

SECTION C

MISSION DESCRIPTION/EXPECTATIONS/STATEMENT OF WORK

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## **PART I**

### **SECTION C: MISSION DESCRIPTION/EXPECTATIONS/WORK STATEMENT**

#### **C.1 – INTRODUCTION**

This Performance-Based Management Contract (PBMC) is for the management and operation of the Princeton Plasma Physics Laboratory (PPPL or the Laboratory). The Contractor shall, in accordance with the provisions of this contract, accomplish the missions and programs assigned by the Department of Energy (DOE or the Department) and manage and operate the Laboratory.

The Laboratory is one of DOE's Office of Science (SC) single-program national laboratories. The Laboratory is a Federally Funded Research and Development Center (FFRDC) established in accordance with the Federal Acquisition Regulation (FAR) Part 35 and operated under this management and operating (M&O) contract, as defined in FAR 17.6 and DOE Acquisition Regulation (DEAR) 917.6.

This contract reflects the Department's effort to enable the Contractor under a PBMC to achieve more highly effective and efficient management of the Laboratory, resulting in a safe and secure environment, outstanding science and technology results, more cost-effective operations, and enhanced Contractor accountability. Toward this end, this contract establishes a process for minimizing the use of unnecessary DOE orders by tailoring existing and new orders. Contractor managers shall be held accountable for maintaining risk mitigation as Laboratory processes and assurance models change.

This contract reflects the application of performance-based contracting approaches and techniques which emphasize results or outcomes and minimizes "how to" performance descriptions. The Contractor has the responsibility for total performance under the contract, including determining the specific methods for accomplishing the work effort, performing quality control, and assuming accountability for accomplishing the work under the contract. Accordingly, this PBMC provides flexibility, within the terms and conditions of the contract, to the Contractor in managing and operating the Laboratory.

Desired results of this contract include improved Contractor operational efficiencies, allocations of Contractor oversight resources to direct mission work, and streamlined and more effective line management focused on a system-based approach to federal oversight with increased reliance on the results obtained from certified, nationally recognized experts and other independent reviewers.

Under this PBMC, it is the Contractor's responsibility to develop and implement innovative approaches and adopt practices that foster continuous improvement in accomplishing the mission of the Laboratory. DOE expects the Contractor to produce effective and efficient management structures, systems, and operations that maintain high

levels of quality, safety, and security in accomplishing the work required under this contract and that, to the extent practicable and appropriate, rely on national, commercial, and industrial standards that can be verified and certified by independent, nationally recognized experts and other independent reviewers.

The Contractor shall conduct all work in a manner that optimizes productivity, minimizes waste, and fully complies with all applicable laws, regulations, and terms and conditions of the contract.

To the maximum extent practical, this PBMC shall:

- (a) Describe the requirements in terms of outcome or results required rather than the methods of performance of the work;
- (b) Use a limited number of systems-based measurable performance standards (i.e., in terms of quality, timeliness, quantity, etc.) to drive improved performance and increased effective and efficient management of the Laboratory;
- (c) Provide for appropriate financial incentives (e.g., fee) when performance standards and contract requirements are achieved;
- (d) Specify procedures for reduction of fee when services are not performed or do not meet contract requirements; and
- (e) Include non-financial performance incentives where appropriate.

## **C.2 - IMPLEMENTATION OF DOE'S MISSION FOR PPPL**

The Contractor shall propose a comprehensive and compelling plan to implement the DOE's SC strategic mission for the Laboratory, as defined below in Section C.4.b. "Laboratory Mission and Major Programs". Within this plan, the Contractor will map the Laboratory's core competencies to this Laboratory mission. The Contractor will highlight the unique roles it proposes that the Laboratory fills in SC's capability to accomplish its missions and, more broadly, that of the Department. Upon approval and acceptance by the Department, the plan shall be updated and executed in accordance with instructions to be issued by the DOE Contracting Officer.

The Performance Evaluation and Measurement Plan (PEMP), as called for within the clause entitled "Standards of Contractor Performance Evaluation", identifies performance goals, objectives, measures, and targets, which are updated and agreed upon by the Parties annually, as standards against which the Contractor's overall performance of scientific, technical, operational, and/or managerial obligations under this contract shall be assessed annually.

## **C.3 - PERFORMANCE EXPECTATIONS, OBJECTIVES, AND MEASURES**

### **C.3.1 - Core Expectations**

#### **C.3.1.1 – General:**

The relationship between DOE and its national laboratory management and operating contractors is designed to bring best practices for research and development to bear on the Department's missions. Through application of these best practices, the Department seeks to assure both outstanding programmatic and operational performance of today's research programs and the long-term quality, relevance, and productivity of the laboratories against tomorrow's needs. Since fusion is a highly collaborative program among institutions both within the United States and abroad, the Contractor must be able to integrate the in-house research with collaborative activities with other institutions. Accordingly, DOE has substantial expectations of the Contractor in the areas of program development and mission accomplishment; laboratory stewardship; and excellence in laboratory operations and financial management.

