompass high performance computing, systems biology, nuclear science and engineering, new vehicle technology and the electronics industry. All these promising beginnings are being promoted by the investment made by Battelle in supporting fourteen Technical Networks that link scientists and engineers with similar interests across the laboratories and core universities to improve communications, coordination and collaboration.

- A team of the DOE sector and Battelle's Technology Partnership Practice completed a prospectus for the Long Island Association, a New York state economic development group, which proposed a $50M state investment in translational R&D and technology transfer from BNL, Cold Springs Harbor Laboratory, and University of Stony Brook to boost the island's economic development in biotechnology, electronics and information technology.

Other Actions and Accomplishments-Financial Resources

- BSA provided financial resources to improve aspects of Laboratory operations, such as the quality of work-life/wellness programs, user/visitor enhancements, and related areas.
- BSA continues to provide financial resources to community involvement initiatives such as scholarships/financial awards for local students studying science, including a highly visible National post-doctoral award named after Maurice and Gertrude Goldhaber (Goldhaber Research Fellowships).
- BSA has enhanced corporate involvement through participation within DOE sanctioned organizations such as EFCOG, NLIC, FMSIC, TWPG, and MOCAA. These organizations address issues affecting the DOE complex as a whole, as well as the strategic direction of complex-wide initiatives, through the sharing of best practices and lessons learned.
- BNL personnel conducted an assessment of the Battelle Columbus Laboratories Decommissioning Project, a $10-15M per year project, 90% funded by DOE, to decontaminate and restore Battelle-owned facilities. Opportunities were identified for using PBM approaches to achieve a schedule acceleration of three years, with closure in FY06, and a cost savings of $26M.

Results

Score (0~4.0)	Rating	Schedule Status
4.0	Outstanding	Not Applicable

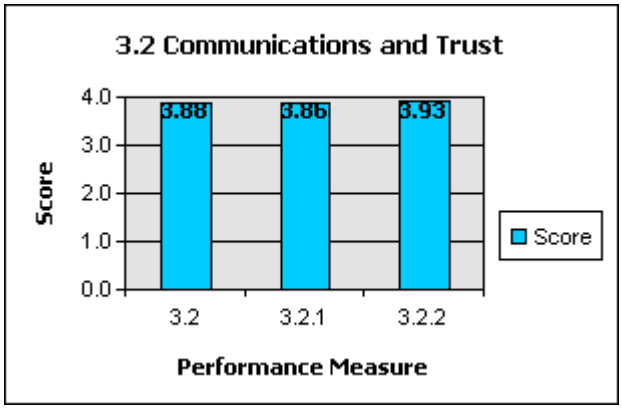
3.2 Communications and Trust

Objective Description

Communications and Trust
The weight of this Objective is 35%
The following metric applies to all Performance Measures in this Objective:
BNL and BAO will conduct a peer review process to evaluate all of the activities enumerated under each of two Measures contributing to this Objective. This peer review will engage qualified, experienced, outside experts who will evaluate programs on an annual basis using

Baldrige Criteria and other relevant criteria appropriate to their state of development. Consistent with DOE expectations, a Baldrige scoring system will be used. The primary focus of the peer review will be on evaluating Communications & Community Relations Program effectiveness. The peers will also provide counsel on how best to improve the communications and community relations programs at the Laboratory and the most appropriate techniques for measuring and assessing the quality, appropriateness and effectiveness of these programs. The peer review will serve as the basis for the Laboratory's evaluation under this Critical Outcome. At a minimum the peer review process will include a pre-meeting, evaluation and closeout session, so Laboratory and DOE concerns are addressed before the peers provide a rating for the Laboratory's performance.

The key aspects of the Communications & Community Relations Program at the Laboratory are presented below in the Performance Measures. It is expected that each element of the Communications & Community Relations Program at the Laboratory will have associated self-assessment activities in the appropriate organizations (i.e.: CIGPA, Departments and Divisions). These activities and the resulting findings and conclusions will be made available to the peer review team. Information regarding community feedback, outcomes testing, surveys and follow-ups will also be made available to the peer review team.



3.2 Communications and Trust
3.2.1 Effective and Understanding Performance
3.2.2 Stakeholder Involvement Performance

Accomplishments

The Objective for excellence in Communications and Trust is rated Outstanding with a score of 3.88. FY 2001 has shown marked increases in media and public interest in BNL science and has produced an unprecedented number of positive media stories focused on BNL with primary emphasis on breakthrough research such as quark matter, g-2, and brain research. A great deal of press interest focused on the selection of Dr. Marburger as President Bush's Science Advisor. The Laboratory completed several actions to enhance reporter relationships, including Laboratory Director meetings with regional and national reporters and publication editorial boards. BNL has also taken actions to collect and respond to feedback from reporters.

The Laboratory continues to collect feedback and data from formal and informal surveys, Communications and Trust Advisory Panel (CTAP) peer review panel, and other sources, to evaluate the adequacy and effectiveness of communications and community relations programs. Reviews and input indicate that the museum education programs, envoy program, and speakers'

bureau continue to add value to the Laboratory's community relations program. However, the stakeholder relation program is being re-assessed due to difficulty in enlisting and training employee volunteers.

The Laboratory established and filled a new "Web Site Administrator" position to refresh and upgrade the contents and graphics on high level web-pages and to improve processes for managing the web site contents. This work complements both employee communications and press and external relations.

Since research surveys and participant evaluations indicate that people who visit the Lab leave with a much better understanding of the Lab's science and a more favorable opinion of the Lab, VIP tours and facility open houses are an important part of the community relations program. In FY01 over 30,000 individuals toured or visited the Laboratory. The Summer Sunday program and the educational opportunities are the primary draws.

The Community Advisory Council (CAC) has been and continues to be extremely valuable to the Laboratory. Input from the CAC's diverse membership has contributed greatly to cleanup programs and general operations. As the cleanup of the Laboratory progresses and some of the CAC's priority issues are addressed, it will be important to re-visit the CAC's charter and the roles of its members.

Community Involvement has been made the responsibility of all senior and middle-level managers. At the end of FY00 the "Community Involvement in Laboratory Decisions" Subject Area was published to clearly define laboratory expectations. As part of the subject area implementation 58 Level I, Level II, and project managers have received community involvement training. Approximately 40% of those trained were part of the targeted population. The training has improved communications between and among divisions and departments and between the Lab and the community. It will be continued in FY02 for the remaining targeted individuals, as well as DOE staff having community involvement responsibilities

Results

Score (0~4.0)	Rating	Schedule Status
3.88	Outstanding	On Schedule

Notes

Communications and Trust performance measures are unique at Brookhaven Laboratory in that they are subject to an annual peer review by a panel of outside experts from academia, industry and other governmental agencies. This panel, CTAP, is currently undergoing its first leadership change since it was formed in 1998. Because all members of the panel are volunteers and are very prominent in the communications and public affairs fields, this change of leadership could have significant impact on the future of the panel.

Issues and Trends

FY2001 has shown a marked increase in media and public interest in BNL science and has produced an unprecedented number of positive media stories focused on the Laboratory with primary emphasis on breakthrough research such as quark matter, g-2, and brain research.

During third quarter, a great deal of press interest focused on the selection of Director Marburger to be nominated as President Bush's science advisor.

Assumptions
CTAP will continue its peer review responsibilites for 2002.

3.2.1 Effective and Understanding Performance

Accomplishments
See Performance Measure 3.2.1.1 for details.

Results

Score (0~4.0)	Rating	Schedule Status
3.86	Outstanding	On Schedule

3.2.1.1 Strategic Communications & Community Relations Program

Accomplishments
3.2.1.1 Strategic Communications and Community Relations Program

Research

Community – ongoing data is collected regularly from Envoys and Speakers and shared as appropriate with decision-makers. Research from Summer Sunday visitors has been collected at three events and analyzed. Program changes based on this research will be implemented as appropriate. Advertising data for FY2000 has been used to refine media mix for FY 2001 broadcast and print in support of Summer Sundays. Four radio stations were added to the media mix

Media Relations identified, planned and implemented communications for the following scientific programs during 3rd quarter:
--Environmental research: mercury waste treatment
--Biological research: enzyme evolution
--Neutrino research, Sudbury Neutrino Observatory
--Addiction and HIV research
--Full-energy collisions at RHIC
Enhanced reporter relationships
--Brookhaven Director’s media trip to Washington, D.C. (Washington Post, NPR, Inside Energy)
--Brookhaven Director’s meeting with Newsday’s editorial board
--Proactive contacts with select national and regional reporters
--Draft reporter feedback survey instrument Planned communications to respond to sudden media interest in Brookhaven Director as possible presidential nominee as White House science advisor
--Web site with Director’s statement and links to biographical sketch, high-resolution photo

The Laboratory also issued press releases on awards earned by science and other staffers, science-related student activities, concerts, speakers and other stakeholder and community-related events at the Laboratory.

EMPLOYEE COMMUNICATIONS

Employees were informed about research and issues in third quarter primarily through The Bulletin, the Monday Memo, broadcast e-mail, and the Lab's Website. Significant were the following issues:
--Worker health assessment
*e-mail notice of upcoming news
*Brookhaven and DOE statements via e-mail
*special Website *employee information sessions
*comprehensive Bulletin article with first-class mailing to retirees
*CAC presentation
--Independent consumer confidence report on the Lab's water quality report --Historical emissions report, 1947-61

Laboratory Web Site
A new position, Web Site Administrator, has been established to refresh and upgrade the contents and graphics on high level web pages. The Web Administrator has introduced a systematic program for reviewing and updating that part of the web site which is under the administrator's span of control. This work complements both employee communications and press and external stakeholder relations.

Stakeholder Relations
This program is being reassessed due to difficulties in enlisting and training employee volunteers.

Envoy Program
· Two meetings conducted during the third quarter; presentations given on Smart Cities, on-line classroom, and current educational programs.
· Envoys distributed over 200 flyers to advertise for Summer Sundays
· Envoys following up with school districts to ensure their areas are participating in the contests.
· Evaluations continue to indicate participants consider the program valuable when interacting with outside groups and extended family.
· Luncheon held for all envoy volunteers in June.

Speakers Bureau
· During third quarter, 25 employees gave 29 presentations.
· Addiction research presentations continue to be in demand; presentation given to four organizations two hundred students and faculty from Riverhead HS and faculty of Mercy High School.
· RHIC presentation given to two business groups. Also given at Hofstra University and at a high school award ceremony. Lab researcher was keynote.
· Evaluations indicated outreach is completed at this time relating to fire fighter groups.
· Media group completed wide variety of fact sheets that are used by speakers during their engagements.
· Photo coverage by local paper on addiction presentation.
· Volunteers honored at a luncheon during mid-June.

Ambassador Program
Boy Scout Atomic Energy Merit Badge
· Program conducted on March 31 for approximately 60 scouts received their merit badges; a waiting list of 150 scouts for next program.

· Three CI staff and 12 scientists, engineers, and technicians staffed the program.

Science Fair Help Day
· No programs conducted between March 30 and July 25; science fairs have been completed in school districts.
Museum Education Program
· Approximately 15,400 students and teachers visited the museum
· Forty-one schools were represented
· Magnets to Go program - 7,712 students attended from 23 different school districts.
· The program began July 9. Scheduled to date are a total of 32 libraries with 59 programs, which will be conducted in libraries.
· These programs continue to be in alignment with State standards.
· Two-day teacher workshop was conducted at the Lab on July 13 and July 16. Attended by 65 teachers from throughout NYS.

Tours - High Schools
· Eleven high school classes participated in the Lab's Science Experience program between 4/1 and 6/30, including one from the State of Indiana, another group included four classes from one school.
· Completed a Science Teacher Staff Development Day. Program provided entire science department of Westhampton Beach HS with researchers in the teacher's respective fields to shadow. Evaluations of the day indicated it is a program we should consider repeating.
· Since input from the evaluations is used to improve the experience, CIGPA is examining the feasibility of incorporating at least one researcher contact per tour.

Tours - College and Adult
· To date 2000 adults and college students have participated in tours that include one-on-one interactions with researchers.
· In the third quarter there were three programs set up for conferences, including Educational Programs on Science and Research, International Conference on Future Accelerators, and HR's Take Your Daughter to Work Day.
· During the third quarter significant groups included Norwegian Royal Minister, Congressman Grucci, Congressman Frelinghuysen, Schumer's senatorial staff, Director of Russian Aviation and Space agency, Columbia and NYU Graduate Schools of Journalism, and four business groups.
· Evaluations typically range from 4 to 5 on a scale of 5.

Community Involvement Management System (CIMS)
CIMS had been put into operation and is being used to manage data and prepare reports related to the Speakers Bureau, the CI Calendar, the Envoy program, and the Tour program.

HFBR
A public meeting (roundtable) was held in November, 2000 to generate and collect stakeholder input on alternatives for the future of this facility. About 40 people participated. A web page has been created to supply the public with a summary of current activities and developments relative to the HFBR.

BGRR
A continuing series of monthly meetings with a working group of stakeholders has been

conducted. Participants include regulatory personnel, stakeholders and environmentalists. Weekly updates on this project are posted on the web.

Analysis

The Community Involvement, Education, Government, and Public Affairs (CEGPA) Directorate, which has major responsibility for this performance measure is subject to annual peer review by a panel of non-BNL subject matter experts - the Communications and Trust Advisory Panel (CTAP). The rating for this measure is based on the findings of this peer review and is submitted to DOE directly by the CTAP reviewers.

Management Focus for the Coming Quarter

CTAP recommendations and BAO findings will be analyzed for process improvement opportunities.

Results

Score (0~4.0)	Rating	Schedule Status
3.86	Outstanding	On Schedule

3.2.2 Stakeholder Involvement Performance

Accomplishments

See Performance Measure 3.2.2.1 and 3.2.2.2 for details.

Results

Score (0~4.0)	Rating	Schedule Status
3.93	Outstanding	On Schedule

3.2.2.1 Lab-wide Community Involvement Implementation

Accomplishments

Community Involvement Process and Plan Implementation

· Since March 30, CI conducted two training sessions for managers; 23 people attended, including two Level 1 and seven Level II.

· Working through process on issues including wildland fires, NSLS EA, cultural resource management plan, the natural resources management plan, gas pipeline, BNL's drinking water quality, Landtrek, equestrians.

· Continued tracking: sewage treatment plant upgrades, worker health assessment, emissions report, beryllium, RHIC noise, master plan, transportation.

· Two Landtrek roundtables will be conducted in August.

· Received two requests from outside organizations to give presentations and seminars on the community involvement process.

· Received the Organization of the Year award from the International Association for Public Participation.

Analysis

The Community Involvement, Education, Government, and Public Affairs (CEGPA) Directorate, which has major responsibility for this performance measure is subject to annual peer review by a panel of non-BNL subject matter experts - the Communications and Trust Advisory Panel

(CTAP). The rating for this measure is based on the findings of this peer review and is submitted to DOE directly by the CTAP reviewers.

Management Focus for the Coming Quarter
CTAP recommendations and BAO findings will be analyzed for process improvement opportunities.

Results

Score (0~4.0)	Rating	Schedule Status
3.95	Outstanding	On Schedule

3.2.2.2 Community Advisory Council

Accomplishments
Community Advisory Council
· Met monthly, with facilitator; fully supported CAC administratively with minutes, organizational analyses. Completed ten action items.
· Supported six forums on the energy and environment, which included from three to five speakers at each session.
· Since March 30 report, presentations were given on issues including, Worker Cancer Assessment, Environmental Services Division update, dose/risk assessment fundamentals, STP modifications, historical emissions report, cleanup status on CERCLA activities, OUV.
· Science presentations included: scrapie research, addiction research, RHIC, and Dr. Marburger's State of the Lab address, which included the Lab's vision for science.
· CAC's Accelerated Cleanup Committee organized a further effort to seek funding that had been cut from the budget. This effort may contribute to the Lab receiving an additional $10 million.
· CAC is hosting a party for the community for J. Marburger; CIGPA is supporting the effort.

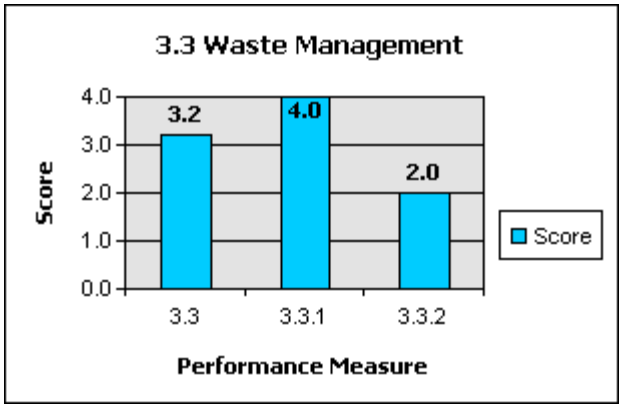
Management Focus for the Coming Quarter
CAC will not meet in August. In September CAC will host Dr. Marburger.

Results

Score (0~4.0)	Rating	Schedule Status
3.9	Outstanding	On Schedule

3.3 Waste Management

Objective Description
The weight of this objective is 10%



3.3 Waste Management
3.3.1 Routine Waste Disposition
3.3.2 Waste Shipping and Disposal Performance

Accomplishments

Overall waste management operations are rated as *Excellent* with a score of 3.2. All wastes were shipped off-site in accordance with RCRA permitted storage time limits for hazardous waste and within time limits specified in DOE Order 435.1 and the DOE approved Radioactive Waste Management Basis Document. As such, performance for routine waste shipment has earned an *EXCELLENT* rating.

Total unplanned disposal/disposition costs for FY01 was $218,530. Performance in this area is rated as *Good.* These costs were all associated with the laboratory's environmental restoration mission. Causes for the unplanned costs were determined and the laboratory has taken several actions to minimize the potential for unplanned waste disposal costs. The actions include improved requirements, guidance, and tools for waste characterization to ensure compliance and consistency. Organizational changes were also made to better integrate the waste management function within the restoration program. Prior to these changes, environmental restoration waste disposal was managed on a project-to-project basis allowing inconsistencies in approach and eventually in compliance.

The waste management assessment program has matured substantially both organizationally and programmatically across the laboratory. In FY01, nineteen laboratory 90-day storage areas as well as all EM storage the waste management division inspected areas. Unsatisfactory items were addressed and re-inspected satisfactorily. An unannounced NYSDEC inspection which also included 90-day storage areas revealed only 1 finding and 6 potential findings, all of which have been resolved.

In FY01 thirteen non-conformance reports were written by the waste management organization to document non-conforming conditions as well as follow-up actions. Of the thirteen, 12 were due to miss-classification or characterization and 1 was for work control practices. All corrective and preventive actions are being tracked many have been completed.

The (waste) Generator Interface Group (GIG) is proving to be a valuable process for communicating and resolving issues among organizations impacted by the waste management program. To improve integration with the laboratory's environmental management program, in FY01 the laboratory will explore merging the GIG with routine meetings of the Environmental Management System Representatives.

A significant concern for Laboratory management in the coming fiscal year is anticipated changes in DOE funding of waste management (WM) for FY03. Specifically, it appears that the Office of Science

(SC) will end direct funding of waste management activities in FY03. We expect SC to redistribute WM funding to individual science programs. In anticipation of these changes the laboratory has to implement a waste allocation/recharge method that fairly charges for waste disposal based on actual and historical generation, encourages responsible wastes stream minimization, and stabilizes core WMD funding requirements.

Other aspects of performance, either directly or indirectly related to waste management are discussed under Critical Outcome 2, Excellence in Operations Objectives 2.1 and 2.3, ES&H Operations and ES&H Management Systems respectively.

Analysis

This performance measure contains Part A, which has a year end score of 4.0 and Part B, which has a year end score of 2. Given the respective weighting of the two parts of 60 and 40 percent, the overall year-end score is 3.2.

Results

Score (0~4.0)	Rating	Schedule Status
3.2	Excellent	n/a

3.3.1 Routine Waste Disposition

* A total of twenty items, including twelve items in package 25-99-3120B, were scheduled for shipment in September 2001 under task order 33. This waste will be shipped upon the lifting of the DOE shipping suspension for radioactive wastes. As stated in the RWMB, page 14, "wastes which reach a one-year storage date within the first half of a fiscal year will be shipped from the site for disposal no later than the end of the same fiscal year." Therefore, even though the waste shipment was halted due to force majure events, the waste will be shipped within the storage limits approved by DOE in the RWMB document.
* 13 items in package 8-0503B are BLIP wastes and were scheduled for shipment in September 2001. Even though the shipment of the waste was halted due to force majure events, the RWMB Document allows for the storage of non-contact handled wastes, which includes BLIP wastes, for up to three years.
* Two items are scheduled for shipment and are addressed under task order 29. This waste will be shipped upon the lifting of the DOE shipping suspension for radioactive wastes, within the storage limits approved by DOE in the RWMB document.
* One item containing Spent Resin in Bldg 865 remains in inventory without a task order but is scheduled for shipment within the next three months. This waste will be shipped upon the lifting of the DOE shipping suspension for radioactive wastes, within the storage limits approved by DOE in the RWMB document.
* 1 package being held for decay in storage - Items held for decay in storage are not subject to storage times prior to disposal.

Results

Score (0~4.0)	Rating	Schedule Status
4	Outstanding	On Schedule

3.3.2 Waste Shipping and Disposal Performance

Accomplishments

This performance measure tracks negative performance. As intended in the description and assumptions of the performance measure, this measure captures additional costs bore and invoiced by the Treatment, Storage and Disposal Facility (TSDF) for wastes not meeting the TSDF Waste Acceptance Criteria (WAC). The total unplanned disposal/disposition costs for FY01 was $218,530. Non-conforming waste at Envirocare and Hanford incurred an incremental cost of $181,010 and $37,520, respectively. (A detailed analysis of the incremental costs associated with three waste streams contributing to this negative value are included in the section below.) Thus, BNL rates itself as GOOD for this performance measure.

The root cause of the non-conforming waste costs at Envirocare involved the improper characterization, or rather "under characterization" of soils containing mercury from the Glassholes Stockpile 10. Only three composite samples were taken to characterize a very large volume of soil contaminated with mercury. Even though the composite analytical results indicated the presence of mercury at seventy percent of the RCRA threshold for mercury. No additional samples were taken, and the project managed the waste as non-RCRA-regulated. When received at Envirocare, additional sampling indicated that a portion of the waste stream contained regulated levels of mercury and thus the waste had to be re-certified and disposed of as mixed radioactive waste. To reduce the likelihood of occurrence of these types of issues, the EM Directorate, together with the Waste Management Division (WMD), has implemented many technical, programmatic and infrastructure changes over the course of fiscal years 2000 and 2001. Those changes include the following:

* A document titled, "Bulk Waste Characterization for Off-Site Disposal Final Sampling Guidance", dated August 2000 was issued to provide guidance on sampling and characterization of bulk CERCLA wastes containing multiple constituents of concern (COC). This guidance is based on statistical approaches endorsed in EPA and ASTD standards and guidance. A Microsoft Excel macro called the "tool box" was developed as a part of this guidance to aid project managers in performing the statistical evaluation. Essentially, the program requires first a statistically defensible set of data to evaluate a waste for characterization and disposal. The approach requires the project manager to evaluate the distribution of the data set with respect to regulatory thresholds for each of the constituents of concern. Risk evaluations and Director approval are required for those waste streams to be managed as a non-regulated waste that are within seventy percent of the regulatory threshold for any COC.
* A Low-Level Radioactive Waste (LLRW) Certification Program Plan was issued in September of 2001 to establish the requirements for certifying LLWR and mixed wastes for disposal. Certification of waste includes the requirement for proper characterization as described above, but also includes other requirements to ensure a waste meets a TSDF's WAC prior to the waste being shipped off-site. These other requirements include proper container selection and management, control of wastes during the generation and packaging processes, and the quality assurance processes that apply to waste related activities.
* An EM Waste Management Plan has been drafted to define the requirements for managing wastes within the restoration program at BNL. This plan goes beyond characterization and certification of specific waste streams and includes, but is not limited to, the requirements for waste generation planning, cost and schedule management, risk evaluation, risk aversion,

baseline development and assumptions and compliance with applicable DOE Orders and DOE, EPA and other regulatory requirements.
* Infrastructure changes were made to integrate the WM function within the restoration program.
* The waste management function was re-centralized within the WMD. Prior to this organizational change, waste management functions were carried out on a project to project basis, leading to inconsistencies in approach and in compliance.
* A new position was added to the EM Organization to manage all remediation wastes at the 30,000 foot level and to eliminate "stove-piping" among restoration projects.

Analysis

Stockpiles 10 soils:
In late calendar year 1999, soils from the Glassholes Stockpile 10 project were shipped by rail to Envirocare as Low-Level Radioactive Waste (LLRW). Upon receipt of the waste at Envirocare, the waste was sampled in accordance with Envirocare's Waste Analysis Plan (WAP). Some of the samples taken during implementation of the WAP showed mercury at levels exceeding the RCRA threshold. As a result, Envirocare excavated the waste that had been buried and stored it in a total of 146 waste boxes. On January 11, 2000, Envirocare submitted a non-conforming waste report to the State of Utah and a letter to BNL stating that the waste was non-conforming. BNL performed a statistical analysis of the results in accordance with the methodologies outlined in EPA's document SW-846, Chapter 9. These results indicated that the waste stream was statistically below the regulatory threshold for mercury. Using this methodology, all remaining waste in rail cars were tested and released for disposal as LLRW. At the request of BNL, the waste in the boxes were again sampled and tested by Envirocare in June 2000. Results from this test were inconclusive. Upon review of the results, the BNL Project Manager for the Glassholes project ordered the sampling of all 146 boxes. This sampling effort was conducted in December 2000 and indicated that two-thirds of the analytical results were greater than the RCRA threshold for mercury of 0.2 ppm. On December 22, 2000, the BNL Project Manager re-certified the waste as mixed waste and authorized Envirocare to proceed with treatment and subsequent disposal. A task order to the Envirocare-BSA Basic Ordering Agreement was prepared for covering the costs for treatment and disposal of $82.23 per cubic foot, as there was no DOE held contract for managing this type of waste stream. All wastes contained mercury of less than 260 ppm and were successfully treated using chemical stabilization.

