

Enclosure 1

The Office of Science Performance Evaluation and Measurement Plan (PEMP) process implements a numeric scoring system (4.3-0.0), with corresponding letter grades (A+ to F) for each performance measure Goal and Objective. A score/grade of “B+” is awarded for performance results that fully meet the “expected” performance level for an objective. Therefore, scores/grades above a “B+” indicate a degree of performance that exceeds expectations. An overall grade for each of the Goals is determined based on the weighted sum of the scores associated with its individual Objectives. The table below indicates the scale utilized for assigning scores and letter grades:

Final Grade	A+	A	A-	B+	B	B-	C+	C	C-	D	F
Total Score	4.3-4.1	4.0-3.8	3.7-3.5	3.4-3.1	3.0-2.8	2.7-2.5	2.4-2.1	2.0-1.8	1.7-1.1	1.0-0.8	0.7-0.0

A brief summary of PPPL Performance on each Goal and Objective in FY 2009 follows. In Goals and Objectives where scoring differed between the two grading periods, the grades for the reporting period ending March 31, 2009 are included in parenthesis. If no grades are provided in parenthesis, the performance for both grading periods is indicated by the grade given.

1.0 Provide for Efficient and Effective Mission Accomplishment

Grade: A-

In FY 2009, PPPL produced high quality research results that advanced fusion plasma science and technology, and provided considerable leadership to the fusion community. The research performed by PPPL scientists resulted in a large number of publications in leading peer-reviewed journals, and in presentations in international conferences and workshops. Peer reviews of PPPL programs were very positive. PPPL fully met its goals and milestones and was very positive in HQ guidance. Overall, PPPL exceeded expectations in this area.

- The NSTX team had a very successful year in FY 2009, achieving significant results in Spherical Torus (ST) physics, ITER related research, and other key areas of magnetic fusion science.
- The PPPL ITER and Tokamak Department has been very productive in ITER support activities and in its collaboration with major tokamak programs in the U.S. and abroad.
- A PPPL-led multi-institutional and multidisciplinary team was competitively selected to carry out a two-year planning study for the Fusion Simulation Program (FSP).

- PPPL scientists received a number of major awards. Two PPPL scientists were honored with the Presidential Early Career Award for Scientists and Engineers (PECASE). A senior scientist received the American Physical Society's Maxwell Prize. A recent Ph.D. student received the APS Rosenbluth Thesis Award.

The PPPL M&O contract changed on April 1, 2009. The transition was very smooth and the ratings under this Goal apply equally to the prior contract and the new contract.

1.1 Science & Technology Results Provide Meaningful Impact on the Field

Grade: A-

- The NSTX team had a very successful year in FY 2009, completing all scientific milestones on schedule, including the FY 2009 joint research target: "Conduct experiments on major fusion facilities to develop understanding of particle control and hydrogenic fuel retention in tokamaks. In FY09, FES will identify the fundamental processes governing particle balance by systematically investigating a combination of divertor geometries, particle exhaust capabilities, and wall materials. Alcator C-mod operates with high-Z metal walls, NSTX is pursuing the use of lithium surfaces in the divertor, and DIII-D continues operating with all graphite walls. Edge diagnostics measuring the heat and particle flux to walls and divertor surfaces, coupled with plasma profile data and material surface analysis, will provide input for validating simulation codes. The results achieved will be used to improve extrapolations to planned ITER operation." In these experiments, the NSTX team made gas balance measurements and found prompt retention of greater than 90% of hydrogen isotopes. The retention decreased slowly due to post shot out-gassing.
- The NSTX team achieved significant results in many other key areas of magnetic fusion science, such as macroscopic stability, energetic particle-plasma interaction, high performance plasmas with a significant fraction non-inductive Current drive, and controlling Edge Localized Modes (ELMs). In the area of macroscopic stability, the NSTX team carried out research on the Resistive Wall Mode (RWM) and showed that kinetic effects are important for determining the plasma rotation required to stabilize the RWM. Based on theoretical calculations it was expected that fast-ion content from neutral beam injection (NBI) could strongly modify RWM stability in NSTX and, in particular, that fast-ions are stabilizing for the RWM. Experiments with reduced fast-ion content demonstrated that a higher plasma rotation frequency is required to achieve RWM marginal stability for the plasma with lower fast ion content – consistent with the theoretical predictions.

