Project Execution Plan
for the
U.S. CONTRIBUTIONS TO ITER
(US ITER)

Project Number: 14-SC-60

at
Oak Ridge National Laboratory

Office of Fusion Energy Sciences
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Project Execution Plan for the U.S. Contributions to ITER

Submitted by:

Dr. Ned R. Sauthoff, Project Manager, ORNL — Date: 11/30/2016

Dr. Thom Mason, Laboratory Director, ORNL — Date: 11/29/2016

William J. Cahill, Federal Project Director, ORNL Site Office, DOE — Date: 12-1-2016

Johnny O. Moore, ORNL Site Office Manager, ORNL Site Office, DOE — Date: 12/1/16

Joseph J. May, Acting Program Manager, Facilities, Operations and Projects Division, Office of Fusion Energy Sciences, Office of Science, DOE — Date: 12/7/16

Joseph J. May, Director, Facilities, Operations and Projects Division, Office of Fusion Energy Sciences, Office of Science, DOE — Date: 12/7/16

Concurrence:

Dr. Edmund J. Synakowski, Associate Director for Fusion Energy Sciences, Office of Science, DOE — Date: 12/8/16

Stephen W. Meador, Director, Office of Project Assessment, Office of Science, DOE — Date: 12/9/16

Dr. J. Steven Binkley, Deputy Director for Science Programs, Office of Science, DOE — Date: 12/14/16

Dr. Cherry A. Murray, Director, Office of Science, DOE — Date: 12/21/16

Dr. Franklin Orr, Under Secretary for Science and Energy — Date: 1/9/17

Approval:

Dr. Elizabeth Sherwood-Randall, Deputy Secretary of Energy — Date: JAN 13 2017

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Change Log

Revision History		
Rev.	**Date**	**Reason**
0	10/10/2007	Initial release of PPEP
1	07/24/2014	Updated primarily to account for: • SC's exemption from the requirements of DOE Order 413.3B; • Removal of US ITER's designation as a capital asset project; • Addition of US ITER as a Congressional Line Item as directed by Congress; • Changes in the project's preliminary cost and schedule estimates; and • Changes in the assumed annual funding plan.
2	12/10/2014	Updated to account for: • FES Associate Director has approval authority for US ITER annual Performance Plans.
3	12/13/16	Updated the PPEP to a PEP. Significant changes include: • Designation of the Deputy Secretary (S-2) as the Project Management Executive; • Dividing the in-kind hardware scope into two subprojects (SP-1 and SP-2) that will be sequentially baselined; each with their own CD-2/3 and CD-4; and • Establishing separate subordinate PEP documents for each subproject.

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Acronym List

AD	Associate Director
BA	Budget Authority
BAC	budget at completion
CD	Critical Decision
CS	Central Solenoid
CX	Categorical Exclusion
DA	Domestic Agency
DOE	Department of Energy
EAC	estimate at completion
EDA	Engineering Design Activities
ES&H	environment, safety and health
ESAAB	Energy Systems Acquisition Advisory Board
EU	European Union
EURATOM	European Atomic Energy Community
EVMS	Earned Value Management System
FES	Fusion Energy Sciences
FESAC	Fusion Energy Sciences Advisory Committee
FPD	Federal Project Director
FY	fiscal year
IO	ITER Organization
IPR	Independent Project Review
IPT	Integrated Project Team
ISMS	Integrated Safety Management System
JIA	Agreement on the Establishment of the ITER International Fusion Energy Organization for the Joint Implementation of the ITER Project
KPP	Key Performance Parameters
M&O	Management & Operating
MAC	Management Advisory Committee
MIE	Major Item of Equipment
MR	Management Reserve
MW	megawatt
NEPA	National Environmental Policy Act
OMB	Office of Management and Budget
OPA	Office of Project Assessment
OR-ISC	DOE Oak Ridge Office Integrated Support Center
ORNL	Oak Ridge National Laboratory
OSO	ORNL Site Office (DOE)
PA	Procurement Arrangement
PEP	Project Execution Plan
PME	Project Management Executive
PM	Office of Acquisition and Project Management
PPEP	Preliminary Project Execution Plan
PPPL	Princeton Plasma Physics Laboratory
PSO	Program Secretarial Officer
QA	Quality Assurance
R&D	research and development

RMP	Risk Management Plan
SC	Office of Science (DOE)
SC-1	Director of the Office of Science
SP	Subproject
SRNL	Savannah River National Laboratory
TPC	Total Project Cost
U.S.	United States
USDA	United States Domestic Agency
US ITER	U.S. Contributions to ITER
USIPO	US ITER Project Office
UT-Battelle, LLC	University of Tennessee – Battelle, Limited Liability Corporation
VE	Value Engineering
WBS	work breakdown structure

1.0 INTRODUCTION

The United States (U.S.) Contributions to ITER (US ITER) is a U.S. Department of Energy (DOE) project that was established to provide the U.S. share of ITER hardware and cash contributions to support ITER construction. The Project Management Executive (PME) is the Deputy Secretary of Energy (S-2), and the Director of the Office of Science (SC-1) is the Program Secretarial Officer (PSO) for the US ITER Project. These designations are consistent with overall policy direction provided from the Deputy Secretary in a memorandum dated December 4, 2012, to the Office of Science (see Appendix A), and also with DOE's commitments to Congress about applying rigorous project management oversight to this project.

The mission of the Department's Office of Science (SC), which is the responsible program office for this acquisition, is "the delivery of scientific discoveries and major scientific tools to transform our understanding of nature and to advance the energy, economic, and national security of the United States." Within SC, the Fusion Energy Sciences (FES) program is the "Project Owner" for the US ITER Project. The FES mission is to expand the fundamental understanding of matter at very high temperatures and densities and to build the scientific foundation needed to develop a fusion energy source. This is accomplished through the study of plasma, the fourth state of matter, and how it interacts with its surroundings. The next frontier, not only for the FES program, but also for all the major fusion programs around the world, is the study of the burning plasma regime, in which the fusion process itself provides the dominant heat source for sustaining the plasma temperature (i.e. self-heating). Production of strongly self-heated fusion plasma will allow the discovery and study of a number of new scientific phenomena.

In the field, a qualified Federal Project Director (FPD) from DOE's Oak Ridge National Laboratory (ORNL) Site Office is in place to oversee project execution by the US ITER Project Office (USIPO), which is located in Oak Ridge, Tennessee. While ORNL is the lead laboratory, it is supported by two partner laboratories, Princeton Plasma Physics Laboratory (PPPL) and Savannah River National Laboratory (SRNL). This arrangement takes advantage of ORNL's fusion, nuclear and large-scale project management capabilities, PPPL's scientific and technical expertise as DOE's only single-purpose fusion research laboratory, and SRNL's considerable expertise in tritium handling. Under DOE's direction, the USIPO has responsibility for planning, managing, and delivering the entire scope of all hardware contributions for the US ITER Project.

This Project Execution Plan (PEP) was prepared in accordance with provisions of the delegation of authority granted to SC for implementation of project management, and describes the management and project execution processes that are used to ensure that US ITER Project scope is completed on time and within budget. The PEP outlines the project scope, describes the organizational framework and overall management systems for the project, and identifies roles and responsibilities of the project participants. As explained in Section 2.0 (Tailoring of the Project Execution Strategy), the US ITER Project is divided into two separate subprojects, each governed by its own PEP that is subordinate to this PEP. These two PEPs contain their respective subproject completion criteria (similar to key performance parameters (KPPs)), and baseline scope, schedule, cost, and funding profile information. Administrative updates to this PEP and the two subproject PEPs can be made from time to time as deemed necessary by the US ITER FPD, without going through the formal concurrence and approval process. The FPD will ensure dissemination of the latest updated versions to all project participants and stakeholders.

1.1 Project Background

The idea to cooperatively design and build a larger and more powerful magnetic confinement device to create the self-sustaining burning plasma conditions required in a working fusion power plant and to demonstrate its scientific and technical feasibility originated from a Geneva superpower summit in November 1985. At that meeting, Soviet General Secretary Gorbachev proposed to President Reagan that an international project be set up to develop fusion energy for peaceful purposes. The project subsequently began as a four-member collaboration between the Soviet Union [later, the Russian Federation], the United States, the European Union (EU) and Japan. As a technical basis for ITER, the four parties agreed that the tokamak[1] configuration of magnetic plasma confinement devices would be the logical choice given its superior performance (both then and now) in plasma energy confinement. The ITER Conceptual Design Activities began in 1988, followed in 1992 by the Engineering Design Activities (EDA), which involved a great deal of research and development (R&D); the EDA concluded in 1998. At that point, Congress directed DOE not to participate in a three-year extension of the EDA primarily because of concerns over the magnitude of ITER's construction cost estimate. The remaining three members continued to work on the ITER design, with an emphasis on dramatically reducing its construction cost. The result was the 2001 ITER Final Design Report, from which the existing ITER technical baseline was subsequently developed. The next logical steps were to select a construction site and commence construction of the ITER facility.

Following the collapse of the Soviet Union, the Russian Federation took its place as an ITER member. The U.S. joined ITER negotiations in 2003, as the result of a Presidential Initiative. The People´s Republic of China and the Republic of Korea both joined the project in 2003, and finally India joined in December 2005. Thus, there are now seven Members in the ITER Project.

Negotiations between Japan and the EU, two members who offered to host ITER, were successfully concluded in the summer of 2005 with St. Paul lez Durance, France, designated as the construction site, and Europe agreed that they would support a qualified Japanese candidate as Director General (DG) to initially lead the international project organization.

A series of international negotiations then took place that culminated in a signing ceremony on November 21, 2006, when representatives of all seven ITER members signed the *Agreement on the Establishment of the ITER International Fusion Energy Organization for the Joint Implementation of the ITER Project* (ITER Joint Implementation Agreement, or JIA). The ITER JIA was ratified on October 24, 2007, and it provides the legal framework for the four phases of the program: Construction, Operation, Deactivation, and Decommissioning. With regard to the Construction Phase, the JIA (and subsequent modifications) specifies that, as the Host, the EU (represented by the European Atomic Energy Community, or EURATOM) will provide five elevenths (45.45 percent) of the ITER facility's construction cost, while the other six members, including the U.S., will each contribute one eleventh (9.09 percent) of construction cost. Once ITER's construction is completed, the JIA provides for operation, deactivation, and

[1] The tokamak is a torus-shaped magnetic confinement configuration that was pioneered by Russian scientists in the 1960s. The word tokamak is actually a Russian acronym that means "toroidal chamber in magnetic coils."

decommissioning of the facility to be funded through a different cost sharing formula in which the U.S. will contribute a 13 percent share.

The ITER Organization (IO) in St. Paul lez Durance (near Cadarache) is an international organization that is an independent legal entity and is not part of any national institution. The IO was officially established on December 1, 2006, and it is led by a DG and governed by the ITER Council (IC), which is comprised of senior government officials of the seven members. The IC serves as the primary governing and decision-making body for ITER. The majority of the component fabrication effort will be accomplished by the members' Domestic Agencies (DAs) in their home territories. This is accomplished through an "in-kind" contribution approach, which allows each member to retain its currency largely within its own territory. The JIA, and subsequent changes approved by the IC, identify the hardware procurement allocations among the seven members. The allocations are based upon a negotiated valuation scheme that provides an amount of "credit" associated with each hardware item or set of items.[2] The resulting U.S. hardware scope is described in Section 3 of this PEP. DOE officially serves as the DA for the U.S.

The IO has overall responsibility for the design, construction, and operation of ITER. Because ITER is classified as a nuclear facility, the IO must comply with all applicable French laws and regulations related to nuclear liability. It is the IO's responsibility then to issue top-level design specifications, performance parameters, procurement specifications, and schedules. The IO is responsible for integrated management, systems engineering, component assembly, installation, and commissioning as well as oversight associated with its role as Nuclear Operator. Interactions between the IO and the seven DAs are governed by the JIA, which defines their roles and responsibilities. The members' in-kind hardware contributions to the IO are specified via Procurement Arrangements (PAs) between the IO and each DA for a given set of components. Following IO acceptance of each member's hardware deliveries consistent with their approved QA program, title for ownership will be transferred to the IO and the remaining credit will be given to the respective DAs for the value assigned to the hardware item(s) in the JIA.

As previously mentioned, the JIA requires the seven ITER Members to annually contribute cash (in Euros) to the IO in addition to hardware and in accordance with the cost sharing formula that requires the U.S. to provide 9.09 percent of the total cash needed for completing the Construction Phase. The IO uses these funds to pay its staff and infrastructure expenses; to perform its assigned R&D activities; to procure certain hardware and perform on-site assembly/installation/ testing of all ITER components; and to maintain an IO Reserve Fund, which serves as a contingency fund.[3]

At the beginning of the ITER Construction Phase in 2007, the IO and DAs conducted a design review of the 2001 ITER Final Design Report, and recommended several important design

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[2] The amount of credit assigned to a particular set of hardware items is completely independent of their actual cost to the responsible DA.

[3] In March 2015, the IC created an IO Reserve Fund for the DG to expeditiously implement design changes to prevent further schedule slippages and cost overruns. The DG is required to report semi-annually to the IC on how these funds are applied. With IC approval, it will be replenished as needed by cash contributions from the member governments.

improvements and identified some missing items of scope, such as certain test facilities and a number of spare parts. This modified design has then served as the IO's reference design going forward. DOE used this reference design along with the U.S. allocation of scope from the JIA to achieve Critical Decision-1 (CD), Approve Alternate Selection and Cost Range, on January 25, 2008. The estimated project cost/schedule range at CD-1 consisted of: (1) a preliminary estimate of the Total Project Cost (TPC) range—$1.45 to $2.2 billion, and (2) a preliminary estimate of the project completion schedule range— fiscal year (FY) 2014 to FY 2017. Approval for procurement of long-lead items was granted in conjunction with CD-1.

During the post-CD-1 period (2008 – 2016), the US ITER Project worked closely with the IO and other six DAs to further develop the reference design, establish PAs for its assigned hardware, and execute the design, R&D, and fabrication work specified in the PAs. Meanwhile, the IO's overall project schedule has suffered considerable delays, primarily due to design immaturity and insufficient systems engineering, IO internal management issues (some related to establishing a project organization from a green field site), inadequate IO-DA integration, and the annual funding limitations in some DAs. Consequently, slippage in the IO's overall project schedule prompted DOE to defer CD-2 for the US ITER Project until a generally credible and stable IO project schedule emerged in 2016. The IO schedule calls for initial operation of ITER at a milestone called "First Plasma" (FP)[4] at the end of 2025. Since there is no contingency in that schedule, DOE considers it to be an "early finish" date. A more reliable estimate which includes schedule contingency, is deemed to be three years later at the end of 2028. Since only the hardware needed for FP will have been delivered, installed, and commissioned by then, additional hardware fabrication, delivery, installation, and commissioning activities will continue up to the milestone for full operation of ITER with deuterium-tritium (DT) fuel.[5] This DT operation is presently expected in 2035, but the DT schedule has lower confidence than the date for FP. By 2035, all of the DAs' hardware contributions will have been delivered, installed, and commissioned, and the ITER Construction Phase will be complete. The IO plans for a limited series of operating periods using helium, hydrogen, and deuterium plasmas during the interval between FP and DT, so as to be fully prepared to exploit the facility's burning plasma research capabilities once all of the hardware has been installed and commissioned.