Unplanned shipping and disposal costs incurred by the TSDF (1) for this waste stream were as follows:
Excavation and packaging of waste from the cell $29,670
Analytical costs (rush included).....$ 7,820
Sampling labor .....$ 1,750
Demurrage (2 cars, 158 days @ $50/day + 15%) $18,170
Additional sampling effort in Dec. 2000 .....$50,400 (including analytical, sampling, labor, post-sampling costs) G&A on BOA for treatment and disposal of waste (2).....$ 73,200 (4,735 ft3 * $82.23/ft3 * 18.8% G&A)

TOTAL $181,010

Reference 1: Letter from KayLin Loveland, Envirocare to Ralph Holland, USDOE Ohio Field Office, "Contract #DE-AM24-980H20053, Receipt of Nonconforming Waste Shipments from Brookhaven National Laboratory (BNL) - Additional Sampling Costs, Other Waste Management Costs, Reconciliation of Oversize Debris Billing", dated November 21, 2000.

Reference 2: Envirocare invoice voucher number 159.

811 SLUDGE IN DRUMS:
Realtime radiography (RTR) of 54 drums out of the 62 shipped in this campaign showed a small amount (less than one half liter) of water trapped in the bottom of the inner liner. Free liquids are not permitted in LLRW packagings at Hanford. To remedy the non-conforming items, Hanford was authorized by BNL to place the 55-gallon drums into 85-gallon overpacks containing adequate absorbent material. Incremental costs associated with this non-conformance were as follows:

Additional disposal costs for added volume.....$ 17,420 ($322.56/overpack * 54 overpacks) Material charge for overpacks ($150/overpack * 54 overpacks)..$ 8,100
Labor for overpacking .....$ 12,000

TOTAL .....$ 37,520

Reference 1: E-mail from Jeanette Smith, Project Analysis, Waste Management Project, Fluor Hanford to Ed Richards, Radioactive Waste Programs Manager, Waste Management Division.

BGRR Above Ground Duct Sections
One additional waste stream that was shipped off-site to US Ecology in Tennessee, the BGRR Above Ground Ducts (AGD), was not properly characterized as PCB Bulk Product waste. However, there were no incremental costs associated with the treatment or disposal of these wastes. The wastes were intended for disposal as radioactive waste and were not treated, as such, as a PCB Bulk Product material. The AGD's were disposed of at Envirocare at the BOA negotiated price of $20 per cubic foot. The presence of the PCB's in paint had no bearing on the disposal costs. In fact, BNL was able to negotiate a rate $10 per cubic foot less than the disposal rate given in the DOE held Ohio Field Office contract of $30 per cubic foot.

Management Focus for the Coming Quarter
A letter of justification will be submitted to DOE explaining the BNL evaluation of this performance measure rating.

This letter will include all corrective actions taken in FY 2000 and FY2001 to mitigate the probability of recurrence of these types of incidences.

Results

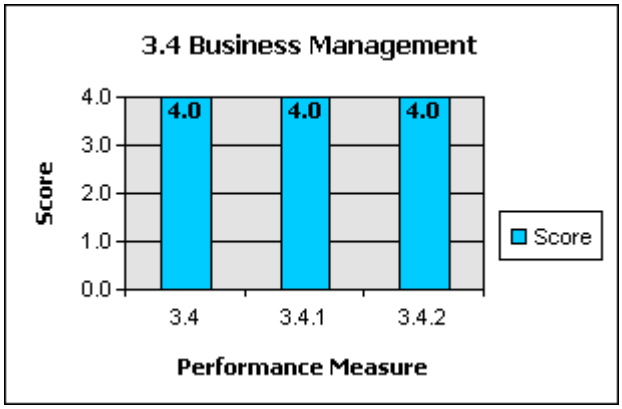
Score (0~4.0)	Rating	Schedule Status
2.	Good	On Schedule

Notes
Initially, costs associated with the non-conformances with Stockpile 10 were reported at $400,000. This cost included all costs associated with treatment and disposal of the waste. This measure aims to capture incremental costs associated with a non-conforming waste that does not meet a TSDF's WAC. Given that, all incremental costs associated with the excavation, sampling, and management of the waste stream, including G&A, were included. What is not included in this summary are costs incurred by BSA at BNL for program enhancement and development, additional characterization and waste stream validation performed at BNL as a result of lessons learned from the event. BNL exercises the right to take measures to mitigate laboratory liability and costs associated with improperly or under-characterized waste.

3.4 Business Management

Objective Description

Business Management
BNL will conduct its business operations with distinction, as described by and in support of the Leadership and Management Critical Outcome.
The weight of this Objective is 20%.



3.4 Business Management
3.4.1 Business Services
3.4.2 Business Systems

Accomplishments

All of the measures in this section were completed on schedule with an outstanding rating. The two measures (3.4.2.1 and 3.4.2.1) for the implementation of the Benefit and Payroll modules of PeopleSoft have been completed ahead of schedule.

Additional accomplishments and Challenges in the area of Business Services and Business Systems that support the overall critical outcome of Leadership and Management

The Business Services and Systems at the Laboratory cover a broad spectrum of activities that touch all sectors of the Laborotory population including the scientific and administrative staff, users, guests and visitors. The functions performed include financial and support services in budgeting, accounting, procurement, information services, property, travel, transportation, housing and food services. Business Management adheres to the principles of continuous improvement in all its areas of responsibilities through a process of Self Assessment. Each Division and Office within the Business Management Directorate performs a self assessment on their areas of responsibilities, which results in improved efficiency and effectiveness. Several examples of these improvements and challenges that were not included as contractual performance measures are as follows:

Budget Execution: In FY2001 the indirect portion of the budget had to be reduced twice to accommodate changes in the Laboratory funding expectations and spending plans. While considerable effort was expended to accommodate these reductions, disruptions and impacts did occur, and mid-year budget reductions are not desirable. In recognition of this situation, the Budget Formulation/Implementation/Execution process for FY 2002 was modified to incorporate a larger reserve to accommodate variances with predicted funding and direct spending in FY2002.

Credit Card Administration: In FY 2001 a case of fraud was uncovered by BNL in the use of a BNL credit card. The discovery of the fraudulent activity and resulting Internal Audit demonstrated that the existing credit card administration did provide some oversight and protection against misuse of credit cards. As a result of the subsequent Internal Audit review recommendations, additional oversight was instituted to strengthen the overall program. This oversight includes purchased item screens and monthly random audits of individual credit card holders by Property Management and Procurement Division as well as random audits by Internal Audit. This additional oversight program will be reviewed periodically to ensure that the revised protection and controls are adequate and effective.

Housing: An ongoing issue at the laboratory is the aging infrastructure, part of which includes the on-site housing facilities that are made available for guests and visitors in the form of dormitories, apartments, efficiencies, and cottages. Most of these facilities were built in the 1940's and have far surpassed their designed useful life span. Despite the Laboratory's best efforts to keep them reasonably current and in a well-maintained condition, the cost to maintain these facilities is steadily increasing and in time will become prohibitive. Funding from DOE to replace these facilities has not and is not expected to be available; therefore, alternative funding methods must be found. Currently a committee has been formed to investigate the possibility of third party financing to develop replacement housing.

Electronic Library: In order to effectively fulfill the Laboratory's scientific mission, the Scientific staff must have access to journals, books and reference materials. The Research Library has been under-funded for a significant amount of time, and today provides information through a very limited book and hard copy journal collection as well as by a limited but steadily increasing amount of electronic resources. It has become clear that, within current resource constraints, the only viable option is for an expanded electronic journal collection, a goal being pursued through an E-journals Project for the Research Library.

Succession Planning and Career Development: In a fashion similar to other areas of the Laboratory, there is a population "bulge" in the middle 40's age range within the Business Management area. This is illustrative of the need to improve our succession planning and career development for more junior personnel. Therefore, a group of senior managers have begun meeting to formulate ways of improving career opportunities and individual growth of Level II, III and IV managers.

Procurement Training - Successfully implemented the Contract Administrator training program which requires updated training to maintain the proper level of knowledge of those individuals with responsibilities related to the procurement of goods and services for the Laboratory.

Quality of Life Peer Review - A comprehensive quality of life corporate assessment of BNL was conducted during FY2001. The assessment targeted our approach to improve the quality of user services in order to help the Laboratory improve them to be consistent with BNL's status as a premier user facility dedicated to scientific research. The primary focus of the review team was on the facilities and services targeted at BNL's user population, but which have implications for the entire BNL community, such as Housing, Food Services, Communications, and Transportation. The recommendations in the finished plan are currently under management review.

Business Systems - Aside from the Critical Outcome implementation activities (i.e. PeopleSoft HR/Benefits/Payroll version 7.5), there were several other important upgrades and implementations scheduled and completed during the year as part of the business systems strategic plan. The upgrades and implementations included the Guest Information System, high priority improvements to the Financial modules, the HR/Benefits/Payroll portion of the web-based PeopleSoft v8.0 upgrade, completion of the major components of the eCompensation and eBenefits modules, and participation in the requirements definition for the replacement of the Travel & Expense system.

Realignment of the BSD Operations Group with ITD's Operations Group - The purpose of the realignment of the BSD Operations Group with ITD's Operations Group was to leverage talents within the existing groups and ultimately provide better customer service to Brookhaven through a single, centralized data center, help desk, and desk-side support structure. At the beginning of FY01, 17 staff and managers from BSD were reassigned to ITD. The achieved benefits include elimination of confusion and double coverage on production data centers, a single telephone number for staff to call for help in hardware, software and communications, one help desk, and one desk-side support group. It also brought a commercial-style operation methodology to the data center formerly within ITD, including automated backup, off-hours support and disciplined, regimented operations. The merger was implemented by establishing the Building 459 data center as the location for all Laboratory production servers and placing it organizationally within ITD but operated by former BSD personnel. This has proven to be a excellent organizational and structural move on several dimensions: It leveraged the skills of scarce infrastructure talent, it raised the overall professionalism of the ITD operations group, it simplified user support, it moved production servers away from the risks associated with a computer lab environment, and it opened up raised-floor space for RHIC computing expansion in Bldg 515. The overall theme of these observed improvements has been superior service without additional cost.

Business Systems Division High Profile Staff Retention - Working with Personnel, the Laboratory established a new IT salary structure. This new Schedule provides clearer IT job descriptions and pay rates that more closely reflect the external job market, and a Strategic Skills Stipend program that provides supplemental quarterly payments to bridge the gap between BNL pay rates and temporary increases in pay rates for scarce IT skills.

Photography and Graphic Arts - The Photography and Graphic Arts Strategic Plan was implemented in FY 01 in response to the recommendations of the BPAC Sub-Committee. While there were many benefits derived from Strategic Plan initiatives, it became clear during the course of the year that they alone would not be sufficient to reverse the downward business trend. The decrease in sales of P&GA services continued due to shrinking budgets, rising costs due to escalation, and the continuing evolution of desktop technology. During the course of the year several alternatives for addressing the financial context in which P&GA operates were considered. In October 2001, a Limited Core Plus business model was approved for FY 02. The success of this approach will be carefully monitored to evaluate its success.

Work for Others - Conducted a Baldrige type self assessment of the Work-for-Others Program as it relates to work for other federal agencies. The final draft was completed at the end of September 2001 and subsequently submitted to the DOE-BAO for review and comments. When comments are received, they will be reviewed for consideration and where appropriate they will be included in the final report.

Fiscal Services Division - Prepared detailed Baldrige Assessments for the Accounts Payable Purchase Order Vendor Payment Function and BSA Accounting and Reporting Function. Issues, strengths, and improvement opportunities as well as action plans for any noted improvement opportunities for each of these individual functions can be found in their related detailed Baldrige Assessments.

Analysis

The outstanding rating reflects the fact that BNL conducts its business operations with distinction. It should be noted that the outstanding rating for each measure was accomplished during a year in which additional pressured to reduce budgets were

Results

Score (0~4.0)	Rating	Schedule Status
4	Outstanding	On Schedule

3.4.1 Business Services

Accomplishments

This performance measure (3.4.1) is a roll up of three measures in the Finance and Administrative Directorate. The three measures are Uncosted Balances (3.4.1.1)from the Budget Office, PeopleSoft Users (3.4.1.2) from BSD and Consolidation of S&M (3.4.1.3) from PPM. All three measures have been complete on time with a outstanding rating.

Analysis

The outstanding rating is reflective of the diligence of the staff at accomplishing the task required.

Results

Score (0~4.0)	Rating	Schedule Status
4	Outstanding	On Schedule

3.4.1.1 Uncosted operating balances for Landlord and EM activities at levels to ensure continuity of operations

Accomplishments

Using total operating funds received for SC and EM in FY 2001: FY 2001 Department Cost Plans (SC & EM Operating): 295M YTDCost 268M Percent expended for FY 2001: 90.8% Uncosted Balance percentage: 9.2%
However, in September 2001, BNL received $7 million of EM funds that are prefinance funds for FY 2002
Since these funds distorted the FY 2001 ending uncosted balance, the FY 2001 Cost Plan is restated without these funds: FY 2001 Department Cost Plans (SC & EM Operating): 288M YTDCost 268M Percent expended for FY 2001: 93.1% Uncosted Balance percentage: 6.9%
The analysis at the end of the third quarter assumed no additional funding would be received. In addition to the $7 million of EM funding identified above, the SC funded programs received an additional $8.5 million above the amount stated in the 3rd quarter reporting. No adjustment was made for the impact of the additional SC funding.

Results

Score (0~4.0)	Rating	Schedule Status
4	Outstanding	n/a

3.4.1.2 Assess results of Enterprise Resource Planning (PeopleSoft) modules

Accomplishments

The average number of PeopleSoft users is 771 per month for the year. This is clearly above the Outstanding rating level (>600 per month). For the first three months, these counts only include the PeopleSoft Financial applications. In January, the Guest and HR/Payroll modules went into production and are included in the remaining user counts for the year.

Analysis

The PeopleSoft user count sharply moved up in the second quarter after the implementation of the Guest and HR/Payroll modules. Utilization of the Financial, HR/Payroll, and Guest modules leveled out at that point. There continued to be growth in the Pick Ticket and Web Requisition portions of the system. From February through September, total utilization grew by 13%, mostly in these two areas. These two modules are utilized by a broader user population and are also web-enabled. During FY02, we will be transitioning the rest of the PeopleSoft system towards an enhanced web-based version. Since this version is more user friendly and includes some self-service features, utilization can be expected to increase even further at this point.

Management Focus for the Coming Quarter

The PeopleSoft implementation team is focused on the upgrade of PeopleSoft to version 8. This will occur first with the HR/Benefits/Payroll portion of the system and then the Financial portion. The HR upgrade will occur during the first quarter of FY02 and the Financial upgrade will follow that. It is expected that these upgrades will further expand our user count, demonstrating strong user acceptance of the system.
This Measure is useful to demonstrate the growth in the use of PeopleSoft modules in a quantitative way. Going forward beyond this year, we intend to build on the strength of the PeopleSoft modules through our network of functional application owners. We have found that aggressive system ownership, coupled with knowledgeable users groups (where needed), is an excellent platform for continuous improvement of the individual PeopleSoft modules. This is a key approach for us to insure the continued acceptance and growth of the PeopleSoft environment at BNL.

Results

Score (0~4.0)	Rating	Schedule Status
4	Outstanding	On Schedule

Notes

The specific number of PeopleSoft users for FY01 on a monthly basis is as follows: October 584 November 576 December 551 January 712 February 805 March 858 April 845 May 850 June 841 July 829 August 888 Sept 908 AVERAGE 771

Issues and Trends

Issues - There are no issues with this Performance Measure. Trends - The number of PeopleSoft users have trended upward during the year as more modules were implemented. The number of PeopleSoft users in September 2001 was more than 50% higher than the number in October

2000. This spike in utilization was mainly due to the Guest, HR, Benefits, and Payroll modules of PeopleSoft going into production at the end of December. As of September, there are more than 900 PeopleSoft users. We anticipate that the number of PeopleSoft users will move even higher during the next fiscal year when the self-service components of PeopleSoft HR version 8 are implemented.

Assumptions

The rating scales for this measure were based on the prior year's utilization statistics for PeopleSoft and expected growth based on the potential population that could use the system. If the utilization of PeopleSoft decreased, this would have been measured as Marginal or Unsatisfactory. If PeopleSoft utilization stayed level, this would be considered as Good. If the utilization increased, the rating would move to the Excellent or Outstanding range.

3.4.1.3 Assess results of the consolidation of Supply & Material activities

Accomplishments

As a result of the consolidation of DCP with S&M, the new Procurement and Property Management Division has saved $1,135,385 in FY01. This is a savings of 19.3% on the FY99 baseline cost of $5,871,602.

Analysis

PPM's savings are computed as follows:
Labor (S/W/F) $989,436 (10 voluntary RIFs accomplished during FY00) Space Charges 133,349 (Part of Bldg. 355 vacated during FY00, and Bldgs. 89, 90, 91 and 158 vacated during FY01) ITD Charges 12,600 FY01 Total $1,135,385
Total Savings to date from the consolidation $1,743,588 (FY00 and 01)

Management Focus for the Coming Quarter

PPM continues to streamline its operations and looks for opportunities for additional savings. Savings will continue to accrue each year for the salaries and space which are no longer required.

Results

Score (0~4.0)	Rating	Schedule Status
4	Outstanding	Not Applicable

3.4.2 Business Systems

Accomplishments

Both measures were completed ahead of schedule. The user sign-off for the Benefits module occurred on 9/29/00. The user sign-off for the Payroll module was 11/30/00. The rating for this Measure is Outstanding.

Results

Score (0~4.0)	Rating	Schedule Status
4	Outstanding	n/a

3.4.2.1 Install Enterprise Resource Planning (ERP) System (PeopleSoft)

Accomplishments

The user sign-off for the Benefits module occurred on 9/29/00. This was 8 weeks earlier than the target date of 11/30/00. The rating for this Measure is Outstanding. The user sign-off for the Payroll module was 11/30/00. This was 4 weeks earlier than the target date of 1/1/01. The rating for this Measure is Outstanding. This is a final rating for this Performance Measure since both implementations are now complete.

Analysis

The Benefits and Payroll modules were the 8th and 9th PeopleSoft modules installed at BNL. Since we now have such extensive experience with the installation process, our internal ability to plan and implement PeopleSoft modules on a timely basis is clearly very strong. With the completion of this Measure, the focus has now shifted from initial implementation to upgrades designed to leverage our investment in the integrated PeopleSoft environment. (See Item #6 below.)

Management Focus for the Coming Quarter

This Measure is complete. The PeopleSoft implementation team is now focused on the upgrade of PeopleSoft to version 8.

Results

Score (0~4.0)	Rating	Schedule Status
4	Outstanding	Ahead of Schedule

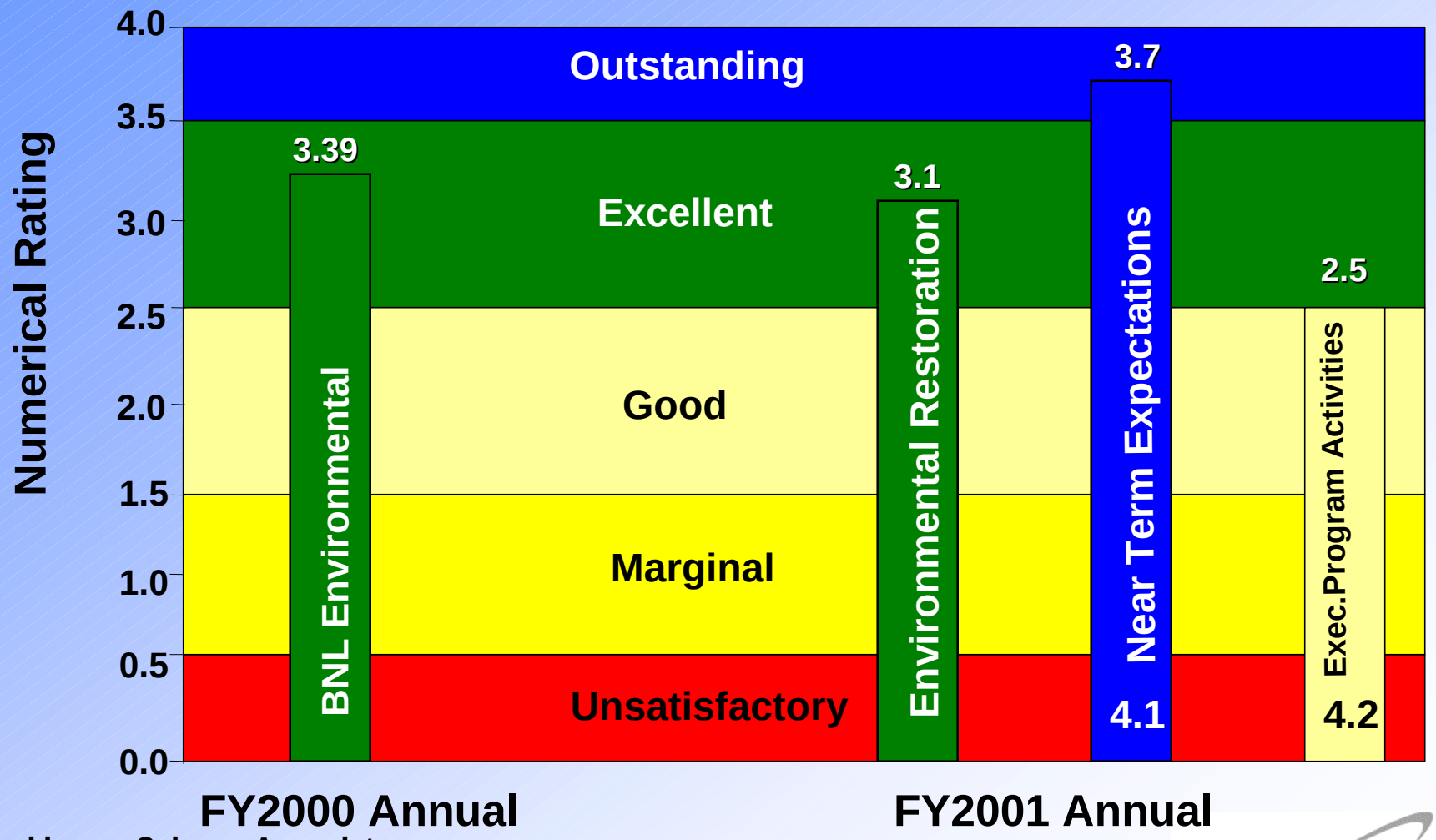
Notes

This completes the initial implementation of PeopleSoft at Brookhaven. We now have nine PeopleSoft modules in production servicing the BNL community and covering most of the major functional areas in Fiscal, Procurement/Property Management, Budget, and HR.

Issues and Trends

The next phase of our PeopleSoft implementation will involve an upgrade from version 7.x to version 8.0 for both the Financial and HR modules. This will move us to the current web-enable version of the product and facilitate later initiatives into self-service functions that are more efficient and provide improved user functionality.

Critical Outcome 4: Environmental Restoration



4.0 Environmental Restoration

Critical Outcome	Objectives	Performance Measures
4.0 BNL Will Be Implement The Environmental Management (EM) Program In Accordance With The Commitments Contained In The Environmental Restoration Program Memorandum Of Understanding (Attachment A) Executed Between J. Marburger, BNL and M. Holland, BAO On May 4, 2001. **8% of BNL Score**	4.1 **Near Term Expectations (50% of C.O. #4)** BSA will be evaluated on its implementation of the recommendations of the DOE/BSA Workshop, meeting and exceeding expectations outlined in M. Holland's letter to Dr. Marburger, dated March 22,2001, Subject: BNL Environmental Restoration Program-Near Term Performance Expectations, and progress toward Re-engineering the program to achieve the Accelerated Cleanup Goal.	
	4.2 **Execution of Program Activities (50% of C.O. #4)** BSA will execute the DOE approved/BSA accepted EM Baseline program in accordance with acceptable cost and schedule thresholds and the following parameters: BSA will meet all primary, secondary and removal action milestones scheduled under the Interagency Agreement (IAG) as agreed upon with the U.S. EPA and NYSDEC and all Level 1, 2A, and 2B Milestones for the third and fourth quarters of FY01.	

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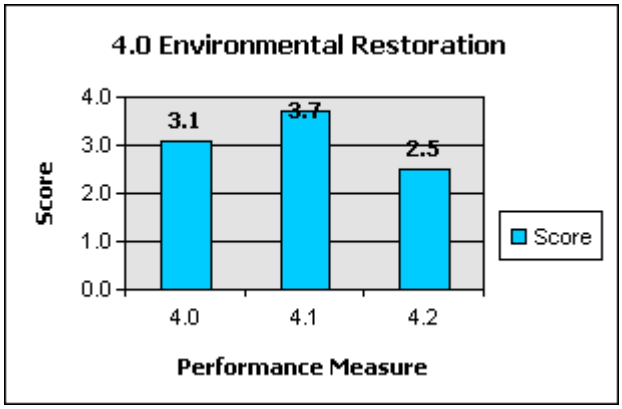
4.0 Environmental Restoration

Critical Outcome Description

BNL Will Implement The Environmental Management (EM) Program In Accordance With The Commitments Contained In The Environmental Restoration Program Memorandum Of Understanding (Attachment A) Executed Between J. Marburger, BNL And M. Holland, BAO On May 4, 2001. The weight of this Outcome is 8%



4.0 Environmental Restoration
4.1 Near Term Expectations
4.2 Execution of Program Activities

Accomplishments

4.1 Near Term Expectations – Summary Discussion

6 total NTPEs required for FY01

** 6 NTPEs completed **

BSA completed a wide range of substantial EM program improvement initiatives well beyond the stated Near Term Expectations. Such FY01 accomplishments include:
- The successful resolution of the long-standing Bechtel contract issue(s) and demobilization of Bechtel during June.
- The re-engineering, reorganization and stabilization of BSA's EM organization including clarification of roles and responsibilities, elimination of unnecessary layers of management, identification of human resource voids in key areas, and mobilization of additional project engineers, field engineers and project managers, and the addition of much needed regulatory affairs function.
- The completion of over 48 Re-engineering Action Items. Although 7 were specifically related to Near Term Expectations, the majority of these were the result of DOE and internal BSA assessments and needs analyses.