1.2 Provide Quality Leadership in Science & Technology

Grade: A-

- NSTX is the most powerful spherical torus facility in the world and it is unique on several ways. Because of its large mid-plane ports, NSTX provides unique direct tangential access for a wide range of diagnostics. It is also the only large spherical torus in the world capable of studying coaxial helicity injection and the only spherical torus in the world studying lithium as a plasma facing material.
- In FY2009, the NSTX team implemented several upgrades to keep the facility at the forefront of ST research. These upgrades included the dual lithium dropper system, edge sample probe, three-view divertor bolometer system, and improvements to the High-Harmonic Fast Wave (HHFW) antenna system to increase its power handling capability.
- Since it is a world-leading spherical torus research facility, NSTX attracts a large number of national and international researchers and students (approximately 250) from more than 50 institutions to collaborate in the research program. Nationally, the team members are from 28 universities, national laboratories, and industries. Internationally, there are collaborating researchers from 28 institutions in Japan, Korea, England, France, Germany, Israel, the Czech Republic, Canada, Ukraine, and Russia.
- The NSTX team has undertaken a number of high-risk/high payoff/long-term research problems, including the plasma start-up with coaxial helicity injection, the study of instabilities driven by super-Alfvenic fast ions, an investigation of high-k turbulence and its effects on electron transport, and lithium wall conditioning. The NSTX team is also actively involved in 21 joint ITPA experiments in support of ITER and contributes to 12 others. The NSTX team has made significant progress on these and other topics during the past year and several team members are recognized leaders in the scientific community.

1.3 Provide and Sustain Science & Technology Outputs that Advance Program Objective/Goals

Grade: A-

- The PPPL theory program met all expectations in this area. The PPPL theory effort clearly provided sustained output as evidenced by the large numbers of papers and technical presentations they produced. They also maintain a strong record in achieving their milestones.

- The PPPL efforts on C-Mod resulted in a number of interesting publications usually in collaboration with MIT. PPPL researchers have come a long way in improving their usefulness to the C-Mod program by providing support in improving the quality of experiments on the facility. In addition they became actively involved in writing mini-proposals for particular C-Mod experiments and leading some experiments.

1.4 Provide for Effective Delivery of Science & Technology

Grade: A-

- Overall, PPPL has delivered on its promises. Publications and presentations at scientific meetings by the NSTX team have been very good. In addition, NSTX team members have played a major role in the research needs workshops organized by OFES and in ITPA meetings organized under the auspices of ITER. The NSTX team met all of its research milestones on or ahead of schedule, including the Joule milestones for the large facilities. The NSTX team communicated these results to the scientific community in a timely basis via publications in referred journals, invited talks and reports.
- The PPPL theory program met all expectations in this area. They met all of their milestones. They also made a large number of presentations at technical meetings. They also were given the job of developing a plan for a fully funded theory program, and they delivered a very useful plan in a short period of time.

2.0 Provide for Efficient and Effective Design, Fabrication, Construction and Operations of Research Facilities

Grade: A-

In FY 2009, PPPL was very effective and efficient in the safe and reliable operation of NSTX, its flagship facility, and its efforts on the U.S. ITER project continue to exceed expectations.

As a partner laboratory responsible for portions of U.S. ITER Project scope (Diagnostics, Steady-State Electrical Power Systems, and In-Vessel coil design), PPPL has done an outstanding job in meeting project objectives, and its support of design reviews and development of operating scenarios for the machine.

The NCSX Project Team successfully completed closeout activities under cost and ahead of schedule.

The NSTX Major Item of Equipment (MIE) Upgrade Project was initiated in FY 2009 and is progressing well.

The PPPL M&O contract changed on April 1, 2009. The transition was very smooth and the ratings under this Goal apply equally to the prior contract and the new contract.

2.1 Provide Effective Facility Design(s) as required to Support Laboratory Programs (i.e. activities leading up to CD-2)

Grade: A

- The impact of PPPL's research team on the ITER design has been deep. Detailed analysis of operating scenarios for ITER was carried out with an international team under the leadership of Charles Kessel. Through the most thorough study of the impact of magnet design choices on plasma operating space performed to date, C. Kessel identified that the starting point design yielded a highly restricted operating space that would have limited ITER's ability to carry out its advanced tokamak mission. Through an analysis effort marked by creativity, care, and thoroughness, C. Kessel's work pointed out the urgency of magnet design changes that dramatically opened up the ITER operating space, thus substantially improving the chances for ITER's technical success.
- Following the termination of the NCSX project, PPPL proposed two major NSTX upgrades to support both ITER and further exploration of the spherical torus concept. The upgrades include a replacement of the center stack to double the toroidal field and plasma current capability of the facility and the addition of a second neutral beamline to increase the heating and current drive capability of the facility. The NSTX MIE Upgrade project successfully received Critical Decision 0 (CD-0) "Mission Need Justification" approval by the Office of Science in February 2009. Subsequently, eighteen new engineers and designers have been added to the NSTX Upgrade Project staff, and a functioning project organization has been put in place to begin conceptual design. These activities have proceeded very well in 2009, and PPPL completed a Conceptual Design Review on October 28, 29. An Office of Science review is scheduled for December 2009 and will provide the basis for CD-1.