Despite the uncertainties associated with the overall ITER Project, the U.S. has made considerable progress in completing its assigned hardware design, R&D, and fabrication work under the PAs that the USIPO has negotiated and signed thus far with the IO. For instance, most R&D has been finished, overall design of US hardware is about two-thirds complete (by value) through Final Design, and fabrication (and even delivery in some cases) of components has begun in certain areas including Toroidal Field Magnet Conductor, Central Solenoid (CS) Magnet, Tokamak Cooling Water Drain Tanks, Vacuum Auxiliary System components, and Steady State Electrical Network equipment. DOE authorization and management oversight of this work has been handled through annual US ITER Project Performance Plans (FY13-FY16), approved by the Associate Director (AD) for FES, that specified progress milestones and used

[4] First Plasma is the initial operation of the tokamak with a confined plasma, which is an important milestone indicating that all basic machine assembly and commissioning have been successfully accomplished and a large number of major project risks have been retired.

[5] A fuel mixture of deuterium and tritium, both hydrogen isotopes, is needed to produce substantial amounts of fusion power and to conduct burning plasma research. Deuterium can be extracted from seawater, and tritium can be produced by subjecting lithium to neutron radiation (as in a fusion reactor).

Earned Value Management System (EVMS) techniques to measure schedule and cost performance.

1.2 Justification of Mission Need

Fusion has the potential to become a major new source of energy and it has many attractive features: no greenhouse gas emissions; no production of long-lived radioactive waste; and fuel (DT) that is both abundant and widely distributed.

There are two general approaches to fusion energy development: magnetic plasma confinement, and inertial confinement. Only the former was considered here because of the dual-purpose nature of inertial fusion for both power production and nuclear weapons stockpile stewardship.

There is a distinct need to investigate the fusion process in the performance region between the current scientific knowledge base and that needed for practical fusion power. There are two parts to this need. The first part is to investigate the fusion process in the form of a "burning plasma," in which the heat generated by the fusion process exceeds that supplied from external sources by a significant amount (e.g., with a power "gain factor" of at least ten). Some of the heat is used to help sustain the burning plasma while additional fuel is being added, but the majority of the heat is captured in a so-called blanket and used to make power available for producing electricity. The second part of this need is to sustain the burning plasma for a long duration (e.g., several hundred to a few thousand seconds), during which time equilibrium conditions can be achieved within the plasma and adjacent structures. In the major fusion programs around the world, no fusion research facility exists or is being built in which such sustained burning plasmas can be achieved. The existing facilities have reached their limits. The heat generated in the plasma at these facilities is about equal to that supplied to the plasma from external sources, a gain of about unity. At this level of performance, the plasma behavior is dominated by external heating rather than self-heating. The duration of such experiments is only on the order of ten seconds.

Today, fusion research is at the threshold of exploring sustained burning plasmas in which self-heating dominates the plasma behavior. Such exploration is a necessary step toward the realization of a fusion energy source, and it must be accomplished to establish confidence in proceeding with development of a demonstration fusion power plant. Through the years, DOE, the fusion community, the Fusion Energy Sciences Advisory Committee (FESAC), the National Research Council, and others have thoroughly evaluated the scientific alternatives coupled with the anticipated funding constraints. There is broad consensus that the next major step in this field is a sustained burning plasma experiment. Accordingly, the mission need is to establish a fusion facility for sustained burning plasma research.

There have been no material changes to the US ITER Project Mission Need Statement since it was approved in February 2005. The US ITER Project was formally initiated on July 7, 2005, when the Deputy Secretary signed CD-0, Approve Mission Need. The overall ITER project mission remains the same: To construct an international research facility that will demonstrate the scientific and technological feasibility of fusion energy, an essential feature of which would be achieving sustained fusion power generation.

1.3 Alternative Selection

Alternative approaches to demonstrate the scientific feasibility of fusion energy have been considered and analyzed over the past three decades. From these analyses, there were only three viable alternatives for the U.S.:

- Continue with the FES base fusion program of existing research facilities; or
- Build the next-step device independently in the U.S.; or
- Build the next-step device through an international collaboration, such as ITER.

The idea of continuing with the base program was discarded based on a series of community-wide studies during this time period by the National Research Council, DOE, FESAC, and others. The conclusion was clear: The next step is a large device that enables the study of burning plasmas. The tokamak approach is the most advanced magnetic confinement concept and the only effective approach to use for burning plasma physics exploration based on current knowledge.

The second alternative, to build the next-step device independently in the U.S., was pursued beginning in the late-1980s with the Compact Ignition Tokamak and Burning Plasma Experiment projects. This effort was terminated due to budget difficulties. In the end, this alternative was eliminated because it was unaffordable within the projected FES program budget.

The third alternative, to build the next step device collaboratively through an international agreement, was the chosen path forward as was re-confirmed in a recent Secretary of Energy report to Congress,[6] which stated "ITER remains the best candidate today to demonstrate sustained burning plasma, which is a necessary precursor to demonstrating fusion energy power." With the ITER approach, the current design, cost, schedule, and project site selection were determined to be the best for the ITER Project by the ITER Members via an international process of technical assessments and high-level negotiations. It allows the U.S. to leverage a modest investment into vital knowledge for commercializing a highly desirable energy source. The recognized project risks created by the complexities of an international collaboration were considered acceptable because of the management provisions that the U.S. was able to negotiate into the ITER JIA. Although noted in the May 2016 Report, "ITER remains the best candidate today to demonstrate sustained burning plasma" the report also stated that "the Project appears to be technically achievable, although significant technical and management risks remain." As a result, the Secretary of Energy recommended that "the U.S. remain a partner in the ITER Project through FY2018", and "the U.S. revisit this recommendation as part of the FY2019 budget process."

1.4 Critical Decision-1

As previously mentioned, CD-1 was approved in January 2008 with a TPC range of $1.45 to $2.2 billion. Since then, the US ITER Project has maintained a comprehensive and up-to-date bottoms-up TPC point estimate that includes a risk-based amount of contingency. It has been

[6] U.S. Participation in the ITER Project (May 2016)

periodically re-evaluated to account for, among other things, foreseeable and actual ITER construction schedule delays as well as annual appropriations of funds and DOE out-year funding guidance. In order to evaluate the validity of U.S. hardware costs, an independent external review was conducted in 2013 of the cost estimates for the two largest U.S. hardware subsystems and of the risk management approach for the entire US ITER Project scope. The two hardware subsystems that were examined, the CS Magnet system and the Tokamak Cooling Water System, together comprise almost half of the U.S. total hardware cost. Chief among its findings, the review report[7] concluded, "in general, the cost estimating processes were sound and the cost estimates themselves were appropriately detailed and credible."

As a point of reference, a bottom-up pre-CD-2 TPC estimate of $3.915 billion for delivering the full US ITER Project scope was prepared in August 2013. This estimate was underpinned by certain annual funding profile assumptions, and by assumptions for the schedule of U.S. payments to the IO of its cash commitments under the JIA. It was independently assessed by a DOE/SC Project Review Committee, and the review committee stated that a cost range of $4.0 to 6.5 billion would be likely to encompass the final TPC.[8] This range has been cited in subsequent President's Budget Requests to Congress, as well as in the previously mentioned Secretarial report to Congress. Subsequently, the USIPO and DOE formally updated the TPC range estimate in November 2016 to $4.7B to $6.5B, increasing the low end to reflect a more realistic contingency allocation and updated SP-1 cost estimate.

2.0 TAILORING OF THE PROJECT EXECUTION STRATEGY

The US ITER Project has a number of features that require tailoring of the standard processes prescribed by DOE Order 413.3B. It is not a conventional DOE capital asset project for the following reasons:

- The US ITER Project will not result in a facility owned by DOE. Instead, the ultimate owner will be the IO located at the facility's site at St. Paul lez Durance, France.
- The U.S. Government is not responsible for overall ITER integration, system engineering, safety basis and licensing, civil construction, installation of hardware, commissioning, and delivery of the other members' hardware components.
- The IO has the authority, subject to guidance from the ITER Council (of which the U.S. is a member) to set the ITER construction schedule that includes the Members' hardware delivery milestones.

In recognition of these facts, the designation of the US ITER Project as a capital asset project as defined by DOE Order 413.3B (Program and Project Management for the Acquisition of Capital Assets) was rescinded by the DOE PME (see Deputy Secretary Memorandum of December 4, 2012 in Appendix A). While unrelated to this, the Congress subsequently directed in the FY

[7] J. Diekmann et al, "DOE External Independent Review Report for the Cost Estimate for Select US Work Breakdown Structure Items and Risk Management Approach, Plans and Procedures on the U.S. Contributions to ITER Project," May 2013.
[8] Reference the August 2013 US ITER Project Review Report issued by SC OPA.

2014 Appropriation that the US ITER Project transition from its status as a Major Item of Equipment to a Line Item (non-capital asset) construction project.
In addition to the above unique characteristics, the US ITER Project schedule is integrated with the overall ITER Project, which is under the IO's control. Because the overall project schedule has substantially slipped, and only the FP milestone is currently defined with reasonable confidence, DOE has chosen to divide the US ITER Project hardware scope into two distinct subprojects (Subproject 1 or SP-1 for FP hardware scope[9], and Subproject 2 or SP-2 for the post-FP hardware) and to baseline SP-1 as soon as possible. SP-2 will follow once the post-FP portion of the ITER construction schedule has been firmly established by the IO and the Secretary of Energy has made a recommendation at the end of FY2017 that the U.S. will continue its participation in ITER. It is not anticipated that there will be any procurements for SP-2 scope until at the earliest FY2021.

In addition to SP-1 and SP-2, U.S. cash contributions to support IO construction-phase activities comprise the third and final element of the US ITER Project scope. Since cash contributions are not part of the subprojects' (SP-1 and SP-2) scope, they are exclusively covered in this overall PEP document. The source of funds for all three project elements is the annual US ITER Line Item appropriation.

Given the above, the overall tailoring strategy for the US ITER Project is to manage it, to the extent practicable, according to the policies, principles, and processes of DOE Order 413.3B as follows:

- The PME is the Deputy Secretary of Energy (S-2), who is responsible for approving all future CDs and Level 0 changes to the Performance Baseline after CD-2 (for the subprojects, as well as for the overall project).
- In accordance with the policy memorandum Appendix D, project implementation will conform to SC project management requirements, processes and procedures, to include conducting periodic SC Independent Project Reviews (IPR) and other external technical peer reviews.
- The two subprojects, SP-1 and SP-2, will both be managed within the same USIPO organizational structure, but they will have their own individual Work Breakdown Structures (WBS), schedules, CDs, project completion criteria, cost estimates, and funding profiles as described in Section 3.0 and in their individual PEPs, which are subordinate to this document.
- Each subproject will have its own CD-2, CD-3, and CD-4.
- The US ITER Project will not deliver an entire integrated operating facility, as would a typical DOE construction project. Instead, in-kind U.S. hardware contributions, for the most part, represent portions of technical subsystems for the ITER facility. Consequently, demonstrating KPPs in the traditional sense as a means for determining project completion (CD-4) is neither appropriate nor possible. Rather, this PEP defines project completion as delivery and IO acceptance of an approved scope of deliverables. Acceptance of the hardware by the IO will be in accordance with the hardware PAs, including elements such as Manufacturing and Inspection Plans. SP-1

[9] The scope of SP-1 also includes the remaining design work for all of the post-FP hardware. Thus, the scope of SP-2 only encompasses procurement (fabrication and delivery) of the post-FP hardware.

also includes the design of all U.S. hardware contributions. Design completion/acceptance will be based on IO approval of the Final Designs.

3.0 PROJECT BASELINE

As explained above, the tailoring strategy is aimed at dividing the US ITER Project hardware scope into two distinct and well-defined hardware subprojects (described in Appendix B) to permit establishing a stable Performance Baseline for the FP hardware scope (SP-1) in the near-term. This is made possible by: (1) the existence of a credible ITER construction schedule to FP, and (2) the exclusion of future U.S. cash contributions from the scope of SP-1 (and also from SP-2). The SP-1 PEP describes the areas of scope, cost, schedule, and funding that together comprise the Performance Baseline for SP-1. Eventually, a SP-2 PEP will be prepared to provide the same information for that subproject. Baselining the cost of the U.S. construction cash contribution will require the IO to eventually provide a reliable cost baseline for the total cash needed to complete the Construction Phase. This overall ITER baseline, along with any subsequent changes, must be approved by the IC. Realistically, reaching this step could be many years away. Only then can there be a complete Performance Baseline with a TPC for the entire US ITER Project. Any changes to the subproject Performance Baselines, once approved, must be made in accordance with Section 6.1, Change Management.

3.1 Scope

The IO has established an overall technical baseline for the ITER Project that is documented in a top-level "Project Specification," which was initially approved by the ITER Council in June 2008. Beneath this top tier, the IO has developed a hierarchy of technical baseline documentation in the form of Project Requirements and System Requirements. All of these are under control of the IO's configuration management system.

The ITER Project Specification identifies two top-level technical performance goals:

1. Produce substantially more thermal fusion energy than the energy expended in heating the plasma. Specifically, ITER is designed to burn DT fuel to produce 500 megawatts (MW) of fusion power in pulses of 300 to 500 seconds. This would provide a power gain factor of at least 10.

2. Integrate and test many of the key technologies and processes needed for future fusion power plants, including superconducting magnets, components able to withstand high heat loads, and remote handling.

The hardware scope of the US ITER Project is well defined by the U.S. commitments specified in the ITER JIA and in its PAs with the IO. As a result, there is no scope contingency that is typically available in SC projects. The US ITER Project scope falls into two basic categories:

1. **In-kind hardware** for twelve specific ITER subsystems or components of systems (see again Appendix B which contains a description and schematic of the U.S. hardware commitments). This includes the remaining design, fabrication, testing (prior to delivery) and delivery of designated hardware components in accordance with the design and performance specifications and acceptance criteria defined in the

18 PAs between the U.S. DA and the IO.[10] For the purpose of dividing the twelve hardware elements into SP-1 scope and SP-2 scope, the US ITER Project has followed formal guidance from the IO (see again, Appendix B, for a description of how the IO has defined this division of scope and how it has been allocated between the subprojects). It should be noted that many of the twelve do not entirely fit into either SP-1 or SP-2, but rather, are subdivided between the two subprojects. The US ITER Project Work Breakdown Structure (WBS) dictionary further defines how the U.S. hardware scope is allocated between the subprojects. The in-kind hardware category also includes the operation of the USIPO that manages and coordinates all activities of the US ITER Project. The completion criteria (similar to KPPs) for SP-1 and SP-2 are described in their respective PEPs.