While all 6 NTPE were completed, not all were accomplished within the two-week "outstanding" timeframe. Some of these NTPEs involved review and revision cycles between BSA and BAO. It is BSA's judgment that these review and revision cycles, along with the substantial improvement initiatives that went well beyond the Performance Measures, more than offset any

inconsequential issues or questions related to NTPE timing/timeliness. Based on the foregoing, BNL rates itself "Outstanding" but shy of perfect.
4.2 Execution of Program Activities – Summary Discussions
9 IAG Milestones Total
** 7 are Complete (2 were Early)
** 2 have DOE approved extensions that are being finalized with the Regulators

7 Level 2B Milestones
** 4 were Completed (2 were Early)
** 1 was late
** 2 are pending change approval

As reflected herein, BSA missed one milestone by 16 calendar days. Prior to and subsequent to this event, BSA has taken several initiatives to improve overall schedule performance. Such initiatives include:
- The development of detailed Level III project schedules for management and control purposes.
- The institution of weekly schedule review meetings to evaluate execution performance, identify weaknesses and opportunities for performance improvement, and promote personal accountability for schedule performance.
- The planned development of an independent IAG schedule database in order to ensure that IAG commitments are not inadvertently impacted by routine schedule adjustments and analysis.
- Substantial efforts to build schedule float between BSA's operational schedules and the IAG commitments.

Results

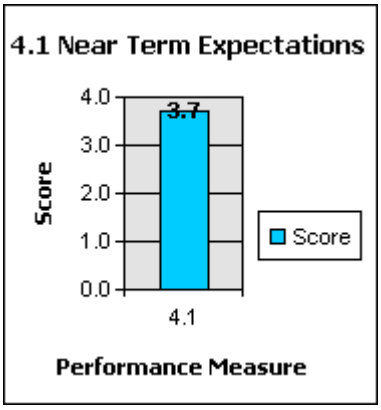
Score (0~4.0)	Rating	Schedule Status
3.1	Excellent	n/a

4.1 Near Term Expectations

Objective Description

The weight of this Objective is 50%.
BSA will be evaluated on its implementation of the recommendations of the DOE/BSA Workshop, meeting and exceeding expectations outlined in M. Holland's letter to Dr. Marburger, dated March 22,2001, Subject: BNL Environmental Restoration Program-Near Term Performance Expectations, and progress toward Re-engineering the program to achieve the Accelerated Cleanup Goal.
Progress will be assessed against the following activities:
· New EM Director is proposed as Key Personnel in BSA contract (Completed on Schedule).
· MOU for Accelerated Cleanup executed between BSA and DOE by 4/30/01.
· Finalize project team staffing analysis / resource evaluation commensurate with the accelerated completion goal by 4/16/01.
· Implement human resource program to support the accelerated completion including proposed employee and subcontracting incentive plans and supporting career path/outplacement activities by 5/16/01.
· BSA will submit a revised Baseline that supports the defined Accelerated Cleanup Goal at BNL as defined in M. Holland's letter to Dr. Marburger dated March 9, 2001.
The progress against this task will be evaluated by the following activities:
1) Support DOE validation and BAO review of the ERD and HFBR Baselines. Validation support will be

defined through submission of an Action Plan to address DOE comments. This Action Plan will be submitted within 10 workings days after receipt of DOE Baseline validation and BAO review comments.
2) Incorporation and resolution of comments from BSA Review, BAO review and DOE Validation. Completion will be defined as submission of the Final Baseline to DOE within 30 days of receipt of comments.
3) Complete revision of the HFBR Program Baseline and submittal to DOE by 6/5/01.
4) Complete BSA Project Oversight Team review of revised ERD and HFBR Baselines and incorporate recommendations into revised baseline. Completion will be defined with the submittal of the Project Oversight Team's Closeout Report and comment resolution to DOE and incorporation of comments into the Baseline.
Metrics
Outstanding: BSA completes all 6 NTPE's within 2 weeks of specified due date.
Excellent BSA completes all 6 NTPE's : 4 within 2 weeks of specified due date, 2 within 4 weeks of specified due date.
Good BSA completes all 6 NTPE's: within 4 weeks of specified due date.
Marginal BSA completes all 6 NTPE's: 2 within 4 weeks of specified due date, 4 more than 4 weeks of specified due date.
Unsatisfactory BSA does not complete all 6 NTPEs: within 4 weeks of specified due date
Assumptions: · Work Breakdown Structure (WBS) Dictionary or comparable documentation that clearly identifies the program's approved scope/technical baseline.
· Cost Estimate detail and basis for cost estimate for all authorized work scope, including all supporting assumptions.
· Network schedules which relate to authorized work scope, including the identification of activity relationship, interdependencies, and critical path analysis, and current estimates of schedule float.
· Contingency analysis that corresponds to the authorized scope and areas of estimated uncertainty.
· All other parameters as specified in M. Holland's letter to Dr. Marburger dated 3/9/01 Subject: Development of Program Baselines to Support an Accelerated Environmental Clean-up of BNL.
· BSA will follow the change control procedure to implement this request.



4.1 Near Term Expectations

Accomplishments

6 total NTPEs required for FY01
** 6 NTPEs completed**

Analysis

** Staffing analysis submitted to BAO needs was revised, resubmitted and accepted by BAO.
** Incentive Plan submitted to DOE was approved for a one year trial period.
** Baselines submitted and approved for use.

Management Focus for the Coming Quarter

** Continued implementation of EM Re-Engineering agenda. ** Continued Support of DOE Quarterly Assessment Team. ** Finalize Completion Criteria for FY02 Critical Outcomes.

Results

Score (0~4.0)	Rating	Schedule Status
3.7	Outstanding	On Schedule

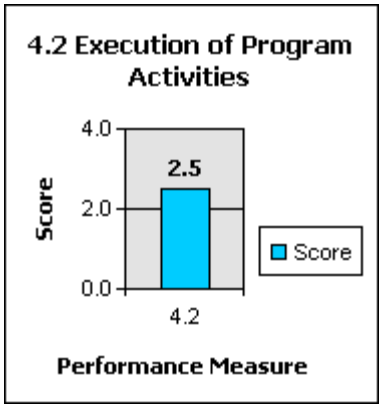
Notes

While all 6 NTPE were completed, not all were accomplished within the two week "outstanding" timeframe. Additionally, some facets of this measure were subject to several review and revision cycles between BSA and BAO. Thus BNL rates itself "Outstanding" but shy of perfect.

4.2 Execution of Program Activities

Objective Description

The weight of this Objective is 50%.
BSA will execute the DOE approved/BSA accepted EM Baseline program in accordance with acceptable cost and schedule thresholds and the following parameters:
BSA will meet all primary, secondary and removal action milestones scheduled under the Interagency Agreement (IAG) as agreed upon with the U.S. EPA and NYSDEC and all Level 1, 2A, and 2B Milestones for the third and fourth quarters of FY01.
Metrics
Outstanding All Milestones described above are met on schedule. In addition, 2 or more of these milestones are completed 10 or more working days early.
Excellent All Milestones described above are met on schedule. In addition, 1 of these milestones is completed 10 or more working days early.
Good BSA completes all milestones described above on schedule.
Marginal BSA misses one milestone.
Unsatisfactory BSA misses two or more milestones.
Assumptions:
1.) All IAG milestone dates are subject to change through IAG Milestone Extension requests. 2.) Level 1 and 2 milestones are subject change through to baseline change control.
Conditions:
In addition, the following conditions must be met. If these conditions are not met, the rating for 4.2 will be subject to reduction by DOE.
1.) The cumulative Total Program cost and schedule performance variances must be greater than –5% for FY01. Total cost and total schedule variance are those calculations reported in the CPR-Format 1, EM Monthly Report for the month of September 2001 as accepted by DOE. The figures used will be those indicated as the totals given for total "Project to Date" BCWP, BCWS and ACWP and will include DOE costs. The data will be reviewed by DOE and subject to reconciliation for consistency (e.g. the ACWP and BCWP must be taken on the same tasks).
2.) The program's latest variance at completion (based on the latest revised estimate (LRE) and authorized TPC) must be greater than –1 percent as of September 30th, 2001. The LRE will be reflected in the CPR-Format 1, EM Monthly Report, for the month of September 2001 and is subject to validation by DOE.
*Variance at Completion = (Total Project Budgeted Cost at Completion – Total Project Latest Revised Estimate) * 100 / Total Project Budgeted Cost at Completion*



4.2 Execution of Program Activities

Accomplishments

9 IAG Milestones Total
** 7 are Complete(2 were early)
** 2 have DOE approved extensions that are being finalized with the Regulators.
7 Level 2B Milestones
** 4 were completed (2 were early)
** 1 was late
** 2 are pending change approval.

Analysis

Technically BSA rates a "marginal" for this area due to missing 1 milestone by 16 calendar days. However, BSA notes that the intention of this measure was to bring focus to the quality and timeliness of milestone submittals to DOE, EPA and DEC. BAO has noted better quality submittals in the second half of FY01.

(Note that one of the conditional variance thresholds: variance at completion being greater than -1% may have been exceeded. Early FY01 Sept figures indicate that VAC= -2.1%)

With this in mind and noting that several milestone submittals were completed early (enough so that BAO has chosen not to make early completion of milestones a factor in FY02) BSA rates itself a "Good" for this measure.

Management Focus for the Coming Quarter

** Submitting FY02 IAG Schedules Document (completed)

Results

Score (0~4.0)	Rating	Schedule Status
2.5	Good	Not Applicable

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1.0 Excellence In Science & Technology

Summary for Excellence in Science & Technology (S&T)

Results for Excellence in Science & Technology

Score (0~4.0)	Rating	Schedule Status
3.58	Outstanding	Not Applicable

1.1 Quality of Research

Results for Quality of Research

Score (0~4.0)	Rating	Schedule Status
3.67	Outstanding	Not Applicable

1.1.1 High Energy and Nuclear Physics

Accomplishments - Summary

High Energy Physics

Impressive performance in HEP Theory, D0 Upgrade and software rebuild and Muon (g-2) data taking and analysis; very strong performance in ATLAS Detector Construction and Computing Projects, both for project management and for technical performance; very strong performance in data analysis for E787 Rare Kaon Decay and planning/construction for E949 Rare Kaon Decay experiments; excellent progress in MINOS and MECO buildup of BNL contributions to these important future experiments; steady progress in BNL contributions to the muon collider/storage ring R&D program.

Nuclear Physics

Exceptional gains in power and quality of Nuclear Theory; superb performance in the detector commissioning, data acquisition and data analysis activities of the new PHOBOS, STAR and PHENIX experiments, as well as strong performance by BRAHMS and RHIC Computing Facility in their initial commissioning and data runs, all these in the FY00 initial RHIC science program; strong performance by the LEGS experiment in the analysis of earlier data, future planning for and upgrade of the LEGS detector at NSLS; a vigorous and productive start for the RHIC Spin Group physics efforts plus good progress in the beam polarization measurements in the AGS-RHIC accelerators; there was a somewhat weak research performance by the Hypernuclear Group. These accomplishments indicate steady progress in the main lines of research and facilities operation for both the Nuclear and High Energy Physics Programs. The weaker performance in the hypernuclear line is regrettable but reflects the decision to move Medium Energy Physics programmatic resources in the direction of RHIC Spin Physics and this necessitates a downgrading of BNL capability in hypernuclear physics. This programmatic

change is understood and agreed to by DOE's Nuclear Physics Division. Emphasis in the first quarter of FY 2002 will be on moving ahead in DOE's NP division, arguments for the needed increase in RHIC program running resources and seeking NSF R&D resources to continue the buildup efforts in the RSVP sector predicated on a FY 2003 MRE Project start. These efforts will only succeed if appropriate efforts are made in the Congressional sector to educate and inform the decision makers there. All the Laboratory and university partners in the HENP programs being pursued at BNL are fully committed to the success of these programs and outcomes will depend almost exclusively on resources provided by the funding agencies. Hence the plan to focus on these resources in the first quarter of FY 2002.

Results for High Energy and Nuclear Physics

Score (0~4.0)	Rating	Schedule Status
3.6	Outstanding	Not Applicable

Issues and Trends

The completion last year of long range program studies in both the Nuclear and Particle Physics communities is consistent with BNL's future plans, especially in the nuclear area. In particle physics, the primary recommendation that the U.S. pursue at the highest priority, an electron-positron linear collider, somewhere in the world, will introduce an element of policy instability that could severely impact the entire particle physics program in the U.S. If there is a negative outcome here, the BNL HEP program may have severe hadicaps to overcome with RSVP and challenges in the LHC ATLAS program. The only issue in the nuclear program is the arte at which R&D towards the RHIC II and eRHIC future projects can be put in place in view of the very severely restricted budgets in DOE Nuclear Physics.

Assumptions

The BNL HENP Program in future is based on high-profile science that is at the top of the priority lists of the DOE and the NSF. If the needs of the agencies for these high-priority science program elements cannot be realized, the basic BNL assumptions will be called into question and the planned program is placed at risk.

1.1.1.1 Collider Accelerator Department

Significant Achievements Total: 10

- RHIC is operational at full collision energy, all experiments collecting data.
- First experimental paper for FY01-02 run submitted for publication after 5 weeks of operation (PHOBOS).
- AGS proton beam intensity delivered 6.0 x 10^19 protons on target in FY 2001 g-2 experiment very successful data run
- MP6 tandem and beam line operational.
- ISO 14001 Registration recertified.
- First operation of AGS for fixed target experiments concurrent with RHIC operation.
- g-2 experiment completed (E821).
- Commissioned muon collider AGS target test facility (HEP).
- Commissioned AGS neutron spallation test facility (BES).
- Began first data run for the K^+ arrow pi^+ nu nu^- rare kaon decay experiment (HEP, E949)

Significant Instrumentation Developments

Incremental developments leading to superior RHIC performance

Significant computer/software developments
Accelerator mode switching under program control

Awards and Other Recognition Total: 2
- T. Roser: FY2001 BNL Science and Technology Award
- C. Pearson: FY2001 BNL Engineering Award

Publications - in journals or major reports Total: 160
Number of publications in refereed journals, or major reports - 12; Total reports = 160

Talks and invited talks at Conferences and Workshops Total: 148
Talks and invited talks at conferences and workshops: 148

Peer or Other Review Activity Total: 12
Personnel participating in other reviews: 12 reviews

Editorial Activity and major book articles Total: 1
Editorial activity, major books articles: 1 EBIS Workshop Proceedings - K. Prelec

Patents or Disclosures
Laser Neutralization H^- Beam Profile Measurement (Roger Connolly) - Patent Application in Process.

Technology Developments Total: 1
EBIS heavy ion source reaches world record performance (electron current = 400 Ampere · millisec, 50 nanocoulombs ion yield), approaching RHIC specifications (electron beam = 1000 Ampere · millisec, 85 nanocoulombs ion yield, 3.4 x 10^9 Gold ions yield)

Technical Review Committees Total: 12
Activity on peer review, or other review activity - Personnel participating in other reviewed - 12 reviews for DOE, other laboratories, etc.

Notes
Significant S&T Development: RHIC was made operational at full collision energy. RHIC technical goals for FY 2001 were all either achieved or exceeded.

1.1.1.2 Physics Department

Significant Achievements
Nuclear Physics (NP)

Summary. RHIC experiments presented numerous results at Quark Matter 2001 and subsequently published these in refereed journals. All experiments reported on the global characteristics of gold-gold collisions at a center of mass energy of 130 GeV per nucleon. A significant new result emerged – the apparent suppression of hadron production at high transverse momentum. During the shutdown that followed this first run in 2000 all detectors completed major enhancements in detector hardware, data acquisition, triggers and software. PHENIX added a major new capability to the program – the first of two new spectrometers designed to study muons. At year's end all experiments were engaged in taking data at the full design energy of RHIC – 200 GeV per nucleon. Progress in the RHIC experimental program has to be considered spectacular. The RHIC Computing Facility (RCF) followed a successful data processing and analysis performance after the 2000 run with a significant increase in capability to handle the data expected in 2001. At year's end RCF was performing according to

expectations during the ongoing run. LEGS worked toward the commissioning of the new polarized target. The Theory Group had an extremely active year, with many visitors and workshops. The RHIC spin group is in place and growing, with the recruiting of several physicists to work on the STAR spin physics program. The hypernuclear group produced and studied significant numbers of ΛΛ hypernuclei. However the long-term future of this group's remains unclear. All Nuclear Physics Groups actively participated in the Nuclear Physics Long Range Planning process. BNL's NP programs, including RHIC, RHIC II, eRHIC and Spin Physics all are well represented in the draft Long Range Plan.

- RHIC Experiments

  BRAHMS. Detector operational. Successful data taking run underway. Recent papers from the 2000 data have begun to address previous concerns over physics productivity, but the group is small and consequently very heavily committed to operations.

  PHENIX. With the exception of one spectrometer, scheduled for completion in the next shutdown, the entire baseline detector is operational. The Central spectrometers were doubled in acceptance and a new muon spectrometer was completed and commissioned. The silicon Multiplicity Vertex Detector was put into operation, as were the Event Builder and Level 2 triggers. This achievement surpassed the effort to commission the year 2000 detector for first physics running. The 2001 run is proceeding well but PHENIX is in serious need of more integrated luminosity to start its rare event physics program. The Physics Department PHENIX Group continues to play a major role in the data analysis and preparation of physics results. Strong young group with excellent leadership. Need to continue to make sure Physics maintains a real physics role and not just a detector support role. Looks very promising right now.

  STAR. Many physics papers produced from the first year's data. Major addition is the Silicon Vertex Detector. Detector continues to perform extremely well in the 2001 running. Physics Department continues to do an excellent job in running the operations. Major effort to add physics analysis effort to the group was successfully started this year with the recruiting of a senior scientific leader and several post docs. Effort will continue in this area.

- Theory. Continues to be well reviewed and respected. Some young theorists lost to prestigious professorships in the last year. Continuing concern with funding level and commitments made to the Theory Group.
- RCF RCF did a good to very good job during the 2000 run and afterwards when data was being processed and analysis prepared for presentation. Hardware and software enhancements in advance of the 2001 run were integrated smoothly and RCF is keeping pace with the expected growth of data volume. There are still concerns. The staffing is marginal and despite efforts to hire more staff the gains are slow and difficult. This may be a problem with large data rates in the future.
  - LEGS. Continued concern about the rate of progress of the target development. Discussions underway with DOE to set a technical review date.

- RHIC Spin. RHIC Spin Group development is going well, especially the recruitment of scientific personnel to work on the STAR spin program at Brookhaven. This group, together with RBRC is active in making PHENIX and STAR ready for the RHIC polarized proton run in FY2001.
- Hypernuclear Physics. Good physics result this year on 77 hyper-nuclei received good press exposure. The group does not have sufficient staffing to play a continuing role in this physics program. Should decide on the future of this effort in the coming year.

High Energy Physics (HEP)

Summary. Very strong program in diverse areas. Very well reviewed by DOE this year. Need to maintain strengths in theory, D0, ATLAS and Kaons while trying to expand in a reasonable way in MINOS, MECO and muon collider related efforts. Sharp decline in support for FY02 leads to many RIFs.

- Theory Exceptionally strong group – highly praised by all reviews. Key role in ATLAS, D0, Neutrinos, MECO, Lattice gauge, Snowmass Workshop and Long Range Plan
- ATLAS Project Management - good Lehman review. Developing Research Program, which includes Pre-Operations (commissioning and integration), Maintenance and Operations, R&D for Upgrades and Computing.

  Technical Coordination – started activity in this area with David Lissauer taking a significant role in the ATLAS Technical Coordination work.

  Calorimeter – excellent Lehman review.

  Muon system – preparing for production of Cathode Strip Chambers.

  Computing – excellent progress on the Tier 1 center and software. Leading the Liquid Argon reconstruction software. Building up the core software group under Torre Wenaus. Significant DOE funding in 2001 – concerns about the continuation in 2002.

- D0 Very strong team rebuilt – excellent rating from D0 spokespersons. Jon Kotcher named Run 2b Project Manager. Leading efforts on software algorithms and DAQ.
- Muon (g-2) Result published in February 2001 received significant favorable press coverage. The experimental result is 2.6σ away from theory. If this persists with more statistics, this may be the first indication of Supersymmetry. More data taken in 2001 with μ^-. Results with smaller experimental error expected in 2002.
- E787/E949 Final analysis of E787 going slowly. Final result expected in a few months. Upgrade to E949 on schedule – tests going well. Concern about how much AGS beam time will be available.
- MINOS Working to create a suitable role for BNL.
  Leading study of $\nu_\mu \rightarrow \nu_e$ feasibility – important physics goal. Heavily involved in beam studies and beam instrumentation groups.
- MECO Minor role at present. Need to decide what role to play.
  Need some real decisions here – not clear if DOE support for big role.
- Muon Collider Playing major role in national and international efforts. Important target test study at AGS underway.

- Muon Storage Ring for Neutrinos Feasibility 2 study concluded for Snowmass with increased intensity and a slightly reduced cost estimate.
- NLC Major theory role in preparing case for NLC. Starting modest effort on experimental work.

Condensed Matter Physics (CMP)

- The quality of science remains "**outstanding**" in condensed matter physics at BNL. Among the most prominent scientific achievements so far this year are included: The discovery of polar nano-domains in relaxor ferroelectrics, the discovery of freezing of a quantum spin liquid in an applied magnetic field, the demonstration that the coupling to collective modes in high T_c and dichalcogenide materials is electronic in origin, the characterization of the pressure dependence of the structure of the new MgB_2 superconductors, and the discovery of magnetic roughening at the surface of an antiferromagnet. New programs have been initiated in materials synthesis and in soft condensed matter: (a) the former through the hiring of an expert in oxide single crystal growth and through the successful commissioning of a new facility for pulsed laser deposition, and (b) the latter through the hiring of an Assistant Scientist to focus on nanofabrication and characterization of self-assembled block co-polymer systems. All of these initiatives cross departmental boundaries and are part of BNL's Nanoscience Program.

  A significant step has been taken toward rebuilding the Theory Group through the hiring of Alexei Tsvelik, a world-renowned theorist. In addition, a second junior level theorist, Fabian Essler, has been hired from the University of Warwick. The Theory Group, now led by Alexei Tsvelik, has begun a search for a third theorist in electronic structure to replace Michael Weinert, who recently left the Lab. A collaborative effort within the Center for Neutron Science and including the Physics Neutron Scattering Group has accomplished its near-term goals of moving HFBR instrumentation to HFIR, NIST and ANTSO, and of establishing a BNL presence at HFIR toward construction of a cold triple axis spectrometer. They have also taken steps toward long-term plans for designing and building a direct-geometry instrument for the SNS, and toward setting up a scientific alliance with NIST for access to the NIST reactor. In the X-ray Scattering Group, construction of the CMC undulator beamline at the APS was completed and a new beamline for inelastic x-ray scattering has been proposed, and funded by DOE and NSF. Both facilities are led by BNL scientists in the X-ray Scattering Group.

  A number of prestigious awards were won by BNL condensed matter physicists this year, including the Buckley Prize for Vic Emery, The Barrett Award for David Cox, Presidential Young Investigator Award and DOE Outstanding Young Investigator Award to Andrey Zheludev, the Brookhaven R&D Award to Peter D. Johnson, and the Brookhaven Engineering Award to Scott Coburn. In addition, Emery was elected to the American Academy of Arts and Sciences and Doon Gibbs was elected a Fellow of the American Association for the Advancement of Science.

  To date, condensed matter physicists have submitted nearly 200 publications to refereed journals since October 2000. In addition, they have submitted a major book on Neutron Scattering by Shirane, Shapiro and Tranquada and major review articles on Electronic Structure by Watson and Weinert and on Synchrotron-based x-ray magnetic scattering by Gibbs, Hill and Vettier. BNL condensed matter physicists continue to give prominent invited

talks at major national and international meetings with representatives from all of the research groups contributing. As an example, five Invited Talks were presented at this year's March APS Meeting. There is the usual high level of activity reviewing journal articles, scientific and technical proposals, etc.

The major concern facing condensed matter physics remains the flat budgets currently anticipated by the DOE, with the problems most acute in the Powder Diffraction and Electron Spectroscopy Groups.

- With the new programs outlined in the preceding in materials synthesis, soft matter and nanoscience, and with the new hires in the Theory Group, condensed matter physics is now well aligned with DOE priorities, and has responded to the DOE's major criticisms.
- The construction of BNL's two APS facilities has been described in 1.1 above, as well as recent activities toward construction of an SNS instrument.

Significant Instrumentation Developments
Fast optical detector using polarized light CMC Beamline at APS

Significant computer/software developments
RHIC Computer Facility, ATLAS Computer Facility RHIC experiments, D0, (g-2) etc.

Awards and Other Recognition
Total 25 (HEP 5, NP 7, CM 13)

Publications - in journals or major reports
Total 842 (HEP 392, NP 232, CM 218)

Talks and invited talks at Conferences and Workshops
Total 410 (HEP 141, NP 182, CM 87)

Peer or Other Review Activity
Total 198 (HEP 62, NP 113, CM 23)

Editorial Activity and major book articles
Total 30 (HEP 8, NP 11, CM 11)

Patents or Disclosures
Total 1 (HEP 0, NP 0, CM 1)

Technology Developments Total: 0
Total 73 (HEP 18, NP 34, CM 21)

Technical Review Committees
Total 90 (HEP 31, NP 52, CM 7)

1.1.1.3 Instrumentation Division

Significant Achievements Total: 9
Silicon Detectors A new concept has been developed for pixel detectors with position resolution in the range of 1-5 microns.