2.2 Provide for the Effective and Efficient Construction of Facilities and/or Fabrication of Components (execution phase, Post CD-2 to CD-4)

Grade: B+

- The NCSX Project Team successfully completed all close-out activities under cost and ahead of schedule. These activities included the successful completion of assembly trials of high risk component subassemblies, and the completion of modular and toroidal field coil sets and vacuum vessel sectors. All components and hardware have been successfully cataloged and safely stored. All design and manufacturing data has been carefully archived.

2.3 Provide Effective and Efficient Operation of Facilities

Grade: A

- The NSTX team operated the NSTX facility safely and reliably during the past fiscal year, achieving 11 (base) and 5.8 (ARRA) weeks of operation versus the milestone of 11 (base) and 5 (ARRA) weeks. During the 2009 campaign, 2748 plasma pulses, the most ever for a single NSTX year of operations, were produced. The average rate of 163 plasma pulses per run week in FY 2009 represents almost a 30% improvement since 2006. This increase in plasma pulses per run week is the result of pioneering research on lithium wall coatings. The NSTX team has installed two lithium evaporators that deposit a coating of lithium on the carbon tiles in the vacuum vessel. These lithium coatings help control the edge density and have eliminated the need to apply boron coatings to the tiles between shots. The lithium coatings have also improved plasma performance, making it possible to sustain high pressure plasmas for the one second duration, the maximum capability of the magnets.
- In addition, the NSTX team successfully met all facility and diagnostic milestones on or ahead of schedule.

2.4 Utilization of Facility to Grow and Support Lab's Research Base & External User Community

Grade: A-

- The NSTX team is carrying out world leading research on the spherical tokamak concept. In addition, the NSTX results contribute significantly to issues related to the design and construction of ITER. As an example, in FY 2009 they investigated the critical issues of hydrogenic retention in first wall materials and ELM pacing through the use of $n=3$ magnetic perturbations. The NSTX research team, made up of equal numbers of PPPL and collaborating researchers, functions as an integrated team to plan and execute experiments on the NSTX device. The NSTX research leadership also consists of about equal numbers of PPPL and collaborating researchers.
- PPPL provides suggestions for new research topics on NSTX for DOE's annual solicitation, which provides an opportunity for new researchers to join the NSTX research team.

3.0 Provide Effective and Efficient Science & Technology Program Management

Grade: A-

In FY 2009, PPPL managed its scientific program effectively and efficiently, articulating a strong vision for the fusion program and improving research productivity.

- The management of the PPPL Theory Department exceeded expectations.
- PPPL did a very good job in the management of the diagnostic development program and in making the XCS (X-ray Crystal Spectrometer) system available to several machines both within and outside of the U.S.
- PPPL strongly contributed to the OFES strategic planning efforts through the participation of key PPPL scientists in the Research Needs Workshop (ReNeW) for the magnetic fusion energy program.

The PPPL M&O contract changed on April 1, 2009. The transition was very smooth and the ratings under this Goal apply equally to the prior contract and the new contract.

3.1 Provide Effective and Efficient Stewardship of Scientific Capabilities & Program Vision

Grade: A-

- The annual NSTX research forum provides an open competitive process for researchers from the fusion community, including international participants, to propose experiments to be carried out in NSTX. In addition, the NSTX team members are active in the International Tokamak Physics Activity (ITPA), which plans experiments to be carried out on the world's major fusion facilities and analyzes results to provide input to the ITER physics basis. The NSTX team is contributing to the scientific basis for potential next-step options to complement the capabilities of ITER and prepare for a demonstration power plant. PPPL management initiated the NSTX Upgrades Project to enhance the performance of the NSTX facility to maintain its capability to carry out world-leading ST research.
- The PPPL theory program provided strong programmatic leadership in critical areas of fusion theory and modeling—including plasma turbulence and transport, macroscopic stability, and the physics of energetic particles—and maintained strong core competencies in these areas. Because of their leadership they will have a strong stewardship role in energetic particles, transport, and MHD.

- The FSP planning team has articulated a strong scientific vision for the FSP and has been able to attract highly qualified scientists to carry out the two year planning study.