Because of modest adjustments in hardware procurement sharing among the IO and DAs that have been made for various reasons over the past few years, the total credit value of U.S. hardware contributions has fallen below the specified 9.09 percent level. In order to make up the difference, the U.S. is obligated to contribute so called "in-kind" cash to the IO. The "in-kind" cash is part of SP-1 scope because it is required during the SP-1 time frame of the overall US ITER Project. This is distinct from the cash contributions necessary to support the IO functions described below.

2. **Cash** (in Euros) to be paid to the IO for its construction-phase activities including:
   - ITER R&D,
   - IO staff and infrastructure, and
   - IO-provided hardware and on-site assembly/installation/testing of all ITER components, and the IO Reserve Fund.

Per the previously mentioned May 2016 Secretarial report to Congress, the Department intends to cap the amount of future U.S. cash contributions (through negotiations within the ITER Council) as a way to impose disciplined cost control on the entire US ITER Project TPC.

The criteria for achieving CD-4 (Approve Project Completion) for the entire US ITER Project are to a certain degree reliant upon the IO. In particular, the US ITER subprojects will each be considered ready for their respective CD-4 approvals when all of their hardware scope and associated documentation are delivered and accepted by the IO per the corresponding PAs. In the case of SP-1, which includes the design of all U.S. hardware, design completion/acceptance will be based on IO approval of the Final Designs. The USIPO will present verification of the completion criteria and delivery of subproject scope to the FPD for review and approval. Upon confirmation that the completion criteria have been met and all WBS scope delivered, the FPD will recommend to the PME that the corresponding subproject is ready for CD-4 approval. The remaining scope element, the U.S. cash contribution for the Construction Phase, will be completed once the last payment of the U.S. share of the final total IO construction cash budget as approved by the ITER Council. This final payment could occur before or after the completion of SP-2.

[10] As of late 2016, the USIPO has negotiated and signed 15 of the 18 PAs with the IO.

3.2 Cost

SP-1and SP-2 each have their own subproject TPCs, which together with the total U.S. construction cash contribution, comprise the overall US ITER Project TPC. The SP-1 TPC ($2.5 billion) is the only one of these components currently known with the degree of accuracy and confidence needed to establish a Performance Baseline. It includes 46 percent of cost contingency on the remaining hardware-related work, and is described in more detail in the SP-1 PEP. The cost estimate for SP-2 is still preliminary, and it is represented by a range of $1.1 to $1.7 billion. The cost estimate range for the total U.S. cash contribution is $1.1 to $2.3 billion.

3.3 Schedule

Figure 1 illustrates the US ITER Hardware Project schedule range, and the table below it lists the key schedule milestones for the US ITER Project. Each subproject has its own CD-2/3 and CD-4, and there is an overall project CD-4. The approval authority for all CDs is the PME. The entire US ITER Project will be considered complete upon approval of CD-4 for SP-2 and the payment of the final U.S. construction cash contribution. The dates for SP-2 CD-2/3 and CD-4 will be set once an acceptable level of cost and schedule risk has been reached for establishing a SP-2 Performance Baseline, as determined by the PME. The Performance Baseline schedule for achieving CD-4 for SP-1 is December 2027, which is consistent with supporting an ITER FP in 2028. It includes 40 months of schedule contingency. See the SP-1 PEP for a more detailed description of the SP-1 schedule, including a comprehensive list of lower-tier SP-1 baseline performance milestones. The IO has requested that the completion of the U.S. construction cash contributions be completed by 2035.

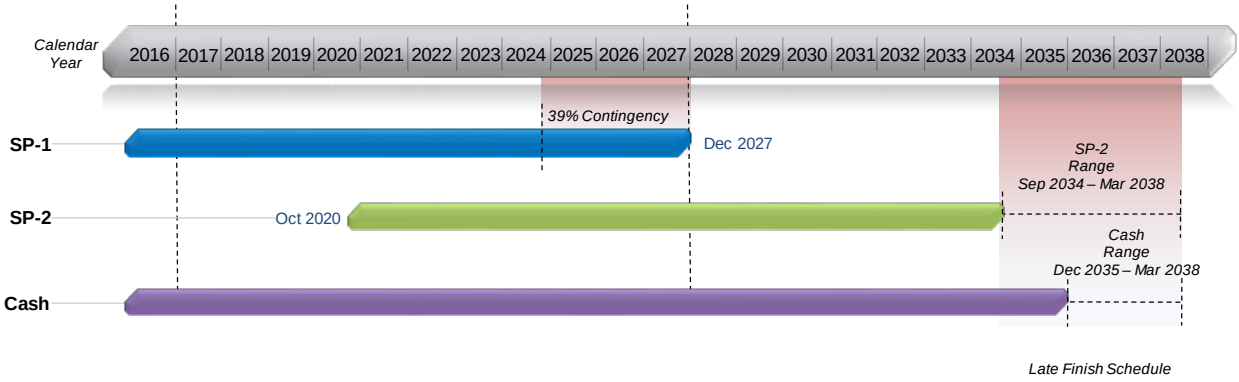


Figure 1. Hardware Schedule Range

Table 1. Schedule of Critical Decisions for the US ITER Project

Level 0 Milestone	Schedule	
CD-0 Approve Mission Need	July 2005 (Actual)	
CD-1 Approve Alternative Selection and Cost Range	January 2008 (Actual)	
Updated CD-1 Cost Range	December 2016	
Subproject	CD-2/3 Approve Performance Baseline and Start of Fabrication	CD-4 Approve Completion
SP-1	December 2016	December 2027
SP-2	2019	2034-2038
Overall Project	Not Applicable	2034-2038

3.4 Work Breakdown Structure (WBS)

The US ITER Project scope has been organized into a WBS that forms the basis for planning, executing, and controlling project activities, with subordinate WBS's for SP-1 scope and another for SP-2 scope. The overall WBS at Level 2 is shown below in Table 2.

Table 2. US ITER Project Level 2 WBS

WBS #	WBS Name
1	Subproject 1
1.1	Tokamak
1.2	Tokamak Ancillary Equipment & Cryostat
1.3	Tokamak Fluids
1.4	Electrical Systems
1.5	Port Interfacing Systems
1.6	Project Support
1.7	In-Kind Cash and Miscellaneous
1.8	Supplemental Task Agreements with IO
1.9	Instrumentation & Controls
2	Subproject 2
2.2	Tokamak Ancillary Equipment & Cryostat
2.3	Tokamak Fluids
2.5	Port Interfacing Systems
2.6	Project Support
2.7	Support to IO
2.9	Instrumentation & Controls

3.5 Funding Profile

Since the US ITER Project involves no civil construction, SC initially budgeted this project as a Major Item of Equipment (MIE). Beginning with the FY2014 appropriation, Congress mandated the US ITER Project to be managed as a Line Item project. The US ITER Project (both hardware and construction cash) will be entirely funded from the Line Item in the FES program budget; there are no inter-agency funding agreements or external sources of funding.

The overall US ITER Project funding profile consists of the profiles for SP-1, SP-2, and construction cash. The baseline SP-1 funding profile is contained in the SP-1 PEP. Baseline funding profiles for SP-2 and construction cash will be established when post-FP uncertainties in the IO's construction schedule have been reduced to a manageable level. No funding for SP-2 is anticipated before FY2021.

A notional near-term funding profile for U.S. construction cash contributions, as reported in the May 2016 Report, is shown in Table 3, below. It is anticipated that construction cash payments will extend into the mid-FY2030s, and that the U.S. will start making cash contributions to the IO for the ITER Operations Phase as early as FY2024. Contributions for ITER Operations are not part of the US ITER Project TPC and are not included in Table 3.

Table 3. Notional Near-Term US ITER Annual Budget Authority (BA) Funding Profile for Construction Cash (in $M)

Fiscal Year	Prior Years	FY16	FY17	FY18	FY19	FY20	FY21	FY22	FY23	FY24	FY25
BA	126	-	25	108*	77	82	85	88	98	105	54

* Includes funds for payments due in FY2016 - 17

4.0 U.S. CONTRIBUTIONS TO ITER LIFE-CYCLE COST

The ITER JIA established a 35-year international collaboration that, in addition to construction, nominally envisions a 20-year operations phase, followed by a 5-year period of deactivation. Decisions on decommissioning the facility, which would occur beyond the 35-year program period, will be left to the host country (France). As previously noted, the U.S. share of the operating, deactivation, and decommissioning phases is 13 percent. Annual cash contributions for these phases are due to commence approximately one year before ITER achieves its FP milestone. When combined with the U.S. share to construct ITER, the total U.S. life-cycle cost consists of the following elements:

- In-kind hardware contributions (including In-kind cash);
- Cash contributions to the IO for ITER construction;
- Cash contributions for ITER operations, deactivation and decommissioning;
- Pre-operations support (U.S. personnel support during installation and commissioning); and
- The U.S. research program for using the ITER facility.

The initial rough preliminary estimate made in 2007 for post-CD-4 cost (operations, deactivation, decommissioning) was about $1.5 billion (as spent). The IO and the ITER Council have not updated the JIA cost estimates for operation, deactivation, and decommissioning. DOE will update its estimate in the PEP for the U.S. portion of those life-cycle phases needed.

5.0 ACQUISITION APPROACH

Based on the approved US ITER Acquisition Strategy, it was determined that the USIPO at ORNL, along with its two partner laboratories (PPPL and SRNL), will procure and deliver all of the U.S. in-kind hardware in accordance with the PAs established with the IO. Detailed arrangements for shipping, receiving, acceptance testing, and transfer of ownership for these items are specified in each individual PA.

The US ITER Project is committed to the broadest possible use of open competition among all qualified firms, including non-U.S. firms where appropriate. Non-competitive procurements will be documented in accordance with DOE-approved purchasing requirements. The US ITER Project procurements will comply with U.S. laws and regulations designed to assist U.S. businesses.

The US ITER Project procurement team is using competitive solicitations for fixed-price procurement of most (~80%) of the in-kind hardware, which has been enhanced by the early involvement of industry. In addition, consideration is routinely given to wide dissemination of the draft solicitations prior to the formal solicitations, as well as the use of pre-proposal and pre-award conferences.

The project is making efforts to encourage participation from women-owned, minority-owned, and small/disadvantaged businesses. Additional information can be found in the *Acquisition Strategy for the U.S. Contributions to ITER Project*.

5.1 Acquisition Strategy

As described in the US ITER Acquisition Strategy, DOE is meeting the U.S commitments under the JIA for providing the IO with design, fabrication, and delivery of in-kind hardware, as well as payments of cash to the IO, through the USIPO, which is run by the management and operating (M&O) contractor responsible for ORNL. That contractor is currently the University of Tennessee – Battelle, Limited Liability Corporation (UT-Battelle, LLC). Subcontract procurements for all of the U.S. in-kind hardware are the responsibility of the USIPO and the partner laboratories.

5.1.1 Prime Contract

The M&O contractor responsible for ORNL (UT–Battelle, LLC) is serving as the prime contractor to DOE, and ORNL is ultimately responsible for delivering the entire US ITER Project scope as described above in Section 3.1. The contract is administered by the DOE ORNL Site Office (OSO). Under this authority, the US ITER FPD has been delegated Contracting Officer’s Representative authority for all US ITER Project matters.

5.1.2 Subcontracts

To the extent practical for this project, USIPO is using competitive fixed-price contracting with a "Best-Value" evaluated procurement approach. All of the subcontracts are being evaluated and awarded based on the best value to the U.S. Government.

5.1.3 Small and Disadvantaged Business

Efforts are being made to encourage participation of small and disadvantaged businesses in execution of the US ITER Project. The scale and technical complexity of the project may preclude small and disadvantaged businesses from principal roles; however, it may be possible to identify smaller packages of work that match the capabilities of these companies and to solicit their involvement. Where feasible, targets/goals for participation by small and disadvantaged businesses are included in management agreements and subcontracts with the major project participants.

6.0 BASELINE MANAGEMENT

The US ITER Project manages changes in functional or physical scope requirements and evaluates the impact of changes on cost and schedule through a formal baseline change control process. The essential elements of configuration control are a well-defined baseline, and an effective method of communicating, evaluating, and documenting changes to that baseline. This promotes orderly evolution of the baseline design, and ensures that the effect of changes on cost, schedule, and technical scope are properly evaluated and documented by project management. A Project Change Request (PCR) must be initiated when a proposed change to the project will have an impact on any of the cost, schedule, or scope baselines.

The baseline change control process is administered by a Change Control Board (CCB) consisting of members of the US ITER Project. The board includes the chairman (the US ITER Project Manager), a change control manager, and board members. The board members review the technical, cost, and schedule implications of proposed changes and advise the chairman. A record of all PCR actions is maintained in a change control log.

6.1 Change Management

PCRs are processed through a hierarchy of change control levels with progressively structured authority for approval/disapproval of changes. The DOE and contractor change control levels for the US ITER Project are described in Table 4, below. These will be utilized to manage changes to the Performance Baselines for SP-1 and SP-2 (once established), as well as for changes to the baseline total construction cash contribution and its associated funding profile (once established).

Table 4. US ITER Project Change Control Thresholds

	Level 0 Project Management Executive (S-2)	**Level 1 Associate Director for FES (SC-24)**	**Level 2 Federal Project Director**	**Level 3 US ITER Project Manager**
Scope	Any deletions or additions to the total U.S. share of the in-kind hardware as defined in the JIA.	Any transfer of U.S. in-kind hardware scope to the IO or to another DA. Any U.S. voluntary (i.e., non-creditable) contributions to the IO. Any changes to SP-1 and SP-2 scope at WBS Level 3.	Any scope change to a PA that would require using contingency.	Any scope change to U.S. PAs whose cost impact can be accommodated by using Management Reserve. Any change to the WBS.
Cost	Any increase in the SP-1 TPC, SP-2 TPC, or the total construction cash contribution.	The cumulative use of over 25% of total project contingency. *	Any change that requires use of contingency.**	Any change to Budget at Completion (BAC) that does not require use of contingency. Any use of Management Reserve.
Schedule* **	Any change in a Level 0 milestone.	Any change to a Level 1 milestone.	Any change to a Level 2 milestone.	Any change to a Level 3 milestone.
Funding	Any changes to the funding profiles for SP-1 and SP-2, as well as the construction cash profile that negatively impacts their respective Performance Baselines.			

* After the cumulative threshold has been reached and the next higher change authority has been notified and has approved the changes, the cumulative cost thresholds will reset.
** US ITER FPD will notify the US ITER Program Manager of any cost contingency usage.
*** For a listing of SP-1 and SP-2 performance baseline milestones, see the respective subproject PEPs.