#### **C.3.1.2 - Program Development and Mission Accomplishment:**

The Contractor shall execute assigned programs so as to strive for the greatest possible impact in achieving DOE's mission objectives, to aggressively manage the Laboratory's science and technology capabilities and intellectual property to meet these objectives, and to bring forward innovative concepts and research proposals that are in concert with DOE missions and that demonstrates clear leadership in the area of fusion and plasma research.

The Contractor will be a recognized national and international leader in fusion and plasma science. The Contractor shall provide the highest quality planning, management, and execution of assigned research and development programs. The Contractor shall propose work that is aligned with, and likely to advance, DOE's mission objectives, and that is well matched to Laboratory capabilities. The Contractor shall strive to meet the highest standards of scientific quality and productivity, "on-time, on budget, as-promised" accomplishment of program deliverables, and first-rate services to the national and international fusion research communities through user facility operations.

The Contractor shall demonstrate benefit to the nation from research and development (R&D) investments by transferring technology to the private sector and supporting excellence in science, engineering, and high performance computing education consistent with achieving continuous progress towards DOE's core missions.

**C.3.1.3 – Laboratory Stewardship:**

The Contractor shall be an active partner with DOE in assuring that the Laboratory is renewed and enhanced to meet future mission needs. Within the constraints of available resources and other contract requirements, the Contractor, in partnership with DOE, shall:

- (a) Maintain an understanding of DOE’s evolving Laboratory vision and long-term strategic plan and address the evolution of Laboratory capabilities to meet anticipated DOE and national needs.
- (b) Attract, develop, and retain an outstanding work force, with the skills and capabilities to meet DOE’s evolving mission needs.
- (c) Renew and enhance research facilities and equipment so that the Laboratory remains at the state-of-the-art over time and is well-positioned to meet future DOE needs.
- (d) Build and maintain a viable portfolio of research programs that generates the resources required to renew and enhance Laboratory research capabilities over time.
- (e) Build and maintain a positive relationship with the broader national and international research community, to enhance the intellectual vitality and research relevance of the Laboratory, and to bring the best possible capabilities to bear on DOE mission needs through partnerships.
- (f) Build a positive, supportive relationship founded on openness and trust with the community and region in which the Laboratory is located.

**C.3.1.4 - Operational and Financial Management Excellence:**

The Contractor shall effectively and efficiently manage and operate the Laboratory through best-in class management practices designed to foster world-class research while assuring the protection and proper maintenance of DOE research and information assets; the health, safety, and security of Laboratory staff; and the public and the environment. The Contractor shall operate the Laboratory so as to meet all applicable laws, regulations, and requirements.

The Contractor shall manage the Laboratory cost-effectively, while providing the greatest possible research output per dollar of research investment, and, accordingly, to develop and deploy management systems and practices that are designed to enhance research quality productivity and mission accomplishment consistent with meeting operational requirements.

**C.3.2 – Performance Evaluation Expectations:**

The performance expectations of this PBMC are broadly set forth in this Section and reflects DOE's minimum needs and expectations for Contractor performance. Specific performance work statements, performance standards (measures applied to results/outputs), acceptable performance levels (performance expectations), acceptable quality levels (permissible deviations from performance expectations), and related incentives shall be established annually, or at other such intervals determined by the DOE Contracting Officer to be appropriate. The related incentives may be monetary, or where monetary incentives are not desirable or considered effective, the Contractor's performance may be used as a factor which directly affects the past performance report card, or a factor in a decision to reduce or increase DOE oversight or Contractor reporting.

In performance under this contract, the Contractor shall be evaluated within the following general performance goals and expectations:

(a) Science and Technology (S & T):

The Contractor shall deliver innovative, forefront science and technology aligned with DOE strategic goals in a safe, environmentally sound, and efficient manner, and will operate world-class experimental facilities used by multi-institutional research teams.

(1) Provide for Efficient and Effective Mission Accomplishment:

The Contractor shall produce high-quality, original, and creative results that advance science and technology; demonstrate sustained scientific progress and impact; receive appropriate external recognition of accomplishments; and contribute to overall research and development goals of the Department and its customers. This goal measures the overall effectiveness and performance of the Contractor in delivering science and technology results which contribute to and enhance the DOE's mission of protecting our national and economic security by providing world-class scientific research capacity and advancing scientific knowledge by supporting world-class, peer-reviewed scientific results, which are recognized by others. This includes the Contractor's support to the U.S. Contributions to ITER Project, being managed by the DOE Oak Ridge National Laboratory, as well as collaborations in national and international fusion programs.

(2) Provide for Efficient and Effective Design, Fabrication,

Construction, and Operations of Research Facilities:

The Contractor shall provide effective and efficient strategic planning; fabrication, construction and/or operations of Laboratory research facilities and shall be responsive to the user community. This goal shall measure the overall effectiveness and performance of the Contractor in planning for and delivering leading-edge specialty research and/or user facilities to ensure the required capabilities are present to meet current and future complex challenges. It also measures the Contractor's innovative operational and programmatic means for implementation of systems that ensures the availability, reliability, and efficiency of these facilities; and the appropriate balance between R&D and user support. This includes the Contractor's support to the US Contributions to ITER Project being managed by the DOE Oak Ridge National Laboratory.