Our silicon detector group has been a leader in detector engineering for radiation hardness.

Novel detectors have been fabricated for experiments with synchrotron radiation and for x-ray microscopy.

Gas Detectors. The large neutron detector for thermal neutrons with position resolution of 1mm has been completed and installed at LANL/LANSCE small angle scattering station for structural biology studies.

Microelectronics. Lowest noise amplifiers for particle and photon detectors have been developed, and a world record in noise performance of the CMOS technology has been achieved. This is of interest for a wide range of applications from x-ray detectors for synchrotron radiation to detectors for medical imaging.

Lasers and Optics. High efficiency has been achieved with niobium photo cathode.

Pulse shape measurements and generation of optical pulses have been extended down to 10 femtoseconds.

In optics metrology, sensitivity of optical surfaces characterization has been extended down to ~3-5 nanometers.

Micro/Nano Fabrication Processing of high-aspect-ratio structures has been developed.

Significant Instrumentation Developments Total: 2
A 5 mega volt pulse generator with 1 nanosecond pulse width has been installed for photo cathode studies and high brightness electron gun development.

Our scanning electron microscopy has been upgraded for electron beam lithography with smallest features of ~30 nanometers.

Significant computer/software developments Total: 1
Real-time position encoding on interpolating detectors (for x-rays or neutrons) has been developed by implementing centroid calculation on an advanced digital signal processor and programmable gate arrays.

Awards and Other Recognition Total: 2
1 Life Fellow of IEEE
1 Adjunct Professor at SUNY

Publications - in journals or major reports Total: 41
Most publications have been in Nuclear Instruments and Methods, and in IEEE Transactions on Nuclear Science.

Talks and invited talks at Conferences and Workshops Total: 6
Total 6

Peer or Other Review Activity Total: 12
P. O'Connor, V. Radeka, S. Rescia and B. Yu served as reviewers on various projects and programs, mostly those related to the worldwide effort on the Large Hadron Collider (LHC).

Editorial Activity and major book articles

Total 2

Patents or Disclosures Total: 4
Charged Particle Detector with Subpicosecond Resolution.
Novel Stripixel Detector Configuration.
Surface Preparation of Niobium for High Photoelectron Yield.
Offset-Free Rail-to-Rail Derandomizing Peak Detect and Hold Circuit.

Technology Developments Total: 2
Ball grid interconnection technology for integrated circuits made operational. Doublesided processing of 6 inch high resistivity silicon wafers introduced at BNL.

Notes
Basis for Science Score: The Instrumentation Division rating is based on: 1. Excellent DOE-peer review reports; 2. Our numerous scientific-technical achievements.

1.1.1.4 Superconducting Magnet Division

Significant Achievements Total: 6
-Six helical dipole magnets (2 siberian snakes, 4 spin rotators) delivered to RHIC for spin physics program.
- Four magnets delivered to DESY for HERA luminosity upgrade.
- Assembly completed on five D1 dipole magnets for LHC at CERN; testing underway.
- Assembly completed on two D2 2-in-1 cold mass units for LHC at CERN; testing underway.
- Testing completed on 372 samples of superconducting cable for LHC at CERN.
- Magnetic measurements completed on first article SNS magnets; construction of system for production measuring complete.

Talks and invited talks at Conferences and Workshops Total: 21
Low Temperature Superconductor Workshop (LTSW) (1)
18th High Energy Accelerator Conference (1)
EFCOG Executive Council Meeting (1)
Particle Accelerator Conference (PAC) (2)
American Physical Society - Snowmass 2001 (7)
17th Annual International Conference on Magnet Technology (MT-17) (5)
12th International Magnet Measurement Workshop (IMMW12) (3)
Neutrino Factory Storage Ring Study II (1)

Peer or Other Review Activity Total: 4
HENP SciDAC
Advanced Hydrodynamic Facility Project (LANL)
ASAC (ORNL)
Scientific/Technical Review Panel (MIT)

Technology Developments
HTS materials
Common coil design

Technical Review Committees Total: 13
Nuclear Science Advisory Committee (NSAC)
VLHC National Steering Committee

LHC Quarterly DOE Review
LHC Machine Advisory Committee
U.S. LHC Interlab Steering Committee
U.S. ATLAS Project Advisory Panel
Muon Collider Technical Advisory Committee
Fermilab Accelerator Advisory Committee
Cornell CESR/CLEO PAC
SNS Accelerator Systems Advisory Committee
NSAC Rare Isotope Accelerator (RIA) Cost Committee
Fermilab URA Visiting Committee
BEPC-II Review Committee at IHEP (Beijing)

1.1.2 Basic Energy Sciences

Accomplishments - Summary

The BES Directorate quality of research remains outstanding with significant achievements, recognition via awards and published papers. The NSLS remains the most frequented user facility in the world. In FY2001 over 800 papers were published based on research at the NSLS and more than 1100 experiments were conducted. High profile awards were received in nuclear chemistry and high profile results were achieved in homogeneous catalysis, combustion and neuroscience. Outstanding ratings were received as a result of a DOE review of the Chemical Physics program. A summary follows:

- Experimental and theoretical studies on model sorption catalysts for the removal of sulfur have shown that the chemical activity is very sensitive to covalent band-orbital mixing between the oxide and the sulfur-containing molecule.
- Experiments at the Laser Electron Accelerator facility (LEAF) created molecular anions of aryl halides and observed their dissociation reactions to occur with rates in the picosecond time scale.
- In collaboration with Dupont (a CRADA), new homogeneous catalysts were developed for selective deoxygenation of diols, converting them to alcohols; these reactions are relevant to efforts to convert renewable feedstocks to useful industrial materials.
- PET and microdialysis have been used to begin the first comprehensive study of solvent abuse in living systems.
- The Accelerator Test facility demonstrated SASE FEL saturation in the visible region in the VISA experiment, an important proof-of-principle of the LCLS x-ray FEL
- Bone composition differences were revealed in osteoporosis using a new IR micro-spectroscopy technique.
- The spatial distribution of Cr induced in Fe/Cr multilayers was determined by soft x-ray magnetic scattering for the first time.
- In situ studies of cathode materials in rechargeable Lithium ion batteries provided fundamental insight into how charge compensation is achieved in various cathode materials that can be used to design advanced Li-ion batteries.
- Measurements of interfacial displacements in the picometer range have been achieved using electron beam holography.

Results for Basic Energy Sciences

Score (0~4.0)	Rating	Schedule Status

3.8	Outstanding	Not Applicable

1.1.2.1 Chemistry Department

Significant Achievements Total: 37

BES Programs

Gas-Phase Molecular Dynamics

- For the first time, spectroscopy has been used to measure the barrier to internal rotation for an alkyl free radical, ethyl (CH3CH2·), which is an important species in the combustion of hydrocarbons.
- Transient FM Doppler spectroscopy has been extended to prototype studies of non-adiabatic interactions in the branching of chemical reactions, which is a key element in predictive codes for modeling combustion.
- Through a combination of a new repetitively sampled time-of-flight mass spectrometry apparatus and tunable IR diode laser spectroscopy, it has been possible to examine the kinetics and product branching ratios for the important combustion reaction, CH3· + O (3P), with unprecedented precision.

Photo-Induced Molecular Dynamics

- A new spectrometer has been constructed for electron coincidence measurements that address long-standing issues in multiple electron ejection induced by strong optical fields.
- A recently developed ultra-short, tunable mid-IR radiation laser source has revealed a rich and complex structure in the electron spectrum resulting from multiphoton ionization in the alkali atoms not observed at visible wavelengths.
- Using a novel Ag-membrane reactor, it has been possible to obtain quantitative, surface reaction kinetics for the partial oxidation of methanol in real time and under collision-free conditions.
- For the first time, laser spectroscopy has been successfully used to study the reaction dynamics of oxygen adsorption on an important catalytic metal surface (Ag) through measurements of state- and energy-resolved product distributions.

Catalysis: Reactivity and Structure

- Experimental and theoretical studies on model sorption catalysts for the removal of sulfur (MgO, NiMgO, ZnO, Cs/ZnO, CeO_2, Cu/CeO_2) have shown that the chemical activity is very sensitive to covalent band-orbital mixing between the oxide (or doped oxide) and S-containing molecule.
- High-resolution photoemission studies at the NSLS indicate that molybdenum hexacarbonyl fully dissociates on Au(111) and deposits Mo nanoparticles on the surface. The Mo nanoparticles are less chemically reactive than extended surfaces of Mo, being unable to dissociate CO. The Mo nanoparticles are transformed by reaction with sulfur to MoS_x nanoclusters, also exhibiting size-modified chemical reactivity.

- Using high-resolution photoemission we identified three different species of sulfur adsorbed on $TiO_2(110)$ surface and discovered that at 600 K all surface oxygen is replaced by sulfur. Using first-principle density functional calculations we showed that the thermodynamically unlikely surface sulfidation is facilitated by surface segregation of oxygen vacancies and the transformation is self-limiting.

Thermal, Photo- and Radiation-Induced Reactions in Condensed Media

- Experiments at the Laser Electron Accelerator Facility (LEAF) created molecular anions of aryl halides and observed their dissociation reactions to occur with rates in the picosecond time scale.
- In collaboration with DuPont (CRADA), new homogeneous catalysts were developed for selective deoxygenation of diols, converting them to alcohols; these reactions are relevant to efforts to convert renewable feedstocks to useful industrial materials.
- We have presented the first clear evidence of the involvement of Re-CO(O)-Re and Re-COOH as intermediates in photochemical CO_2 reduction with rhenium(I) diimine complexes. The reaction mechanism for the formation of Re-CO(O)-Re with CO and H_2O from Re-COOH observed in our study is quite different from that previously reported by others.
- A combined experimental kinetic and electronic structural study has shown that charge transfer through OPV (oligophenylenevinylene) molecular 'spacers' is not limited by electronic tunneling, even over distances as large as 3 nm, in contrast to behavior of other spacers studied to date.
- The discovery that cations form large clusters of 0.6 to 1.0 nm radius in supercritical fluids by attaching neutral solvent molecules is helpful in understanding ionic reactions. The size of the ion clusters was deduced from theoretical modeling of ion mobility measurements.
- Recent measurements have shown that a dendrimeric molecular triad of redox-active chromophores can be used as an electron antenna to deposit multiple reducing equivalents on a single core acceptor, a promising step towards the design of catalytic systems for photoinduced, multi-electron chemical transformations.
- Flash-photolysis and pulse radiolysis studies led to a total revision of the NO^-/HNO chemistry by demonstrating that the reactivity in this system is controlled by the spin state of NO^-; an occurrence of the non-adiabatic proton transfer that involves triplet NO^- and singlet HNO has been shown for the first time.
- Electroabsorption studies of a series of ruthenium(II) metal complexes $L^D(NH_3)_4RuL^{A\ n+}$ have shown that hyperpolarizabilities calculated from the electroabsorption data yield values similar to those obtained from hyper-Rayleigh scattering experiments. The studies identify the chemical properties need to obtain a large nonlinear optical response from these complexes.
- ZINDO calculations on a series of $(NH^3)^5RuL^{\ n+}$ ruthenium(II) complexes show that we can predict the dipole moment changes between the ground and MLCT excited state with reasonable accuracy. The calculations indicate that the low lying π^* orbitals (of L) span only the first two aryl rings.
- We have compared the nonlinear optical (NLO) response of a series of ruthenium salts $(NH_3)_5Ru–(NC_5H_5–C_5H_5N^+-R)$ with an organic series $Me_2N–(NC_5H_5–C_5H_5N^+-R)$. The metal complexes have considerably larger β_0 values than their organic counterparts as well as the

added attraction that their charge transfer absorption and NLO responses are redox-switchable.

BER Programs

Radiotracer Chemistry and Neuroimaging

- Solvent Abuse: PET and microdialysis have been used to begin the first comprehensive study of solvent abuse (the most frequent form of substance abuse in children) in living systems beginning with a study of the pharmacokinetic and pharmacodynamic effects of toluene, the most widely abuse solvent.
- Addiction Treatment: The addiction drug, gamma vinyl GABA (GVG) which has shown great promise in abolishing addictive behaviors in animals has been labeled with carbon-11 for the first imaging studies of its distribution and pharmacokinetics in primates.
- Addiction and Environmental Cues: Relapse in drug abusers frequently occurs when a drug abuser is exposed to an environment where the drug formerly used. We have shown that exposure to environmental cues produces similar neurochemical changes to the drug itself illustrating the powerful role that environment plays on drug-related behavior.
- Labeled Amino Acids for PET Studies of Cancer and Cancer Treatment: Aromatic amino acids which may be accumulated in rapidly growing tumors have been labeled with carbon-11 for PET studies in primates to determine their utility as tracers in cancer detection. D and L-boronphenylalanine, have been labeled with carbon-11 for investigations of amino acid transport, melanoma imaging and BNCT therapy for brain tumors.
- Short lived Isotopes to Study Plant Stressors: A new collaboration has been initiated to use the short lived positron emitting isotopes to study environmental stressors on plants.

MRI Imaging

- Recent MRI studies using the BNL 4 T scanner have identified a new advantage of high magnetic fields not before realized, which permits the detection of commonly employed contrast reagents (CRs) at very low levels.
- The increased sensitivity to CR at 4 T suggests that it is possible to detect CR transport across the blood-brain-barrier (BBB) in the white matter of the normal human brain which has tremendous potential for detecting slight BBB compromises (such as in stress, AIDS, etc.).
- CRs are widely used in the classification of tumors, MS lesions, and other pathologies. The increased CR detectability also suggests that a simple model for quantitative analysis of such results will be appropriate. Currently, this model is used for the results from clinical (low magnetic field) MRI instruments, where our theory suggests that it leads to significant errors.

HENP Programs

Solar Neutrino Research

- The highlight of our year was the announcement (June 18) and publication (July in Physical Review Letters) of the first results from SNO, the Sudbury Neutrino Observatory. The data obtained by running the neutrino detector with pure D_2O (the so-called Phase I of SNO operations) provided the first definitive proof of oscillations of solar neutrinos. We found that (a) 65% of the ^8B electron-neutrino (ν_e) flux from the Sun is converted into the other neutrino

flavors, and (b) that the total ^{8}B solar flux deduced from the measurements agrees with the value predicted by the Standard Solar Model.

- Relevant to Phase II, that is design to enhance the probability of detection of the neutrons that are produced in the D_2O by the neutrino neutral-current interaction, the BNL group made needed measurements of (a) the optical properties of dilute NaCl solutions, ≈0.2% concentration, to ensure that the neutrino detector's performance would not be degraded by the addition of the salt, and (b) the operation of Liquid-Cell degassing columns in the presence of the salt solution.
- We developed electrochemical plating methods to produce well-characterized counting sources for alpha-particle spectroscopy. These methods were applied to produce sources of thorium and radium that served to calibrate several counting procedures that are routinely used at SNO.
- The Group has become active in the LENS collaboration, with the goal of developing a prototype of a low-energy solar neutrino detector to observe solar pp and ^{7}Be neutrinos. We have been focusing our LENS research on chemical questions concerning the preparation and properties of metal-loaded liquid scintillators (M-LS) that will serve as the neutrino detector. Recently we have been preparing varieties of M-LS with either ytterbium or indium as the metal at ~10% concentration levels.

PHOBOS Heavy Ion Collaboration

- Successfully commissioned the full detector and took several million events.
- Published 4 papers in PRL, including the first publication from RHIC ever, which has been cited more than 80 times according to the SPIRES citation index maintained by SLAC.
- Published the first paper from the full energy RHIC running. We showed that the number of particles produced in RHIC collisions, a direct measure of the entropy, did not grow as strongly with energy as expected. This puts strong constraints on the physics and has already stimulated theoretical work to understand it. This should improve our understanding of the strong interaction in the high-density regime where non-perturbative and non-linear effects become important.

Successful Proposals

- A proposal submitted to the DOE Office of Basic Energy Sciences in response to the Nanoscale Science, Engineering and Technology solicitation for DOE Laboratory Activities entitled "Charge Injection and Transport in Nanoscale Materials" was funded in July 2001.
- A proposal submitted to the DOE Office of Basic Energy Sciences in response to the Nanoscale Science, Engineering and Technology solicitation for DOE Laboratory Activities entitled "Catalysis on the Nanoscale: Preparation, Characterization and Reactivity of Metal-Based Nanostructures" was funded in July 2001.

Significant Instrumentation Developments Total: 4

- A novel ion imaging spectrometer which provides information on the internal-state, translational and spatial distributions of desorbing molecules has been developed to probe the dynamics of photo-induced reactions on metal surfaces.

- A gas-phase ablation source has been developed that can that can be used to study the electronic structure of metal-containing radicals (e.g., PtC, TiS) by direct adsorption/fluorescence spectroscopy.
- MicroPET: A small animal PET scanner (microPET) has been commissioned as a new scientific tool for preclinical research to measure biochemical transformations and the movement of drugs in the living animal, including the genetically modified animal over time.
- Miniature PET Probes: Two specialized PET devices have been developed to measure radiotracer in blood. One is a beta probe implanted in a blood vessel and the other is a co-incidence detector positioned external to the wrist to measure positron emitter concentration. Both hold the promise of making PETstudies simpler and safer.

Awards and Other Recognition Total: 4

• Joanna Fowler, 2001 Glen T. Seaborg Award for Nuclear Chemistry
• Stephen Dewey, 2001 DOE Energy 100 Award Services
• Stephen Dewey, Brookhaven Award
• Charles Springer, Science and Technology Award

Publications - in journals or major reports Total: 124

SUBMITTED: 35 BES, 21 BER, 5 HENP

PUBLISHED: 48 BES, 10 BER, 5 HENP

Talks and invited talks at Conferences and Workshops Total: 31

PRESENTATIONS: 10 BES, 19 BER, 2 HENP

Peer or Other Review Activity Total: 1

• The FWP groups “Gas Phase Molecular Dynamics” and "Photo-Induced Molecular Dynamics" were reviewed by DOE program managers and an outside peer review panel on October 29-31, 2000. The written report from that review was extremely positive with specific mention of the quality and relevance of research.

Editorial Activity and major book articles Total: 14

- Editorial Activity: Synapse (Dewey), J. Nuclear Medicine (Fowler), Chemical Physics (Newton), CRC Reviews in Theoretical Chemistry (Newton), Organometallics (Bullock), Comments on Inorganic Chemistry (Sutin)
- Book Chapters/Articles: 6 BES, 2 BER

Patents or Disclosures Total: 4

Patents

- BSA No. 00-12, Inventor: Richard Ferrieri, Application of Chiral Critical Clusters to Asymmetric Synthesis Record of Invention
- Marcel Schlaf, R. Morris Bullock, Paul J. Fagan and Elisabeth Hauptman: “Catalytic Hydrogenation of Ketones and Aldehydes Using Organometallic Ruthenium Complexes”
- Marcel Schlaf, R. Morris Bullock, Paul J. Fagan and Elisabeth Hauptman: “Catalytic Reductive Dehydroxylation of diols and Polyols to the Corresponding Alcohols and -Diols Using Organometallic Ruthenium Complexes”

Technical Review Committees Total: 61

BES - 9 extramural, 21 intramural, BER - 11 extramural, 11 intramural, HENP - 8 extramural, 1 intramural.

Notes
Basis for Science Score
The Chemistry Department rating is based on: 1. High-profile awards in nuclear chemistry and DOE 100 2. High-profile results in homogeneous catalysis, combustion and neuroscience 3. High numbers of invited talks at major meetings 5. Excellent DOE-peer review ratings for the Chemical Physics program.

1.1.2.2 National Synchrotron Light Source

Significant Achievements Total: 13

1. The spatial distribution of Cr induced moment in Fe/Cr multilayers was determined by soft x-ray magnetic scattering for the first time.
2. Interfacial uncompensated Ni spins in a Co/NiO exchange bias bi-layer was observed for the first time by using the elliptically polarized wiggler.
3. Free standing liquid crystal films were studies with resonant diffraction at the sulfur K-edge. The thiophene films showed split 1/4 order peaks, which allows determination of the super structure.
4. The fundamental mechanism of ion conduction in an ion transport protein was discovered based on determination of the structure of a K+ channel-antibody protein complex.
5. In situ studies of cathode materials in rechargeable Lithium ion batteries provided fundamental insight into how charge compensation is achieved in various cathode materials that can be used to design advanced Ii-Ion batteries.
6. The ATF demonstrated SASE FEL saturation in the visible in the VISA experiment, an important proof-of-principle of the LCLS x-ray FEL.
7. The basic infrared properties of the new MgB2 superconducting material were studied at U10, revealing an unusual combination of low carrier density and weak electron-phonon coupling, plus evidence for more than one energy gap.
8. The structure of a key protein on the bacterium that causes Lyme Disease was reported.
9. Bone composition differences were revealed in osteoporosis using new IR micro-spectroscopy technique.
10. Sub-millisecond folding of proteins was observed with IR micro-spectroscopy.
11. The complete optical phonon spectrum of water was determined for the first time using inelastic x-ray scattering.
12. The physical mechanisms underlying the perpendicular magnetic anisotropy in Amorphous TbFe-based magneto-optic materials were successfully elucidated by spectroscopic studies at X23B and X23A2.
13. A technique was developed and demonstrated at X1B that selectively enhances the carriers in x-ray diffraction from High Tc cuprates. It is the first direct scattering probe of the superconducting condensate.

Significant Instrumentation Developments Total: 11

1. A double focusing Laue monochromator for hard x-rays was sucessfuly demonstrated and implemented in fixed energy configuration on the X17 wiggler beamline.
2. Procurement of a soft x-ray scattering chamber and diffractometer was started in FY01. Completion and commissioning is anticipated in FY 02.

3. Coherent x-ray scattering chamber procurement was started in FY01 with completion of procurement and commissioning scheduled for FY02.
4. Fast avalanche photo-diode detector package was developed and used as a high count rate substitute for NaI scintilator detectors at NSLS x-ray beamlines.
5. Electronics for the curved blade detector for powder diffraction were significantly improved in FY01. They will be deployed in FY02.
6. Single element CCD detector was procured for general use at the NSLS.
7. 32 channel custom IC was developed for detector readout. It will be used for the turn-key EXAFS detector in FY 02.
8. The DUV-FEL linac was successfully commissioned and achieved baseline performance required for FEL operation. The linac was connected to the NISUS undulator this year with FEL experimentation to start in FY 02.
9. Based on X-13 cryogenic monochromator results, a new (more powerful) cryogenic monochromator cooler is being designed and procured for the X25 ID beamline.
10. Procurement of a new high resolution photo-emission spectrometer (PES) was completed and commissioning of the new system is underway.
11. X1B beamline upgrade procurement (new multi-grating monochromator) was completed in FY 01 and commissioning is underway.

Significant computer/software developments Total: 4

1. Software and hardware were developed for real-time digital feedback of the electron orbit in the NSLS X-ray storage ring. Digital feedback has been operating successfully for over a year in the VUV storage ring and implementing it to control the orbit in the larger X-ray ring is nearly complete. The digital feedback system is quieter and more stable than the analog feedback systems previously used.
2. The NSLS computer group started to develop Oracle database applications for the NSLS accelerator control system. Oracle will first be used to maintain records of computers on the NSLS network, to store data for software quality assurance, and to store information about the nearly 10,000 devices in the control system. Oracle will eventually be used for real-time data logging of accelerator systems.
3. Much effort went into improving the security of the NSLS computer network. The computer monitoring software, Radia, that is required by BNL computing policy, was installed on over 300 computers at the NSLS. Preparations were made to install a firewall to protect the control system computers from outside access. Unnecessary conduits through the BNL campus firewall to computers on the NSLS network were closed.
4. DHCP servers for automatic internet address assignment were implemented on the beamline computer network. Visiting users can now plug in their computers and begin to work on their experiments without requesting network addresses. An automated network monitoring system and on-line computer registration system developed by BNL's Information Technology Division keeps track of the computers as they are attached to the network.

Awards and Other Recognition Total: 1

Ben-Zvi, I. Recipient, BNL Science and Technology Award for 2001.

Publications - in journals or major reports Total: 60

The above number refers to citations for work published by NSLS staff and reported in FY2001. It contains some reports that were published in a previous year but not reported as published until this fiscal year.

Our most accurate and comprehensive reporting of publications is contained in the annual Activity Report, which will not be available until later this calendar year. As a result, this list is not complete and is expected to increase after all citations are reviewed for completeness.

Talks and invited talks at Conferences and Workshops Total: 36 consisting of 24 Invited Talks and 12 Talks

Peer or Other Review Activity Total: 13

Patents or Disclosures Total: 2

Technical Review Committees Total: 4

Notes
FY 2001 was a very productive research year at the NSLS. Outstanding work in many areas of science continues. The NSLS remains the most frequented user facility in the world. In FY00, over 800 papers were published based on research at the NSLS and more than 1100 experiments were conducted. Details of these experiments and highlights are available in the annual NSLS Activity Reports.

1.1.2.3 Materials Sciences Department

Significant Achievements
Achievements prior to FY 2002 are addressed under the ES&T Department description

Significant Instrumentation Developments
Achievements prior to FY 2002 are addressed under the ES&T Department description.

Significant computer/software developments
Achievements prior to FY 2002 are addressed under the ES&T Department description.

Awards and Other Recognition
Achievements prior to FY 2002 are addressed under the ES&T Department description.

Publications - in journals or major reports
Achievements prior to FY 2002 are addressed under the ES&T Department description.

Talks and invited talks at Conferences and Workshops
Achievements prior to FY 2002 are addressed under the ES&T Department description.

Peer or Other Review Activity
Achievements prior to FY 2002 are addressed under the ES&T Department description.

Editorial Activity and major book articles
Achievements prior to FY 2002 are addressed under the ES&T Department description.

Patents or Disclosures
Achievements prior to FY 2002 are addressed under the ES&T Department description.

Technology Developments
Achievements prior to FY 2002 are addressed under the ES&T Department description.

Technical Review Committees
Achievements prior to FY 2002 are addressed under the ES&T Department description.