6.2 Performance Measurement

The actual cost of work performed, using accrued costs and progress on the project (earned value or budgeted cost of work performed), is being collected using a project-wide reporting and controls system. Monthly earned value reporting to DOE will be implemented for each subproject once their respective performance baselines are established. Project performance data will then be tracked against the baselines, variance analyses will be performed, needed corrective actions will be implemented, and future risks will be identified. UT-Battelle, LLC has a certified EVMS as described in Section 8.3.

6.3 Contingency Management

In general, the TPC is the sum of the Budget at Completion (BAC) plus cost contingency. At CD-2, the subproject BACs will be developed by the USIPO to represent the most realistic estimate of probable costs for all WBS elements. Contingency funds are necessary to cover costs that result from incomplete design, uncertainties associated with market conditions, technical difficulties, schedule delays, event risks, and other circumstances commonly encountered during project execution. Contingency estimates will also be developed at CD-2 for each major cost element, usually at WBS Level 4 or lower, using a risk-based contingency approach that reflects the status of hardware design, procurement, and fabrication. Once contingency is developed and

baselined for SP-2 and for construction cash, those amounts will be combined with the SP-1 contingency and held at the Project level. The process for contingency development is further described in the USIPO Risk Management Plan.

The FPD will control distribution of the contingency in accordance with the baseline change control process and in close coordination with USIPO management and the FES US ITER Program Manager. Formal baseline changes will normally be made following a subproject-wide Estimate-at-Completion (EAC) process done annually or on individual elements when the existing baseline no longer provides a reasonable basis for performance measurement.

The USIPO Project Manager is responsible for managing and approving the use of Management Reserve (MR) funds. MR funds are derived from cost savings across the subprojects and assignment of DOE contingency. MR will be used by the contractor as a management tool to facilitate project changes within the contractor's change thresholds. MR does not apply to construction cash.

6.4 Estimate at Completion (EAC)

One of the most important indicators of the financial health of a project is management's realistic estimate of the cost to complete the job. When added to the cost already incurred, the result is the EAC. Because of the dynamic nature of projects such as the US ITER Project, the formal performance measurement baseline will always lag behind this estimate of "management's best judgment."

As the information base grows throughout the project execution phase (actual cost history, design maturity, procurement experience, etc.), project personnel will develop periodic, comprehensive, detailed "bottom-up" estimates of the cost to complete the subprojects. In general, these will be prepared on one-year intervals, or when conditions indicate that a substantive impact on the project is developing. In addition, adjustments to the EAC will be made on a continuing basis by USIPO management to reflect new information and keep the management assessment current. The US ITER Project projections for the EAC will be evaluated periodically as part of the SC IPRs process. The USIPO establishes and justifies the EAC.

Management of cost, schedule, and technical risks is integral to contingency management. US ITER Project management will evaluate the project risk issues on a continuing basis during project execution.

7.0 MANAGEMENT STRUCTURE AND INTEGRATED PROJECT TEAM (IPT)

7.1 Organizational Roles and Responsibilities

The US ITER Project organization, shown in Figure 2, that has been established to accomplish the project. The IPT Charter (contained in Appendix C) defines and integrates the roles and responsibilities of the IPT.

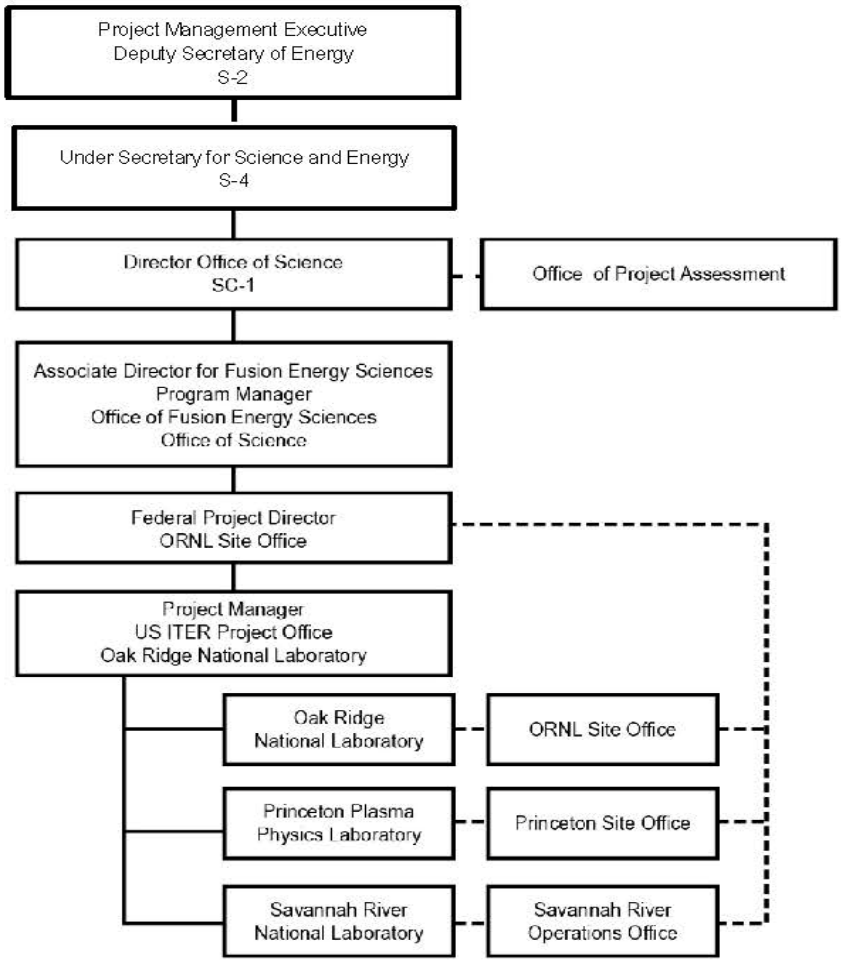


Figure 2. US ITER Project Organization

7.2 Project Management Executive

The PME for the US ITER Project is the Deputy Secretary (S-2). The PME's specific responsibilities for this project include:

- Serves as the Energy Systems Acquisition Advisory Board (ESAAB) Chair;
- Approves all CDs;
- Renders decisions on Level 0 baseline changes per Table 4;
- Appoints the FPD and ensures that this individual is sufficiently qualified and has appropriate communication and leadership skills;
- Approves this PEP, as well as subproject PEPs, including substantive updates; and
- Approves the IPT Charter (as part of this PEP).

7.3 Director of the Office of Science (SC-1)

The Director of the Office of Science is the PSO for the US ITER Project. As such, SC-1 is responsible for incorporating the US ITER Project baseline funding requirements in annual SC budget requests. In addition, SC-1's specific responsibilities for this project include:

- Advocates US ITER and the international ITER projects with senior DOE and other Executive Branch organizations (e.g., Department of State, Office of Management and Budget [OMB]) and brief congressional members and committees as necessary.

7.4 SC Office of Project Assessment (OPA)

The SC OPA, which reports directly to SC-2, provides key project management support and advice to the PME, FES, and the FPD. OPA's specific responsibilities for this project include:

- Provides independent oversight, and advise the PME, SC-1, SC-2, and FES on resolving project issues;
- Performs IPRs as requested by the PME, SC-1, or FES, and informs them of the results;
- Coordinates with other DOE organizations and offices, including Office of Project Management Oversite & Assessment (PM), to ensure the effective implementation of key policies.

7.5 FES Associate Director

The FES AD has programmatic responsibility for DOE's fusion science mission, including construction of state-of-the-art research facilities. Hence, the FES AD is the DOE Headquarters "Project Owner." The AD's responsibilities include:

- Prepares and defends the annual FES program budget requests including the necessary SP-1 and SP-2 baseline funding profile levels and required cash contributions;
- Approves Construction Cash payments to the IO;
- Provides executive leadership to the IPT and USIPO on the management of the US ITER Project;
- Champions US ITER and ITER projects with senior DOE and other Executive Branch organizations (e.g., Department of State, OMB) and briefs congressional members and committees as necessary.

7.6 FES Program Manager

FES provides the overall program policy and guidance, technical oversight, budget formulation and planning, and funding needed to execute the US ITER Project. Specific responsibility within FES for carrying out these functions is assigned to the US ITER Program Manager in the FES Facilities, Operations and Projects Division (SC-24.1). The Program Manager's responsibilities include:

- Serves on the US ITER IPT;
- Develops, and if necessary, updates the US ITER Mission Need Statement;
- Oversees development of project definition and objectives, technical scope, and budget to support the mission need;
- Formulates annual budget request for funds required to execute the project, prepares and coordinates project budget-related documents, and provides guidance to the FPD and USIPO regarding future project funding scenarios;
- In consultation with the FPD, prepares Financial Plan requests;

- Leads efforts to prepare for and support ESAAB Board actions, such as baseline development as needed for CD-2;
- Coordinates initial approval and approval of updates to this PEP and the subproject PEPs;
- Functions as the central DOE Headquarters point of contact for project matters, such as the United States Domestic Agency (USDA) interface with the IO and external audits;
- Monitors and evaluates the project's technical, cost, and schedule performance through completion, and informs and advises the FES AD on major issues and facilitate their resolution;
- Facilitates the baseline change control process at the Headquarters level;
- Coordinates with the FPD, IPT, other FES program elements, other SC staff offices, as needed, to promote and expedite progress on the project; and
- Coordinates with OPA to plan, organize, conduct, document, and report results of IPRs and other project reviews.

7.7 Federal Project Director

The US ITER Program Manager in FES implements the US ITER Project through the field organization, which is led by the FPD, who has been delegated responsibility and authority for project execution. Additional support to the US ITER FPD is provided by the DOE Oak Ridge National Laboratory Site Office and the Oak Ridge Integrated Support Center (OR-ISC) support organizations at the level required for project success.

The FPD leads a project office to oversee and direct the US ITER Project with matrixed staff support from the OSO and part-time OR-ISC support staff. The FPD's staff nominally consists of two directly assigned individuals.

The support personnel resources are provided primarily through staff assignments from the OR-ISC and OSO. A summary organizational diagram for the project is provided in Figure 3. The FPD is responsible for overseeing the prime contractor's (UT-Battelle, LLC) effort to provide in-kind hardware, and make authorized in-kind and construction cash payments to the IO.

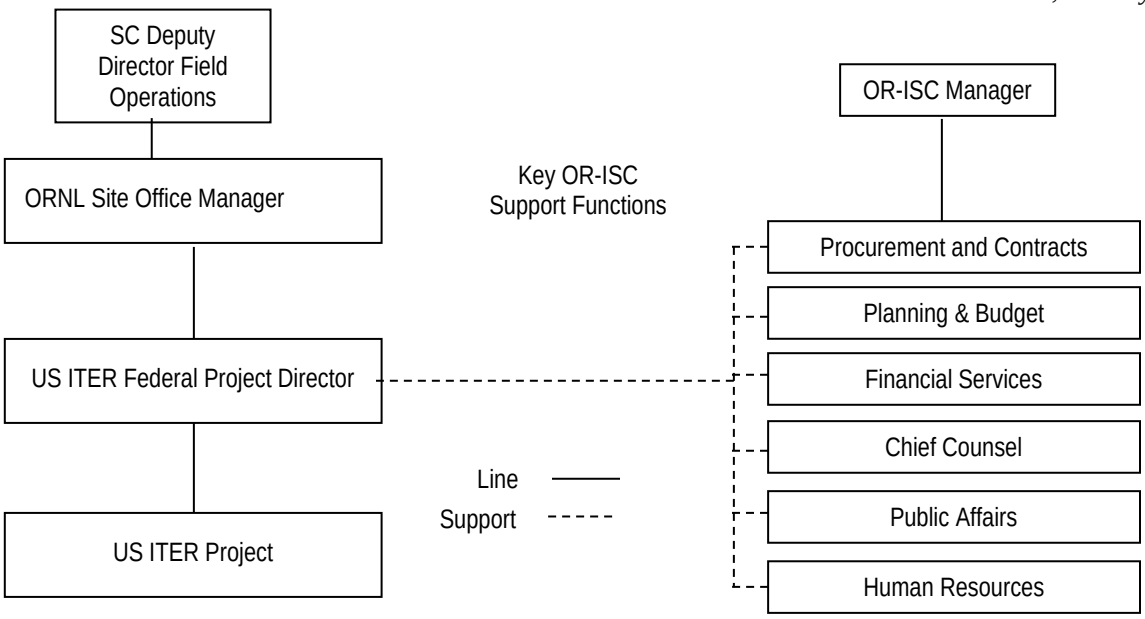


Figure 3. DOE Field Organization for the US ITER Project

The FPD's responsibilities include:

- Leads the IPT, provides overall guidance, and delegates appropriate decision-making authority to the IPT members;
- Prepares and maintains the IPT Charter and operating guidance with IPT support;
- Keeps the IPT and senior DOE management informed;
- Schedules and holds regular IPT meetings;
- Initiates development and implementation of key project documentation (e.g., the PEP and subproject PEPs);
- Serves as the DOE Contracting Officer's Representative for matters pertaining to the US ITER Project;
- Serves as the single point of contact between Federal and contractor staff for all matters relating to the project and its performance. Maintains effective communications among SC, OR-ISC, the USIPO, and other cognizant DOE Site Offices;
- Oversees implementation of project cost, schedule, performance, and scope baselines;
- Provides day-to-day oversight of the project, anticipates potential problems, and take corrective actions to minimize potential delays and cost growth;
- Supports FES in the formulation of budget requests and funding documentation to the US ITER Program Manager for funds required to execute the project;
- Ensures that the US ITER Project complies with applicable environment, safety and health (ES&H) requirements, export controls, security requirements, public laws, regulations, and Executive Orders;
- Monitors and reports on the performance of the project against established technical, cost, and schedule performance baselines, and monitors risk management planning and mitigation activities;
- Evaluates and verifies reported progress. Makes progress projections and identifies trends;

- Proactively identifies and ensures timely resolution of critical issues within Federal control that impact the project's performance;
- Participates in project reviews by DOE Headquarters and others;
- Facilitates external audits of the US ITER Project;
- Authorizes the use of project contingency funds;
- Controls changes to the project baselines within the FPD's authority per the PEP and seeks Headquarters approval for changes beyond the FPD's authority;
- Ensures that the contractor's R&D, design, and procurement efforts produce in-kind hardware per the specifications in the various US/IO PAs;
- In concert with the US ITER Project Manager, communicates and coordinates with the IO and other DAs on the details of overall ITER construction project execution; and
- Approves administrative changes to the PEP and subproject PEPs, as needed.