(3) Provide Effective and Efficient Science and Technology Program Management:

The Contractor shall provide effective program vision and leadership; strategic planning and development of initiatives; recruitment and retention of a quality scientific workforce; and outstanding research processes, which improve research productivity. This goal shall measure the Contractor's overall management in executing S & T programs. Dimensions of program management covered include: 1) providing key competencies to support research programs to include key staffing requirements; 2) providing quality research plans that take into account technical risks and identifying actions to mitigate risks; and 3) maintaining effective communications with customers to include providing quality responses to customer needs.

(b) Management & Operations Expectations:

The Contractor shall establish and maintain a standard of excellence in all aspects of laboratory maintenance and operations including, health and safety, business systems, facilities and infrastructure, and safeguards and security.

(1) Provide Sound and Competent Leadership and Stewardship of the Laboratory:

The Contractor's Leadership shall provide effective and efficient direction in strategic planning to meet the mission and vision of the

overall Laboratory and shall be accountable and responsive to specific issues and needs when required. Corporate office leadership shall provide appropriate levels of resources and support for the overall success of the Laboratory. Laboratory-wide strategic vision and effective planning shall include the creation of partnerships and alliances; selection of Laboratory priorities and culture, educational programs, technology transfers, and development of a working relationship with the local community; responsiveness and accountability; and corporate involvement/contributions, including joint appointments, innovative financing proposals, infrastructure support, and an overall investment in the success of the Laboratory.

(2) Sustain Excellence and Enhance Effectiveness of Integrated Safety, Health, and Environmental Protection:

The Contractor shall protect the environment and guarantee the safety and health of its workers and the public. The Contractor protects the safety and health of the Contractor workforce, subcontractors, the community, and the environment in all work performed at the site, and sustains and enhances the effectiveness of safety, health, and environmental protection through a strong and well deployed Integrated Safety Management (ISM) System. This goal shall measure the Contractor's overall success in preventing worker injury and illness; implement ISM down through and across the organization; and provide effective and efficient waste management and minimization and pollution prevention.

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

The Contractor shall sustain and enhance core business systems that provide efficient and effective support to Laboratory programs and its mission(s). This goal shall measure the Contractor's overall success in deploying, implementing, and improving integrated business system that efficiently and effectively support the mission(s) of the Laboratory.

(4) - Sustain Excellence in Operating, Maintaining, and Renewing the Facility and Infrastructure Portfolio to meet Laboratory Needs:

The Contractor shall provide appropriate planning for, construction of, and management of Laboratory facilities and infrastructures required to efficiently and effectively carry out current and future S & T programs. This goal measures the overall effectiveness and performance in



planning for, delivering, and operating Laboratory facilities and equipment needed to ensure that required capabilities are present to meet current and future challenges.

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

The Contractor shall sustain and enhance the effectiveness of integrated safeguards and security and emergency management through a strong and well-deployed system. This includes all aspects of cyber security management. This goal shall measure the Contractor's overall success in safeguarding and securing Laboratory assets that supports the mission(s) of the Laboratory in an efficient and effective manner and providing an effective emergency management program.

**C.3.3 - Performance Objectives and Measures:**

The results-oriented performance objectives of this PBMC are stated in the Performance Evaluation and Measurement Plan (PEMP) (Appendix B) and/or in the Work Authorization Directives issued annually in accordance with the special clause entitled, "Long-Range Planning, Program Development and Budgetary Administration." The Contractor shall develop a Business Plan for the overall direction of the Laboratory and for the accomplishment of these objectives. The Plan shall be actively maintained and annually updated in accordance with instructions issued by the DOE Contracting Officer. The objectives shall be accomplished within an overall framework of management and operational performance requirements and standards contained elsewhere in this contract. To the maximum extent practicable, these requirements and standards have also been structured to reflect performance-based contracting concepts, including the clause entitled "Application of DOE Contractor Requirement Documents", which permits the Contractor to propose to the Contracting Officer alternative and/or tailored approaches based on national, commercial, or industrial standards and best business practices to meet the outcomes desired by the Government.

DOE's Quality Assurance/Surveillance Plan (QASP) for evaluating the Contractor's performance under the contract shall consist primarily of the PEMP as called for within the Part II, Section I (I.105 DEAR 970.5203-1). The QASP establishes the process DOE shall use to ensure that the Contractor has performed in accordance with the performance standards and expectations and acceptable quality levels for each task, describe how performance will be monitored and measured; describe how the results will be evaluated; and state how the results will affect contract payment.