Notes
The Materials Science Department, within the Basic Energy Sciences Directorate, was created on October 1, 2001. Achievements prior to FY 2002 are addressed under the ES&T Department description.

1.1.3 Life Sciences

Accomplishments - Summary
The Medical and Biology Departments advanced the understanding of human health and biological structures in FY 2001 through the expansion of clinical research and the macromeolecular crystallography programs as well as many other related projects. The scientific staff published many papers, paticipated in a large number of conferences, and received several prestigious awards. Several initiatives were successful that will allow us to establish an animal MRI facility and a cryogenic electron microscopy capability in the next year.

Results for Life Sciences

Score (0~4.0)	Rating	Schedule Status
3.8	Outstanding	Not Applicable

Issues and Trends
Almost every category of evaluation showed improvement from FY 2000, particularly publications and awards. The review of the Life Sciences Program by an elite BSA-sponsored Visiting Committee in November 2000 was extremely positive and encouraging. Other reviews by DOE-SC were also supportive of the research being conducted and the intitiatives being pursued.

1.1.3.1 Biology Department

Significant Achievements Total: 15

1. As part of the Macromolecular Crystallography program, established an Automated Structure Determination Platform system for high-throughput in structural genomics (http://asdb.bnl.gov) and released to worldwide crystallography community.
2. Structural Genomics group achievements include the design of a suite of vectors to facilitate parallel, high-throughput cloning and expression of protein coding sequences, fusions to increase affinity, solubility or stability, and coexpression of different coding sequences in the same cell. Group is currently analyzing more than 100 yeast proteins.
3. Betsy Sutherland showed that DNA damage cluster induction is a one-radiation hit phenomenon and thus clusters can be induced at low radiation doses.
4. Swaminathan et al solved the three-dimensional crystal structures of Staphylococcal enterotoxin C2 and the outer surface protein C of the Lyme Spirochete (B. Burgdorferi).

5. Swaminathan et al have identified a novel mechanism for C. botulinum neurotoxin inhibition.
6. P. Freimuth et al deciphered the molecular-level interaction between coxsackievirus — which infects the heart, brain, pancreas, and other organs — and the human cell protein to which it attaches. This may lead to improved ways to thwart viral infections, and may help scientists design virus-based vehicles for gene therapy.
7. Shanklin etal have found a way to make a plant enzyme that is 100 times more efficient than similar enzymes found in nature.
8. DOE's Joint Genome Institute (JGI) released the draft gene sequence of the bacterium, known as Ralstonia metallidurans, which was deciphered by John Dunn and Geoffrey Hind in collaboration with scientists in Belgium and others at JGI. Understanding the genetic makeup of microbes that thrive in polluted environments may one day help scientists engineer bacteria that can clean contaminants from soil.
9. Mangel etal, while studying the germs that cause the Black Plague, plant infections, and colds discovered that these three very different microorganisms share a common strategy: They all prevent the cells they're attacking from calling out for help. Knowing how cells communicate with each other should allow the development of means to prevent communication, for example to prevent cancer cells from communicating with each other.
10. B. Sutherland etal showed that a UV-sensitive rice called Norin 1 (progenitor of many commercial important rice strains) has a mutation in the DNA repair enzyme photolyase, probably a structural mutation. From this information scientists could introduce the correct gene, thereby significantly increasing the productivity of this crop plant.
11. Initial efforts in the Center for the Structure of Complex Proteins have already led to the cloning and expression of seven integral membrane proteins and the crystallization of one integral membrane channel protein.
12. Anderson, etal completed and submitted 33 kbp segment of human gene (PRKDC) for the catalytic subunit (DNA-PKcs) of the DNA-activated protein kinase (Genbank AY030284). And has also completed the analysis of 5 human DNA-PKcs gene exons for polymorphisms in ~90 individuals; showed that two amino acid changes associated with breast cancer susceptibility in mice are not common in the human population. And collaborated with groups from the NIH and University of San Diego on the analysis of p53 protein phosphorylation sites in mice; showed that p53 Ser15 is critical for responses to DNA damage but Ser20 is not.
13. The Genome Group tested and formulated improved methodologies for sequencing difficult regions of the human genome by using the Nested Deletion Strategy. This is being used to help complete the sequence of the chromosomes being sequenced by the Joint Genome Institute. Nested deletions are being investigated for their possible advantages in sequencing highly repeated DNA, which can cause problems in sequencing human DNA.
14. Dunn etal has developed protocols for Serial Analysis of Gene Expression (SAGE) and Serial Analysis of Signature Tags (SAST) which allows for the validation of gene predictions as well as the identification of expressed regions that might be overlooked without experimental data.

15. Dunn etal have, in collaboration with SUNY SB, developed a second-generation chimeric recombinant OspA-base Lyme disease vaccine which is currently in the process of being commercialized.

Significant Instrumentation Developments Total: 6

1. Funds secured and an order has been placed for a CryoElectron Microscope to be used as part of the Center for the Structure of Complex Proteins.
2. Added a stopped-flow device to enhance the Circular Dichroism, fluorescence, and fluorescence polarization anistropy capabilities at the Ultraviolet Biophysics facilities.
3. The Macromolecular Crystallography program has used multilayer monochromators to get extraordinary intensity from a dipole beamline.
4. The Macromolecular Crystallography group has a novel project to extract phases directly by three-beam diffraction.
5. In the Genome group,a major improvement was the introduction of 96 well gel combs for sample spotting.
6. Funding was secured to upgrade the DNA sequencing facility capabilities by purchasing a ABI3100 capillary DNA sequencer.

Significant computer/software developments Total: 4

1. In our NSLS Macromolecular Crystallography program we have developed a computer/disk cluster to provide facility-wide computational power,
2. The Macromolecular Crystallography group service users worldwide and to better serve their customers has developed beamline-control software to allow control and observation around the world in a collaboratory environment.
3. The shared computing resource for crystallography data has grown to include a dozen units with a total of 26 processors.
4. Established an Automated Structure Determination Platform system for high-throughput in structural genomics (http://asdb.bnl.gov) and released to public.

Awards and Other Recognition Total: 9

1. Carl Anderson served on Board of Directors for National Space Biomedical Research Institute
2. Carl Anderson named Deputy Director for Center for Molecular Toxicology (USB-BNL)
3. F. William Studier named Co Director for Center for Molecular Toxicology (USB-BNL)
4. Michael Becker elected to the NSLS Users Executive Committee's Special Interest Group for Biological X-Ray Scattering and Crystallography
5. John Shanklin, Nathan Edward Tolbert Endowed Lectureship
6. Robert Sweet appointed to tenured staff
7. Paul Freimuth appointed to tenured staff.
8. Daniel van der Lelie elected Secretary of International Society of Trace Element Biochemistry
9. Elena Lymar recipient of Goldhaber Fellowship.

Publications - in journals or major reports Total: 79

Talks and invited talks at Conferences and Workshops Total: 70

Peer or Other Review Activity Total 63

Editorial Activity and major book articles Total: 20

Patents or Disclosures Total: 3

1. Patent Application, (2001) BSA 00-22, Method for Assaying Clustered DNA Damages; (Betsy M. Sutherland)
2. License was granted on two patents to Promega (Walter Mangel)
3. Patent application: "Facilitating protein folding and solubility by use of peptide extensions" (Paul Freimuth)

Technology Developments Total: 10

New FY01

1. Devised new methods for isolation of high molecular length DNA from many plant species.
2. Developed a second generation chimeric vaccine for Lyme Disease which is in the process of being commercialized.
3. Established an Automated Structure Determination Platform system for high-throughput in structural genomics (http://asdb.bnl.gov) and released to worldwide crystallography community.
4. Developed protocols for Serial Analysis of Gene Expression (SAGE) and Serial Analysis of Signature Tags (SAST) which allows for the validation of gene predictions as well as the identification of expressed regions that might be overlooked without experimental data.

Ongoing:

1. Use of Nested Deletion Strategy to Sequence Difficult Regions in Chromosomes.
2. A novel bacterial selection system has been developed which provides a rapid means of isolating novel fatty acid desaturase activities for modification of seed oil composition.
3. New antiviral therapy that is designed to prevent an organism from becoming resistant to certain drugs.
4. Development of a technique to measure damage clusters induced by ionizing radiation in genomic DNA.
5. Development of a system for high-throughput protein structure determination.
6. Development of analytical dispersion functions to relate the distance of migration (or mobility) of double stranded DNA moving through an electrophoretic gel with the size (or length, measured in base pairs) of the DNA molecules.

Technical Review Committees Total: 20

1. Carl Anderson, DOE Review Panel for Microbial Cell Program
3. Carl Anderson, Thesis Committee, SUNY SB Dept. Microbiology and Biochemistry
4. Walter Mangel, member qualifying exam committee, SUNY SB Dept of Pharmacology
5. Walter Mangel, Reviewer Biochemistry (4 papers) and Acta Crystallography D (1 paper)
6. Howard Robinson, Biological Sciences Study Curriculum participant to produce high school crystallography educational package (NIH Funded)

8. Richard Setlow, Reviewer Cancer Research, Biochimica Biophysica Acta, Photochemistry and Photobiology, J. Molecular Biology, PNAS USA, BNL Site Environmental Report
9. F. William Studier, Scientific Advisory Board of the Institute for Molecular Biotechnology, Jena Germany
10. F. William Studier, Scientific Advisory Board of Structural GenomiX, California
11. Betsy Sutherland, Chair BNL Scientific Advisory Committee for Radiobiology
12. Betsy Sutherland, Member National Scientific Advisory Panel For American Foundation for Aging Research
13. S. Swaminathan, Thesis Committee, SUNY SB Dept. Physiology and Biophysics
14. Robert Sweet, Member Advisory Committee for MacCHESS
15. Swaminathan reviewer JBC, Biophy. Biochim. Acta, Acta Crystallographica
16. Robert Sweet, Member NASA Iterative Biological Crystallization Project
17. Swaminathan, Review Wellcome Trust Foundation, UK
18. Anderson, C. participated in the mock site review for renewal of the NSBRI contract with NASA, December 2000.
19. Anderson, C. reviewed research grants for Medical Research Council (U.K.), Yorkshire Cancer Board (U.K.), and Canadian Cancer Board.
20. Anderson, C. reviewer for J. Biol. Chem., EMBO J., Molec. Cell. Biol., J. Mol. Biol.,J. Cell Sci., Gene, FASEB J.

1.1.3.2 Medical Department

Significant Achievements Total: 25

MR:
- Expansion of clinical research activities, including initiation of six IRB-approved protocols.
- Developed quantitative proton magnetic resonance spectroscopy for 4T MRI scanner.
- Developed echo planar imaging (EPI) for functional MRI studies on 4T MRI scanner.
- Recruitment of H. Benveniste to lead the start-up of a micro-MR facility at BNL.
- Patent awarded for "Automatic Scan Prescription for Tomographic Imaging.

MEDICAL PHYSICS:
- Initiation of new DOE project in Biomedical Engineering, entitled "Imaging the Awake Brain". DOE funds of $4.3m over next 3 years to support collaboration among BNL (5 departments), SUNY-SB and LBL. Project head is T. Ernst.
- Continued research of Microbeam Radiation Therapy (MRT), including application for funds to DOE, Office of SCience and NIH. Funding decisions pending.

PET:
- Instalation of microPET instrument and commencement of research activities.
- Expanded clinical research of obesity
- Significant contributions to clinical research on addiction, including substance abuse, evidenced by over 30 papers.

PET Radiotracer Program:
- Evaluation of in vitro and in vivo binding of the cannabinoid radiotracer, [131I]AM22332)
- Characterization of in vivo binding of the D1 radiotracer, [3H]A690243)

- Development of a modified nuclease protection assay to measure hybridization of peptide nucleic acid antisense probes to target mRNA

RADIOBIOLOGY:
- Continued to participate in, and serve as Scientific Liasion, to the NASA/ AGS run (held January 2001) (Vazquez)
- Participate in the National Space Biomedical Research Institute (NSBRI) and serve as BNL Point of Contact (Vazquez, Gatley).
- Initiate research using NSLS and HIMAC (Japan) under LDRD project entitled "Gene Expression Profiling of Methamphetamine-induced Toxicity in Neurons in Culture using DNA Microarrays" (Vazquez)
- Secure new funds from NSBRI for two proposals - annual funds of ~ $500K to Medical Dept. (Vazquez)
- Invention Disclosure submitted for 2 patents (Pena)

RADIOISOTOPE PROGRAM:
- Continue efforts towards a 70 MeV Cyclotron Facility at BNL, including preparation of materials to local politicians and Federal elected officials (Srivastava, Mausner)
- Completed development of new method of production of Paladium-103 for brachytherapy (Mausner, Kolsky).
- Successful synthesis and characterization of a new 1:1 tin 117m stannic DTPA chelate (Srivastava).
- Development of 95m-Tc as a long-lived tracer for Tc and Co-57 for Co (Kolsky).
- Assume responsibility for American Chemical Society (ACS) Summer School Program (Kolsky).
- Secure funding and initiate Phase 2 IPP project (Kolsky).
- Patent awarded "Radiopharmaceutical stannic Sn-117m chelate composition and methods of use (Srivastava, Meinken)

Significant Instrumentation Developments Total: 4
- Upgrade of 4T MRI scanner (EPI gradient upgrade).
- Installation of microPET instrument.
- Completed quantitation overhaul of PET data processing activities.
- Completed instalation of Animal Facility Tunnel Washer to improve operating efficiency (GPE funded). - Completed instalation of Animal Facility bedding grinder to reduce waste disposal efforts and costs (P2 funded).

Awards and Other Recognition Total: 5
L. Chang - elected to the Board of Trustees for the International Society of Magnetic Resonance in Medicine (ISMRM); only one Clinician is elected from North America each year from among 5000 members
N. Volkow - U.S. News Magazine's "Innovator of the Year", 2000.
N. Volkow - NYS Senate's "Woman of Distinction" Award, 2001·
N. Volkow - Council member NARSAD, 2001·
N. Volkow -Institute of Medicine of the National Academy of Sciences, 2000

Publications - in journals or major reports Total: 125
125 articles have been published and or submitted to peer-reviewed journals during FY 2001.

Talks and invited talks at Conferences and Workshops Total: 132

Peer or Other Review Activity
The following Medical Dept. staff members participated in NIH Review Panels during FY 2001:
Chang, Gatley

Editorial Activity and major book articles Total: 14
MR - Total: 5
Chang: Reviewer for Journals: Neurology, Journal of Magnetic Resonance in Medicine, Archives of Neurology, Psychopharmacology, Psychiatry Research: Neuroimaging Section

PET Radiotracer Dev., - Total 4
Gatley: Manuscript reviewer for: Nuclear Medicine and Biology; Journal of Nuclear Medicine; Synapse; Journal of Pharmacology and Experimental Therapeutics; Neuropharmacology; Journal of Medicinal Chemistry

Radiobiology, Total #1
Pena: Editorial Board, Journal Of Neuroscience Research (Elsevier)

Radioisotopes, Total #4
Srivastava: Editorial Board: Bioconjugate Chemistry; ALASBMN Journal; Rev. Esp. Nucl. Medicine Reviewer of NIH supported NCRR GCRC Programs, 2001

Patents or Disclosures Total: 7
Awarded:
Ernst, Itti, Chang "Automatic Scan Prescription for Tomographic Imaging", (US Patent # 6,195,409)
S.C. Srivastava and G.E. Meinken. Radiopharmaceutical stannic Sn-117m chelate compositions and methods of use. U.S. Patent #6,231,832; May 15, 2001.
P. Vaska. Radiation-Based Imaging System Employing Virtual Light-Responsive Elements (owned by ADAC Laboratories, Inc.)awarded U.S. Patent no. 6,169,285 on 1/2/01:
Pending:
S.C. Srivastava, Z. Li and G.E. Meinken. Stable low-DTPA Sn-117m stannic chelates for radionuclide therapy
S.C. Srivastava, Z. Li and G.E. Meinken. A 1:1 tin-117m DTPA chelate

Submitted:
Peña L.A., Zamora P.O.: A class of synthetic cytokine analogs for surface coatings of medical devices. Invention Disclosure, October 12, 2001.
Peña L.A., Glass J.D.: A class of synthetic analogs for heparin-binding growth factor / cytokines. Invention Disclosure, October, 2001.

Technical Review Committees Total: 28

During FY 2001, Medical Department staff participated in a total of 28Technical Review Committees.

1.1.4 Energy, Environment & National Security

Accomplishments - Summary
EENS research programs and scientific staff have made a number of significant accomplishments which are detailed in Departmental Summary Evaluations. Particularly noteworthy scientific and technological accomplishments include: The atmospheric sciences program was recognized for its leadership role in the successfully completed Houston 2000 Air Quality Study, in the Atmospheric Radiation Measurements (ARM) program, and in the Free Air Carbon Enrichment Studies; the PFT tracer technology was successfully deployed to facilitate the characterization of BGRR environmental impacts; Energy research programs continue to be recognized for outstanding contributions in geothermal areas (R&D 100 Award), advanced oil heat technologies (ER-100 Award, NORA program, NYSERDA), superconductivity and advanced battery technology developments, and nuclear energy research.

Results for Energy, Environment & National Security

Score (0~4.0)	Rating	Schedule Status
3.5	Excellent	Not Applicable

1.1.4.1 Environmental Sciences

Significant Achievements Total: 5
Environmental Sciences' major achievements included: completing the Houston 2000 Air Quality Study (DOE), producing the first global survey of marine atmosphere aerosols from surface observations (DOE/NASA), producing the first DOE ARM site wide heating calculations from large-scale solar radiation measurements, discovering that soil fertility limits carbon sequestration by forests growing in carbon dioxide enriched atmosphere, and completion of the perfluorocarbon tracer deployment at BNL's Boron Graphite Research Reactor.

Significant Instrumentation Developments Total: 2
A cooled lens for the single particle laser-mass spectrometer (D. Imre) and an infrared sea surface skin temperature sensor (M. Reynolds) were developed.

Awards and Other Recognition Total: 1
BNL's Environmental Sciences Department was ranked among the top five major institutions worldwide in terms of the impact of its environmental research, according to a study completed by The Guardian, a British newspaper.

Publications - in journals or major reports Total: 84
Environmental Sciences staff reported their work in the following manner: 68 peer reviewed articles, 7 book chapters, 9 formal reports and 38 abstracts(not counted in total publications)for presentations at national meetings.

Talks and invited talks at Conferences and Workshops Total: 62

TALKS AND INVITED TALKS AT CONFERENCES AND WORKSHOPS: 62

Peer or Other Review Activity
Peer-reviewed 8 articles.

Editorial Activity and major book articles Total: 4
Environmental Sciences had 4 Editorial Reviewers; one major book chapter. Reviewers: S. Schwartz, Tellus; Y. Liu, Applied Optics; R. McGraw, J. Phys. Chem.; D. Ellsworth, Tree Physiology; Global Change Biology; New Phytologist; Oecologia; Plant Cell & Environment.

Patents or Disclosures Total: 1
Environmental Sciences submitted one patent entitled 'Condensational Growth and Impaction of Aerosol Particles Into a Liquid Stream for Continuous On-line Particle Chemical Composition' Inventors are Y. Lee and R. Weber.

Technology Developments Total: 2
Developing a device based on inelastic neutron scattering to measure carbon content of soil.
Continuing development of techniques to grow, manipulate and analyze small (100 nm)aerosol particles.
BNL licensed the department's mercury-waste treatment technology to Newmont Mining Corporation, the largest gold producer in North America. The technology chemically stabilizes and solidifies liquid elemental mercury, a byproduct of gold mining, to safely isolate the material from the environment.

1.1.4.2 Energy Sciences and Technology

Significant Achievements
• Initiate new NEPO Program on human factors
• LDRD award for liquid fuel reformers in fuel cells
• LDRD award for methods for assessing electric grid vulnerabilities
• Received first program award from NORA (National Oil Research Alliance)

Significant computer/software developments
• Monitored and provided oversight for acceptance tests for power plant simulators at Kola Unit 4, Balakova Unit 4 and South Unkraine Unit 3

Awards and Other Recognition
Dr. James McBreen was named a fellow of the American Chemical Society.
Dr. Radoslav Adzic was given tenure for his research in electrochemistry.
Dr. Martia Berndt received the Crosby Field Award for the best paper presented before the American Society for Heating, Refrigeration, and Air Conditioning Engineers in 2000.
Dr. Mow Lin received an R&D 100 award for his reseach on sillicates from geothermal wells.
Dr. Devinder Mahajan was named to the Methane Hydrate Advisory Committee by Secretary Abraham.
Dr. Tom Butcher recieved an ER-100 award for his work on the flame quality indicator.

Publications - in journals or major reports
122 publications

Talks and invited talks at Conferences and Workshops
Six invited talks

Peer or Other Review Activity

Three staff members participated on the Nuclear Energy Research Initiative review for USDOE. One staff member served on the Nuclear Plant Optimization review for USDOE.

Editorial Activity and major book articles
Editorial Activity, two major book chapters.

Patents or Disclosures
Four patents issued, seven patent applications filed, approximately six record of inventions filed.

Technical Review Committees
Dr. David Welch served as a reviewer for DOE's Office of Energy Efficiency on their superconductivity program. Dr. David Diamond served as referee for DOE NEER program. Dr. Devinder Mahajan was named to and selected as chair of the Methane Hydrates Advisory Committee.

Notes
Overall, the department is doing well across its divisions. The nuclear divisions continue to increase their funding levels, with significant new programs in non-power reactors. Our energy efficiency programs continue to win awards. We have increased our active programs with NYSERDA to five including a new program in biodiesel fuel. As part of our regional energy strategy, we have assisted New York State in the development of an energy efficiency program for the Mohawk Valley and the Long Island region in developing a study to assess the potential of off-shore wind power.

Issues and Trends
The movement of the Materials and Chemical Sciences division to the BES directorate will significantly decrease the number of journal papers published by the department. We will need to address this in our strategic and operational plans for next year.

1.1.4.3 Nonproliferation and National Security

Significant Achievements
• Issued final report (Report # ISPO-446) on "Mathematical Models for Safeguards Implementation Parameters", used by the US SAGSI representative for discussion on IAEA Integrated Safeguards.

• Prepared draft report on "Inspection Randomization and Integrated Safeguards: Some Questions and Answers", prepared for the IAEA SAGSI Working Group.

• BNL has a lead technical role in developing the transparency arrangements for the US/Russia HEU Purchase Agreement. Under this Agreement, 500 metric tons of highly enriched uranium from Russian nuclear weapons is being blended down to low-enriched uranium for peaceful use in nuclear reactors.

• Assistance to DOE/NN-44 on implementation of the US/IAEA Additional Protocol to the US/IAEA Safeguards Agreement is essential to gaining ratification of similar Protocols by non-nuclear weapons states, thereby strengthening IAEA safeguards and the non-proliferation regime worldwide.

• At the request of the DOE and the Department of State, performed analyses of IAEA Integrated

Safeguards approaches for fuel-cycle facilities and for specific countries as a whole.

• BNL continued as DOE's lead laboratory for technical support on the Fissile Material Cutoff Treaty (FMCT). BNL completed and distributed the BNL Report SAC-00-11 entitled, "A Review of the Status of the Fissile Material Cutoff Treaty from the Perspective of the Department Of Energy". This report provides a summary of the U.S. approach to the FMCT, identifies a number of unresolved issues, and provides recommendations for next steps that could usefully be taken by DOE.

• BNL staff participated in the integrated DOE/DoD technology development plan which coordinates the efforts made by DOE labs on several international initiatives, including START III and beyond, Trilateral Agreement, Mayak Fissile Material Storage Facility, and Plutonium Production Reactor Agreement. BNL leads a task on recommending scenarios for the use of radiation templates in monitoring arms control agreements or warhead dismantlement. A working group meeting on template applications involving six DOE labs and DTRA was hosted at BNL, and a draft report is being circulated and edited.

• A BNL scientist presented an invited talk on gamma ray signatures of nuclear weapons and components at the US-UK Workshop on Arms Control Verification and Monitoring.

• Two papers were presented at the Institute of Nuclear Materials Management Annual Meeting, concerning the use of templates in arms control monitoring and outlining the lessons learned from the Controlled Intrusiveness Verification Technology project, which was noted by other speakers as “ahead of its time”.

• A contract was signed with the All-Russian Research Institute of Automatics (VNIIA) to design a Russian version of the BNL CIVET system for warhead transparency, and progress on this work is being monitored.

• NNS staff reviewed and evaluated the research projects carried out by the BNL Instrumentation Division, Biology Department, and Materials and Chemical Sciences Division for potential national security significance; published three reports on the results of these reviews. Surveys of research projects in the Environmental Sciences Department and the Accelerator Test Facility are in progress.

• Under Laboratory-Directed Research and Development funding, we are developing a new concept in high-sensitivity mass spectrometry. The approach uses the concept of coded apertures to create multiple ion beams that are mathematically combined to generate a stronger signal than that obtainable with individual slit apertures.

• BNL has maintained a key technical role in transferring technologies and methods for upgrading materials protection, control and accounting (MPC&A) of weapons-usable nuclear materials at Russian facilities:

• Technologies transferred under the MPC&A Program include the development and implementation of comprehensive physical inventory-taking statistical sampling plans,

measurement requirements and performance procedures, and the use of measurement control techniques. The transfer of these technologies has provided unprecedented access to the largest of the Russian production facilities as well as to Russian nuclear research facilities.

• Our activities involve direct interaction and collaboration with Russian technical specialists. A significant recent achievement, conducted with BNL oversight, was the successful completion of a material balance for the production of fuel assemblies for the BOR-60 fast reactor at the Research Institute for Atomic Reactors (RIAR) in Dimitrovgrad, Russia.

• BNL continues to play a major role in the Nuclear Materials Conversion and Consolidation (MCC) project, which is an important component of the MPC&A program. Current MCC activities are underway at the Luch and Dmitrovgrad facilities in Russia. A critical goal of the MCC project is to reduce the number of sites and buildings that contain weapons-usable nuclear material, as well as to reduce the attractiveness of existing highly enriched uranium by downblending it to low enriched uranium.