7.8 US ITER Project Manager

The FPD implements the US ITER Project through the M&O contractor for ORNL (currently UT-Battelle, LLC), which is responsible for overall project coordination and execution. ORNL's US ITER Project Manager is assigned line management responsibility and authority for carrying out the US ITER Project in a manner consistent with this PEP and the M&O contract. This responsibility includes leadership of the partner laboratories (ORNL, PPPL and SRNL), along with authority and accountability for all project activities. Within the ORNL organization, the US ITER Project Manager reports directly to the ORNL Director. The Project Manager is responsible for the overall successful execution of the US ITER Project, including the following:

- Serves on the US ITER IPT;
- Completes the baseline project scope for SP-1 and SP-2 as described in Section 3.1 above, within their baseline completion schedules and TPCs;
- Defines and leads the contractor project organization, and manages day-to-day project execution activities;
- On a day-to-day working level, represents the USDA in dealing with the IO and the other six DAs;
- Supports the FPD in implementing DOE's project management processes, and communicates accurate and reliable project status and performance issues to DOE;
- Provides executive-level management of R&D, design, and fabrication/ procurement of hardware, payment of in-kind cash contributions to the IO, and ensures that all mission requirements are fulfilled in a safe, cost-efficient, and environmentally responsible manner;
- Implements an approved EVMS and provides monthly progress reports to the FPD;
- Proactively identifies and ensures timely resolution of critical issues within the contactor's control that impact project performance;
- Exercises full financial authority and accountability, as assigned by DOE, to develop budgets and control US ITER Project work within the approved subproject baselines and to control changes to the approved baselines in accordance with the established configuration management procedures;
- Identifies and proactively manages the project risks;
- Manages and directs procurements within the authority assigned by DOE, including the authority to execute and deliver subcontracts, agreements, teaming agreements, purchase

orders, assignments and instruments, and documents of any kind relating to the acquisition, sale, or disposition of products, services, materials, supplies, and equipment relating to and necessary and desirable for completion of the US ITER Project;

- Provides input on project documentation (e.g., the PEP and subproject PEPs) and on developing and maintaining the contractor project documentation;
- Ensures that the US ITER Project's ES&H and quality assurance goals are achieved;
- Maintains overall responsibility for hiring and managing the human resources necessary to complete the US ITER Project; and
- Maintains relationships with fusion research programs worldwide that are designing and operating similar tokamak facilities, and keeps abreast of potentially significant developments that could impact the US ITER Project.

7.9 Integrated Project Team

The US ITER Project will be managed through an IPT that is organized and led by the FPD. Besides the FPD, the core members of the IPT are the US ITER Project Manager and Deputy, and the US ITER Program Manager. The IPT is led and organized by the FPD. The IPT also includes other support members from the USIPO, OSO and DOE OR-ISC, as described in the IPT Charter provided in Appendix C.

7.10 Critical Interfaces and Roles and Responsibilities

Effective management of the US ITER Project requires smoothly functioning interfaces with many different domestic and international entities. This project is unique in many ways: The U.S. is only one of seven participating governments contributing both cash and in-kind hardware to construction of a major research facility in a foreign country that will be owned and operated by an international legal entity (the IO). Thus, there are many more interfaces to manage than in a typical SC construction project. These include interfaces between the USDA and the IO as well as among the seven DAs, interfaces among the DOE Program and Field offices and USIPO, and interfaces between the USIPO and its partner laboratories. The USIPO has responsibility for establishing agreements among the partner laboratories.

7.11 Domestic Agency Function and Delegation

Another aspect of interface management that is crucial for the overall success of this project is clear delineation of the roles and responsibilities among SC, OSO, OR-ISC and the USIPO, consistent with expectations and commitments made in the ITER JIA. DOE officially functions as the DA for the US ITER Project. Under DOE's direction, the USIPO is assigned responsibility and authority for managing the day-to-day activities related to planning, managing, and delivering the full scope of the US ITER Project. The USIPO's daily management of this project is consistent with provisions of the prime contract between DOE and UT-Battelle, LLC, and focuses on those matters considered to be within the project's scope, schedule, and cost baseline.

DOE considers this assignment of responsibilities and authority to be comprehensive in nature; hence, most of the USDA' responsibilities are delegated to the USIPO. However, DOE will decide on a case-by-case basis those situations where it deems exceptions to this approach are necessary.

7.12 Project Summary Schedule

The baseline schedule for SP-1, along with a comprehensive list of milestones and due dates, has been developed as part of the effort to prepare for approving an SP-1 Performance Baseline. This list is included in the SP-1 PEP for PME approval. A similar list, once developed, will be included in the SP-2 PEP when it is developed. Changes to these milestones are under the authority of the PME, the AD for FES, the US ITER FPD, and the US ITER Project Manager in accordance with the change control thresholds contained in Section 6.1.

7.13 Financial Management

Following approval of CD-2 for each subproject, annual budget requests will be submitted by FES in accordance with their respective baseline funding profiles. These requests will identify the funds needed for hardware design and procurement (including appropriate contingency), supporting R&D, and in-kind cash contributions to the IO. They will also include the construction cash contribution that was approved by the ITER Council for that year. All US ITER Project funds will be provided by FES to the USIPO at ORNL, which will in turn, make allocations to the partner laboratories, place subcontracts as necessary, and make DOE-authorized cash payments to the IO.

FES issues work authorization documents to the Field to initiate, continue, or redirect the project effort and to identify funds being allocated via an approved Financial Plan. These documents will be issued on an as-needed basis, but no less than annually. The FPD issues project work authorizations to the Project Manager to authorize work. These work authorizations identify the specific work to be performed by the contractor and specify the project funds available for project activities. Revised work authorizations are issued when new work phases or activities are to begin and when incremental funds are authorized.

8.0 PROJECT MANAGEMENT/OVERSIGHT

8.1 Risk Management

Risk management will be performed throughout the life of the US ITER Project. A complete methodology that describes the approach and processes to be used is documented in the US ITER Project Risk Management Plan (RMP). In addition to providing both a qualitative and quantitative evaluation of the risk items related to scope, schedule, and cost. The key risks related to the international interfaces are identified and evaluated to ensure successful project completion.

The US ITER Project Manager has overall responsibility for SP-1 and SP-2 project risk management. The activities required to implement the RMP are performed by the Deputy Project Manager, Project Risk Coordinator, Division Directors, and the WBS Team Leaders for performing detailed risk analyses, mitigation planning, performing periodic reviews, and maintaining the Risk Management Information System that contains the Risk Registry. The Risk Registry includes potential impacts and related mitigation plans for each identified risk. Continually monitoring and mitigating risks, when appropriate, throughout the life of the project and appropriately updating the risk register will result in the downgrading or retiring of risks.

Performance monitoring against the established mitigation plans is being done for risk elements as part of the monthly metrics and performance monitoring meetings. In addition, risk management issues and updates are also covered as part of regular weekly project team meetings and management meetings between the FPD and senior managers of the US ITER Project.

At this stage of the project, identified high-level risks to US ITER include:

- Timely deliveries of information and equipment from other DAs or the IO;
- Manufacture of first-of-a-kind, high-technology equipment; and
- Potential for further overall ITER project schedule slippage and cost growth (i.e., increases in construction cash contributions (Programmatic Risk)).

8.2 Project Reporting and Communication Management Plan

DOE management oversight will be exercised in accordance with SC project management procedures. Real-time project monitoring will take place using established mechanisms among the US ITER Project participants, such as frequent project team meetings and discussions, weekly management teleconferences and monthly topical IPT meetings (design status, fabrication status, etc.). When charged, OPA will conduct periodic IPRs of the project (see Section 8.4 below). The US ITER Program Manager will provide progress/status reports and briefings to the PME as required, as well as monthly project status briefings to SC-1 and SC-2. Formal project reporting on a monthly basis is in effect for the duration of the project in accordance with provisions of the SC exemption. In addition, the FPD and the US ITER Project Manager will conduct monthly metrics meetings as a regular, comprehensive assessment of the project's status.

The US ITER Project will issue the following project reports:

1. Monthly Project Status Report: The Project Status Report issued each month will contain the overview and assessment of the project by the US ITER Project Manager. The Project manager will supply details on the status of the technical work, significant accomplishments and problems, milestone schedule status, cost and schedule performance (e.g., earned value reporting), variances, and corrective actions, as needed.

   The Monthly Project Status Report will integrate all participants' input, with the exception of the FPD's overview and assessment. The report will be issued by the end of the month following the reporting month. For example, the March activity report will be available by the end of April.

2. Project Technical Report: Project technical reports will be issued to document special topical items.

3. Project Procurement Status Report: The Project Procurement Status Report will be updated and maintained in the US ITER Project's web-based information system and included in the monthly metrics report. The information will provide the status of major subcontracts and material procurements.

4. Annual Budget Submission: The USIPO will be required to provide information to support annual DOE budget preparations, to include that for the Project Data Sheet.

8.3 Earned Value Management System (EVMS)

ORNL (UT-Battelle) has a certified EVMS that complies with the American National Standards Institute/EIA-748 Standard, which is a UT-Battelle, LLC contract requirement. The project EVMS that has been implemented for US ITER is consistent with the site EVMS description document (with approved tailoring) that provides an objective measure of actual costs and schedule performance against the targets. This EVMS will continue to be used throughout the duration of SP-1 and SP-2 to evaluate progress against their respective Performance Measurement Baselines. Actual cost (invoices, cost transfers, and accrued costs) for work performed on the US ITER Project is accumulated by UT-Battelle, LLC, using standard, existing accounting procedures and systems.

8.4 Project Reviews

IPRs of the project status and management will be conducted prior to each subproject CD. These may be conducted jointly with other oversight organizations (e.g., PM) as appropriate. Also, in preparation for CD-2/3 for each subproject, an IPR will be conducted. Non-CD IPRs will be conducted semiannually. Results of these reviews are provided to the PME and FES AD. As discussed in Section 8.2, formal project reporting is required in accordance with the provisions of the SC exemption and this PEP. In addition, the FPD and the US ITER Project Manager conduct routine status meetings as a regular, comprehensive assessment of the US ITER Project status.

Design Reviews are an integral part of the project and are performed by individuals external to the project. For the US ITER Project, the IO organizes design reviews because it is the ITER Design Authority. The USIPO also performs its own design reviews on U.S. hardware subsystems as well as peer reviews in special topical areas on an as-needed basis.

8.4.1 Project Monitoring and Assessment

Monitoring and assessment of the US ITER Project occurs through routine IPT interfaces among the project participants (e.g., weekly conference calls among contractor management, the USIPO staff, and FES and OPA staff), IPT meetings, and OPA IPRs. The PME or FES AD may also charge ad hoc reviews on special topics as deemed necessary. Per Section 8.2, Monthly Project Status Reports are submitted to the US ITER Program Manager by the FPD.

8.5 Engineering and Technology Readiness

The project assesses engineering and technology readiness through design reviews, IPRs, and other independent technical reviews. In general, the US ITER Project tends to apply and/or extend existing technologies.

8.6 Alternative Analysis and Selection

As was previously described in Section l.3, an alternative analysis was performed as part of the Acquisition Strategy development process. The alternative selected at CD-1 and underscored in the May 2016 DOE Secretary's Report, was to participate in an international collaboration to build the next-step experiment for exploring the science of sustained burning plasmas and for demonstrating the scientific and technological feasibility of magnetic confinement fusion as a potential future energy source. Further details are contained in the *Acquisition Strategy for the U.S. Contributions to ITER Project*.

8.7 Environment, Safety and Health

Consultations on application of the National Environmental Policy Act (NEPA) requirements to the US ITER Project were held with SC; the Office of Health, Safety and Security; OR-ISC; the DOE Chicago Office; and the DOE Princeton Site Office. They jointly determined that NEPA applies to the activities of the US ITER Project (i.e., NEPA applies to the design, procurement, and manufacture of equipment for use at the ITER site, but does not apply to international ITER construction phase activities that will be conducted outside the U.S.). The US ITER Project was determined to meet the eligibility criteria for a Categorical Exclusion (CX) as stated in Title 10, Code of Federal Regulations, Part 1021, Subpart D, Appendix A. DOE OR-ISC managed development of a CX to assess the US ITER Project as a whole. The proposed action for OR-ISC and other participating DOE sites would be conducted under DOE's authority pursuant to the Atomic Energy Act, as amended. The CX determination for this proposed action was approved on December 7, 2006.

All USIPO personnel and contractors will plan, manage, and execute their respective duties consistent with the requirements of the UT-Battelle, LLC, Integrated Safety Management System (ISMS) and ensure that all U.S. in-kind hardware is fabricated and shipped in a safe, environmentally sound manner. Expectations for ES&H performance have been established in the ES&H Plan for this project.

The US ITER Project follows the existing, approved ISMS in place at ORNL and the other partner laboratories with respect to overall project safety management and performance of the work assigned to each of these laboratories.

8.8 Safeguards and Security

A security and vulnerability risk review was performed and the conclusion was that safeguards and security issues for this project are considered small and manageable with standard practices. No additional security requirements have been identified beyond the existing ORNL, PPPL or SRNL policies and procedures.

8.9 Systems Engineering

The IO is responsible for performing the systems engineering functions for the international effort to design and construct the ITER facility. The USIPO supports the IO in this regard, and uses a systems engineering approach to execute and manage the US ITER Project scope, including performing value management analysis and value engineering studies; specification

and design development, reviews and verification; risk analysis and management; and interface management activities.

8.10 Value Management

Value management is performed on the US ITER Project and integrated into the design review process to ensure that all essential functions required by the project scope are achieved at the lowest life-cycle cost consistent with safety, performance, reliability, and quality requirements. The US ITER Project Manager will make every effort to identify additional opportunities for value engineering that could improve value at reduced cost. These opportunities are continuously analyzed.

8.11 Value Engineering

Value Engineering (VE) studies will continue to be conducted throughout the design phase of the project, and are being extended into the procurement/fabrication phase. See the US ITER Value Engineering Plan for the VE approach. VE studies can lead to significant project cost savings and free resources to accelerate the project.

8.12 Configuration Management/Document Control

An essential element of project management systems is controlling changes to the project baselines and the implementation approach. This objective will be carried out through a hierarchy of change control levels, with progressively structured authority for approval and disapproval of changes. The DOE and contractor control levels for the US ITER Project are described in Section 6.1. As indicated there, Level 0 changes that would constitute a deviation to the performance baseline are under the control of the PME.

All requirements, design documents, and ITER project level change requests are maintained by the IO through the ITER Document Management System. Documentation related to US ITER and DOE are controlled in the US ITER Document Management System.

8.13 Vendor Management

Vendor management is being accomplished in a structured manner by implementing a set of administrative tools by experienced personnel over the entire scope and life cycle of the project. The objectives are to: 1) evaluate vendor performance, 2) identify issues in the early stages, 3) ensure appropriate mitigation steps are identified, implemented and completed, and 4) recognize and learn from positive and negative attributes of vendor performance.

The goal of the US ITER vendor management approach is to implement a set of processes that are disciplined, forward looking, and continuous. Those processes are described in more detail in US ITER Vendor Management Plans that are developed for major fabrication procurements.