The Contractor shall develop and implement a Laboratory assurance process, acceptable to the DOE Contracting Officer, which provides reasonable assurance that the objectives of the Contractor's management systems are being accomplished and that the systems and controls will be effective and efficient. The Contractor's assurance process shall reflect an understanding of the risks, maintain mechanisms for eliminating or mitigating the risks, and maintain a process to ensure that the management systems and their attendant assurance process(es) meet contract requirements.

#### C.4- STATEMENT OF WORK

(a) General:

The Contractor shall, in accordance with the provisions of this contract, provide the intellectual leadership and management expertise necessary and appropriate to manage, operate, and staff the Laboratory; to accomplish the research missions and roles assigned by the DOE to the Laboratory; and to perform all other work described in this Statement of Work (SOW). DOE research activities are assigned through strategic planning, program coordination, and cooperation between the Contractor and DOE.

Given that the assigned missions of the Laboratory are dynamic, this SOW is not intended to be all-inclusive or restrictive but is intended to provide a broad framework and general scope of the work to be performed at the Laboratory during the term of the contract. This SOW does not represent a commitment to, or imply funding for, specific projects or programs. All projects and programs will be authorized individually by DOE and/or other work sponsors in accordance with the provisions of this contract.

All work under this contract shall be conducted in a manner that protects the environment and assures the safety, health, and security of employees and the public. This objective is to be accomplished by the Laboratory implementing an Integrated Safety Management System (ISMS) that includes an Environmental Management System (EMS). In performing the contract work, the Contractor shall implement appropriate program and project management systems to track progress and maximize cost-effectiveness of work activities; develop integrated plans and schedules to achieve program objectives, incorporating input from DOE and stakeholders; maintain sufficient technical expertise to manage activities and projects throughout the life of a program; utilize appropriate technologies and management systems to improve cost efficiency and performance; and maintain Laboratory facilities and infrastructure as necessary to accomplish assigned missions.

(b) Laboratory Mission and Major Programs:

Laboratory Mission. PPPL is devoted primarily to plasma and fusion science and is one of the leading institutions investigating the science of magnetic fusion energy. As such, it is expected that the Contractor will be a strong leader of the DOE-supported fusion and plasma sciences programs and will develop and support compelling scientific endeavors in these fields. The Laboratory has three major missions: (1) to develop the scientific knowledge and advanced engineering to enable fusion to power the U.S. and the world; (2) to advance the science of nanoscale fabrication for technologies of tomorrow; and (3) to further the development of the scientific understanding of the plasma universe from laboratory to astrophysical scales. PPPL will:

1. conduct world-leading research in fusion science, plasma science and enabling technologies;
2. conduct scientific research and develop key innovations to develop the knowledge base for fusion energy;
3. provide scientific leadership and support of the national fusion science program;
4. effectively and efficiently manage all construction and Major Item of Equipment (MIE) projects; and
5. provide the highest quality of scientific education.

The Laboratory both hosts experimental facilities used by multi-institutional research teams conducting fusion and plasma science research and also provides scientific and engineering support of off-site fusion science facilities.

The primary sponsor of work at PPPL is the Office of Science's (SC) Fusion Energy Sciences Program. Additionally, the Contractor may be authorized to pursue other DOE and non-DOE missions for other federal and non-federal sources and sponsors that derive from the Laboratory's missions and utilize the Laboratory's core competencies. The Laboratory is slowly experiencing a strategic shift from a single-program laboratory to a multi-program, multi-purpose laboratory.

Major Programs. The Fusion Energy Sciences programs at PPPL include participation in the mainline program element of the U.S. fusion program, which is research on burning plasmas utilizing the tokamak concept, as well as investigating non- tokamak concepts for configuration optimization. These activities are strongly supported by theory and modeling programs, international collaborations, design of future facilities, research on plasma science and technology, technology transfer, and university and science education/outreach programs. The details of these programs are as follows:

- (1) Burning Plasma Science and Support of ITER:

PPPL will contribute as a partner on the U.S. Contributions to ITER project during its construction, in preparing for and participating in burning plasma experiments on ITER during its operation (ITER scientific program). The U.S. Contributions to ITER project activities are carried out through the U.S. ITER Project Office (USIPO) at Oak Ridge National Laboratory (ORNL). ITER scientific research will be carried out by a U.S. team to be formed by FES, as well as through activities of the U.S. Burning Plasma Organization (USBPO) and the International Tokamak Physics Activity (ITPA). The Contractor shall continue to support the USIPO and other ITER activities by applying the resources and experience of PPPL staff to the ITER program.

PPPL will contribute a substantial portion of its burning plasma science activities through collaborations with the DIII-D tokamak at General Atomics and collaborations with major international fusion programs in Europe, Japan, China, and Korea. The Contractor shall continue to develop these collaborations. To facilitate the increasingly collaborative nature of fusion science research on centralized facilities, PPPL shall aid the national research community in developing effective means of remote participation in national and international fusion research programs by both PPPL researchers and other members of the U.S. research community.