3.2 Provide Effective and Efficient Science & Technology Project/Program Planning and Management

Grade: A-

- The NSTX Research Forum was held in December 2008. In these sessions, members of the NSTX research team presented ideas for experiments which were then discussed and prioritized. A total of over 122 proposals for experiments, requesting over 123 days of runtime, were presented and evaluated. From these, a subset of highest priority experiments was selected by the Experimental Topic (ET) Groups and reported by the ET Group leaders to a final plenary session of the forum. The NSTX Run Coordinator for FY 2009, Dr. Roger Raman, (an NSTX researcher from the University of Washington) then presented the plan for preparing and reviewing the detailed NSTX Experimental Proposals and allocating run time. This plan was reviewed by the NSTX Program Advisory Committee, a committee made up primarily of outside scientists. Technical risk is minimized using the following approaches:
 - NSTX operations are controlled using defined procedures and policies by trained operators.
 - Machine safety is established using an Integrated Safety Test Procedure to make sure all necessary systems are functional and operating correctly.
 - NSTX systems are designed with safety interlocks to prevent inadvertent operation that could damage the experiment.
 - Necessary spares are maintained in the event of a failure since this is a one-of-a-kind device.

3.3 Provide Efficient and Effective Communications and Responsiveness to Customer Needs

Grade: A-

- The NSTX team provides weekly reports to OFES, and immediate reports of any significant events. The NSTX management participates in quarterly status reviews with OFES program managers and provides reports on the quarterly targets. These communication channels are well-defined and the NSTX team has communicated in a timely manner throughout the year.

- The PPPL Theory program exceeded expectations in this area. The PPPL Theory leadership provided prompt and well thought out responses to OFES needs. Their work was of high quality and was precisely what was needed by OFES. Of particular importance was the rapid and effective response to the OFES request for a plan for a fully funded theory program.

4.0 Provide Sound and Competent Leadership and Stewardship of the Laboratory

Grade: B+

PPPL met expectations in this area. Significant changes were made to the Management structure of the Laboratory with the implementation of the new prime contract. We anticipate many positive outcomes as these new processes mature in future performance periods.

4.1 Provide a Distinctive Vision for the Laboratory and an Effective Plan for Accomplishment of the Vision to Include Strong Partnerships required to carry out those plans

Grade: B+

- PPPL has developed a significant collaborative program with worldwide breadth and participation. These collaborations create tremendous leverage in both knowledge and resources within the fusion community.

4.2 Provide for Responsive and Accountable Leadership throughout the Organization

Grade: B+

- PPPL is heavily engaged in the ITER project and the US Burning Plasma Organization. PPPL is lead organization for specific scope assignments, and work is proceeding as scheduled in support of the USIPO.

4.3 Provide Efficient and Effective Corporate Office Support as appropriate

Grade: B+

- The University's Dean for Research is heavily involved in PPPL activities, oversight, and management. The PPPL Management Group Board of Directors meets regularly and addresses issues critical to success.

5.0 Sustain Excellence and Enhance Effectiveness of Integrated Safety, Health and Environmental Protection

Grade: B+ (B)

PPPL did not meet all expectations in this area in the first performance period. Performance improved in the second performance period. PPPL did exceed some expectations in this area. Grades in parenthesis are for the first reporting period.

5.1 Provide a Work Environment that Protects Workers and the Environment

Grade: B+ (B-)

- PPPL did not meet the quantitative objectives for TRC or DART rate in the first reporting period.

5.2 Provide Efficient and Effective Implementation of Integrated Safety, Health, and Environmental Management

Grade: B+ (B)

- PPPL did not meet the quantitative objectives for completing all safety related training on schedule in the first reporting period.
- PPPL did not meet the quantitative objective to complete all ORPS and NTS corrective action reports as scheduled in the first reporting period.

5.3 Provide Efficient and Effective Waste Management, Minimization, and Pollution Prevention

Grade: A-

- PPPL completed a third party audit of the Environmental Management System in support of future ISO 14001 registration. The Lyman Spitzer building was awarded the Energy Star award, recognizing the positive systems in place at the laboratory to minimize the facilities negative impacts on the environment.

6.0 Deliver Efficient, Effective and Responsive Business Systems and Resources that Enable the Successful Achievement of Laboratory Mission(s)

PPPL met/exceeded all expectations in this area.

Grade: A-

6.1 Provide an Efficient, Effective and Responsive Financial Management System(s)

Grade: A-

- Ongoing reviews/audits have demonstrated that the laboratory financial management systems internal controls are effective and being utilized. Changes are made to strengthen internal financial internal controls based on internal reviews, internal reviews and audits.