8.14 Quality Assurance and Testing and Evaluation

The primary objective of the US ITER Quality Assurance (QA) Program is to ensure that the US ITER Project produces items and services that meet all requirements, while providing protection for workers, the public, and the environment. US ITER personnel are required to attend appropriate training to become familiar with the US ITER QA Program and related procedures, and implement them in their work processes.

It is the goal of US ITER Project management that this program meets or exceeds the expectations of DOE and the IO in order to meet the needs of the research staff that will use the ITER facility during its operation phase. This goal will be accomplished by incorporating proactive measures that ensure quality.

The QA program for the US ITER Project defines the QA requirements and implements the applicable requirements of DOE Order 414.1C (Quality Assurance). The US ITER QA Plan, which has been approved by the IO, is complete and consistent with provisions and requirements of the IO's QA Plan including French nuclear requirements. Each partner laboratory working on the US ITER Project works within its own QA Plan, which must be consistent with provisions and requirements of the US ITER QA Plan. The US ITER QA program is periodically assessed by the IO and OSO.

8.15 Transition to Operations

In accordance with the ITER JIA, the U.S. will participate in ITER's operations phase, which is envisioned to span a nominal 20-year period. The U.S. commitment during ITER operations consists of providing resources to the IO for personnel and facility operations. There will also be a US ITER Research Program that supports scientists and engineers who will participate (in person and remotely) in experiments on ITER. DOE will budget for the U.S. share of ITER operations as well as the scientific research program separately from the US ITER Project TPC. These remaining life-cycle costs have already been discussed in Section 4.0.

8.16 Project Closeout

Prior to CD-4 for SP-2, a Project Closeout Plan will be developed and implemented that will cover the following activities:

- Project lessons learned;
- How all PA obligations, products, services, and deliverables have been completed and accepted by the IO;
- How excess equipment and associated components will be properly dispositioned;
- How project team members will be informed that the work is complete and that they are no longer authorized to charge to the project accounts;
- How subcontractors/vendors are notified of the closeout, and how a formal request is submitted to ORNL Business Support Services to de-obligate balances and/or accrue outstanding costs and resolve/de-obligate balances (de-obligation and contract close out requires formal concurrence of vendors); and
- How costs associated with closed accounts must be cleared.

Some US ITER hardware manufacturing activities have already progressed to the point of generating tooling and equipment that is no longer needed. If individual vendor contracts do not already specify delivery of these items to USIPO or the IO, then the USIPO and DOE will determine the final disposition of the items on a case-by-case basis at the time of contract close-out.

The USIPO and the FPD will jointly develop a draft Project Closeout Report prior to CD-4 for SP-1, and 90 days after CD-4 has been approved, the FPD will submit an initial Project Closeout Report to the US ITER Program Manager in FES. The Closeout Report will contain the final cost of SP-1, subproject lessons learned, and performance achieved at SP-1 completion. Once all financial closeout activities have been completed the Final Closeout Report for SP-1 will be issued. A similar process will be followed for SP-2 at completion.

U.S. CONTRIBUTIONS TO ITER

PROJECT EXECUTION PLAN

Appendix A

Reference Document on Tailoring of the Project Execution Strategy

The Deputy Secretary of Energy
Washington, DC 20585
December 4, 2012

MEMORANDUM FOR WILLIAM F. BRINKMAN
DIRECTOR
OFFICE OF SCIENCE

FROM: DANIEL B. PONEMAN

SUBJECT: Management of U.S. International Thermonuclear Experimental Reactor Project

The purpose of this memorandum is to remove the subject project's designation as a capital asset project as defined by DOE Order 413.3B. Nevertheless, you are responsible to the extent practical to apply the Department's project management policies, principles, and processes to efficiently and effectively accomplish the U.S. ITER goals.

The ITER Project is being executed by an international collaboration of seven members consisting of the U.S., Russia, Korea, Japan, India, China, and the European Union to demonstrate the scientific and technological feasibility of fusion energy. The U.S. Government has committed, as a party to the ITER Joint International Agreement, to design, fabricate, and deliver in-kind hardware and provide cash contributions in support of this major international fusion project.

The U.S. ITER Project, established by the Office of Science (SC) to deliver the U.S. commitments, faces daunting technical, organizational, and fiscal challenges. However, the U.S. Government is not responsible for ITER project integration, system engineering, safety basis and licensing, civil construction, commissioning, and a host of hardware components to be provided by other members of the international collaboration. The ultimate owner is the ITER Organization located at the facility's site in Caderache, France. Therefore, the U.S. ITER Project does not fit the definition of a capital asset project.

The Office of Science has a proven record of successfully delivering complex projects, including critical contributions to other international science facilities. I commend SC, the U.S. ITER Project, and the Office of Acquisition and Project Management for their efforts in applying, to the extent practical, the Department's project management policies, principles, and processes. While you should continue to follow the essential project management principles underpinning DOE's project management system, I recognize that significant tailoring of requirements for the U.S. ITER Project's decision-making, baseline management, independent review, and reporting is necessary to efficiently and effectively accomplish the project goals.

I have confidence that SC will continue to manage the U.S. commitments in support of ITER, consistent with your demonstrated performance in the management of your capital asset project portfolio. We will continue to rely on your commitment to effective project management to advance the Department's mission and benefit the American people.

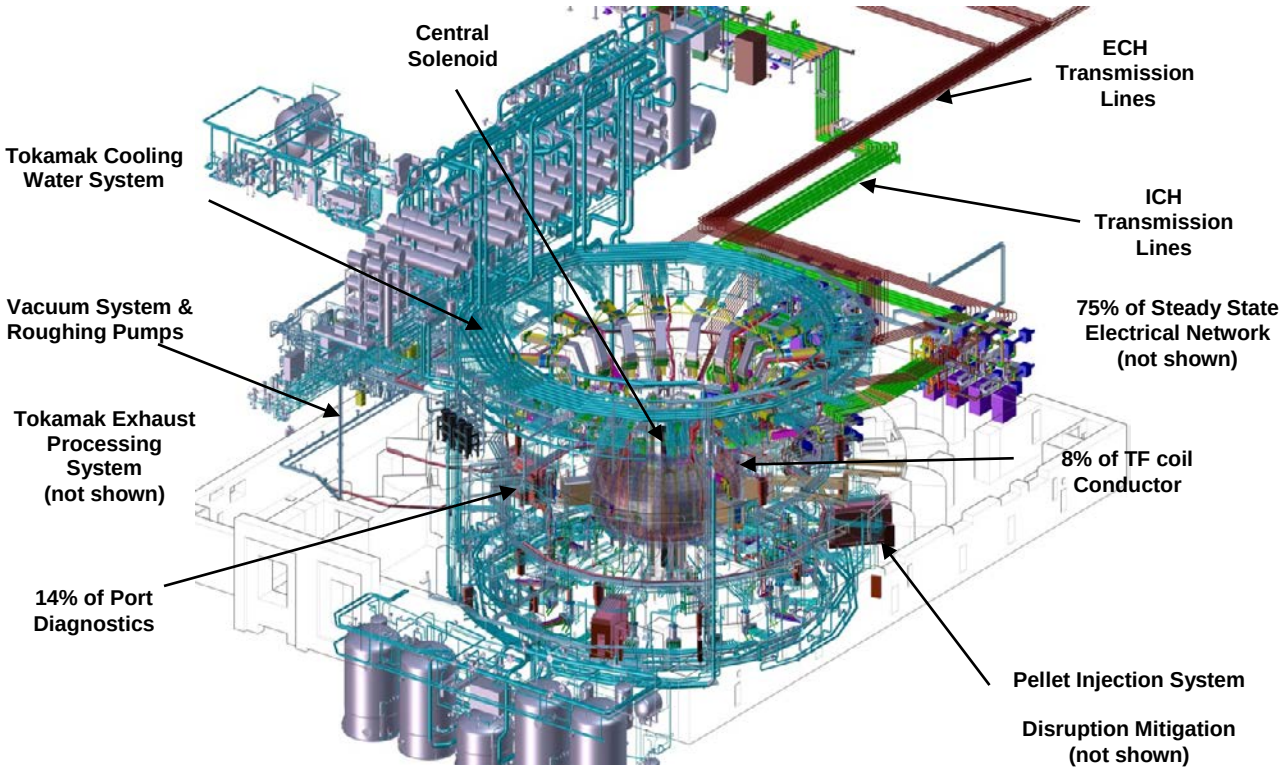
U.S. CONTRIBUTIONS TO ITER

PROJECT EXECUTION PLAN

Appendix B

Description of US ITER Hardware Contributions and Allocation of Scope Between Subprojects 1 and 2

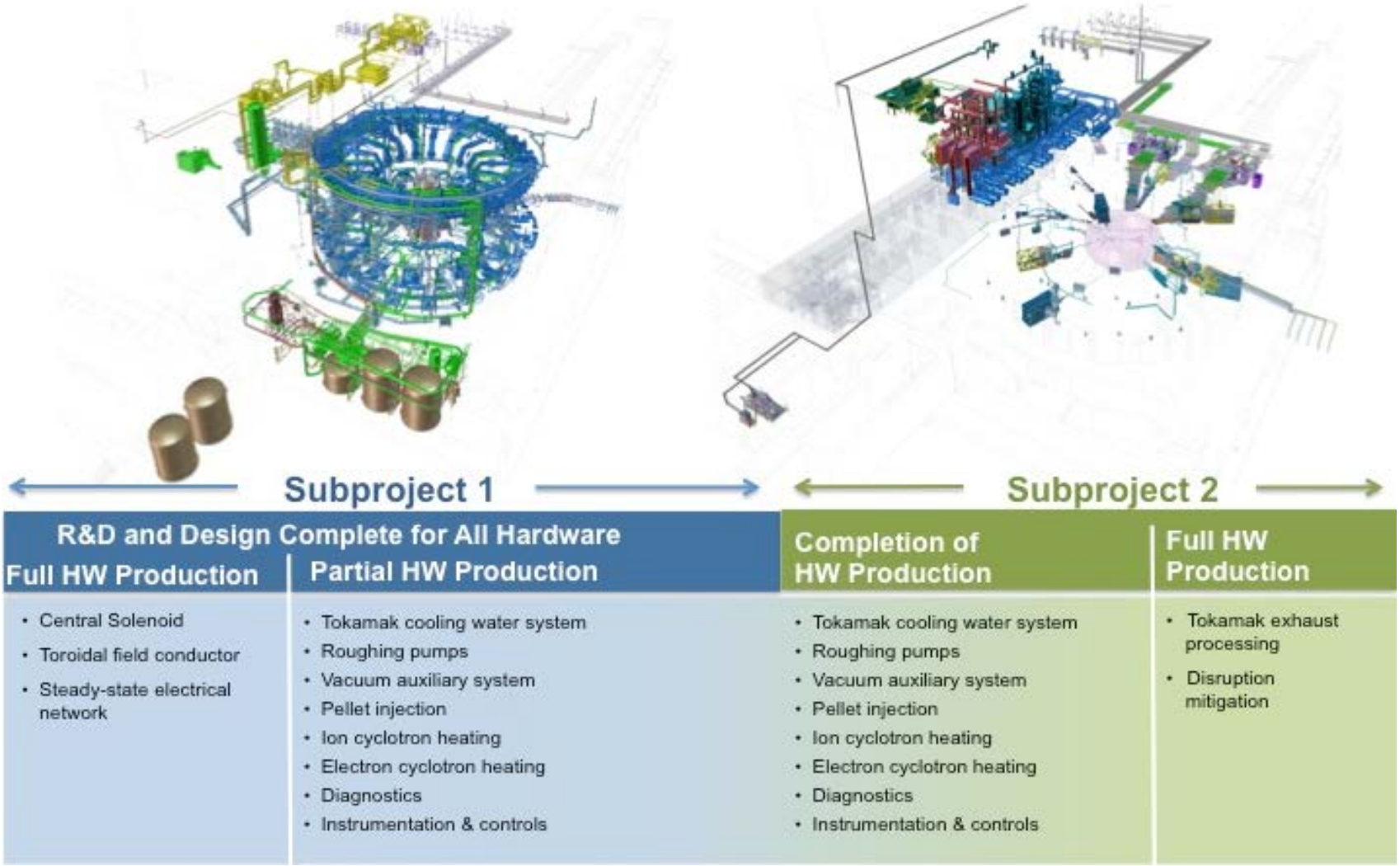
ITER Tokamak Showing U.S. Hardware Contributions



System/Subsystem	Subproject*	Description
Central Solenoid Magnet System	SP-1	Provide 7 (including spare) independent coil packs made of superconducting niobium-tin providing 13 Tesla at 45 kA, the vertical pre-compression structure, and assembly tooling.
Toroidal Field Magnet Conductor	SP-1	Provide 9 active lengths (~765m), 1 dummy length (~765m) for winding trials and 2 active lengths (~100m each) for superconducting qualification.
Steady-State Electrical Network	SP-1	Provide components for a large AC power distribution system (transformers, switches, circuit breakers, etc.) at high-voltage (400kV) and medium-voltage (22kV) levels.
Tokamak Cooling Water System	SP-1/SP-2	Provide major industrial components (heat exchangers, pumps, valves, pressurizers, etc.) capable of removing 1 GW of heat.
Diagnostics	SP-1/SP-2	Provide 4 diagnostic port plugs and 7 instrumentation systems (Core Imaging X-ray Spectrometer, Electron Cyclotron Emission Radiometer, Low Field Side Reflectometer, Motional Stark Effect Polarimeter, Residual Gas Analyzer, Toroidal Interferometer / Polarimeter, and Upper IR/Visible Cameras).
Electron Cyclotron Heating Transmission Lines	SP-1/SP-2	Provide approximately 4 km of aluminum waveguide lines (24 lines) capable of transmitting up to 1.5 MW per line.
Ion Cyclotron Heating Transmission Lines	SP-1/SP-2	Provide approximately 1.5 km of coaxial transmission lines (8 lines) capable of transmitting up to 6 MW per line.
Pellet Injection System	SP-1/SP-2	Provide injector system capable of delivering deuterium/tritium fuel pellets up to 16 times per second.
Vacuum Roughing Pumps	SP-1/SP-2	Provide a matrix of pump trains consisting of approximately 400 vacuum pumps.
Vacuum Auxiliary Systems	SP-1/SP-2	Provide vacuum system components (valves, pipe manifolds, auxiliary pumps, etc.) and approximately 6 km of vacuum piping.
Tokamak Exhaust Processing System	SP-2**	Provide exhaust separation system for hydrogen isotopes and non-hydrogen gases.
Disruption Mitigation System	SP-2**	Provide design, R&D, and some fabrication (up to a limit of $25M) for a system to mitigate plasma disruptions that could cause damage to the tokamak inner walls and components.

* SP-1 PEP describes SP-1 scope in detail.
** Design of the Tokamak Exhaust Processing and Disruption Mitigation Systems is in the scope of SP-1. Any costs >$25M for the Disruption Mitigation System will be the responsibility of the IO.