• BNL is leading an evaluation effort to ensure that the most appropriate and sustainable equipment is used in the MPC&A Program in Russia. During this fiscal year, BNL was instrumental in identifying, researching and evaluating potential Russian MPC&A equipment vendors who might be able to help Russia sustain the MPC&A upgrades for the long term. Under this project, revision 2 of the report entitled “An In-Depth Market Research Survey of MPC&A Suppliers in the Russian Federation” was published. A catalog of MC&A equipment, published jointly by BNL and the Research Institute of Automatics (VNIIA), Russia, was placed on the MPC&A website. This catalog is now widely used as a reference for selecting destructive and non-destructive assay equipment, as well as measurement capabilities and methodologies. BNL was instrumental in establishing and supporting a MINATOM MC&A Equipment and Methodological Support Working Group responsible for implementing modern equipment and methodologies within the MINATOM complex.

• A BNL scientist continues as chair of the "Technical Survey Team" (TST), a group of experts which provides top-level, objective, technical review, strategic and program-related advice and recommendations to DOE/HQ on all projects under the MPC&A Program.

• A BNL staff member was appointed lead of the MPC&A Awareness Project. Under this project, BNL hosted a workshop in Russia to discuss a Russian MPC&A Awareness Program and to initiate the design of an Awareness Training Module. Workshop participants included staff from the Russian Navy, the Kurchatov Institute, two MINATOM training facilities, and the Moscow State Engineering Physics Institute.

• A BNL staff member was appointed as Program/Operations Manager for a subset of the MPC&A Civilian sites (consisting of eight facilities in Russia).

• A BNL staff member was appointed lead of the MPC&A Operations Monitoring Project. Under this new activity BNL will design, construct and install a system to monitor MPC&A systems at the Russian Sites to ensure that they continue to detect, delay, and respond to attempts to divert nuclear material. The Moscow State Engineering Physics Institute was selected as the first

facility to have this system installed.

• Another new project was also initiated in which BNL has the lead role. Under this project, BNL will develop an approach to calculate relative risk reduction as a function of the various upgrade activities completed under the sponsorship of the MPC&A Program.

• BNL was tasked with the responsibility for managing all of the contracting activities associated with the MPC&A upgrades at the Siberian Chemical Combine (Tomsk-7), one of the largest and most complex Russian nuclear enterprises.

• BNL made substantial contributions under the MPC&A Regulatory Project in assisting Russia's MINATOM and Gosatomnadzor in the development of a regulatory framework for implementing the improved and more comprehensive nuclear materials safeguards.

• BNL staff has developed the framework for a site-specific sustainability effort on optimizing physical inventory taking (PITs). This effort will result in a guidance-level directive which will help standardize threat analysis, statistical sampling, measurement accuracy, and other related techniques employed during the planning and conducting of PITs.

• BNL staff have assisted in the reorientation of the MPC&A program plan for the Mining and Chemical Combine (K-26) site. In addition to existing tasks, BNL staff proposed new activities, as well as assuming responsibility for radio communications and TIDs.

• BNL continues to enhance Russian Ministry of Defence radiation safety program for management of radioactive wastes generated by submarine dismantlement program.

• BNL completed the upgrade and participated in the official opening of the Murmansk Low-Level Radioactive Waste Treatment Plant, Murmansk, Russia.

• Research started in support of the Department of Transportation/ FAA's aircraft electrical wire aging program. NNSD has been awarded a competitive grant through the BAA process to conduct an investigation into the mechanisms of polymer degradation over time. This will include experimental investigations of the usefulness of tera hertz reflectometry that could lead to the development of new measurement technology for use in aircraft inspection. The Lab is partnered with United Airlines and Airbus on this multi year effort.

• Green Buildings - Energy efficiency and environmental technologies that can be implemented in urban high-rise buildings are being investigated with the objective of developing a set of science based performance indicators. This is to the be applied at Battery Park City.

Significant Instrumentation Developments

• Under Laboratory-Directed Research and Development funding, we are developing a new concept in high-sensitivity mass spectrometry. The approach uses the concept of coded apertures to create multiple ion beams that are mathematically combined to generate a stronger signal than that obtainable with individual slit apertures.

• ISPO/BNL has fostered the development of a new, unique method for enhancing the sensitivity

of thermal ionization mass spectrometers (TIMS). The project, which is nearing completion, will improve ionization efficiencies by an order of magnitude, making it possible to measure femtogram quantities of U and Pu for the first time. This represents one of the most significant advances in TIMS in the past 50 years.

• Through a privately funded R&D program an instrument to locate ferrous underground water and gas pipes, their diameters and their joints to an accuracy of a few cms has been developed. A commercial model is now under development at the Lab and a licensing application is being pursued.

• Funded through an LDRD the labs Smart Cities program developed a concept of use of a laser interferometer to remotely measure structural distortion in bridges and complex long span supports. Recent discussions with NYC Dept of Environmental Protection has raised another use in the real time internal inspection of damaged water mains.

• A precision navigation system for mapping GIS type information in 2 dimensions is under development. It is hoped that this work will lead to a future 3d unit.

Publications - in journals or major reports
Number Submitted: 17, Number Awarded/Published: 13

Talks and invited talks at Conferences and Workshops
17

Peer or Other Review Activity Total: 2
Member of a DOE Panel that prepared "Report of the Independent Review Panel on – Final Report of the ATRP-R Project Environmental Security Implications of Decommissioned Russian Nuclear Submarines, Including Dismantlement; Feasibility Study" US Department of Energy, Center for Risk Excellence, February 2001.

Contributor to a DOE and STATE Dept. report on "Environmental Security Threats from Russian Marine Nuclear Reactors, Waste, and Contamination," Prepared for the U.S. Congress Pursuant to U.S. Public Law 106-255, Cross-Border Cooperation and Environmental Safety in Northern Europe, US Department of State, Washington, DC, February 2001.

Editorial Activity and major book articles Total: 1
INMM Associate Editor

Patents or Disclosures
Number Submitted: 6 Number Awarded/Published; awaiting outcome

Technology Developments
BNL is negotiating with a small business to design, build and run a grid based 1.5 to 2 megawatt photo voltaic electric power generation system on a BNL capped land fill. This grew out of DOE's Bright Fields Program.

Technical Review Committees
1 MPC & A technical survey team, 15 BNL and professional society committees

Issues and Trends
- Transparency Integrated Technology Plan.

- Plan for Warhead dismantlement and SNM transparency is proposing technology and approaches to rectify these deficiencies.
- AMEC program facing sunset in FY 2002.
- Antiterrorism program launched in FY 2001.

1.2 Relevance to DOE Missions and National Needs

Results for Relevance to DOE Missions and National Needs

Score (0~4.0)	Rating	Schedule Status
3.57	Outstanding	Not Applicable

1.2.1 High Energy and Nuclear Physics

Accomplishments - Summary

All research programs in the Physics/Chemistry Departments have been reviewed by the DOE NP Division and all are aligned with and support DOE NP Program goals. BNL NP activities include: Nuclear Theory; 4 RHIC Experiments (BRAHMS; Phobos; STAR; PHENIX); RHIC Computing Facility; RHIC Spin; LEGS; Hypernuclear Physics.

Results for High Energy and Nuclear Physics

Score (0~4.0)	Rating	Schedule Status
3.4	Excellent	Not Applicable

Notes

The topics studied in the BNL HENP Program are strongly based in basic research and the applications outcomes for industrial application are not a primary focus of the work. Still, the need for beyond-the-state-of-the-art technology in electronics and computing has resulted in past periods in developments in these areas that are transferred to other scientific and technology sectors. A recent example of such technology transfer is the conept of the world wide web, a development that was made in High Energy Physics at CERN. A more recent example is the co-development at IBM and Columbia University, with BNL participation, of a next-generation computing development, the "computer on a chip" that is planned to be first applied in the lattice gauge computing program at BNL and Riken BNL Research Center and that will later become a commercial IBM computing product of great applicability due to its high speed and very low power consumption.

Issues and Trends

The trendline in application of basic research achievements to commercial and industrial applications is sporatic and is not a reliable indicator of future direction.

Assumptions

The BNL HENP Program is not based on the assumption of commercial and industrial applications being a planned outcome. If such applications occur, it will be a desirable result but can't be reliably counted upon.

1.2.1.1 Collider Accelerator Department

Contribution to DOE Sci and Tech Program for Major Programs Total: 8
KEK (Japan) high intensity proton synchrotron systems
TRIUMF (Canada),
KEK (Japan) polarized proton H-minus source
BINP (Novosibirsk-Russia) EBIS ion source electron gun
BINP (Novosibirsk-Russia) RHIC electron cooling
University of Pennsylvania RCMS (Rapid Cycling Medical Synchrotron)
Facility operations of RHIC (NP), AGS (NP,HEP,BES,NNSA), Linac (NP,HEP,BES,NE,NNSA), Tandem (NP) (NP=Nuclear Physics; HEP=High Energy Physics; BES=Basic Energy Science; NNSA = National Nuclear Security Administration; NE=Nuclear Energy
CERN (Switzerland) Collider Beam Dynamics

FWPs submitted to DOE Total: 5
Number of FWPs – 5

Non-DOE Funded Programs That Connect To DOE Total: 3
• NASA radiobiology at AGS and BAF (construction)
• RCMS (Pennsylvania) medical synchrotron (funding pending)
• NSF high energy physics RSVP experiments (R&D funding, construction funds pending)

Collaborations with Other Laboratories or Universities Total: 7
KEK (Japan) high intensity proton synchrotron systems
TRIUMF(Canada), KEK (Japan) polarized proton H-minus source
BINP (Novosibirsk-Russia) EBIS ion source electron gun
BINP (Novosibirsk-Russia) RHIC electron cooling
University of Pennsylvania RCMS (Rapid Cycling Medical Synchrotron)
ORNL, ANL, LANL, LBNL, TJNAF on SNS Project
CERN (Switzerland) Collider Beam Dynamics

Service Activity for DOE Program and/or Nat'l/Regional level Total: 8
Review committees at FNAL, SLAC, CERN, ORNL, NSCL, TJNAF
US/Japan HENP Committee
US/Russia Joint Coordinating Committee on Fundamental Properties of Matter

1.2.1.2 Physics Department

Contribution to DOE Sci and Tech Program for Major Programs
HEP Everything aligned with core DOE efforts ATLAS, D0, Theory, Kaons, MINOS, Muon Collider. Lead role in U.S. ATLAS project and U.S. ATLAS Computing effort. NP Everything aligned with core DOE efforts RHIC Experiments, RHIC Computer Facility, RHIC Spin, LEGS, Hypernuclear Physics. Responsibility for RHIC Detector Operations and RHIC Computing Facility CM There are continuing efforts underway to focus on Nanoscience, materials growth, and soft matter, to strengthen the theory group, and to improve communication with the DOE program office.

FWPs submitted to DOE Total: 19
Number of FWPs submitted: Total 19 (HEP 8, NP 5, CM 6)

Non-DOE Funded Programs That Connect To DOE
RIKEN BNL Research Center

Collaborations with Other Laboratories or Universities
Many labs. And hundreds of universities all over the world

Service Activity for DOE Program and/or Nat'l/Regional level Total: 35
Total 35 (HEP 4, NP 30, CM 1)

Program Development for DOE
Muon Collider, RHIC II, eRHIC, ATLAS Computing, Teraflop Computer, Detector Development for RHIC experiment upgrades

1.2.1.3 Instrumentation Division

Contribution to DOE Sci and Tech Program for Major Programs
All efforts in our five core technology areas (semiconductor detectors, gas & liquid detectors, microelectronics, lasers and optics, micro/nano fabrication) are aligned with CORE DOE programs. We have made significant instrumentation technology developments in support of research in every scientific department at BNL, and in other DOE Laboratories, as well as in numerous universities. Our work has received very positive reviews by DOE program offices and by the BSA Science and Technology Committee.

FWPs submitted to DOE Total: 5
IO-003, KP-11-01-01-0 "Radiation Instrument Development" (G. Smith)
IO-004, KC-02-04-01-1 "Optics Systems for Synchrotron Radiation Applications" (P. Takacs)
IO-005, KA-04-03-02-0 "Detector & Electronics Research and Development Program for High Energy Physics" (Z. Li/P. O'Connor/P. Rehak)
IO-006, KB-02-01-00-0 "Detector & Electronics Research & Development Program for Nuclear Physics" (Z. Li/P. O'Connor/P. Rehak)
IO-007, KC-02-04-01-1, Optics & Detectors for Light Sources, P.I.: G. Smith/P. Takacs

Non-DOE Funded Programs That Connect To DOE
NSBRI (National Space Biomedical Research Institute): "Heavy Ion Microbeam and Micron Resolution Detector"

CRADA Total: 5
CRADA: Brookhaven Technology Group (BTG):Pulsed Electron Beam(T. Srinivasan-Rao)
CRADA: Symbol Technologies (P. O'Connor)
CRADA: Ocean Optics (P. Takacs)
CRADA: Advanced Energy Systems (T. Srinivasan-Rao)
CRADA: eV Products:eV Systems (P. O'Connor)

Collaborations with Other Laboratories or Universities Total: 17
Labs: FNAL, LANL, LBL, ANL, SLAC, ORNL, NIST, LAL Orsay, CERN, SANDIA

Universities: Columbia (NEVIS), Milan Poly, SUNY, Wayne State, Pittsburgh, Johns Hopkins, Princeton

Service Activity for DOE Program and/or Nat'l/Regional level
Provide reviewers for the SBIR program

Program Development for DOE

Nano Science Program, Nano Fabrication Facility Design. RHIC Detector R&D Program Development

1.2.1.4 Superconducting Magnet Division

Contribution to DOE Sci and Tech Program for Major Programs Total: 4
Spare magnets for RHIC Helical magnets for RHIC Spin Program Magnets and superconductor testing for LHC ATLAS Detector for LHC Superconducting Magnet R&D for future facilities

Non-DOE Funded Programs That Connect To DOE Total: 3
Neutrino factory storage ring magnet R&D (LDRD) High field NMR (LDRD) GSI rapid cycling magnet R&D (LDRD)

Collaborations with Other Laboratories or Universities Total: 11
GSI - rapid cycling superconducting magnets
LANL - large aperature quadrupole magnets for AHF Project
ORNL - testing of SNS magnets
FNAL - LHC superconducting magnets and superconductor testing
LBL - LHC superconductor testing
CERN - LHC superconducting magnets and superconductor testing; ATLAS detector
DESY - HERA luminosity upgrade magnets
IHEP - BEPC-II magnets
USPAS - courses on superconducting accelerator magnets (2)

Service Activity for DOE Program and/or Nat'l/Regional level
Review committees at FNAL, ORNL, CERN HENP SciDAC IHEP BEPC-II

Program Development for DOE Total: 4

NEUTRINO FACTORY AND MUON COLLIDER ERHIC NEUTRINO FACTORY AT BNL VLHC

1.2.2 Basic Energy Sciences

Accomplishments - Summary
The BES FWPs submitted to DOE total slightly more than 50 and are evenly distributed among the four DOE science and technology areas. The Gas-Phase Chemical Dynamics program was realigned to support the DOE combustion emphasis through the successful implementation of a realigned to support the DOE combustion emphasis through the successful implementation of a radical kinetics program. New initiatives were developed in nanoscience related to charge transfer and catalysis. The NSLS provides a reliable and versatile tool for experimenters throughout the world for many areas of science and technology. The NSLS contributes to the industrial competitiveness of the U.S. economy – there are 72 industrial firms conducting research there. In fact, over 430 institutions (mostly universities) conducted research at the NSLS in FY2001.

Results for Basic Energy Sciences

Score (0~4.0)	Rating	Schedule Status
3.7	Outstanding	Not Applicable

1.2.2.1 Chemistry Department

Contribution to DOE Sci and Tech Program for Major Programs Total: 32

Fuel the Future: 6 FWPs
Photo and Radiation Chemistry: 1
Chemical Energy: 1
Chemical Physics: 3
Materials Chemistry: 1

Protect Our Living Planet: 9 FWPs
Photo and Radiation Chemistry: 1
Chemical Energy: 1
Chemical Physics: 3
Materials Chemistry: 1
MRI Imaging: 1
Radiotracer/Neuroimaging: 2

Explore Matter and Energy: 7 FWPs
Photo and Radiation Chemistry: 1
Chemical Energy: 1
Chemical Physics: 3
Materials Chemistry: 1
Nuclear Physics: 1

Provide Extraordinary Tools for Extraordinary Science: 10 FWPs
Photo and Radiation Chemistry: 1
Chemical Energy: 1
Chemical Physics: 3
Materials Chemistry: 1
MRI Imaging: 1
Radiotracer/Neuroimaging: 2
Nuclear Physics: 1

FWPs submitted to DOE Total: 10

Number of FWP's submitted to DOE by the department 10 FWPs: Photo and Radiation Chemistry 1, Chemical Energy 1, Chemical Physics 3, Materials Chemistry 1, MRI Imaging 1, Radiotracer/Neuroimaging 2, Nuclear Physics 1

Collaborations with Other Laboratories or Universities Total: 118

Total: BES 92
BER 21
HENP 5

Notable collaborations:
HERMES Neutron Detector Project: Materials Chemistry (Larese), Center for Neutron Science (BNL), LANSCE (Los Alamos National Laboratory)
GALLEX: BNL Nuclear Chemistry (Hahn), Gallium Neutrino Observatory (Italy)

Solar Neutrino Observations: BNL Nuclear Chemistry (Hahn), Sudbury Neutrino Observatory (Sudbury, Ontario)
PHOBOS Detector Project: BNL Chemistry, Argonne National Laboratory, Institute of Nuclear Physics, Krakow; Jagellonian University, Krakow; Massachusetts Institute of Technology; National Central University, Taiwan; University of Rochester; University of Illinois at Chicago; University of Maryland.
BNL Gas-Phase Molecular Dynamics/SUNY-Stony Brook joint-hire (A. Suits)
BNL Photo-Induced Molecular Dynamics/SUNY-Stony Brook joint-hire (M. White)
BNL Center for Neuroimaging: Radiotracer Chemistry and Neuroimaging, High-Field MRI Imaging, BNL Medical Department

Notes
Basis of Score
1. Alignment of Gas-Phase Chemical Dynamics program along DOE combustion emphasis through the successful implementation of a new radical-radical kinetics program 2. Strong technical connection to BNL DUV-FEL project through L. DiMauro's ultra-fast laser program 3. Improvements in performance of LEAF facility which is a major new capability in the DOE Chemical Sciences program 4. Developed new initiatives in nanoscience for all Chemistry-BES programs which is a major thrust area for DOE. 5. Encouragement from DOE to pursue current STM imaging work in catalysis group 6. Developing protype of low-energy solar neutrino detector within the LENS collaboration.

1.2.2.2 National Synchrotron Light Source

Contribution to DOE Sci and Tech Program for Major Programs
The NSLS provides a reliable and versatile tool for experimenters throughout the world for many areas of Science and Technology, including Chemical Sciences, Materials Sciences, Life Sciences, Geosciences and ecology, Applied Sciences, Engineering, Atomic Physics, Medicine and Nuclear Physics.

The NSLS also contributes to the industrial competiveness of the U.S. Economy. There are 72 industrial firms conducting research at NSLS, including representatives from the automotive, chemical, communications, petroleum, and pharmaceutical industries.

Work at the NSLS, ATF, and SDL contributes significantly to the DOE's program of short wavelength Free Electron Laser (FEL) technology development.

FWPs submitted to DOE Total: 7
The NSLS Department submitted 7 FWPs requesting funding from DOE during FY 2001. These requests were for support for:

NSLS Operations & Development
ATF Operations & Development
Inverse Free Electron Development
X-ray Free Electron Laser R&D Program
Precision Photo-Fabrication R&D
Neutron Instrument Development & User Support

Accelerator Physics R&D Towards a Light Source Based on a Photoinjected Energy Recovery Linac

Non-DOE Funded Programs That Connect To DOE
Starting in FY2000, the NSLS will receive over $5M dollars in the next 6 years from NIH for the design, construction, and operation of a new beamline at X-6A.

Starting in FY2001, the NSLS will receive $400k from the Air Force Office of Scientific Research for the support of Short Wavelength HGHG Free Electron Laser.

Collaborations with Other Laboratories or Universities
Research at the NSLS and the ATF is performed in constant collaboration with the universities, national laboratories and industrial firms that conduct experiments at BNL. In FY01, 436 institutions performed research at the NSLS, 72 of which are U.S. Corporations.

Service Activity for DOE Program and/or Nat'l/Regional level
NSLS is providing an on-going education and collaboration program with the Swiss Light Source as a part of a Memorandum of Understanding established between the Department of Energy and the Swiss government.

Program Development for DOE
NSLS staff members are actively participating in the Nano-technology program that BNL and DOE are developing.

Notes
Science at the NSLS contributes to many DOE research programs.

1.2.2.3 Materials Sciences Department

Contribution to DOE Sci and Tech Program for Major Programs
Accomplishments prior to FY 2002 are addressed under the ES&T Department description.

FWPs submitted to DOE
Accomplishments prior to FY 2002 are addressed under the ES&T Department description.

Non-DOE Funded Programs That Connect To DOE
Accomplishments prior to FY 2002 are addressed under the ES&T Department description.

Collaborations with Other Laboratories or Universities
Accomplishments prior to FY 2002 are addressed under the ES&T Department description.

Service Activity for DOE Program and/or Nat'l/Regional level
Accomplishments prior to FY 2002 are addressed under the ES&T Department description.

Program Development for DOE
Accomplishments prior to FY 2002 are addressed under the ES&T Department description.

Notes
The Materials Science Department was created within the Basic Energy Sciences Directorate on October 1, 2001. All accomplishments prior to FY 2002 are addressed under the ES&T Department description.

1.2.3 Life Sciences

Accomplishments - Summary

Life Sciences research contributes directly to DOE's Science and Technology initiative, specifically their goals of "Extraordinary Tools for Extraordinary Science" and "Protecting the Living Planet", and "Exploring Matter and Energy". In addition, the Directorate supports National Security initiative related to "Countering Weapons of Mass Destruction/Terrorism-Responding to Chemical/Biological Proliferation". Significant research has also been accomplished from non DOE funding sources that has relevance to DOE's mission. This includes work supported by NIH, NASA, LDRD, and CRADAs associated with low dose radiation effects, drug addiction, and biotechnology developments. The research base has been broadened with the hiring of senior scientists with leadership capabilities in MRI, BioMedical Engineering, and bioremediation.

Results for Life Sciences

Score (0~4.0)	Rating	Schedule Status
3.5	Excellent	Not Applicable

Issues and Trends

Support has been obtained from DOE to procure a cryogenic electron microscope, an integral part of the our initiative to establish a Center for the Study of Complex Structures. Additionally, scientific staff have joined BNL bringing with them active programs that will enhance our capabilities in the area of Magnetic Resonance Imaging. Support continues to be provided for non-DOE initiatives such as studies related to the effects of radiation in space (NASA) and clinical studies associated with various forms of addiction (NIH). Personnel turnover continues to be an issue of concern as sources of funding change.

1.2.3.1 Biology Department

Contribution to DOE Sci and Tech Program for Major Programs Total: 4

Biology Department research is aligned with DOE's Science and Technology initiative and the National Security initiative.
Specifically, our research addresses the following Science and Technology missions:
1. Extraordinary Tools for Extraordinary Science - Instrumentation for the Frontiers of Science;
2. Exploring Matter and Energy - Components of Matter;
3. Protecting the Living Planet - Impacts on People and the Environment;
4. From the "National Security" portfolio, our research addresses the DOE mission entitled: "Countering Weapons of Mass Destruction/Terrorism - Responding to Chemical/ Biological Proliferation"

FWPs submitted to DOE Total: 16

Non-DOE Funded Programs That Connect To DOE Total: 27

Collaborations with Other Laboratories or Universities Total: 7

Service Activity for DOE Program and/or Nat'l/Regional level Total: 7

Program Development for DOE Total: 3

1.2.3.2 Medical Department

Contribution to DOE Sci and Tech Program for Major Programs Total: 2

Medical Department research efforts primarily contribute to two DOE goals, namely: "Extraordinary Tools for Extraordinary Science" and "Protecting the Living Planet".
See Section 1.1.3.2 for FY 2001 accomplishments.

FWPs submitted to DOE Total: 14

Non-DOE Funded Programs That Connect To DOE Total: 27

In an effort to expand existing DOE programs, Medical Department staff have successfully obtained funding, under 22 distinct awards, from the National Institutes of Health and other Federal and non-for-profit agencies as follows:
13 NIH grants were awarded/renewed to the following researchers: Chang (3), Ernst (1), Gatley (2), Gifford (1), Pena (1) Volkow (5), .
Funds are received (1 grant) from NASA related to our participation in the AGS/NASA run.
Three grants were funded by NSBRI (Vazquez, PI).
The Medical Department has 4 subcontracts from collaborating institutions (Uconn, Scripps, NEMC, St. Lukes Roosevelt Hosp.) , wherein BNL is the subcontractor on an NIH funded grant.
M. Miura received funding from a private institution under an industry funded CRADA.

The above grants have been awarded as a result of a competitive, peer review process administered by the funding agencies.

In addition, three LDRD proposals commenced in FY 2001. An additional six LDRD proposals were submitted in Spring 2001, of which 2 were awarded funding effective 10/01/01.

Collaborations with Other Laboratories or Universities Total: 38

Brookhaven National Laboratory became a member of the "National Space Biomedical Research Institute" effective October 2000. . As a result of this membership, BNL is represented on the NSBRI Board of Directors.
During FY 2001, BNL was awarded a 3 year DOE grant in BioMedical Engineering. The success of this proposal is largely due to the collaborations established between BNL, SUNY, SB and Lawrence Berkeley National Laboratory.
In addition, numerous Medical Department staff members have on-going collaborations.

Service Activity for DOE Program and/or Nat'l/Regional level

None during FY 2001.

Program Development for DOE

None during FY 2001.