The next five years present a period of challenge and opportunity for the Laboratory. The Fusion Energy Sciences program is supporting the U.S. Contributions to ITER project for the international ITER project, which is one of its priorities and will be its largest experimental facility. The research community must define a successful model for how to conduct fusion research with a major facility at an international site. As the only laboratory with an exclusive focus on fusion and plasma science research, the Laboratory will be expected to play a significant role in the national research community in this transition.

(2) Toroidal Confinement Experiments

The National Spherical Torus Experiment (NSTX) was built at PPPL in close partnership with ORNL during 1996-1999. It operated as a national facility that involves collaborators from other laboratories, universities, and private sector.

NSTX produced plasma that is shaped like a sphere with a hole through its center, qualitatively different from the “donut”-shaped plasmas of conventional tokamaks. The spherical torus plasma configuration has the advantage of being able to confine a higher plasma pressure for a given magnetic field strength (allowing it to provide unique scientific

information for ITER). This has been demonstrated both experimentally and theoretically. Since the amount of fusion power produced is proportional to the square of the plasma pressure, the use of spherically shaped plasmas may allow the development of more economical fusion reactors, as well as a cost-effective fusion pilot plant.

The NSTX facility was upgraded with the addition of a second neutral beam injector and additional magnetic field coils. These enhancements permit the magnetic field, plasma current, and heating power each to be doubled, and the pulse length to be five times longer than before. The facility is now called NSTX-Upgrade (NSTX-U). The upgrade was completed in late FY 2015. The facility operated for ten weeks in FY 2016 before being shut down due to hardware failures and is currently undergoing a Recovery effort to support the NSTX-U Research program. Recovery and repair efforts are ongoing.

Once it begins operating again, NSTX-U will be the main experimental facility at PPPL. NSTX-U is classified as an SC User Facility, and it will be managed as a national facility, with participation in the research team available to interested and qualified researchers from the U.S. and international fusion and plasma science communities. PPPL will develop and manage science and facility plans to integrate a broad, diverse national and international research team to maximize the scientific output of the facility, in support of the fusion science program goals. The scientific program will be developed and executed with participation by all members of the research team.

PPPL is also pursuing stellarator research as another approach with favorable characteristics for steady-state operations. This work is focused on developing stellarator fusion systems that operate continuously with very little power required to sustain plasma configuration. PPPL participates in stellarator research in collaboration with national programs and theory programs (primarily at universities), and on international stellarator programs through international collaborations.

(3) Theory and Modeling:

The burning plasma science program depends on the strong theory and modeling expertise at PPPL. Advanced computing has already proven useful in optimizing the design of devices used in fusion research, such as complex three-dimensional stellarators, and has shed light on long-standing magnetic confinement challenges, such as the transition to the high confinement mode. The evaluation and communication of research

data within the fusion research community is a practical and necessary aspect of achieving the overall goal of developing the knowledge base for fusion energy.

The PPPL theory group is a leader in working to develop the predictive understanding of a burning plasma, which is necessary to define a future fusion power plant. The PPPL theory group carries out both analytic and computational theory that is focused primarily on four topical areas: 1) classical and turbulence-driven transport, including the effects of both magnetic shear and plasma flows; 2) equilibrium and stability of toroidal plasmas with focus on the prediction, avoidance, and mitigation of deleterious off-normal events such as plasma disruptions; 3) wave-particle interactions, especially energetic particle dynamics in plasmas; and 4) plasma boundary physics, including the coupling of the edge and core regions, the prediction of the characteristics of the edge pedestal, and the transition to high-confinement modes.

In addition, the PPPL theory group is playing an important role in the fusion projects that are part of the Scientific Discovery through Advanced Computing (SciDAC) program element. These projects will form the basis for creating a whole device model for a burning plasma. The PPPL theory department is also leading a multi-institutional effort under the SC Exascale Computing Project (ECP) focused on whole-device modeling, which strongly leverages the work performed under the SciDAC program.

In its effort to establish a new core capability in computational science, the Laboratory recently created a new Computational Sciences directorate and selected a new Associate Laboratory Director to lead it.

In general, PPPL shall continue to perform theory and modeling research in burning plasma and configuration optimization concepts and maintain the Laboratory's position of leadership in this area.

(4) International Collaboration:

In accordance with DOE policies, and in consultation with DOE, the Contractor shall maintain a broad program of international collaboration in areas of research of interest to the Laboratory and to DOE. This collaboration will be both in areas where DOE has formal international cooperation agreements which assign the Contractor a specific role, as well as areas of general interest to the Laboratory's and DOE's research programs. In addition to these collaborations on general fusion research topics, PPPL will also undertake special requests from DOE for ITER support in of future scientific operations. In that role, PPPL could be

asked to take the lead in developing and facilitating the integration of the national fusion research community in these international collaborations, especially ITER. As is the case for most new initiatives, the leadership role in organizing the national research community for international collaborations leading to ITER research coordination may be openly competed. If so, PPPL is expected to aggressively compete for that leadership role of this central component of the future fusion program activities.