U.S. Hardware Contributions Assigned to SP-1 and SP-2



Confirmation of SP-1 Hardware

Route de Vinon-sur-Verdon - CS 90 046 - 13067 St Paul Lez Durance Cedex – France

Director-General

Ned SAUTHOFF
Project Manager
US ITER Project

St. Paul-lez-Durance, 25 July 2016

Subject: US hardware needed for First Plasma or First Assembly Sequence – Your Letter of 15 July 2016

Our ref.: DG/2016/OUT/0327 (THWMXQ)

Dear Ned,

Following your request to the ITER Organization (IO) asking for support for the establishment of the US ITER baseline, I am pleased to provide you with the following answers and inputs.

First Plasma Scope and Hardware Deferrals

The deliveries listed in the Annex "US Hardware Needed for First Plasma or First Assembly Sequence" have been validated:

- the list encompasses the First Plasma needs and is compliant with PBS Level 1 and 3 (FP to DT - PBS Level 1 (SNEEBR v2.0) and FP to DT - PBS Level 3 (SNE6G8 v2.0));
- no additional US-DA delivery is expected for the First Plasma configuration.

The conclusion is that the US-DA list is correct and complete, with the understanding that the list includes all the deliveries for First Plasma needs to IO site; deliveries to other DAs and those for further assembly phases are not included in this list.

I would like to inform you that some components identified as "US First Plasma Scope" could be installed after the First Plasma (e.g. some TCWS drain pumps and tanks) if needed and, if not installed during the first assembly phase, they will be stored at IO premises before installation on due time. This conclusion has been validated by the concerned IO Responsible Officers. Appendix 1 provides confirmation of the components required for First Plasma in more detail.

IO confirms that the deferral of the US in-kind hardware to the Operations Budget (Heating System Components, Diagnostic Components and TEPS) will be un-deferred, and the US will supply this hardware as part of their in-kind contributions for ITER Construction.

The impact of un-deferral on the US in-cash contribution for the period 2021 to 2024 will be as follows:

All figures rounded off to MEUR

	2021	2022	2023	2024
Before un-deferral – IC-18 figures	87	90	91	93
Considering un-deferral	84	86	88	90

ITER International Fusion Energy Organization. Phone: +33 (0)4 42 17 66 01; Fax: 33 (0)4 42 17 66 00

It should be noted that the IC-18 estimates including the figures for cash profile do not represent a baseline. This baseline is currently under finalization, and will likely have some changes, including the fact that the payment budgets for 2016-18 are not the same as those indicated in the IC-18 resource estimates.

Radiation and electronics

IO confirms that the electronics installed for First Plasma and up to DT operation in those areas needing ultimately radiation hard electronics can be conventional and neither shielding nor radiation hardening is required. Most electronic in B11 shall be moved into the shielded corners. If all presently planned improvements of shielding (without impacting the building) can be realized the shielded corners should allow the use of standard electronic. However, electronic used in port cells and in galleries during DT operation need to be radiation hard. In these conditions, the architecture needed for radiation hard electronics has to be installed from the very beginning in those areas. If shielding improvements cannot be fully utilized and thus in some shielded corners radiation is above the threshold for conventional electronics radiation hard solutions for critical electronic may have to be employed also in those areas before DT operation starts. Further details are provided in Appendix 2.
The meaning of conventional or standard electronics is that it is not radiation hard.

Fire temperatures

As for every nuclear facility, the fire loads will be limited room by room. A specific operating procedure will be imposed to the operation including the First Plasma.
The fire suppression systems have been already identified in the RPrS and in consistency with the ASN decision (decision 2014-DC-0417). Nevertheless, CDI calculations performed for the tokamak complex show in some rooms the maximum temperature can reach a temperature higher than 200 C. In that case, IO will provide fire isolation material to limit the maximum temperature below 200 C, allowing the required time to suppress the fire (manually or automatically). For First Plasma, manual suppression system will be installed largely in the tokamak complex for coactivity purposes and fire permits will need to be delivered.

Penetration requirements

The US assumption is correct for confinement purposes. Nevertheless, vacuum requirements could impose specific sealing requirements that will be the responsibility of each PBS. Concerning the confinement barriers belonging to PBS-62, the sealing of the penetration is indeed effectively the responsibility of PBS-62.
The overall leak rates of each confinement barrier are already specified in the Project Requirements and in the RPrS. These overall leak rates will be tested. The individual leak rate for each penetration will be specified by IO for design purposes but still the leak rate test will be performed on the complete barrier.

I hope these elements will give you the information you need for completion of the US ITER Project baseline up to First Plasma.

Yours sincerely,

Bernard Bigot
Director-General
ITER Organization

APPENDIX 1: List of Components Required for First Plasma

The following list identifies what is needed from functional point of view and what are the captive components at first Assembly phase.

System/ component	Functional need at FP & captive
Central Solenoid	Need for full magnet technical commissioning and as captive component in the cryostat
Toroidal Field Conductor	Need for First Plasma and Engineering Commissioning
Transmission lines of ECH upper launcher port #16 from B15 to port cell	Functional need for FP. Safety Isolation valves in port cells and gallery are not required.
ICH system PBS51 Transmission Lines penetrations in TKM B11 south wall level L1 (2 sets)	Captive at FP because of building services installation
Roughing Pumps (RP)	Provide rough vacuum in VV and cryostat.
Vacuum Auxiliary System	The whole Vacuum Auxiliary System piping layout is delivered and installed at Assembly phase 1 because of captive parts and because of functional needs according to many clients like Cryogenic system, VV, Cryostat, Heating systems, Fueling, etc.)
TCWS Drain Tanks	According to new VVPSS design, 3 drain tanks delivered by USDA are captive in the drain tank room. Functional need is for VV drainage. Note: The 5 tanks are already delivered on site.
VV-PHTS cooling loop	The VV-PHTS is required for baking and cooling of the VV during conditioning and FP plasma operation. The VV decay heat removal rescue system is required for IP in order to avoid freezing of the vessel.
TCWS Draining system	Required to drain the VV at any stage of the commissioning phase and probably after first plasma
TCWS Drying system	Required to dry the VV with gas at 200 C and for the baking/cooling of Equatorial and Upper plugs with gas.
TCWS IBED-PHTS piping	Installation of captive piping and skids with piping accessories.
Diagnostics EP#11 equipment's	(without RGA as provided by PBS31)
Pellet Injection System	Boundary of the vacuum barrier needed to be installed.
SSEN	Functional need for electrical distribution and power supply.

More details can be found in the following documents in IDM:
USDA First Plasma scope - Deliveries (TEJFJ2)
FP to DT - PBS Level 1 (SNEEBR v2.0)
FP to DT - PBS Level 3 (SNE6G8 v2.0)

The FP to DT – PBS Level 1 and Level 3 implement the outcome of the Configuration Workshop. They will be further updated as soon as the decisions on the top 5 issues identified during the Configuration Workshop are taken. The list of components to be delivered for assembly prior First Plasma is not impacted by the ongoing discussions and decisions on the top issues.

APPENDIX 2: Radiation and Electronics

The IO is working on a solution for the presently too high radiation on electronics in B11 once DT operation starts. As described below there will be different areas where different solutions have to be applied, namely from using standard electronics to full radiation hard. The following road map will be followed:

- End September updated radiation maps will be made available which will provide Neutron and Gamma radiation in B11 without any improvements, i.e. representing the present baseline.
- End August in CCB a PCR will be approved for implementation introducing two new documents, one for the policy on electronics in a radiation environment and one on electronics in an electromagnetic environment. These two documents which will be annexes to the PR will supersede the old policy on the above topics which had not correct thresholds for radiation levels for use of standard electronics.
- In the timeframe August / September a set of PCRs will be introduced which will improve the radiation conditions in B11 as outlined in the bullet points below with the boundary conditions to have no impact on the building construction, i.e. TB03 and TB04.
    - Improved shielding of bio shield plugs at level B1 to L2 to reduce the neutron streaming into the port cells by a factor 10^4
    - Utilise flexible hoses in the B1 port cells for divertor cooling pipes to allow strait pipes from the bio shield to the vertical shafts (reduction of water volume by ~factor 2), apply ~ 100mm shielding around these cooling pipes in order gain a factor 10 reduction on the neutron flux from water resulting in an overall reduction by factor 20.
    - Reduce neutron streaming along feeder penetrations in B2 and L3 by additional shielding, this concept is not yet fully developed and may take longer than the September timeframe
    - Introduce where possible dog legs on top of the vertical shafts in L3 pipe chase in order to reduce neutron streaming into the vertical shafts, this solution is not yet developed and may not be fully implementable
    - Improve the shielding in shielded corners by introducing a labyrinth made of boronized water in tanks or concrete to achieve factor 100 reduction of neutron streaming into the shielded corners.
- Within the November timeframe those of the above improvements which will be approved into the baseline will be the basis of an update of the radiation maps. The aim is to provide conditions suitable for standard electronics in most shielded corners and to relocate most of the electronic into these areas.
- Most likely further improvements on top of those we can approve into the baseline until end September (not the full list of above) will need to be made in order to achieve the goal of allowing standard electronics in shielded corners.
- Electronics which will have to stay in the port cells or in galleries have to be radiation hardened taking into account the radiation maps after improvement of the radiation conditions in B11.
- It is possible to work with standard electronics in all areas up to the start of DT operation; however, the architecture needed for the ultimate radiation hardened electronics has to be applied from the beginning.

In conclusion it will be most likely possible to use standard electronic in most shielded corners and thus only part of the electronics including sensors will need to be radiation hardened and this only before nuclear operation starts.

U.S. CONTRIBUTIONS TO ITER

PROJECT EXECUTION PLAN

Appendix C

Integrated Project Team Charter

Integrated Project Team Charter

1.0 PURPOSE

This charter defines and integrates the roles and responsibilities of the US ITER IPT, which is responsible for the completion of the US ITER Project for the Fusion Energy Sciences (FES) Program in the DOE Office of Science (SC). The charter constitutes the agreement among the IPT members as to how the subproject baselines will be managed, the coordination and cooperation that will be afforded to all team members, and the dedication of each team member to the success of the project. This charter embodies the three basic tenets of an IPT: (1) the Federal Project Director (FPD) is responsible and accountable for the overall success of the project, (2) the IPT is an advisory and implementing body to the FPD, and (3) direct communication is expected as a means of exchanging information and building trust.

This charter was prepared in accordance with the requirements of DOE Order 413.3B, *Program and Project Management for the Acquisition of Capital Assets*, and its implementation manual, DOE Manual 413.3-1, *Project Management for the Acquisition of Capital Assets*. The charter will be in effect until officially rescinded and will be updated by the FPD, as needed, to reflect any changes.

2.0 PROJECT DESCRIPTION

The ITER is an international research project with a programmatic goal of demonstrating the scientific and technological feasibility of fusion energy for peaceful purposes, an essential feature of which would be achieving sustained fusion power generation. ITER is a tokamak, which is a type of magnetic confinement device in which strong magnetic fields confine a torus-shaped plasma that consists of hot ionized gas of hydrogen isotopes (deuterium and tritium). The construction site is located at Cadarache in southern France.

The major elements of the tokamak are the superconducting electromagnetic field coils that magnetically confine, shape, and control the plasma inside a toroidal vacuum vessel. The Magnet System is comprised of Toroidal Field magnets, Central Solenoid magnets, external Poloidal Field magnets, and field correction magnets. The vacuum vessel is a double-walled structure. Inside the vacuum vessel, the internal, replaceable components (including the first wall modules, diverter cassettes, and port plugs that contain the plasma edge limiters, radiofrequency plasma heating antennae, and diagnostics) absorb the radiated heat and most of the neutrons from the plasma, thereby protecting the vessel and magnets from excessive nuclear radiation. The heat that is deposited in the internal components and in the vessel is removed by the Tokamak Cooling Water System. The entire tokamak is enclosed in a cryostat with thermal shields between the hot components and the cryogenically cooled magnets.

Briefly, the scope of the US ITER Project (subprojects 1 and 2) consists of the following:

1. “In-kind” hardware for 12 specific ITER subsystems or groups of components. This effort involves the design, fabrication, and delivery of designated hardware components that meet the ITER Organization’s (IO) design and performance specifications as defined in each of the 18 Procurement Arrangements between the U.S. Domestic Agency and the IO; and

2. Operation of the US ITER Project Office (USIPO) that manages and coordinates all activities of the US ITER Project.

3.0 INTEGRATED PROJECT TEAM

Authority and responsibility for managing all DOE programs and facilities resides with the Secretary of Energy. SC has been delegated responsibility for comprehensive, long-range, basic energy-related research, including state-of-the-art research facilities, crucial to achieving DOE's strategic goals. SC provides overall program policy and guidance, technical oversight, and budgets for implementing its assigned role. As already mentioned in Section 1.0, specific responsibility for the ITER Program has been assigned to FES, which provides funding for the US ITER Project directly to ORNL via approved Financial Plans. The US ITER Program Manager in FES relies on and uses SC and other Department organizations for support in execution of the project. DOE has assigned overall responsibility for planning and execution of the US ITER Project to the M&O contractor of ORNL, which is currently UT-Battelle, LLC. Accordingly, the M&O contractor is accountable to DOE for its performance in executing the project.

OSO provides day-to-day oversight of the project under the leadership of the US ITER FPD. An IPT comprised of the DOE, ORNL, and other laboratory participants, when appropriate, has been established to accomplish this project. ORNL has also established the USIPO that is responsible for coordinating and managing the execution of all US ITER Project scope and for building a strong interface with the IO. Specifically, the USIPO has overall responsibility for planning, design, R&D, and procurement of U.S. in-kind hardware, as well as providing the U.S. in-kind cash contributions to the IO. This section outlines the US ITER Project's organization and management approach.

DOE uses an integrated project teaming approach to manage projects. The IPT, organized and led by the FPD, is an essential element in DOE's acquisition process and is used during all phases of the project's life cycle. This team consists of professionals representing diverse disciplines with the specific knowledge, skills, and abilities to support the FPD in successfully executing the project. The IPT for the US ITER Project consists of members from both DOE and Oak Ridge National Laboratory (ORNL). The team membership may change as the project progresses from initiation to closeout to ensure the necessary skills are always represented to meet project needs.

The IPT:

- Supports the FPD;
- Develops and/or participates in project planning, baseline development, and contracting;
- Ensures that all project interfaces are identified, completely defined, and managed to completion;
- Identifies and defines appropriate and adequate scope, schedule, and cost parameters;
- Supports the preparation, review, and approval of project documentation, including those required for Critical Decisions;
- Reviews and assesses the project's performance and status against the established performance parameters, baselines, milestones, and deliverables;
- Identifies and resolves issues;

- Plans and participates in project reviews, assessments, and appraisals, as necessary;
- Reviews and evaluates baseline and funding change requests and supports the Change Control Boards, as requested; and
- Supports the preparation, review, and approval of project completion and closeout documentation.