6.2 Provide an Efficient, Effective and Responsive Acquisition Management System(s)

Grade: A-

- PPPL's procurement division performance on the Balanced Score Card for the entire fiscal year was 93.4%, consistent with FY08s exceptional performance in this area.

6.3 Provide an Efficient, Effective and Responsive Property Management System

Grade: A

- PPPL Property Management met or exceeded all Balanced Score Card (BSC) measures in FY 2009.

6.4 Provide an Efficient, Effective and Responsive Human Resources Management System and Diversity Program

Grade: B+

- Laboratory management reviewed long and short term staffing needs and identified competencies in a comprehensive workforce plan. Results of this effort culminated in identification of successors for planned retirements as well as establishing a more vigorous post-doc/junior researcher program.

6.5 Provide Efficient, Effective, and Responsive Management Systems for Internal Audit and Oversight; Quality; Information Management; Provide an Effective Communications and Public Affairs Program and Other Administrative Support Services as Appropriate

Grade: A- (B+)

- A new head of internal audit was hired during this period with University placing greater reliance on subcontract staff performing audits at PPPL. As the year progressed the changes have contributed to better communications between PPPL, University Internal staff and DOE.

6.6 Demonstrate Effective Transfer of Technology and Commercialization of Intellectual Assets

Grade: B+

- Royalty income is collected and accounted for by the University in accordance with University Patent Policy. Periodic internal audits are

conducted to assure these distributions are made in accordance with that policy.

7.0 Sustain Excellence in Operating, Maintaining, and Renewing the Facility and Infrastructure Portfolio to Meet Laboratory Needs

Grade: A-

PPPL exceeded all expectations in this area.

7.1 Manage Facilities and Infrastructure in an Efficient and Effective Manner that Optimizes Usage, Minimizes Life Cycle Costs, and Ensures Site Capability to Meet Mission Needs

Grade: A-

- The Laboratory continues to show the appropriate level of attention to the maintenance of conventional facility as demonstrated by their achievement of a MII of 2.0. This level of funding allows the Facilities and Infrastructure directorate to continue to drive down the Site's deferred maintenance (DM) backlog.
- An aggressive recapitalization process was maintained during the reporting period. The major projects undertaken in this reporting period were replacement of the water line leaving the Canal pump house, upgrades to the electrical services at the Canal pump house as well as design of the steam line to D-site replacement and the design of the Engineering wing roof replacement.

7.2 Provide Planning for and Acquire the Facilities and Infrastructure Required to Support the Continuation and Growth of Laboratory Missions and Programs

Grade: A-

- PPPL continues to look at the processes employed by the Facilities and Infrastructure directorate as they relate to the "cost of doing business" at the Laboratory. A new PPPL Policy was issued to incorporate GPP Ranking, OPEX Ranking, Building assessments, Walkthroughs, etc. that are used to minimize increases in the cost of facility operations and ensure mission capability.
- The Laboratory submitted their initial Executable Plan as required by DOE O 430.2B in December 2008. This plan addresses the key strategic areas of Energy Efficiency, Renewable Energy, Water usage, Transportation/Fleet Management, and High Performance/Sustainable Buildings. The plan continues to show PPPL performance meeting or exceed the goals set forth in O 430.2B.

8.0 Sustain and Enhance the Effectiveness of Integrated Safeguards and Security Management (ISSM) and Emergency Management Systems

Grade: B+

PPPL met/exceeded all expectations in this area.

8.1 Provide an Efficient and Effective Emergency Management System

Grade: B+

- The Laboratory's Emergency Management System met all expectations.

8.2 Provide an Efficient and Effective System for Cyber-Security

Grade: A- (B+)

- 100 of all Cyber Security staff and system administrators have received professional training within the past two years.
- Currently 100% of all employees have received cyber security awareness training in the past year.

8.3 Provide an Efficient and Effective System for the Protection of Special Nuclear Materials, Classified Matter, and Property

Grade: B+

- An enhanced Site Security Plan was implemented in December 2008 to meet the new DOE DBT requirements. Both documents were approved by DOE.

8.4 Provide an Efficient and Effective System for the Protection of Sensitive Information

Grade: B+

- The Head of Site Protection has identified contacts that have been followed up by the appropriate authorities in FY09. Effective communication and liaison has been established with DOE, BFO/BNL and now the NRCO which has established an office at PPPL. This new office has allowed better communication and information sharing regarding suspected contacts.