1.2.4 Energy, Environment & National Security

Accomplishments - Summary

EENS research programs are highly relevant to DOE missions and national needs. Furthermore, EENS recent reorganization has created research departments which are extremely well aligned

to DOE's mission areas. Energy Sciences supports research in DOE's BES, EE, and NE offices, Environmental Sciences supports research in DOE's OBER and EM offices, and National Security supports research in DOE's NN and NE offices. In the past year, this organizational alignment was enhanced by the creation of a Material Science Department (formerly Material and Chemical Sciences Division, Energy Sciences Department) which now reports to the Laboratory's BES Directorate. The organizational alignment in EENS has resulted in Departments' improved knowledge of sponsors' needs, in improved collaboration between Department researchers, and in the development of more comprehensive and responsive research proposals.

Results for Energy, Environment & National Security

Score (0~4.0)	Rating	Schedule Status
3.7	Outstanding	Not Applicable

1.2.4.1 Environmental Sciences

Contribution to DOE Science & Technology Program for Major Programs Total: 4

Department scientists provided continuing infrastructure support for the DOE Atmospheric Radiation Measurement (ARM) program and operated the ARM external data center. Scientists and professionals continued providing engineering support for the DOE BER Free Air Carbon Enrichment (FACE/FACTS) sites. The Accelerated Test Site Deployment (DOE EM) tracer study at the Brookhaven Graphite Research Reactor contributed to the characterization of facility.

FWPs submitted to DOE Total: 42

Number of FWP's submitted to DOE by the department- 39 FWP's were submitted at budget time. A total of 68 other proposals were submitted to DOE and WFO agencies.

Non-DOE Funded Programs That Connect To DOE Total: 25

A total of sixty-seven WFO proposals were submitted.

Department scientists, working with the U. S. Environmental Protection Agency, the U. S. Army Corps of Engineers, other agencies, and industry, investigated methods for removing contaminants from the dredge materials sediments. The continuing project ranges from basic research to the planned operation of commercial facilities that clean the sediments to prepare them for beneficial uses, including manufactured soil and construction-grade cement. This work will help solve sediment management problems in harbors worldwide.

Collaborations with Other Laboratories or Universities Total: 4

Collaborations include:

1) Studying the long-term variations in the Gulf Stream with Scientists from the University of Rhode Island, SUNY SB and the Narragansett Research Laboratory,
2) 2) Investigating microbial stabilization of plutonium in the subsurface environment with the Colorado School of Mines and Texas A&M,
3) 3)Microbial colloid research relating to the DOE Waste Isolation Pilot Plan (WIPP) with Sandia National Laboratory and
4) 4)Evaluating actinide migration at Rocky Flats with Kaiser-Hill Co., Rocky Flats, CO.

Service Activity for DOE Program and/or Nat'l/Regional level

Scientists provided proposal reviews for DOE programs, served on DOE review panels and participated in DOE workshops. The Chair served on DOE EM-50 Strategic Laboratory Council and A.J. Francis served as advisor to Actinide Migration Evaluation Group, The Rocky Flats Environmental Technology Site.

Program Development for DOE Total: 5
Scientists contributed to the DOE BER Water Cycle Dynamics and Prediction Science Plan (M. Miller) and the DOE BER Tropospheric Aerosol Science Plan (S. Schwartz). The department hosted the DOE BER ARM Cloud Properties Working Group Workshop, co-hosted the DOE BER Terrestrial Ecology Research Facility Workshops(C. Wirick) and hosted the DOE Atmospheric Chemistry for Emerging Scientists workshops(L. Newman).

1.2.4.2 Energy Sciences and Technology

Contribution to DOE Sci and Tech Program for Major Programs

The Department performed research on three Nuclear Energy Research Initiative Projects, one in conjunction with Purdue University. We initiated a new program in human factors for the Nuclear Energy Plant optimization program. Major contributions were made to DOE's geothermal programs in the areas of cements, sillicates, and coatings. We support the Office of Power Technologies with our work on liquid fuel BCHP. We continue to support DOE's Office of Science and the Office of Energy Efficiency in the development of high temperature superconducting cables.

FWPs submitted to DOE Total: 30
Number Submitted: 142
Number Awarded: 124
Note: These numbers include WFO proposals

Non-DOE Funded Programs That Connect To DOE

Numerous Non-DOE (WFO) Funded Programs that Connect to DOE:

Collaborations with Other Laboratories or Universities

Numerous Collaborations with other Laboratories and Unversities

Service Activity for DOE Program and/or Nat'l/Regional level
Staff participated on the Nuclear Energy Research Initiative and Nuclear Energy Plant Optimization review for USDOE. Dr. Devinder Mahajan was named to the Methane Hydrate Advisory Committee.

Program Development for DOE
Personnel participated in Nuclear Energy Research Advisory Committee Planning Workshops. Dr. David Diamond participates in the GEN-IV roadmapping exercise for DOE-NE.

Notes
Program development activities for DOE are increasing. Our work with OPT-BCHP has been most successful this year, including the development of a five year research plan. We continue to

collaborate with other laboratories, mainly in the nuclear programs and methane hydrate research.

Issues and Trends

A key issue will be the development of joint programs with the Materials Science Department.

1.2.4.3 Nonproliferation and National Security

Contribution to DOE Sci and Tech Program for Major Programs

BNL identified technical approach to make major change in mass spectrometer processing time through use of coded slit technology. This technology selected for LDRD award.
BNL is negotiating with a small business to design, build and run a grid based 1.5 to 2 megawatt photo voltaic electric power generation system on a BNL capped land fill. This grew out of DOEs bright fields program.

FWPs submitted to DOE

Approximately 40, FWPs, life cycle plans and proposals submitted to several offices in NN.

Non-DOE Funded Programs That Connect To DOE

State Department funded technical assistance to IAEA Safeguards. US-AID Program funded through NRC for Nuclear Safety activities in Russia.
At the request of the SSTS, ISPO/BNL reviews the expenditure of State Department funds under the Non-Proliferation and Disarmament Fund (NDF) and the U.S. Voluntary Contribution (USVC) to IAEA Safeguards. ISPO makes recommendations in regards to equipment purchases and tracks the finances of these two funding mechanisms.
The TEMASU program, funded by NYS gas utilities has been licensed.

Collaborations with Other Laboratories or Universities

- Collaborations with Japan Nuclear Fuel Cycle Development Corporation.
- Two collaborations with AMEC and Murmansk Initiatives involve DOE, DOD, EPA, DOS, Russian Institute of Nuclear Safety, Norwegian Defense Research Establishment and Norwegian Radiation Protection Authority.
- Approximately 10 collaborations with Russian Institutes and U.S. companies under the Initiatives for Proliferation Prevention program.
- Several collaborations with Russian Institutes on Material Protection Control and Accounting upgrades on nuclear materials.
- Collaboration with the technology laboratory of Virginia Polytechnic Institute and State University.
- Collaboration with the Center for International Trade and Security, University of Georgia.
- Collaboration with Rensselaer Polytechnic Institute and Siemens/Westinghouse in the area of enhanced proliferation resistant nuclear reactor designs.
- Course entitled “International Organizations” being taught by a staff member at the New York State University of Stony Brook.
- A staff member is assisting Lorex Industries with the development and demonstration of a laminar flow meter for UF6 measurements at the blend-point under the auspices of the U.S.-Russian Uranium Purchase Program.
- Two collaborations with AMEC and Murmansk Initiatives involve DOE, DOD, EPA, DOS, Russian Institute of Nuclear Safety, Norwegian Defense Research Establishment and Norwegian Radiation Protection Authority.

- During the year, ISPO is in constant communication with governmental agencies, other National Laboratories, universities, non-governmental organizations, the private sector, and the IAEA. In addition, each year ISPO attends one meeting with the IAEA in Vienna and a semi-annual meeting at BNL.

- SUNY STony Brook- partnership in Energy and Environmental Incubator
- Cornell Univ- member of the Transportation Infrastructure Research Consortium
- Polytectic Univ - Life Extension Workshop support
- Univ of Pizza - key note speaker at their conference on Complex Systems
- Battelle - collaboration on surgical knife development
- City of Paris, SAGEP - invited speaker at the 2nd workshop on trenchless technology

Service Activity for DOE Program and/or Nat'l/Regional level

• Subgroup on Safeguards Technical Support (interagency steering committee for POTAS program) has consistently expressed appreciation for BNL/ISPO's effective and timely support of POTAS program. In FY 2001, SSTS expanded role of ISPO to include purchases and subcontracts with US commercial entities and plans to expand staff by 1 FTE in FY02.
• Customer expectations in most program areas are satisfactory technical support, demonstration of workable prototype, report of progress, and final report on project.
• In the MPC&A program, DOE expects successful and timely completion of upgrades by Russian subcontractors. The most significant performance measure is the amount of weapons usable nuclear materials consolidated, converted to non-weapons grade, or under upgraded security. BNL has contributed to this program goal and DOE has stated that the MPC&A program has significantly improved security for a large fraction of the declared weapons usable material in Russia.
• Steering Group to the DOE Center for Risk Excellence.
• Environmental Task Group Chair, DOE/NNSA Nuclear Cities Initiative.

Issues and Trends

Recent reorganization at BNL formed new department to fully align with DOE/NN mission, goals and strategic plan.

1.3 Success in Constructing and Operating Research Facilities

Results for Success in Constructing and Operating Research Facilities

Score (0~4.0)	Rating	Schedule Status
3.58	Outstanding	Not Applicable

1.3.1 High Energy and Nuclear Physics

Accomplishments - Summary

High Energy Physics All the HEP construction and upgrade projects performed in the Physics/Chemistry Departments have remained on-budget, on-schedule and within cost guidelines for their respective projects;all have passed DOE project reviews in the past year with good reports. The projects evaluated include: ATLAS Detector & Computing; D0 Upgrade;MINOS Project; E949 Upgrade. Nuclear Physics All the NP construction and upgrade

projects performed in the Physics/Chemistry Departments have remainied on-budget, on-schedule and within cost guidelines for their respective projects; all have passed DOE project reviews in the past year with good reports. The projects evaluated include: 4 RHIC Experiments; RCF; RHIC Spin; LEGS. Since all the projects are within project progress plan values and since there are no open action items for recovery or improvements, the overall status is as good as achievable, suggesting that the rating should be in the outstanding category.

Results for High Energy and Nuclear Physics

Score (0~4.0)	Rating	Schedule Status
3.6	Outstanding	Not Applicable

Issues and Trends

The only issue that is of concern to BNL management is the recent emergence of significant cost overruns projected for the CERN-based Large Hadron Collider (LHC) Project. The U.S. portion of this project is in good status for cost, schedule and technical performance but the projected overall LHC Project cost overrun is likely to cause a significant schedule slip by up to two years. Such an overall schedule slip will compromise U.S. science goals and operations planning. The U.S. does not have any direct means to affect the overall LHC Project status, except for negotiation, which is carried out by DOE and NSF officers. In this forum, BNL's future prospects for participating in LHC provided science are not within our power to affect directly.

Assumptions

BNL planning assumes that the ongoing project involvements of BNL will continue to track along planned baselines and that the necessary resources will be provided by the sponsors. In the case of LHC, we assume that the CERN problems with cost overruns will be solved and that the resulting delay will not exceed about one year.

1.3.1.1 Collider Accelerator Department

Progress on Scheduled Construction and Meeting of Milestones

RHIC operational.
RHIC achieves excellent performance:
Peak luminosity approx. 2 x 10^26cm^-2sec^-1)
Average luminosity approx. 6 x 10^25cm^-2sec^-1
storage times up to 12 hours
operating efficiency > 50%
refill time of 45 minutes between stores
RHIC polarized proton acceleration and storage commissioning begun
BAF construction on schedule
MP6 Tandem operational
SNS:
- All critical milestones have been met.
- Long-lead procurements of up to $5.4M have been placed.
- Staffing is maintained at ~90 FTE's as planned.
- Financial obligations (cost and commitments) are within authorized funding levels in accordance with the baseline cost estimate.
-In summary, milestones identified in the work packages that cover FY 2001 work have been fulfilled

Operation of Facility at Specified or Superior Parameters
-AGS proton operations (fast extracted beam) exceeded previous record performance
Average of 6 x 10^13 protons/pulse
-FY 2001 protons delivered (6.0 x 10^19).
-RHIC operating with Au x Au at 40 TeV

Operation of Facility Compared To Scheduled Hours
HEP
Operating efficiency = 84%
Failure Hours/Total Hours = 343/2424 = 14%
NP(RHIC)
Operating efficiency - 68%
Failure Hours/Total Hours = 894/3664 = 24%

Significant Facility Improvements
• RHIC: cryo system, facility infrastructure, power supplies etc.repaired/implemented.
Approx. 2-3 years at present funding left to go.
• AGS: none
• Booster: slow extraction system under design for BAF
• LINAC: Polarized proton ion source commmissioned
• Tandem: MP6 upgrade operational
Progress on SNS
All critical milestones have been met.
Long-lead procurements of up to $5.4M have been placed.
Staffing is maintained at ~ 90 FTE's as planned
Financial obligations (cost and commitments) are within authorized funding levels in accordance with the baseline cost estimate.
In summary, milestones identified in the work packages that cover FY 2001 work have been fulfilled.

Facility - Number of Internal Users Total: 155

• LINAC: 1 (BLIP GROUP)
• AGS: 46
• RHIC: 102
• TANDEM: 6

Facility - Number of External Users Total: 1590
• AGS: 402
• RHIC: 1097
• Tandem: 91

Users Executive Committee/PAC Activity
See T. Kirk

1.3.1.2 Physics Department

Progress on Scheduled Construction and Meeting of Milestones
High Energy ATLAS, D0 on schedule.

Nuclear Physics

LEGS will have a technical review on milestone progress toward the new polarized target completion in the near future. Completing and measuring the target performance has the full resources of the LEGS group devoted to it. MIE projects for RCF, STAR (SVT and EMCal) and PHENIX (Muon Arm) reviewed quarterly - on schedule. RCF, SVT and Muon Arm complete or awaiting CD-4.

Solid State
The X-ray Scattering Group leads two consortia in the construction and operation of undulator beamlines at the Advanced Photon Source (APS). Construction of CMC-CAT and IXS-CAT at APS. Operation of CMC-CAT and of NSLS Beamlines X22A,B,C, X7A.

1.3.1.4 Superconducting Magnet Division

Progress on Scheduled Construction and Meeting of Milestones
LHC magnet program - on schedule with a new baseline reflecting changes in scope
LHC superconductor testing - on schedule
RHIC helical magnet program - on schedule and budget
DESY/HERA magnet program - magnets delivered in support of installation schedule; magnets installed and operating

Operation of Facility at Specified or Superior Parameters
Performance specifications and objectives for magnet programs have been met or exceeded.

1.3.2 Basic Energy Sciences

Accomplishments - Summary
The NSLS operated reliably and produced a high quality beam throughout the year. Significant facility improvements were planned and implemented during the year: a number of beamlines were upgraded, a digital feedback system was installed at the X-ray ring, removal of electrical safety deficiencies and provision of new user offices to name a few. The X-ray storage ring operated with a “low emittance lattice” which provided an increase in photon brightness due to a smaller horizontal emittance. Progress was made in the conceptual design of a new light source, the Photo Injected Energy Recovery Linac (PERL). The DUV FEL achieved Proof-of-principle experimental results. The TEM and LEAF facilities operated as needed during the year to support research. A new Chair of the NSLS was hired; who is planning to review the methods of operation and identify necessary facility improvements to support future science.

The NSLS user program is very effective: 257 internal users and 2780 external users conducted research at the NSLS in FY2001. The User Executive Committee met 4 times, conducted 3 town meetings and held a record attended annual user’s meeting.

Results for Basic Energy Sciences

Score (0~4.0)	Rating	Schedule Status
3.9	Outstanding	Not Applicable

1.3.2.2 National Synchrotron Light Source

Progress on Scheduled Construction and Meeting of Milestones
The NSLS has no construction activities that were conducted during the last fiscal year.

Operation of Facility at Specified or Superior Parameters
The X-ray storage ring operated reliably and delivered a high quality beam at the desired parameters: electron energy of 2.8 GeV and a maximum circulating beam current of 275 mA. These operations were with the "low emittance lattice" where the horizontal emittance is a factor of more than two smaller than the initial design emittance, with a corresponding increase in photon source brightness. Vertical orbit stability of the beam has been enhanced with the installation and recent turn-on of a digital orbit feedback system similar to the one operating in the VUV ring.

The VUV ring operates with a reliable and high quality beam at the desired parameters: electron energy of 800 MeV and a maximum circulating beam current of 1000 mA.

Operation of Facility Compared To Scheduled Hours

During fiscal year 2001, the NSLS storage rings operated as follows:

STORAGE RING/ HOURS SCHEDULED/ SCHEDULED HOURS OPERATED/ % OF SCHEDULE
VUV/ 5260/ 5112/ 97.2%
X-Ray/ 5266/ 4990/ 94.8%

The total operational hours for each ring during FY2001 were as follows:

STORAGE RING/ TOTAL HOURS OPERATED/ % OF INITIAL SCHEDULE
VUV/ 5850/ 104%
X-Ray/ 5654/ 107%

In addition to the scheduled hours, unscheduled operations are often provided to users. The unscheduled operations are the result of time returned to the experimental programs from study or maintenance periods or more efficient injection periods.

Significant Facility Improvements Total: 19

Facility - Number of Internal Users 257

Facility - Number of External Users 2780

Users Executive Committee/PAC Activity
The Users Executive Committee, consisting of 2 NSLS staff and an elected body of 8 users from the user community at NSLS, met 4 times during FY01. In addition, the UEC conducted 3 town meetings to provide opportunities for users and NSLS management to discuss issues, and organized the 4-day Users Meeting in May.

Notes
The NSLS operates reliably and produces a high quality beam through out the year. Significant facility improvements were planned and implemented during the year.

1.3.2.3 Materials Sciences Department

Notes
The Materials Science Department was created within the Basic Energy Sciences Directorate on October 1, 2001. Accomplishments prior to FY 2002 are addressed under the ES&T Department description.

1.3.3 Life Sciences

Accomplishments - Summary
The Life Sciences Directorate successfully operated a number of important facilities in FY 01. These include: 1. the Isotope Production Facility, which continued outstanding on time production of high quality radiopharmacutical products, 2. the Scanning Transmission Electron Microscopy Facility, 3. the Structural Biology Users Facility at the NSLS, 4. the Clinical Research Center, and 5. the Brookhaven Lab Animal Facility. The CRC resumed operation in support of clinical research activities in May 2000 following a three month standdown to correct deficiencies that had been identified through a series of external audits in 1998 and 1999. All protocols were reactivated under the corrective action plan by July 2001. The Corrective Action Plan is approximately 90% implemented. The other facilities listed above received outstanding marks from various reviewers and users, particularly the STEM which had a major review conducted in fall of 2000.

Results for Life Sciences

Score (0~4.0)	Rating	Schedule Status
3.1	Excellent	Not Applicable

Issues and Trends
The number of radiological occurrences involving personnel contaminations has increased in the recent past prompting an extensive management review with associated corrective actions. We continue to strive for excellence in this area through the elimination of legacy materials, the reduction in radiological posted areas, and the involvement of senior staff in increasing everyone's awareness of the regulations and the importance of following procedures.

1.3.3.1 Biology Department

Progress on Scheduled Construction and Meeting of Milestones
This fiscal year both the Scanning Transmission Electron Microscopy Facility and the Macromolecular Crystallography facilities have been keeping to schedule.

Operation of Facility at Specified or Superior Parameters
Scanning Transmission Electron Microscopy Facility: Operating Hours Planned 40 hours / week Actual 40 hours / week Outage cost $1200 / day

Macromolecular Crystallography Facilities at NSLS: The Biology Department operates 5 beamlines at the NSLS for macromolecular crystallography. Operations are limited to NSLS availability. Operations are about 215 days/yr, beamline maintenance and upgrades are scheduled during NSLS shutdown periods.

Significant Facility Improvements

Macromolecular Crystallography Facilities:

Five beamlines at Brookhaven's National Synchrotron Light Source have been drawn together into a consortium to share personnel, equipment, and research projects. A significant innovation has been to provide Operators for the users. These trained technicians provide night-time and weekend support for the users. Major projects include 1. development of a computer/disk cluster to provide facility-wide computational power, 2. development of beamline-control software to allow control and observation around the world in a collaboratory environment, 3. exploiting of multilayer monochromators to get extraordinary intensity from a dipole beamline, 4. a novel project to extract phases directly by three-beam diffraction, and 5. special attention to development of the wiggler beamline, X25.

Responding to users' requests, we have provided high quality graphics and swappable disks at the beamline, and the whole user space at the control station was rebuilt during winter 2000/2001 to improve comfort and efficiency for users. Users' needs for molecular graphics have been met at the beamline by purchase of a new SGI computer and other components.

The shared computing resource has grown to include a dozen units with a total of 26 processors: Intel CPUs in the range of 450-750 MHz. The cluster, administered by load-balancing software, is used regularly to run data-reduction packages, as well as "back-end" structure-solving systems. The Automated Structure Determination Platform (ASDP), developed BNL employs this cluster as its principal computing host.

Scanning Transmission Electron Microscopy Facility:

The major instrumentation initiative is the replacement of hardware on STEM1, designed specifically for low-dose energy -loss spectroscopy (this was done last year for STEM 3). The new PC based commuter system is working on STEM 1.

Software for image analysis has also been expanded and converted to PC using Windows operating systems for STEM 1. This makes it much easier to upgrade and test and much more user-friendly (as compared to the previous DOS system). Twenty collaborators now have versions running in their own labs and it is expected that this number will continue to increase.

A new detector has been developed and installed which resolves to 10 Angstroms. This may lead to nanotechnology projects.

Methods have been developed that allow for the direct comparison of different sample data including that from embedded specimens and freeze-dried specimens as well as x-ray diffraction data.

There have been significant accomplishments in the user/collaborator program in the areas of Alzheimers and virus assembly.

Facility - Number of Internal Users Total: 20

Facility - Number of External Users Total: 215

Users Executive Committee/PAC Activity Total: 3

1. Macromolecular Crystallography Advisory Committee meeting held June, 2001.
2. M. Becker elected Special Interest Group Representative for biological X-ray scattering and crystallography to the NSLS Users Executive Committee.
3. Scanning Transmission Electron Microscopy Advisory Committee meeting held August, 2001.

1.3.3.2 Medical Department

Progress on Scheduled Construction and Meeting of Milestones Total: 2
During FY 2001, GPP funding was provided under an approved ADS to renovate laboratory space for new scientific recruit P. Thanos. This construction was completed and the lab space occupied by P. Thanos in Spring 2001.

In addition, during FY 2001, an ADS was submitted requesting funding to modify space within Building 490 to house a micro MR instrument. The micro MR facility is being fabricated under a collaboration between BNL Medical Department and the SUNY, SB School of Medicine. Construction is expected to commence in FY 2002 and continue through FY 2003.

Operation of Facility at Specified or Superior Parameters Total: 4
The Medical Department is responsible for and/or provided oversight to the following four facilities:
1. BNL Clinical Research Center:
During FY 2001, approximately 400 human subject visits, under 40 IRB-approved protocols, were coordinated and processed by the CRC. The CRC provides core support to clinical researchers in the areas of protocol coordination and implementation, subject scheduling , administrative assistance, clinical facility housekeeping, pharmacy services, infection control monitoring and clinical record maintenance for all human subject research conducted at BNL. The CRC operations are accredited by the Joint Commission on Accreditation of Healthcare Organization (JCAHO). During FY 2001, investigators from the Medical and Chemistry Departments, as well as collaborators under the NASA/AGS program, utilized the CRC to carry out IRB-approved research involving human subjects. Funding associated with clinical research is estimated at $7.5 m in FY 2001.
Efforts were intiated by L. Chang during FY 2001 to pursue NIH/NCRR funding as a General Clinical REsearch Center (GCRC). Preliminary investigations led BNL to initiate a relationship with SUNY, SB which currently has funding for its GCRC. Efforts continued through fiscal year end to submit a supplemental proposal to NIH so that the BNL facility could operate and be funded by NIH as a satellite of the Stony Brook Facility. These efforts will continue into FY 2002; due to NIH grant review timetables, funding is not likely to occur until at least FY 2003.

2.BNL Animal Facility (BLAF):
During FY 2001 the facility housed a population of rodents, rabbits and baboons. The facility maintains accreditation by the Association for the Assessment and Accreditation of Laboratory Animal Care International (AAALAC) and is periodically inspected by U.S. Department of Agriculture. The facility houses, maintains and cares for all animals used in approved animal studies at BNL. Such research includes, on average, 25 active protocols, held by approximately 15 investigators including members of the Medical, Chemistry and Biology departments as well as collaborators utilizing the AGS/ NASA facility and NSLS.

3. Whole Body Composition (WBC) Facilities:
The current facilities are utilized by BNL researchers and collaborator from St. Luke's-Roosevelt Hospital to investigate changes in the human body's elemental composition associated with aging, obesity and disease.

4. Radiation Therapy Facility (RTF):
The RTF, operated under agreement with the Department of Radiation Oncology at SUNY,

Stony Brook, provides radiation therapy to local cancer patients. The facility treated approximately 750 patients during the fiscal year, while providing a foundation for related research and collaborations between SUNY, Stony Brook and the Medical Department.

Significant Facility Improvements Total: 2

During FY 2001, the BNL Animal Facility completed installation and began use of equipment purchased from GPE funds awarded in FY 2000 and P2 funds awarded in FY 2001.

The GPE funds resulted in a new cage washer and tunnel washer. The equipment replaced equipment that was over 30 years old and improved the efficiency of the facility's workers.

The P2 funds were directed towards the purchase of a "Bedding Grinder" which allows animal bedding to be reduced and then released to sanitary. The item reduced the volume of waste requiring off site disposal and also reduced facility staff efforts associated with such disposal.