Each member is responsible for supporting the project's performance, scope, schedule, cost, safety, and quality objectives; for identifying and meeting the project and contract commitments; and for maintaining communication with other IPT members. The IPT is comprised of three member groups (Executive, Core, and Support) with specific expectations for their responsibilities.

3.1 Executive Members

The Executive Members provide executive leadership to the US ITER Project and champion its success in their respective organizations. The Executive Members consist of the SC Associate Director for FES, the ORNL Site Office Manager, and the ORNL Laboratory Director. These members are responsible for ensuring that the necessary resources and support are provided and that needed approvals are provided in a timely manner.

3.2 Core Members

The Core Members provide the day-to-day leadership for the US ITER Project and consist of the FES Program Manager, the FPD, the US ITER Project Manager, and the Deputy US ITER Project Manager. The FPD serves as the IPT Leader.

<u>Federal Project Director</u> – The FPD's responsibilities are to:

- Lead the IPT, provide overall guidance, and delegate appropriate decision-making authority to the IPT members;
- Prepare and maintain this IPT Charter and operating guidance with IPT support;
- Keep the IPT and senior DOE management informed;
- Schedule and hold regular IPT meetings;
- Initiate development and implementation of key project documentation (e.g., the Project Execution Plan);
- Serve as the DOE Contracting Officer's Representative for matters pertaining to the US ITER Project;
- Serve as the single point of contact between Federal and contractor staff for all matters relating to the project and its performance. Maintain effective communications among SC, OR-ISC, the USIPO, and other cognizant DOE Site Offices;
- Oversee implementation of project cost, schedule, performance, and scope baselines;
- Provide day-to-day oversight of the project, anticipate potential problems, and take corrective actions to minimize potential delays and cost growth;
- Prepare and submit budget requests and funding documentation to the US ITER Program Manager for funds required to execute the project;
- Ensure that the US ITER Project complies with applicable environment, safety and health (ES&H) requirements, export controls, security requirements, public laws, regulations, and Executive Orders;

- Monitor and report on the performance of the project against established technical, cost, and schedule performance baselines, and monitor risk management planning and mitigation activities;
- Evaluate and verify reported progress. Make progress projections and identify trends;
- Proactively identify and ensure timely resolution of critical issues within Federal control that impact the project's performance;
- Approve changes in compliance with the approved change control process documented in the PEP;
- Participate in project reviews by DOE Headquarters and others;
- Facilitate external audits of the US ITER Project;
- Authorize the use of project contingency funds;
- Control changes to the project baselines within the FPD's authority per the PEP and seek Headquarters approval for changes beyond the FPD's authority;
- Ensure that the contractor's R&D, design, and procurement efforts produce in-kind hardware per the specifications in the various U.S.-IO Procurement Arrangements;
- In concert with the US ITER Project Manager, communicate and coordinate with the IO and other Domestic Agencies on the details of overall ITER construction project execution; and
- Serve on the ITER Management Advisory Committee, as requested by FES.

Program Manager – The US ITER Program Manager in FES plays a key role in providing programmatic guidance to the FPD and the IPT. The Program Manager's responsibilities are to:

- Serve on the US ITER IPT;
- Develop the US ITER mission need;
- Oversee development of project definition and objectives, technical scope, and budget to support mission need;
- Initiate development of the Acquisition Strategy before CD-1 (during the period preceding designation of the FPD);
- Budget for funds required to execute the project, prepare and coordinate project budget-related documents, and provide guidance to the FPD and USIPO regarding future project funding scenarios;
- In consultation with the FPD, issue monthly Financial Plan changes;
- Lead efforts to prepare for and support ESAAB actions, such as baseline development as needed for CD-2;
- Coordinate initial approval and approval of updates to the PPEP/PEP;
- Function as the central DOE Headquarters point of contact for project matters, such as the U.S. Domestic Agency interface with the IO, external audits, and export controls;
- Monitor and evaluate the project's technical, cost, and schedule performance through completion, and inform and advise the FES AD on major issues and facilitate their resolution;
- Facilitate the baseline change control process at the Headquarters level;
- Coordinate with the FPD, IPT, other FES program elements, other SC staff offices, as needed, to promote and expedite progress on the project;
- Coordinate with OPA to plan, organize, conduct, document, and report results of IPRs and other project reviews;
- Serve as the U.S. Government representative on the various ITER committees (e.g., MAC, Council Preparatory Working Group, Executive Project Board) as necessary;

- Serve as the US ITER Contact Person (or assign this role to another FES staff member);
- Carry out U.S. responsibilities within the ITER Test Blanket Module Program; and
- Foster relationships with members of the U.S. and international fusion science community.

US ITER Project Manager – The US ITER Project Manager at ORNL is the contractor official responsible and accountable for overall successful execution of the US ITER Project scope of work, including overall project management and ensuring that the project's objectives in terms of technical parameters, cost, and schedule are achieved in a safe and environmentally compliant manner.

The US ITER Project Manager's responsibilities are to:

- Serve on the US ITER IPT;
- Complete the baseline project scope (for subprojects 1 and 2), as described in Section 2.0 above, within their respective baseline completion schedules and TPCs;
- Define and lead the contractor project organization, and manage day-to-day project execution activities;
- On a day-to-day working level, represent the U.S. Domestic Agency in dealing with the IO and the other six Domestic Agencies;
- Support the FPD in implementing DOE's project management processes, and communicate accurate and reliable project status and performance issues to DOE;
- Provide executive-level management of R&D, design, and fabrication/ procurement of hardware, payment of in-kind cash contributions to the IO, and ensure that all mission requirements are fulfilled in a safe, cost-efficient, and environmentally responsible manner;
- Implement an approved Earned Value Management System and provide monthly progress reports to the FPD;
- Proactively identify and ensure timely resolution of critical issues within the contactor's control that impact project performance;
- Exercise full financial authority and accountability, as assigned by DOE, to develop budgets and control US ITER Project work within the approved baselines and to control changes to the approved baselines in accordance with the established configuration management procedures;
- Identify and proactively manage the project risks;
- Manage and direct procurements within the authority assigned by DOE, including the authority to execute and deliver contracts, agreements, teaming agreements, purchase orders, assignments and instruments, and documents of any kind relating to the acquisition, sale, or disposition of products, services, materials, supplies, and equipment relating to and necessary and desirable for completion of the US ITER Project;
- Provide input on project documentation (e.g., the PEP) and on developing and maintaining the contractor project documentation;
- Ensure that the US ITER Project's ES&H and quality assurance goals are achieved;
- Maintain overall responsibility for hiring and managing the human resources necessary to complete the US ITER Project; and
- Maintain relationships with fusion research programs worldwide that are designing and operating similar tokamak facilities, and keep abreast of potentially significant developments that could impact the US ITER Project.

The ORNL US ITER Deputy Project Manager reports to the ORNL Project Manager and oversees day-to-day management of the project.

3.3 Support Members

The Support Members are involved in the daily activities of the US ITER Project and have functions in project management, project controls, procurement, engineering, safety oversight, and/or business operations that are integral to the project. Because of the progressive and dynamic nature of a project, the personnel skill and knowledge mix will change throughout the project's lifecycle. Unexpected events and requirements may arise that require resources beyond that of the IPT. As such, the type and amount of personnel support will vary, and the IPT membership may change to incorporate the necessary skills and expertise. This flexibility allows the FPD to adapt the team to meet specific needs. The FPD and Core Members will identify those resource gaps and determine the timing and level of support needed. The Executive Members are responsible for ensuring that needed support is provided from their respective organizations.

For DOE, support will be provided by a number of organizations within OR-ISC and OSO. Key support members of the US ITER Project IPT include but are not limited to the following organizations: Procurement and Contracts, Legal, Budget, and Finance, and Human Resources.

3.4 IPT Scope of Effect and Limits of Authority

The IPT is governed by this formal charter, which defines the scope of effort and the items of authority. The roles and responsibilities of the IPT members are specified in this section (Section 3).

4.0 REQUIREMENTS

The IPT members assisted the FPD in preparing this charter. The FPD, in coordination with the US ITER Program Manager, will maintain authority for final decision-making and will communicate to the team the decision-making strategy used for specific issues.

The communications guidelines described below address how the IPT will operate.

4.1 Communications

<u>Communications Internal to the IPT</u>

- The FPD will communicate to the team the goals and purpose of the team and all issues related to successful team performance.
- The FPD will ensure that summaries are kept of all meetings and that appropriate documentation is created, maintained, and distributed. This responsibility may be delegated. Any IPT member is authorized to communicate with any other IPT member or support staff, as necessary, to accomplish and fulfill his or her roles and responsibilities. Communications between members of the USIPO and FES will include the FPD to the maximum extent practical.

<u>Communications External to the IPT</u>

- Communications external to the IPT are the responsibility of the Core Members.
- The FPD will ensure that adequate, frequent communication regarding DOE Policy and its impact on the project is delivered to the contractor in a timely manner.

4.1.1 Meetings

The IPT will participate in the following routine meetings to support the FPD:

<u>USIPO Weekly conference calls / Meetings and Monthly topical IPT Meetings</u>
The weekly Management call will be chaired by the FPD and the Project Manager and used to focus on project issues and resolution among the Core Members. Other members may be brought in as needed. Action items will be developed and tracked until resolution. Monthly topical IPT Meetings will be chaired by the FPD and will focus on performance / status / functional issues related to various functional areas of the project such as: design, fabrication, quality control, etc.

<u>Draft Agenda(s)</u>
- Key project updates since last week.
- Status of last week's action items.
- Identification of new issues requiring resolution and possible strategies.
- Coordination of upcoming information needs by the Core Members.

<u>Monthly Performance Metrics Review</u>
This meeting will be chaired by the US ITER Deputy Project Manager and will focus on scope, cost, and schedule performance to aid the FPD in project monitoring and reporting duties. The basis for the meeting will be the Contractor Monthly Project Report and supporting metrics tracking. The Deputy Project Manager and staff are responsible for organizing the meeting, keeping appropriate meeting records, and presenting performance information.

<u>Draft Typical Agenda</u>
- Presentation of contractor scope, cost, and schedule performance;
- Issues and corrective actions; and
- Risk management.

The FPD and the IPT may schedule other meetings, as needed.

5. RECORDS

The following records are generated by this charter and are retained:

- IPT Charter and subsequent revisions.

6. REFERENCES

- DOE Order 413.3B, *Program and Project Management for the Acquisition of Capital Assets*, U.S. Department of Energy, Change 2, May 2016.
- DOE Manual 413.3-1, *Project Management for the Acquisition of Capital Assets*, U.S. Department of Energy, March 28, 2003.

- *Acquisition Strategy for the U.S. Contributions to the ITER Project*, U.S. Department of Energy,2016.
- *Project Execution Plan for the U.S. Contribution to ITER, U.S. Department of Energy, 2016.*

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U.S. CONTRIBUTIONS TO ITER

PROJECT EXECUTION PLAN

Appendix D

Key Assumptions Memorandum

Department of Energy
Washington, DC 20585

August 22, 2016

MEMORANDUM FOR THE SECRETARY AND DEPUTY SECRETARY

FROM: Cherry Murray, Director - Office of Science

THROUGH: Franklin Orr, Undersecretary for Science and Energy

SUBJECT: U.S. ITER Project - Key Assumptions for Baselining First Plasma

MEMO TYPE: FEEDBACK REQUESTED

I'm writing to update you on the efforts to implement the management improvements for the U.S. Contributions to ITER (U.S. ITER) Project described in the May 16, 2016 ITER report to Congress. The May report stated the Department's intent is to remain a partner in the ITER project through Fiscal Year (FY) 2018; and to focus on efforts related solely on First Plasma (FP) through FY 2018. In addition, the report stated that DOE will establish a Performance Baseline for U.S. ITER FP.

The U.S. ITER project team is well on their way to restructuring the FP subproject, formulating required project documentation, preparing for independent reviews, and other actions necessary to baseline the FP subproject. In parallel, the Office of Science (SC) is coordinating with the Office of Project Management Oversight and Assessments (PM) and other staff organizations to meet your expectations to baseline the FP subproject before the end of the Administration. Part of this coordination included clarification of approach and roles and responsibilities that were implicit in the descriptions of management improvements.

Foremost, the U.S. ITER project has been, and will continue to be implemented in a manner that adheres to both DOE's project management principles articulated in DOE O 413.3B, and the successful standard practices established by SC for project management execution.

In support of the baselining effort described above, your approval is requested for the following key assumptions:

1. The Deputy Secretary is the Project Management Executive (PME) for the U.S. ITER Project. Critical Decision approvals will follow established Project Management Risk Committee and ESAAB processes.
2. The U.S. ITER project is classified as a *Major System Project*, but not as a *Capital Asset* (Memorandum attached).
3. With the intent to focus solely on FP, only the FP portion of the U.S. ITER project will be baselined at this point in time, and will be classified as a subproject.
4. The FP subproject consists of the following elements:
    a. completion of the design for all U.S. hardware contributions to ITER, both FP and Post-FP;

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b. completion of U.S. hardware components needed for FP or needed for the ITER construction sequence prior to Post-FP (e.g., embedded or captive piping or tankage); and

c. U.S. payments to the IO required to fulfill the 9.09% FP hardware commitment not met by the delivery of in-kind components in b).

5. Based on the maturity of ongoing FP subproject design and fabrication activities, PME approval will be requested for both Critical Decision (CD) CD-2, "Approve the Performance Baseline and CD-3, Approve Start of Construction/Execution".
6. Consistent with the May 2016 Report to Congress, cash contributions to ITER Organization to support the IO's design, assembly, installation and management of the international project are not included in the FP subproject scope.
7. Consistent with SC's implementation of DOE O 413.3B, SC's Office of Project Assessment (OPA) will conduct Independent Project Reviews with participation by PM; project performance will be reported in Project Assessment and Reporting System (PARS) II, and all documentation supporting CD approval will be submitted to PM.
8. Assessment of the CD-1 Cost Range "refresh" for the entire project (e.g., FP plus Post-FP and IO cash contributions) will be performed concurrent with the CD-2/3 IPR.
9. Prior to attaining CD-2/3 approval, current and/or planned subcontract activities for FP subproject hardware fabrication and design activities will not be suspended.
10. The *2028 First Plasma Construction Cost Profile* from the May Congressional Report will be used as the notional profile for baseline planning purposes. Adjustments to this profile may be necessary as the detailed cost and schedule estimates are finalized to support baselining the FP subproject.

Approved: _____ SEP 2 9 2016
Ernest J. Moniz, Secretary — Date

ATTACHMENTS:

- Dec 4, 2012 Memorandum from Deputy Secretary on U.S. ITER project management.

REVIEWED BY:

- Paul Bosco
- John MacWilliams
- Stephen Meador
- Joseph Hezir
- Edmund Synakowski