Additional areas of potential international collaboration, which could serve as the developmental test bed for ITER collaborations, include advanced tokamak research on the next-generation facilities being constructed and operated in Asia and the existing large tokamak facilities in Europe, as well as spherical tokamak research with international facilities. Also, PPPL will be expected to work closely with the national stellarator research community to define potential areas of collaboration with other large stellarator programs in the international arena to resolve outstanding questions of interest to future national applications of the stellarator to fusion science and technology.

(5) Strategic Planning for Fusion Initiatives:

A. ITER is designed to demonstrate a high fusion power gain in a large (reactor-scale) tokamak device and, as such, its results will strongly influence a societal decision to move forward to a demonstration fusion power plant based on the tokamak. However, other fusion science initiatives and/or research facilities may be needed to address underlying scientific and technological issues that ITER will not address but need to be resolved to inform such a move forward in fusion energy development. It is expected that PPPL scientists and engineers will help define the scientific missions of such efforts and participate in programs to design and operate any such facilities.

B. The Fusion Energy Sciences Advisory Committee (FESAC) recently developed a long-range plan for the Fusion Energy Sciences program. The Laboratory is expected to play a critical leadership role in the implementation of many of the activities identified in that plan..

(6) Plasma Science and Technology Research:

The Fusion Energy Sciences program in the Office of Science of the Department of Energy is a key steward of the field of plasma science and technology, including the fundamental properties of the plasma state; applications of the properties of plasmas to solving problems of

societal interest; and the related area of high energy density laboratory plasma science. The Laboratory has several very successful research programs and facilities that can explore the fundamental properties of plasmas. These programs and facilities serve as a crucial connection between the fusion research community and other areas of science, such as space physics, astrophysics, etc. PPPL is expected to support the strategic interest of the FES program in stewarding this area of science.

(7) Nanoscale Fabrication Technologies

Nanoscale fabrication technologies is an emerging activity that typically requires an interdisciplinary approach to be most effective. Developing and enhancing capabilities in this field will support the fabrication and production of improved materials and new products and will be useful in supporting new U.S. manufacturing capabilities. Plasmas have been shown to be an effective tool in this arena. Given PPPL's capabilities and knowledge in the use of low temperature plasmas to enhance semiconductor manufacturing, PPPL should look for opportunities to expand their research activity in this area, possibly in connection with capabilities and expertise at Princeton University.

(8) Computational Science:

Prediction and interpretation of what is observed in fusion experiments requires computation, and thus the knowledge have about fusion as an energy source is literally encoded and expressed in whole-device models of fusion systems. In this very real sense, fusion energy science is computational science. As the Laboratory diversifies its research into nanofabrication science and greater involvement in astrophysical plasmas, computational science provides a transferable capability. The PPPL program in Computational Sciences serves as a critical connection and is expected to focus on areas such as software engineering, high-performance computing, data science and learning, algorithms and applied mathematics, integrated modeling, artificial intelligence and machine learning, and computing aspects of quantum information science (QIS).

(9) Technology Transfer Programs:

The Contractor shall contribute to technological competitiveness through research and development partnerships with industry that capitalize on the Contractor's expertise and facilities. Principal mechanisms to effect such contributions are cooperative research and development agreements, access to user facilities, reimbursable work for non-DOE activities, personnel exchanges, licenses, and subcontracting.



The Contractor shall cooperate with industrial organizations to contribute to industrial competitiveness by assisting in the application of energy science and technology R&D. Such cooperation may include an early transfer of information to industry by arranging for the active participation by industrial representatives in the Contractor's programs. Cooperation with industrial partners may include long-term strategic partnerships aimed at commercialization of Laboratory inventions or the improvement of industrial products. The Contractor shall respond to specific near-term technological needs of industrial companies, with special emphasis given to working with the types of businesses identified in the Small Business Subcontracting Plan clause of this contract. The Contractor shall develop productive relationships with regional and local companies and through forums such as conferences, workshops, and traveling presentations. It is anticipated that these organizations will be particularly effective participants in the Laboratory's technology transfer activities in promoting a mutually beneficial relationship between DOE and the communities surrounding the Laboratory.

Cooperation may also include use by industrial organizations of Laboratory facilities and other assistance as may be authorized, in writing, by the Contracting Officer.

(10) Outreach Programs:

The Contractor shall maintain outreach programs with academic and educational communities and with nonprofit research institutions for the purpose of promoting research and education in scientific and technical fields of interest to DOE's programs. These outreach programs may include, but is not limited to, such activities as: (i) joint experimental programs with colleges, universities, and nonprofit research institutions; (ii) interchange of college and university faculty and Laboratory staff; (iii) student/teacher educational research programs at the pre-collegiate and collegiate levels; (iv) post-doctoral programs; (v) organization of regional, national, or international professional meetings or symposia; (vi) use of special Laboratory facilities and expertise by colleges, universities, and nonprofit research institutes; and/or (vii) provision of unique experimental materials and expertise to colleges, universities, or nonprofit research institutions or to qualified members of their staffs.