Facility - Number of Internal Users Total: 30

Facility - Number of External Users Total: 10

1.3.4 Energy, Environment & National Security

Accomplishments - Summary

EENS has not constructed any new facilities, nor do we operate any major research facilities or user facilities. EENS does, however, operate and maintain laboratory and office facilities which are located in fifteen buildings. We have developed and implemented an aggressive plan for consolidating our staff and for upgrading our facilities. EENS space consolidation strategy has been focused on improving the interactions and collaboration between our researchers, improving the efficiency of our research and support activities, and reducing costs associated with underutilized facilities. During the past two years, we have successfully consolidated from 23 buildings to 15. In addition, the proposed Energy Sciences Building has been approved by DOE and we are hopeful that funding will be authorized in FY03. Laboratory upgrades have been completed in B-480 and B-815, and future upgrades are planned in B-815. EENS performance on ES&H and EMS has continued to be excellent.

Results for Energy , Environment & National Security

Score (0~4.0)	Rating	Schedule Status
3.5	Excellent	Not Applicable

1.3.4.1 Environmental Sciences

Progress on Scheduled Construction and Meeting of Milestones

Environmental Sciences does not operate Facilities.

1.3.4.2 Energy Sciences and Technology

Notes

The Department supports the SNS target development project at BNL.

1.3.5 SNS-Spallation Neutron Source Project

Progress on SNS

All critical milestones have been met. Long-lead procurements of up to $6.2M have been placed. Staffing is up ~90 FTE's as planned. Preparations are under way to fully obligate the ~$24 M in FY 2001 funding. In summary, the milestones identified in the work packages that cover FY 2001 work have been fulfilled.

Results for SNS-Spallation Neutron Source Project

Score (0~4.0)	Rating	Schedule Status
3.8	Outstanding	Not Applicable

1.4 Effectiveness and Efficiency of Research Program Management

Results for Effectiveness and Efficiency of Research Program Management

Score (0~4.0)	Rating	Schedule Status
3.45	Excellent	Not Applicable

1.4.1 High Energy and Nuclear Physics

Accomplishments - Summary

The management of the HENP Program in the Physics Department has contributed fully to its achievements during FY 2001 and is awarded a summary rating of 3.7. The same level of attention to the elements of the HENP Program will be continued into FY 2002 with an enhanced emphasis on long range planning and its alignment with the long range plans developed in both Nuclear and Particle Physics during CT 2001.

Results for High Energy and Nuclear Physics

Score (0~4.0)	Rating	Schedule Status
3.7	Outstanding	Not Applicable

Issues and Trends

The continuing flat funding profile for HENP research programs in DOE-HENP will continue to erode the staff that BNL can apply to research work and the Lab production will decline. There is no reason at this time to assume an improvement in this trend.

Assumptions

The BNL HENP research program will be forced to contract in size each year as funding remains flat and inflation erodes the effort that can be supported; in this model we will seek to preserve the most important activities of BNL HENP scientists and support personnel. The quality of our contributions will remain high but their number will continue to decline as the staff shrinks.

1.4.1.1 Collider Accelerator Department

Staff Losses Total: 14

New Staff Hires - Number and Prominence
Most new hires were to replace individuals who have left through normal attrition. This is running at about 5-8 staff members per year.

Number of Post-Docs Total: 2

New Initiatives Proposed Total: 8

New Initiatives Actually Started Total: 5

Major Programmatic Achievement by Chairs Total: 3
RHIC is now an operational physics producing facility. Scheduling operations and manpower assignments so that AGS provided high intensity beam for g-2 experiment and rare kaon decay experiment. RHIC and AGS fixed target operations now operate concurrently.

Major Infrastructure Achievement by Chairs
C-A is now structured to operate, maintain and upgrade accelerator facilities.

Major Concern of Chair
In order to improve RHIC performance, the availability of funding to complete RHIC modifications, repairs in the next 3 years is most critical. The Estimate is $18M to complete and $60M to upgrade.

Staff

Year	**2002**
Total	**482**
Tenured	12
Continuing	27
Term	13
Research Associate /PostDoctoral	2
Professional	156
Scientific	54
Technical	236
Administrative	36
Management	n/a

1.4.1.2 Physics Department

Staff Increases Total: 32

Staff Losses Total: 14

New Staff Hires - Number and Prominence Total: 4

Number of Post-Docs Total: 35

New Initiatives Proposed Total: 1

New Initiatives Actually Started Total: 3

Major Programmatic Achievement by Chairs

Key Appointments: A. Tsvelik, Group Leader, Condensed Matter Theory L. Bland, STAR Spin Physics Leader in RHIC Spin Group T. Ullrich, STAR Physics Coordinator

Major Infrastructure Achievement by Chairs
Squeezing space out of the building at great expense. Upgrading communications in conference rooms. Increasing cyber security in Department.

Major Concern of Chair
Attracting, retaining and developing the best young for people Future leadership in the Department. Adequate support of High Energy Physics by DOE. Adequate support for the ATLAS software effort. Development of adequate MINOS collaboration. Finding a suitable role in MECO. The Position of science in the laboratory. Non-scientific Concerns ITD – leadership is not cognizant of the role of support for outside users. By restricting access, we risk losing the ability to build up our user computing facilities and therefore to lead the physics in ATLAS. The PeopleSoft system gives us little ability to forecast our spending since it does not deal correctly with travel, obligations for visitors and multiyear procurements. The Department Administration group may not be optimally organized for the Department's current workload. Space.

Staff

Year	**2001**
Total	**295**
Tenured	40
Continuing	33
Term	54
Research Associate /PostDoctoral	35
Professional	56
Scientific	162
Technical	42
Administrative	34
Management	1

1.4.1.3 Instrumentation Division

Staff Increases Total: 4

Staff Losses Total: 4

Number of Post-Docs Total: 2

New Initiatives Proposed Total: 4

New Initiatives Actually Started Total: 3

Major Programmatic Achievement by Chairs Total: 6

- Completion of the neutron high resolution detector for LANL/LANCE Low Angle Scattering Station.
- Significant findings on radiation effects and on increasing radiation resistance of silicon particle and photon detectors.
- Completion of electronics for the 1st phase of PHENIX experiments.

- Completion of the design and prototyping phase and start of production, of low noise preamplifiers for the LHC/ATLAS Liquid Argon Calorimeter.
- Design of nanofabrication facility.
- Successful reviews by DOE for HEP and NP related programs.

Major Infrastructure Achievement by Chairs Total: 2

- Creation of excellent ESH team and encouragement of division support for the team's efforts.
- Upgrade of the Printed Circuit Fabrication Facility.

Major Concern of Chair Total: 3

Attracting, retaining and developing the best young people.
Inadequate MST budget.
Insufficient funds for capital equipment to keep up with the advancing technology, particularly in silicon detector and microelectronics.

Staff

Year	**2001**
Total	**48**
Tenured	5
Continuing	9
Term	1
Research Associate /PostDoctoral	2
Professional	9
Scientific	17
Technical	17
Administrative	5
Management	1

1.4.2 Basic Energy Sciences

Accomplishments - Summary

During FY2001: new scientific staff and management were hired, new initiatives in nanoscience were started, and modifications of the BES organization at BNL was started. This should benefit in new exciting science in future years.

During FY2001, the postdoc complement was substantially increased to a level of 40 and internal LDRD funding was also increased to the multi-million dollar funding level. This provides the potential of new creative science.

Materials Science has been elevated to the departmental level and united with Condensed Matter Physics through the formulation of the Materials Center. The mission of the Materials Center is to coordinate internal programs in materials science at the NSLS, the new Materials Science Department, the Condensed Matter Physics Group and the Chemistry Department.

BNL has established a new initiative in nanoscience. The theme for this program is controlling the physical and chemical response of nanoscale functional materials. Two nanoscience

proposals were funded: catalytic nanomaterials and charge transfer at the nanoscale. Additionally, we are pursuing the acquisition of a nanocenter facility at BNL.

At the NSLS, the facility is committed to enhancing its role as a national resource for materials, chemical and biological research. BNL is examining a new consortium-based method of supporting users by providing access to the full range of synchrotron-based techniques; the pilot case for this approach is in catalytic chemistry. The NSLS continues to contribute to national R&D leading to the next generation light source, i.e. PERL. A new NSLS department chair was hired, Steven Dierker.

With the permanent shutdown of the HFBR, BNL is working with other neutron sources in the U.S. to sustain expertise in neutron scattering and instrumentation development. This is being coordinated through BNL's Center for Neutron Science. For example, there is a collaboration between ORNL and BNL to construct a new cold triple-axis spectrometer at HFIR.

Results for Basic Energy Sciences

Score (0~4.0)	Rating	Schedule Status
3.6	Outstanding	Not Applicable

1.4.2.1 Chemistry Department

Staff Increases Total: 3

Staff Losses Total: 6

Number of Post-Docs Total: 22

New Initiatives Proposed Total: 12

New Initiatives Actually Started Total: 16

Major Programmatic Achievement by Chairs Total: 3
Results pending: 1. DOE funding for Suits/Chem. Physics received 2. Increased LDRD funding 3. Two nanoscience proposals funded

Major Infrastructure Achievement by Chairs Total: 1
Raised awareness about the state of aging Chemistry building -- roof replaced, chiller removed and facility connected to chilled water.

Major Concern of Chair Total: 2
Flat DOE budgets: Impacts program vitality and growth, and the ability to provide an infrastructure for technical support of programs and administrative support for compliance and BSA mandated management systems. Line-management of programs based on DOE funding lines through the ALD's subordinates position of Department Chair on programmatic issues. Mandated Tasks: Numerous tasks are mandated by DOE/Laboratory but not funded/supported.

Staff

Year	**2001**
Total	**86**
Tenured	19
Continuing	11
Term	11

Research Associate /PostDoctoral	22
Professional	9
Scientific	n/a
Technical	9
Administrative	4
Management	1

Notes
Basis of Score
1. Award of two nanoscience proposals 2. Increased LDRD funding 3. Additional joint appointment in the Chemical Physics Programs -- total of 2

1.4.2.2 National Synchrotron Light Source

Staff Increases Total: 20

Staff Losses Total: 14

New Staff Hires Total: 20

Number of Post-Docs Total: 6

New Initiatives Proposed Total: 13

New Initiatives Actually Started Total: 11

Major Programmatic Achievement by Chairs
Several years ago the VUV ring was in decline in terms of research interest. A re-vitalization was initiated which has resulted in significant new interest in the machine. During that re-vitalization:
· 6 new IR beams have been brought into operation
· a new VUV beam line was established at U-13
· 4 upgraded soft x-ray lines were established
These innovations have produced new state-of-the-art beam line capabilities and have restored the scientific interest as exhibited by increasing users and increasing scientific publications.

Major Infrastructure Achievement by Chairs
There are several infrastructure issues of concern:

Electrical safety issues have been created by lack of maintenance of building roof and the lack of maintenance of electrical cables providing NSLS with electrical power. In 1997 NSLS had a near serious fire and program disruption resulting from power cables overheating in underground cable ductwork. These issues have not been followed up as thoroughly as needed.

NSLS is currently near maximum capacity with regard to voice, fax and modem service in building 725. ITD pulled in an additional 200 pair cable to address this. We are awaiting final connection into the building distribution frame.

NSLS has significant difficulties with the balance and control of the air conditioning system in the building. A plan to address these problems has been developed.

The X-5 water cooling supply needs to be transferred from the High Pressure Copper (HPC) cooling system to the experimental water cooling system and has started to be implemented. To be completed this December shut-down.

Design has started for Bldg. 725 second floor User Office addition - GPP Project.

Assumed occupancy of Bldg. 820 warehouse to allow for consolidation of storage areas, trailers, shipping containers and basements throughout the site.

Major Concern of Chair
The NSLS is competing with newer light sources and must establish a strategic plan to keep the program vital and competitive for the next 5 years. The operating budget must be increased by 3M$/year to allow us to hire additional staff, and the funds available for improvements must be increased by 4M$/year. In addition, we must prepare a conceptual design report for a major upgrade to the NSLS to ensure that it is a leader in synchrotron radiation 5 - 10 years from now.

Staff

Year	**2001**
Total	**180**
Tenured	12
Continuing	8
Term	13
Research Associate /PostDoctoral	5
Professional	41
Scientific	36
Technical	78
Administrative	19
Management	6

Notes
NSLS management has maintained a high quality staff and has vigorously sought out new scientific and technical ideas to improve the quality of science and machine operations.

1.4.2.3 Materials Sciences Department

Staff Increases
Accomplishments prior to FY 2002 are addressed under the ES&T Department description.

Staff Losses
Accomplishments prior to FY 2002 are addressed under the ES&T Department description.

New Staff Hires - Number and Prominence
Accomplishments prior to FY 2002 are addressed under the ES&T Department description.

Number of Post-Docs
Accomplishments prior to FY 2002 are addressed under the ES&T Department description.

New Initiatives Proposed

Accomplishments prior to FY 2002 are addressed under the ES&T Department description.

New Initiatives Actually Started
Accomplishments prior to FY 2002 are addressed under the ES&T Department description.

Major Programmatic Achievement by Chairs
Accomplishments prior to FY 2002 are addressed under the ES&T Department description.

Major Infrastructure Achievement by Chairs
Accomplishments prior to FY 2002 are addressed under the ES&T Department description.

Major Concern of Chair
Accomplishments prior to FY 2002 are addressed under the ES&T Department description

Notes
The Materials Science Department was created within the Basic Energy Sciences Directorate on October 1, 2001. All accomplishments and statistical information prior to FY 2002 are addressed under the ES&T Department description.

1.4.3 Life Sciences

Accomplishments - Summary
Noteworthy achievements in the performance of research activities in accordance with Integrated Safety Management System and Environmental Management System principles and objectives. Specifically, the Directorate achieved ISO 14001 certification.
However, the high amount of personnel turnover experienced over the year was disruptive and contributed to some inefficiencies and operational errors.

Results for Life Sciences

Score (0~4.0)	Rating	Schedule Status
3.1	Excellent	Not Applicable

Issues and Trends
Several new initiatives appear to be promising for the future of the Directorate. For example, funding was provided by the DOE/OBER for the purchase of a cryogenic electron microscope and a new PET cyclotron. The microscope is an essential component of the Biology initiative for establishing a Center for the study of complex protein structures. The new cyclotron is expected to greatly enhance our clinical research studies using PET. The hiring of a scientist to lead the animal MRI facility is another new initiative that will expand the imaging sciences conducted at BNL and increase our utilization of the Animal Facility.

1.4.3.1 Biology Department

Staff Increases Total: 21

Staff Losses Total: 16

New Staff Hires - Number and Prominence Total: 21

Number of Post-Docs Total: 23

New Initiatives Proposed
1. Center for Complex Soil Microbial Communities. Proposals are being submitted for a large scale initiative to utilize BNL's expertise in soil microbiology, genome sequencing, and

crystallography to conduct research on complex soil microbial communities involved in the remediation of heavy metals, radionuclides and organic xenobiotics.

New Initiatives Actually Started

1. Center for the Structure of Complex Proteins (CSCP). As part of this center we have hired three of the planned four new scientists. Currently on staff are a membrane protein crystallography and two soil microbiologists. Funding was obtained and an order placed for a CryoElectron Microscope. Recruiting is in progress for an electron microscopist.
2. 2. Genetic Variation in Human NHEJ DNA Repair Genes: This initiative is identifying the most common polymorphisms in the coding sequences of the five genes of the NHEJ double strand break repair pathway. The next step will be to conduct structure-function analysis of selected polymorphisms. These studies should provide a moderately dense map of polymorphisms for the genes for future association studies between radiation sensitivity, cancer and human genotype; and provide markers for identifying populations potentially at risk from both high and low dose radiation.

Major Programmatic Achievement by Chairs

Successfully recruited 3 scientific staff members as part of the Center for Structure of Complex Proteins (CSCP)initiative. One membrane protein crystallographer and two soil microbiologists. Obtained funding for a CryoElectron Microscope as part of the Center. Secured funding from NIH and DOE for an upgrade to the capillary DNA sequencer for the Genome Sequencing Facility.

Major Infrastructure Achievement by Chairs

1. Return of underutilized space to Plant Engineering for use by the Center for Data Intensive Computing (CDIC). This not only reduced the Biology Space charges but has led to collaborative projects between the CDIC and the Biology Department.
2. Successfully secured GPP funding for the upgrade of lab space for the three new scientists which were hired in FY01 as part of the Center for Structure of Complex Proteins Initiative.

Major Concern of Chair

Scientific Staff Recruiting: The structure and limited scope of DOE calls for proposals, the antiquated condition of most research laboratories, the lack of adequate library services, the high cost of doing business, and the requirement of obtaining 100% of salary support makes recruiting new faculty and retaining current faculty difficult. Postdoctoral Fellows: the lack of a critical mass and poor funding levels makes recruiting postdocs and students difficult. Recruiting good postdocs and students is critical to scientific productivity. Collaborations: Lack of local common room for reading, coffee, lunch inhibits development of intra-departmental collaborations. Excessively rigorous safety and environmental regulations sometimes prevents participation of BNL Biology scientists in DOE mission-related work.

Staff

Year	**2001**
Total	**113**
Tenured	15
Continuing	5

Term	14
Research Associate /PostDoctoral	23
Professional	39
Scientific	57
Technical	9
Administrative	8
Management	24

1.4.3.2 Medical Department

Staff Increases Total: 23

Staff Losses Total: 18

New Staff Hires - Number and Prominence Total: 23

Number of Post-Docs Total: 10

New Initiatives Proposed Total: 1

New Initiatives Actually Started Total: 4

Major Programmatic Achievement by Chairs Total: 1
Obtain new DOE funding line under its BioMedical Engineering Initiative (see above).

Major Infrastructure Achievement by Chairs Total: 3
1. Improved communication among scientific staff as result of initiation of monthly Scientific Staff meetings.
2. Improved mentoring of post doctoral researchers as a result of the initiation of Post Doc forum. The forum invites all post docs within Life Sciences to meet twice monthly. The meetings include formal presentations from the post docs relating to their research, as well as, informal dialogue between post docs and scientific staff.
3. Upgrade of laboratory space. Renovation of laboratory space was designed and completed by Plant Engineering during FY 2001. The renovation provided required space for a new scientific recruit, P. Thanos, to initiate his research.

Major Concern of Chair Total: 1
Our ability to conduct human subject research in compliance with Federal regulations: Despite numerous audits and self-assessments, BNL Life Sciences remains under scrutiny as it pertains to its conduct of clinical research. Clinical research is a primary component of both the PET and MR groups, therefore, it is critical that BNL maintain its ability to conduct human subject research if these groups, and the Department in total, is to remain viable and productive.

Staff

Year	**2001**
Total	**70**
Tenured	3
Continuing	7
Term	8

Research Associate /PostDoctoral	10
Professional	25
Scientific	28
Technical	9
Administrative	8
Management	15

1.4.4 Energy, Environment & National Security

Accomplishments - Summary

EENS continues to make improvements in program management capabilities and performance. Despite a change of ALDs during the year, the Directorate has achieved organizational stability and maturity. Initiatives within the Directorate, such as space consolidation, ISM, EMS, and Departmental strategic planning were successfully coordinated and accomplished. Business Operations continues to improve financial reporting and management, and the new organizational burden structure was implemented. EENS also made significant progress in stabilizing its budget and staffing levels, which had been in a state of decline for the past 5 years. Improvement is needed in developing new research initiatives and programs, and in attracting new staff in areas of strategic interest.

Results for Energy, Environment & National Security

Score (0~4.0)	Rating	Schedule Status
3.4	Excellent	Not Applicable

1.4.4.1 Environmental Sciences

Staff Increases Total: 6

Staff Losses Total: 10

New Staff Hires - Number and Prominence

Three Assistant Scientists were added to the staff. All three had been exceptional research associates at BNL. One professional staff member completed a Ph. D. and was promoted to the rank of Associate Scientist scientific staff. One senior Research Associated was hired to work on a specific project.

Number of Post-Docs Total: 8

Four new research associates joined the department in 2001.

New Initiatives Proposed Total: 1

The department proposed a new BNL initiative this year, the Simulated Observatory for Atmospheric Processes(SOAP).

New Initiatives Actually Started Total: 2

Major Programmatic Achievement by Chairs Total: 1

Co-hosting the Terrestrial Ecology Research Facilities Workshops and moving TERF forward.

Major Infrastructure Achievement by Chairs Total: 1

Space consolidation of the of EENS Directorate.

Major Concern of Chair Total: 1
Funding. The department is declining in size because scientists are not successful at winning new programs. Morale is good, but the staff is concerned about their future at the laboratory. The department desperately needs new programs that can be used to attract new mid-career scientists.

Staff

Year	2001
Total	**72**
Tenured	5
Continuing	17
Term	8
Research Associate /PostDoctoral	8
Professional	22
Scientific	38
Technical	4
Administrative	7
Management	1

1.4.4.2 Energy Sciences and Technology

Staff Increases
The staff level at ES&T was essentially constant over this evaluation period.

New Initiatives Proposed
The department is beginning a new initiative to establish itself as a regional center for DOE energy research activities. We are seeking to increase our activities with state sponsored energy research organizations, such as NYSERDA. We are also initiating three new projects for

1) a liquid fuel reformer for fuel cells
2) a critical infrastructure assessment for electric power grids
3) a fuel cell demonstration program for combined heat and power.

New Initiatives Actually Started
The department has also started new initiatives in critical infrastructure protection and distributed energy systems. The department has participated in the field test microturbines and fuel cells . The department is supporting the development of a world MARKAL-MACRO model for use by the Energy Information Administration in the production of the World Energy Outlook.
We are working with EPA, DOE, and Taiwan on a program to identify clean development mechanisms in the Central American Countries.

Major Programmatic Achievement by Chairs
We have initiated a new program with the NRC on risk assessment for non-reactor facilities. We are actively collaborating with other DOE laboratories in developing new energy programs.

The MARKAL-MACRO code has been selected the Energy Information Administration within DOE as the model for the next World Energy Outlook report.

Major Infrastructure Achievement by Chairs

We have worked with the plant engineering department in the design and DOE review process of the new Energy Sciences and Technology building. This building will consolidate the department's research activities into one campus.

Major Concern of Chair

As the new chair of a new department, I have developed a vision for the department that includes several elements:

1) A National Leader for DOE Energy Resource research in selected areas
2) Northeast Regional Energy R&D Center
3) Continued research support to NRC
4) Laterally and vertically respected results in the energy sciences community
5) work that challenges the staff and offers opportunity for professional growth
6) modern, useable management systems.

I consider all these goals to be difficult to obtain, but for the first five I believe that the department through hard work, leadership, and sufficient resources can be obtained. We have been successful in developing new programs within the department, but must now start to recruit new staff to expand the department into new areas.

Staff

Year	**2001**
Total	**n/a**
Tenured	4
Continuing	57
Term	9
Research Associate /PostDoctoral	n/a
Professional	48
Scientific	n/a
Technical	n/a
Administrative	n/a
Management	n/a

Notes

The Applied Sciences and Technology Directorate was reorganized on March 1, 2000. In this reorganization, three new departments, aligned with three of the four DOE Mission areas, were formed: Energy Sciences and Technology, Environmental Sciences, and National Security. The predecessor departments, Applied Sciences (DAS) and Advanced Technology (DAT), had missions and strategic goals that overlapped these three DOE Mission Areas.
We have been successful in our planning process. Our overall funding increased about 10% and we successfully managed our organizational burden rate.

Issues and Trends

We need to continue our planning process and active management of our organizational burden rate.

1.4.4.3 Nonproliferation and National Security

Staff Increases
None

Staff Losses Total: 7

5 SCIENTIFIC/PROFESSIONAL, 2 ADMINISTRATIVE

New Staff Hires - Number and Prominence
None

Number of Post-Docs
None

New Initiatives Proposed
Several initiatives in preparation and proposed for DOE and Battelle Columbus Operations, government sector.

New Initiatives Actually Started

- LDRD awarded and initiated on coded slit technology for mass spectrometers.
- Technical support program to DOE Office of Counterintelligence initiated.
- Technical assistance to DOE on START-III Initiatives and Weapons Dismantlement Transparency Lab-to-Lab programs, monthly reports to DOE.
- Technical Support to IAEA Safeguards under DOS funding, reporting is valuable depending on specific tasking. Major projects are Integrated Safeguards and Sample Size Determination, Sample Size Report completion 12/2000, Integrated Safeguards ongoing and likely to require several years.
- Technical support to DOE/NN-44 on implementation of U.S./IAEA Additional Protocol, all milestones met or delayed by DOE/HQ. Other activities such as draft U.S. declaration and joint inspection exercise have been delayed awaiting U.S. Senate ratification.
- In MPC&A program, deliverables are completion of upgrades by Russian nuclear institutes; these are verified by BNL and communicated to DOE as they occur.
- AMEC program has ongoing tasking and completion is reported to DOD, DOE, EPA as completed.
- Murmansk Initiative project on Low-Level Liquid Waste Treatment Plant nearing completion.

Major Programmatic Achievement by Chairs
Completion of the first strategic plan for the new NNS Department.

Major Infrastructure Achievement by Chairs
Organization of the NNS department and consolidation of nearly all national security programs at BNL.

Major Concern of Chair
Lack of recognition of BNL's capabilities, role and achievements in the area of non proliferation and national security in DOE, DOD and other federal agencies. A high-level risk in MPC&A program is failing to prevent theft or diversion of weapons-usable nuclear material. BNL makes

every effort to support the goals of MPC&A program within funding allocations. Contingency plans for such risks are at the highest levels of DOE, DOD, and other government agencies. A risk to employees on MPC&A program is safety during travel to Russia, contingency planning emphasis prudent conduct, medical advice and supplies from BNL clinic, and medical evacuation insurance.

Staff

Year	**2001**
Total	**33**
Tenured	n/a
Continuing	13
Term	n/a
Research Associate /PostDoctoral	n/a
Professional	10
Scientific	13
Technical	n/a
Administrative	10
Management	n/a

Issues and Trends

Strong desire by DOE and Congress to hasten progress in all aspects of MPC&A