(11) Other Programs:

The Contractor shall be responsible for the conduct of such other programs and activities as the Parties may mutually agree, including:

- (i) Providing the facilities of the Laboratory to the personnel of public and private institutions for the conduct of research, development, and demonstration work, either within the general plans, programs and budgets agreed upon from time to time between DOE and the Contractor, or as may be specifically approved by DOE. The Laboratory facilities shall be made available on such other general bases as DOE may authorize or approve.
  - (ii) The conduct of research and development work for non-DOE sponsors which is consistent with and complementary to the DOE's mission and the Laboratory's mission under the contract, does not adversely impact or interfere with execution of DOE-assigned programs, and does not place the facilities or Laboratory in direct competition with the domestic private sector and for which the personnel or facilities of the Laboratory are particularly well adapted and available, as may be authorized, in writing, by the Contracting Officer.
  - (iii) The dissemination and publication of unclassified scientific and technical data and operating experience developed in the course of the work.
  - (iv) Furnishing such technical and scientific assistance (including training and other services, material, and equipment), which are consistent with and complementary to the DOE's and Laboratory's mission under this contract, both within and outside the United States, to the DOE and its installations, Contractors, and interested organizations and individuals.
  - (v) Laboratory Directed Research and Development (LDRD): The laboratory may conduct an LDRD program that leverages its scientific expertise and key technologies toward innovations that are applicable to DOE's missions.
- (c) Administration and Operation of the Laboratory:  
The Contractor shall manage, operate, protect, maintain, and enhance the Laboratory's ability to function as a DOE laboratory; provide the infrastructure and support activities; support the accomplishment of the Laboratory's missions; and assure the accountability to the DOE under the results-oriented, performance-based provisions of this contract. The Contractor shall implement a broad-scope continual self-assessment process to assess the overall performance in, and drive continuous improvement of, Laboratory operations and administration.

- (1) Strategic and Institutional Planning. The Contractor shall conduct a strategic planning process and develop institutional business plans and strategic facility plans in consideration of DOE-provided planning guidance and strategic planning material to assure consistency with DOE missions and goals and with due regard for Environment, Safety, and Health (ESH) issues.
- (2) Protection of the Worker, the Public, and the Environment. The safety and health of workers and the public and stewardship of the environment are fundamental responsibilities of the Contractor. Accordingly, the Contractor shall implement a Laboratory Integrated Safety Management (ISM) system which establishes the environmental, safety, and health processes that support the safe and efficient performance of all Laboratory work and comply with health, safety, and environmental laws and regulations; minimizes wastes; and complies with DOE Directives and Orders. The ISM system shall include an effective Environmental Management System. The ISM system shall be applied to all Contractor activities conducted by or for the Laboratory, through subcontractors or other entities, and shall provide for ES&H oversight of Laboratory and subcontractor operations. The Contractor shall also implement emergency management programs.
- (3) Integrated Safeguards and Security (ISSM). The Contractor shall protect Laboratory assets, personnel, property, and information, to sustain the science mission in a manner commensurate with risks. The Contractor shall conduct a Laboratory Integrated Safeguards and Security Management program to include physical site security, protection of Government property, sound cyber security protections, protection of information, personnel security, and access control for Laboratory staff and visitors, export controls, counterintelligence, and a comprehensive emergency management program.
- (4) Laboratory Facilities. The Contractor shall manage and maintain Government-owned facilities, both provided and acquired, to further national interests and to perform DOE statutory missions. Recognizing that these facilities are a national resource, these facilities may also be made available, with appropriate agreements, to private and public sector entities including universities, industry, and local, state, and other government agencies. The Contractor shall perform overall integrated planning, acquisition, upgrades, and management of Government-owned, leased, or controlled facilities and real property accountable to the Laboratory. The Contractor shall employ facilities management practices that are best-in-class and integrated with mission assignments and business operations. The maintenance management program shall

maintain Government property in a manner that (1) promotes and continuously improves operational safety, environmental protection and compliance, property preservation and cost effectiveness, (2) ensures continuity and reliability of operations, fulfillment of program requirements and protection of life and property from potential hazards, and (3) ensures the condition of the assets will be maintained or improved.

- (5) Facility Operations and Infrastructure. The Contractor shall assist DOE through direct participation and other support in achieving DOE's energy efficiency goals and objectives in electricity, water, and thermal consumption, conservation, and savings, including goals and objectives contained in Executive Order 13834, Efficient Federal Operations. The Contractor shall maintain and update, as appropriate, its Site Plan (as required elsewhere in the contract) to include detailed plans and milestones for achieving site-specific energy efficiency goals and objectives. With respect to this paragraph, the Plan shall consider all potential sources of funds, in the following order: 1) the maximum use of private sector, third-party financing applied on a life-cycle cost effective basis, particularly from Energy Savings Performance Contracts and Utility Energy Services Contracts awarded by DOE; and 2) only after third-party financing options are evaluated, in the event that energy efficiency and water conservation improvements cannot be effectively incorporated into a private sector financing arrangement that is in the best interests of the Government, then DOE funding and funding from overhead accounts can be utilized.
- (6) Waste Management. The Contractor shall be responsible for investigations, monitoring, clean-up, containment, restoration, removal, decommissioning and other remedial activity (including any costs for defense of litigation related thereto), for the management and/or clean-up of oil spills, contamination or releases of any solid wastes, hazardous wastes and constituents, hazardous or radioactive substances, wastes or materials present in soil, groundwater, air, surface water, facilities and structures (whether subsurface or above ground), as a result of research or other work conducted by the Contractor during the term of the contract.

The Contractor shall execute pollution prevention efforts to advance cost-effective waste reduction, environmental release reduction, environmentally preferable purchasing, and environmental sustainability in facility construction and operation, in all site operations and facilities covered by this contract.

- (7) Business Management. The Contractor shall manage an effective integrated system of internal controls for all business and administrative operations of the Laboratory.

- (i) Human Resources Management. The contractor shall have an HR system designed to attract and retain outstanding employees in accordance with DOE expectations, policies, and procedures. The contractor shall maintain a market-based system of compensation and benefit plans to motivate employees to achieve high productivity in scientific research and laboratory operation.

The Contractor also shall create and maintain a Laboratory environment that promotes diversity, equity, and inclusion, and fully utilizes the talents and capabilities of a diverse workforce. The Contractor shall seek to recruit a diverse workforce by promoting and implementing DOE and Laboratory goals.

Special consideration will be given to entities such as Historically Black colleges and Universities/Minority Serving Institutions, etc. as potential resource pools. The Contractor shall also strive to promote diversity in all the Laboratory's subcontracting efforts with emphasis on the use of Subcontracting Plan clause of this contract.

- (ii) Financial Management. The Contractor shall maintain a financial management system responsive to the obligations of sound financial stewardship and public accountability. The overall system shall include an integrated accounting system suitable to collect, record, and report all financial activities; a budgeting system which includes the formulation and executions of all resource requirements needed to accomplish projected missions and formulate short- and long-range budgets; an internal control system for all financial and other business management processes; and a disbursements system for both employee payroll and supplier payments. The internal audit group for the Laboratory shall report to the most senior governing body of the Contractor's parent organization(s).
- (iii) Purchasing Management. The Contractor shall have a DOE-approved purchasing system to provide purchasing support and subcontract administration. The Contractor shall, when directed by DOE and may, but only when authorized by DOE, enter into subcontracts for the performance of any part of the research work under this contract.
- (iv) Property Management. The Contractor shall have a DOE-approved property management system that provides assurance that the Government owned, contractor held property is

accounted for, safeguarded, and disposed of in accordance with DOE's expectations and policies. The Contractor shall perform overall integrated planning, acquisition, maintenance, operation, management and disposition of Government-owned personal and real property, and Contractor-leased facilities and infrastructure used by the Laboratory. Real property management shall include providing office space for the DOE Princeton Site Office as directed by the DOE Princeton Site Office Manager.

- (8) Legal Services. The Contractor shall maintain legal support for all contract activities including, but not limited to, those related to patents, licenses, and other intellectual property rights; subcontracts; technology transfer; environmental compliance and protection; labor relations; and litigation and claims.
- (9) Information Resources Management. The Contractor shall maintain information systems for organizational operations and for activities involving general purpose programming, data collection, data processing, report generation, software, electronic and telephone communications, and computer security. Contractor shall provide computer resource capacity and capability sufficient to support Laboratory-wide information management requirements. The Contractor also shall conduct a records management program.
- (10) Project Management. The Contractor shall maintain a project management system to ensure all assigned projects' scopes are completed within the approved budget and schedule and managed in accordance with DOE Order 413.3, Program and Project Management for the Acquisition of Capital Assets and the SC Exemption.
- (11) Self-Assessment Program. The Contractor shall conduct an on- going self-assessment process that continually samples and validates actual program practice and prescribed DOE and Laboratory policies, standards, and procedures.
- (12) Community Involvement. The Contractor shall maintain an effective relationship between the Laboratory and the community which includes educational outreach opportunities.
- (13) Other Support. The Contractor shall provide other administrative services necessary for Laboratory operations and logistics support to the DOE Princeton Site Office as requested by the Contracting Officer.

#### **C.5 - PLANS AND REPORTS**

The Contractor shall submit periodic plans and reports, in such form and substance as required by the Contracting Officer. These periodic plans and reports shall be submitted at the interval, and to the addresses and in the quantities as specified by the Contracting Officer. Where specific forms are required for individual plans and reports, the Contracting Officer shall provide such forms to the Contractor. The Contractor shall require subcontractors to provide reports that correspond to data requirements the Contractor shall be responsible for submitting to DOE. Plans and reports which may be submitted in compliance with this provision are in addition to any other reporting requirements found elsewhere in other clauses of this contract. It is the intention of DOE to consult with the Contractor in determining the necessity, form, and frequency of any reports required to be submitted by the Contractor to DOE under this contract.